ISUZU

Bellett & Wasp

Chassis

Workshop Manual

ISUZU MOTORS LIMITED

TOKYO, JAPAN

Workshop Manual

for

Bellett & Wasp

Chassis

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INTRODUCTION

This Manual has been compiled to assist Isuzu Distributors and Dealers in the efficient repair and maintenance of the chassis and body of the Isuzu Bellett and Wasp.

The Isuzu Bellett is a sport type sedan of high performance made exclusively available by the excellent engineering staff of this company with years of experience in the production of a wide variety of automobiles with the latest equipment and facilities, while the Wasp finds extensive applications in all fields of transportation.

Proper care, maintenance and servicing are the most important key to maintain the automobile in optimum operating condition and to minimize the maintenance cost.

This manual includes as many photographs and illustrations as possible and so arranged as to furnish the Isuzu Motor Servicemen with the point-by-point, easy-to-understand maintenance procedures.

The reference values given herein are subject to change when amendments dealing with design modifications are made so that revised service standards which may be issued from time to time should be used to obtain most up-to-date information.

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SPECIFICATIONS

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PART I SPECIFICATIONS

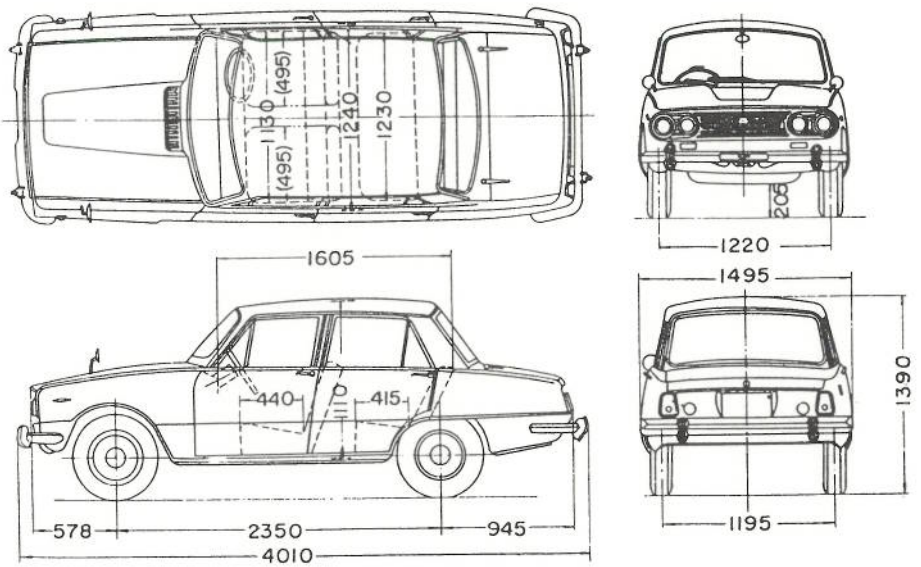
Bellett 1500 4-door deluxe

Bellett 1600 GT

Bellett 1800 Diesel

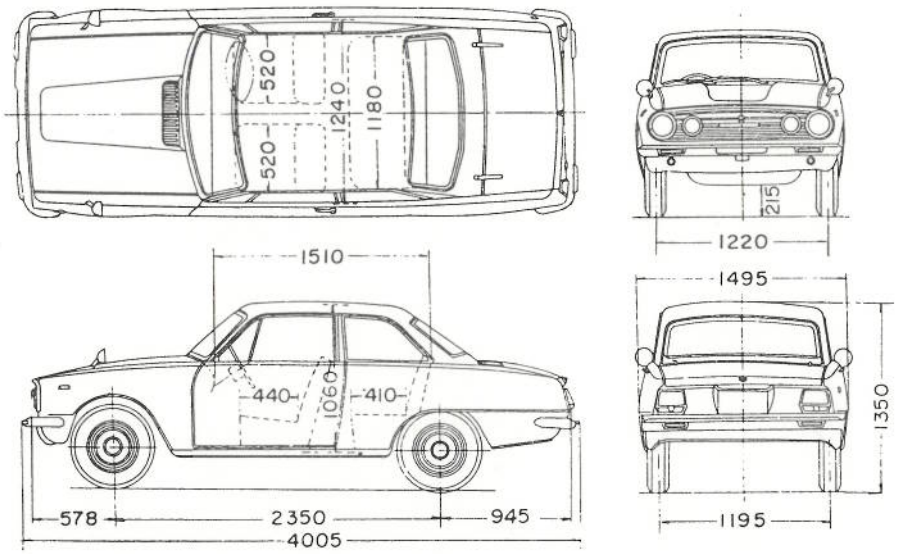
Vehicle dimensions PR series

Bellett 1500 4-door deluxe

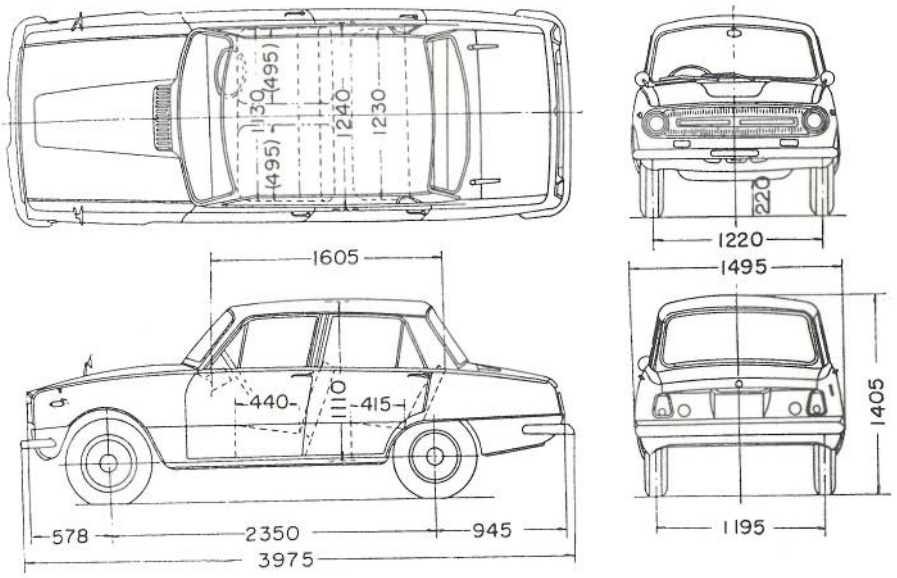


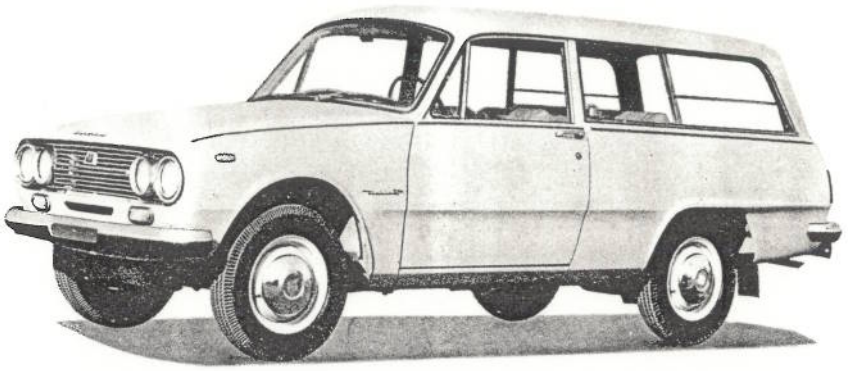
Note: The figures represented by dotted lines and those in parenthesisses are for model with front bucket seats.

Bellett 1600 GT

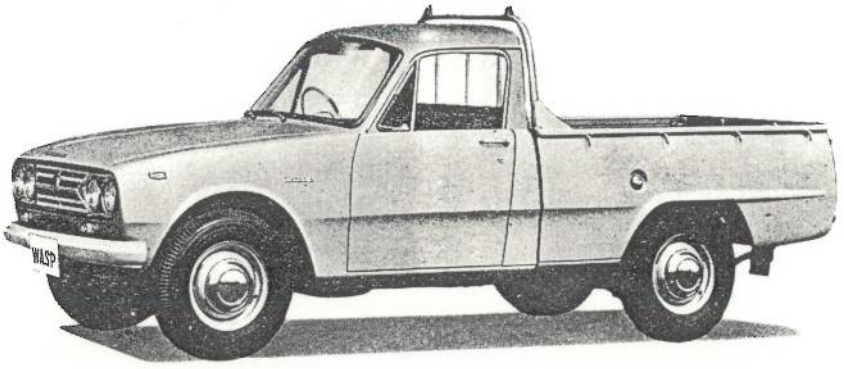


Bellett 1800 Diesel



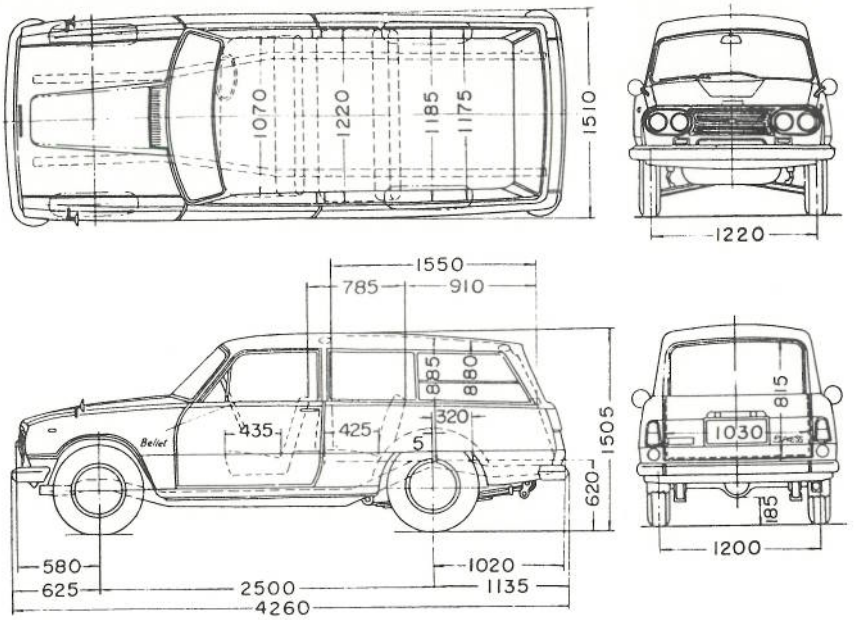


Bellett Express

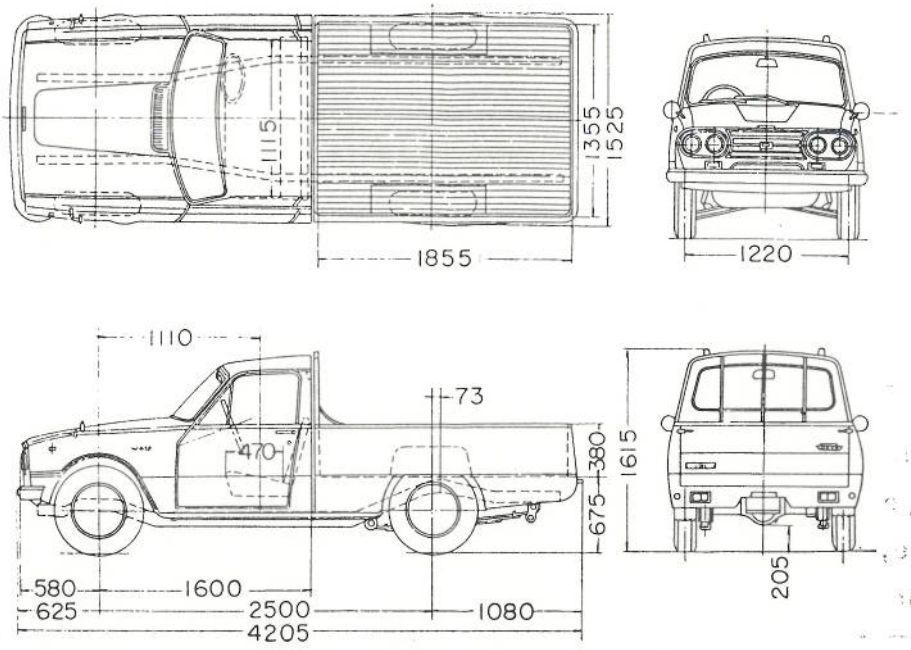


Wasp

Bellett Express



Wasp



General spesification PR, KR series

	Bellett		Bellett	
	PR20D	PR20	PRD10D	PRD10
Dimensions				
Overall length	4010	3975	4010	3975
width	1495		Same as left	
height	1390		Same as left	
Wheelbase	2350		Same as left	
Tread (track) front	1220		Same as left	
rear	1195		Same as left	
Min. ground clearance	205		Same as left	
Weights (kg)				
Vehicle weight front	515	505	580	510
rear	415	410	425	420
total	930	915	1005	990
Gross vehicle weight	*1205	*1190	*1280	*1265

* Including weight of 5 occupants each weighing 55 kg.

Performance		
Max. speed (km/h)	145	100
Climbing ability (sin θ) with G.V.W.	0.401	0.406
Min. turning radius (mm)	5000	5000
Engine		
Model	G150C	C180
Clutch		
Type	Dry single plate	Same as left
Size, outside diameter mm	203	Same as left
Total frictional area cm^2	312	Same as left

Bellett 1600GT PR90	Bellet Express KR10V	Wasp KR10	Wasp KR20	Wasp KRD10
4005	4260	4205	Same as left	Same as left
1495	1510	1525	Same as left	Same as left
1340	1505	1615	Same as left	Same as left
2350	2500	2500	Same as left	Same as left
1245	1220	1220	Same as left	Same as left
1195	1200	1200	Same as left	Same as left
205	185	205	Same as left	Same as left
515	585	585	Same as left	645
420	555	455	Same as left	455
935	1140	1040	Same as left	1100
*1155	1800	2400	Same as left	2400
155	115	116	131	100
0.427	0.346	0.242	0.246	0.246
5000	5200	5200	5200	5200
G160	G130	G130	G150	C180
Same as left	Same as left	Same as left	Same as left	Same as left
Same as left	Same as left	Same as left	Same as left	Same as left
Same as left	Same as left	Same as left	Same as left	Same as left

	Bellett		Bellett	
	PRD20D	PR20	PRD10D	PRD10
Clutch spring				
Number of spring	9		Same as left	
Spring constant (kg/mm)	2.12		Same as left	
Fitting load (kg)	37.7		Same as left	
Free length (mm)	57		Same as left	
Fitting length (mm)	39.2		Same as left	
Transmission				
Type	4 speed; synchromesh on 2nd, 3rd and 4th 3 speed; synchromesh on all forward gears (option)			
	Standard	optional	Standard	optional
Gear ratio 1st	3,746	3,263	3,746	3,263
2nd	2,320	1,631	2,320	1,631
3rd	1,508	1,000	1,508	1,000
4th	1,000	—	1,000	—
Reverse	4,994	4,395	4,994	4,395
Oil capacity ( )	1.9		1.9	
Propeller shaft				
Structure	Hollow steel pipe		Same as left	
length x outside dia. x inside dia. (mm)	1177x63.5x60.2		Same as left	
Front suspension				
Type	Independent		Same as left	
Toe-in (mm)	3		Same as left	
Camber	1°30'		Same as left	
Caster	30'		Same as left	
King pin angle	7°30'		Same as left	

Bellett 1600GT PR90	Bellett Express KR10V	Wasp KR10	Wasp KR20	Wasp KRD10
Same as left	Same as left	Same as left	Same as left	Same as left
3.52	1.93	Same as left	Same as left	2.38
52	34	Same as left	Same as left	41.5
53.5	56.8	Same as left	56.7	Same as left
Same as left	Same as left	Same as left	Same as left	Same as left
3.444	4.449	Same as left	Same as left	Same as left
2.133	2.991	Same as left	Same as left	Same as left
1.387	1.656	Same as left	Same as left	Same as left
1.000	1.000	Same as left	Same as left	Same as left
4.593	5.132	Same as left	Same as left	Same as left
Same as left	Same as left	Same as left	Same as left	Same as left
Same as left	Same as left	Same as left	Same as left	Same as left
1087x63.5x60.2	Same as left	1249x63.5x60.2	Same as left	Same as left
Same as left	Same as left	Same as left	Same as left	Same as left
Same as left	2～4	Same as left	Same as left	Same as left
Same as left	10	Same as left	Same as left	Same as left
Same as left	1°30'	Same as left	Same as left	Same as left
Same as left	7°	Same as left	Same as left	Same as left

	Bellett PRD20D / PR20	Bellett PRD10D / PRD10
Spring (coil)		
free length x wire dia. (mm)	367 x 14	Same as left
Spring (torsion bar)		
length x dia. (mm)	—	—
Shock absorber	Hydraulic telescopic double-acting	Same as left
Rear suspension		
Type	Independent	Same as left
Spring (leaf)		
L x W x T (mm) - Nos	Transverse 969 x 50 x 6 - 1	Same as left
Spring (coil)		
free length x wire dia. (mm)	285 x 14	Same as left
Shock absorber	Hydraulic telescopic double-acting	Same as left
Differential		
Type	Single reduction, hypoid	Same as left
Reduction ratio (to 1)	Model '65 3,778	Same as left
	Model '66 3,727	Same as left
Tire and wheel		
Wheel and rim	4-1/2-J x 13	Same as left
Tire front	5.60-13.4 P.R.	Same as left
rear	5.60-13.4 P.R.	Same as left

Bellett 1600GT PR90	Bellett Express KR10V	Wasp KR10	Wasp KR20	Wasp KRD10
Same as left	—	—	—	—
—	796x20.5	Same as left	Same as left	796x21.1
Same as left	Same as left	Same as left	Same as left	Same as left
Same as left	Conventional	Same as left	Same as left	Same as left
Same as left	1200x 60x6-4 / 50x11-1	1200x60x 6-4 / 12-1	Same as left	Same as left
Same as left	—	—	—	—
Same as left	Same as left	Hydraulic telescopic double-acting	Same as left	Same as left
Same as left	Same as left	Same as left	Same as left	Same as left
Same as left	5.125	Same as left	4.556	4.100
Same as left	4-Jx14	4-1/2-Jx14	Same as left	Same as left
Same as left	5.50-14, 6P.R.	6.00-14, 6P.R.	Same as left	Same as left
Same as left	5.50-14, 6P.R.	6.00-14, 8P.R.	Same as left	Same as left

	Bellett		Bellett	
	PRD20D	PR20	PRD10D	PRD10
Air pressure				
front (kg/cm^2)	1.4		Same as left	
rear (kg/cm^2)	1.4		Same as left	
Brake; service				
Type, front	Drum Uni-Servo		Same as left	
rear	Drum Leading/ trailing		Same as left	
5				
Lining size (WxTxL - mm)				
front	3.71x4.8x$^{158\ P}_{204\ S}$		Same as left	
rear	3.71 x 4.8 x 195		Same as left	
Master cylinder inside dia. (mm)	19.05		Same as left	
Wheel cylinder inside dia. (mm)	Ft. 22.22 Rr. 19.05		Same as left	
Brake; hand				
Type	Internal expanding on rear wheels		Same as left	
Steering				
Type	Rack & Pinion		Same as left	
Wheel diameter	400		Same as left	
Wheel revolving turns (from lock to lock)	3		Same as left	
Steering angle inninner	36		Same as left	
outer	33		Same as left	

Bellett 1600GT PR90	Bellett Express KR10V	Wasp KR10	Wasp KR20	Wasp KRD10
Same as left	1.7	1.7	Same as left	Same as left
Same as left	3.2	4.3	Same as left	Same as left
Disc	Drum Duo-Servo	Same as left	Same as left	Same as left
Same as left	Same as left	Same as left	Same as left	Same as left
Friction pad 45x15.2x60	50x5x 244P / 279S	Same as left	Same as left	Same as left
Same as left	50x5x279	Same as left	Same as left	Same as left
Same as left	19.0	Same as left	Same as left	Same as left
Cariper cyl. 57.15	22.22 / 19.05	Same as left	Same as left	Same as left
Same as left	Same as left	Same as left	Same as left	Same as left
Same as left	Recirculating ball	Same as left	Same as left	Same as left
390	410	Same as left	Same as left	Same as left
Same as left	Same as left	Same as left	Same as left	Same as left
Same as left	29°05'	Same as left	Same as left	Same as left
Same as left	25°50'	Same as left	Same as left	Same as left

PART 2

CLUTCH

CONTENTS

PART 2 CLUTCH

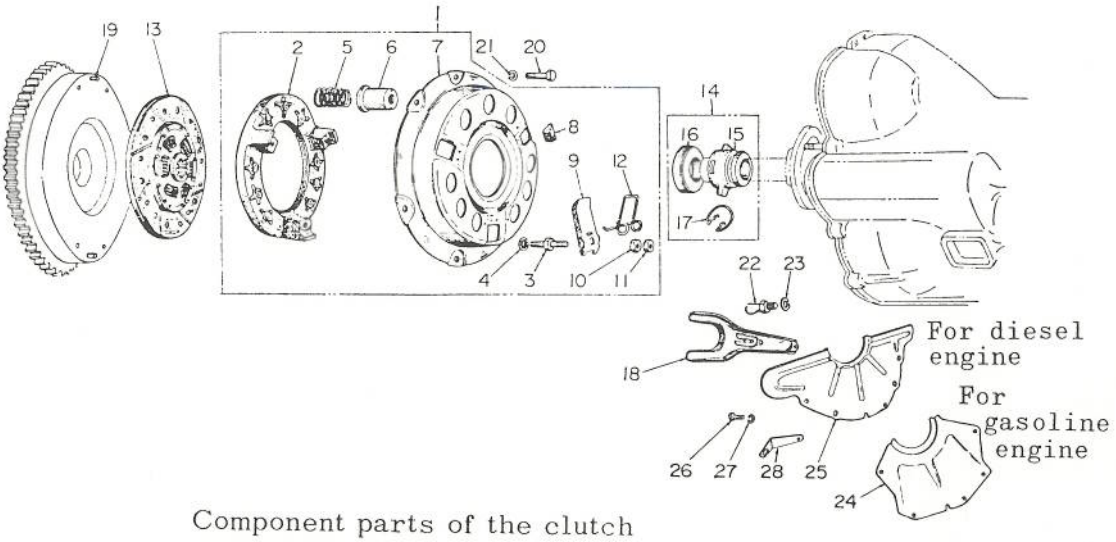
Clutch data

CLUTCH DATA

Item \ Model	PR20, PRD10	KR10	KRD10
Type	Single dry plate	"	"
Facings			
Outside diameter x inside diameter (mm)	203 x 146	"	"
Width x thickness (mm)	28.5 x 3.5	28.5 x 4	"
Driven plate thickness (mm)	(when released) 8.8 ± 0.2	"	"
	(when pressure applied) 8.0 ± 0.2	"	"
Number of damper spring	6	"	"
Operation	Mechanical	Hydraulic	"
Release lever setting height (mm)	(From the cover mounting face of flywheel) 57 ± 1	"	"
Clutch spring			
Number of springs and spring constant (kg/mm)	9 x 2.38	9 x 1.93	9 x 2.38
Fitting load (kg)	41.5	34.0	41.4
Free height (mm)	56.7	56.8	56.7
Length as fitted (mm)	39.2	"	"
Color marking	Pale blue	Yellow	Pale blue

Fig. 1

Clutch assembly in exploded view



Component parts of the clutch

Fig. 2

1. Pressure plate assembly
2. Pressure plate
3. Pressure plate stud
4. Lock washer
5. Clutch spring
6. Clutch spring case
7. Clutch cover
8. Release lever support
9. Release lever
10. Release lever nut
11. Lock nut
12. Release lever spring
13. Driven plate assembly
14. Shift block assembly
15. Clutch shift block
16. Clutch release bearing
17. Shift fork spring
18. Withdraw lever
19. Straight-pin
20. Bolt
21. Spring washer
22. Withdraw lever support
23. Spring washer
24. Cover (for gasoline engine)
25. Cover (for diesel engine)
26. Bolt
27. Spring washer
28. Spring eye

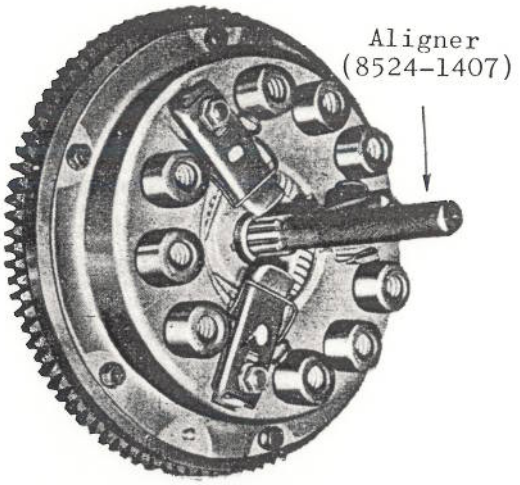
Disassembly, reassembly and inspection

DISASSEMBLY OF THE CLUTCH PRESSURE PLATE ASSEMBLY

Essential tools should be used for the disassembly and reassembly of the pressure plate assembly.

1. Remove the transmission from the clutch assembly.

2. Detach the pressure plate assembly from the flywheel. The pressure plate assembly is dynamically balanced integrally with the crankshaft and flywheel and therefore, it is advisable to mark the flywheel and clutch cover to facilitate re-assembling them to their original positions. The use of the essential tool; aligner (8524-1407) facilitates the disassembly work.

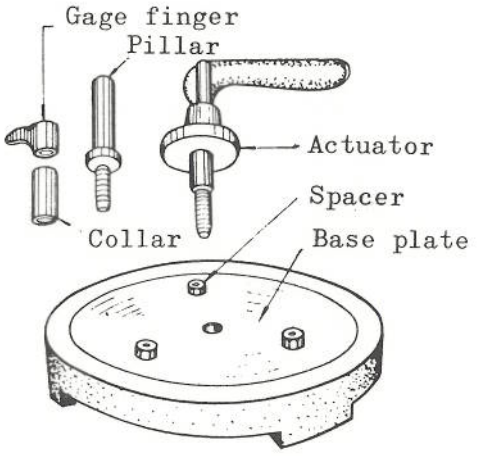


Detaching the clutch assembly

Fig. 3

3. Independent of flywheel and other associated parts, the pressure plate assembly is also dynamically balanced and reposition of the component parts causes the balance to be lost. To avoid this, it is advisable to mark the relative position of the release lever and pressure plate stud, clutch cover and pressure plate to facilitate reassembling them to their original position.

4. Use the essential tool; clutch jig (8522-0023) for the disassembly of the clutch. Mount the spacer on the base plate. (See Fig. 4)

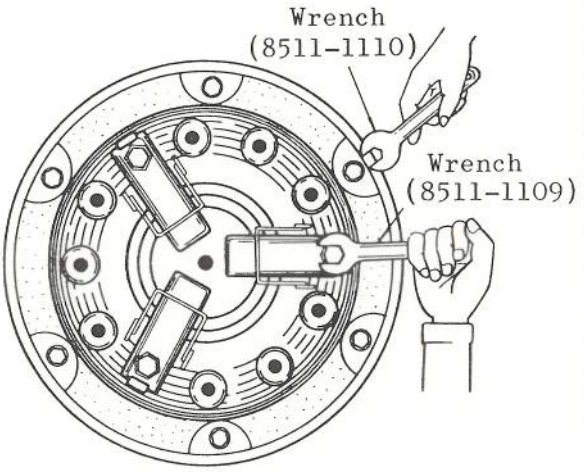


Clutch jig assembly
(8522-0023)

Fig. 4

5. Place the clutch assembly over the spacer and align the mounting holes in the clutch cover with the threaded holes in the base plate. Then, tighten the clamp bolts evenly.

6. With use of the wrenches (8511-1109) and (8511-1110), turn loose the locknuts and adjusting nuts. Then, detach the release lever springs and remove the release levers. (Fig. 5)



Detaching the clutch cover

Fig. 5

7. Turn loose the clutch cover clamping bolts gradually, a little at a time, in the sequence alternate with the bolts diagonally positioned.

REASSEMBLY AND ADJUSTMENT OF THE PRESSURE PLATE ASSEMBLY

Reverse the disassembling procedures for reassembling. Note that the marks on the parts are properly aligned and the component parts are refitted to their original positions.

Clutch assembly

Fig. 6

1. Mount the spacer on the base plate and place the pressure plate over the spacer. Then, fit the clutch springs to their respective positions.

2. Put the cases over the clutch springs and align the clutch cover with the pressure plate noting the setting marks previously applied. Check to make sure that the clutch springs are in up-right position.

3. Mount the release levers to the pressure plate studs and fit the adjusting nuts, lock nuts and release lever springs into their respective positions.

4. With the clamping bolts, fasten the clutch cover with the base plate by tightening each bolt a few turns in progression in diagonal sequence until they are all tight.

5. Properly align the height of the release levers and clamp the stud nuts semi-tight.

6. Fit the actuator; clutch jig (8522-0023), into position and move the lever about ten times in vertical direction to facilitate the parts to fit snugly into their respective positions. (See Fig. 7)

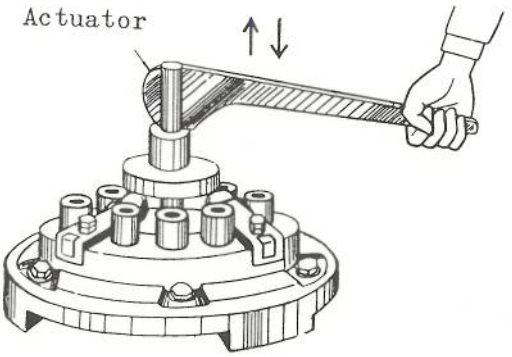
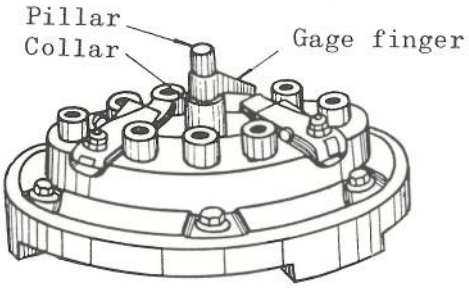


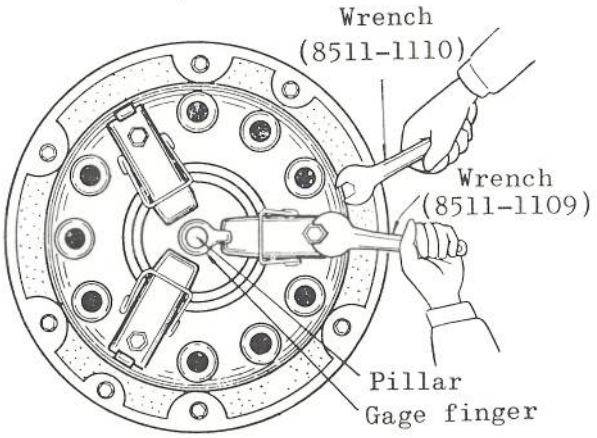
Fig. 7

7. Remove the actuator and fit the pillar and gage finger in place. Then, adjust the height of the release levers with the use of wrenches (8511-1109) and (8511-1110). (See Figs. 8 and 9)



Measuring the height of release levers

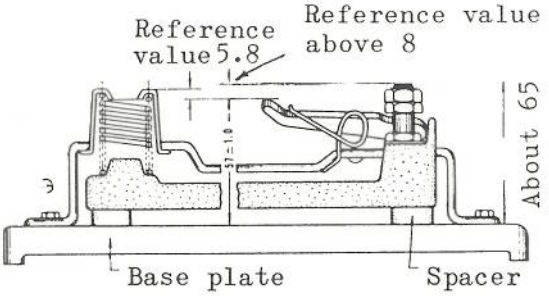
Fig. 8



Adjusting the height of release levers

Fig. 9

8. The use of 8mm-spacer adjusts the height of the release levers to 57mm. With the release lever adjusting nuts, adjust the height of the release levers until the lower face of the gage finger comes in light contact with the upper face of the release levers.



Reference values for clutch adjustment

Fig. 10

9. Upon completion of adjustment, refit the actuator into place and move the lever several times in vertical direction. Then, recheck the height of the release levers.

CHECKING THE COMPONENT PARTS OF THE CLUTCH

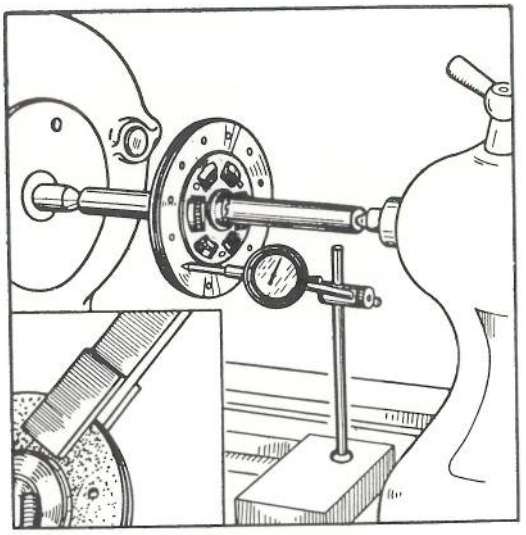
1. Put a test bar through the spline in the clutch driven plate assembly and then fit this into a lathe for measuring the play in the spline and deflection on the facing. (See Fig. 11)

   a. Play of the spline in its rotational direction

   If the play is in excess of 2.0mm when measured on the periphery of the driven plate, the parts should be replaced.

   b. Deflection of the driven plate

   If the side deflection of the driven plate measured at portion close to the periphery is in excess of 1.0mm, it should be rectified or the parts replaced. A special tool as indicated in Fig. 11 is necessary for proper rectification of the driven plate deflection.



Measuring the driven plate deflection

Fig. 11

2. Clutch facing

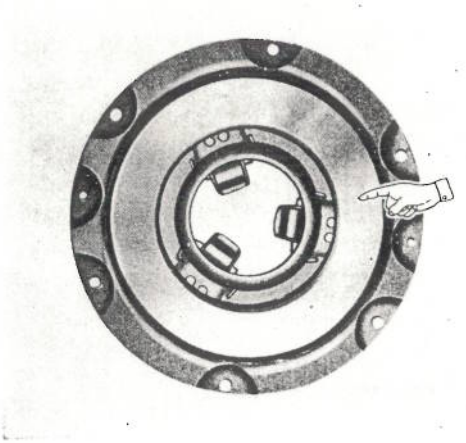
   a. If the clutch facing is worn and the subsidence of the rivet heads is less than 0.2mm, the clutch facing should be regarded due for replacement. (Fig. 12)

Accessing the serviceability of the clutch facing

Fig. 12

b. Loosened rivets, enlarged or damaged rivets holes also require replacement of the clutch facing.

c. Clutch facing with lubricating oil penetrated through the parts should also be regarded due for replacement. When the clutch facing is allowed to come in contact with grease or other contaminant, clean the surface immediately and rub the surface lightly with a cloth soaked with gasoline.



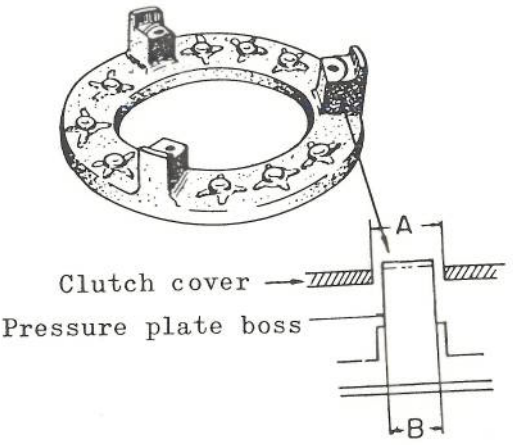
Checking the clutch pressure plate

Fig. 13

3. Clutch pressure plate

a. The mating surface of the clutch pressure plate which comes into direct contact with the facing should be smooth. Carefully check the clutch pressure plate for scores, scratches or partial wear and make necessary correction with emery cloth. When the pressure plate is to be turned down in a lathe, the reduction in the thickness of the pressure plate should be held within 1mm. (Fig. 13)

b. The bosses on the pressure plate are extended through the openings in the clutch cover and snugly fitted under the rear end of the release levers and are subjected to sliding mode of operation. Wear or damage on the sliding part of the boss causes the returning action of the release levers uneven or permits the pressure plate to come into contact with the clutch cover and leads to operating failure. Parts with serious damage or with clearance between A and B exceeding 1mm for wear should be replaced. (Fig. 14)



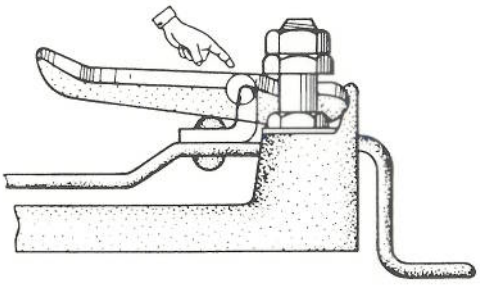
Checking the pressure plate boss

Fig. 14

c. Making the release lever adjustment through the check hole with the clutch assembly mounted in automobile often leads to pressure plate stud loosening. Therefore, release lever adjustment should not be made in such a manner. Make sure to examine the release lever stud for looseness whenever clutch disassembly is effected.

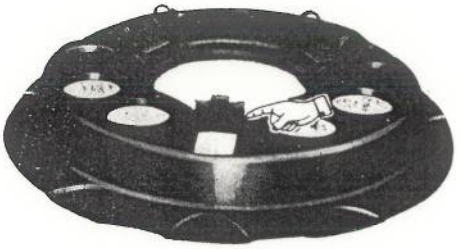
4. Clutch cover

The support of the knife edge which assumes a fulcrum on which the release lever is operated is secured in place by means of rivetting. Cracking or wear in the knife edge will result in malaligned release lever height and lead to clutch dragging. (Figs. 15 and 16)



Checking the knife edge on the support

Fig. 15



Checking the clutch cover

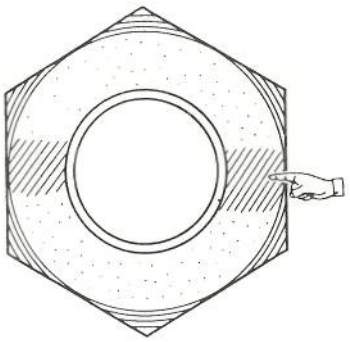
Fig. 16

5. Nuts

These nuts are casehardened for maximum protection against wear or damage, yet they are subject to wear during the clutch operation. The use of the clutch with partially worn nuts accelerates the wear of the nuts resulting in the maladjusted release lever height and further leads to partial dragging of the clutch. To prevent such trouble, the nut with partial wear in the contacting portion should be regarded due for replacement. (Fig. 17)

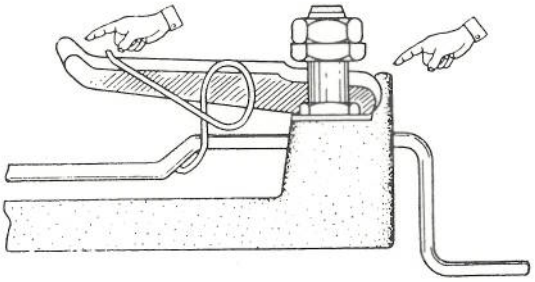
6. Release levers

Carefully examine the tip end, rear end and the fulcrum of the release lever for evidence of wear or crack and make necessary replacement. (Fig. 18)



Checking the nut wear

Fig. 17



Checking the release lever for wear

Fig. 18

7. Crankshaft bush

The crankshaft rear end bush is fabricated with self-lubricating alloy which include 4% of lubricant. However, excess wear in the bush results in the driven plate deflection and causes failure in clutch engagement, slipping or chattering and further gives influence upon the transmission. To prevent such trouble, the crankshaft bush should be carefully examined for wear when the clutch disassembly is effected.

8. Clutch spring

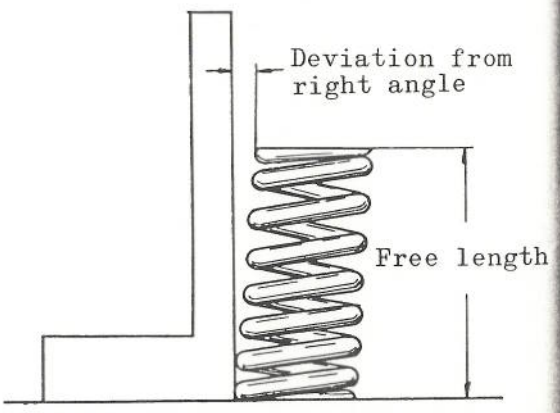
Check the clutch springs for aging, deformation or breakage against the following items and replace the springs if they fall within the items.

a. If the reduction in free length is in excess of 3%.

b. If the reduction in fitting load (when compressed to 39.2mm) is in excess of 15%.

c. If the angle of deviation is greater than 5mm per 100mm of length. (Fig. 19)

d. Broken spring



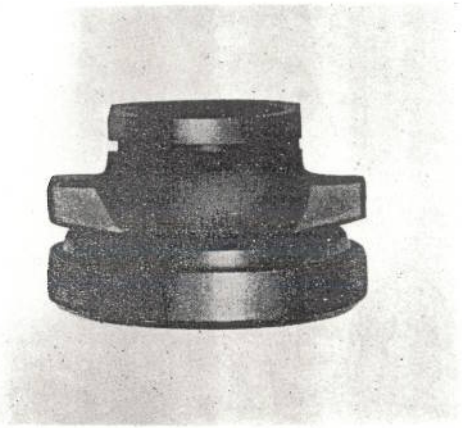
Checking the clutch spring

Fig. 19

9. Release bearing

Sealed-ball bearing is used for clutch release bearing to eliminate subsequent lubrication. Wipe the bearing clean with a cloth and check the working surfaces of the bearing for scores, damages or scratches and make necessary replacement. Also check the bearing for undue noise and excess play by spinning it with fingers and make necessary replacement. (Fig. 20)

CAUTION: The release bearing is filled with special grease for efficient self-lubrication and therefore, it should not be cleaned in detergent oil.

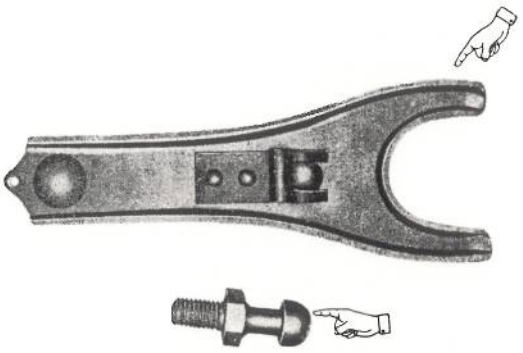


Checking the release bearing

Fig. 20

10. Clutch withdraw lever

Check the support contacting face and clutch shift block contacting face for wear and replace the parts if necessary. (Fig. 21)



Inspecting the withdraw lever and support

Fig. 21

REFITTING THE PRESSURE PLATE ASSEMBLY

1. Clean the crankshaft bush carefully and apply small amount of grease. Carefully clean the contacting face of the flywheel to remove all traces of grease or other contaminant.

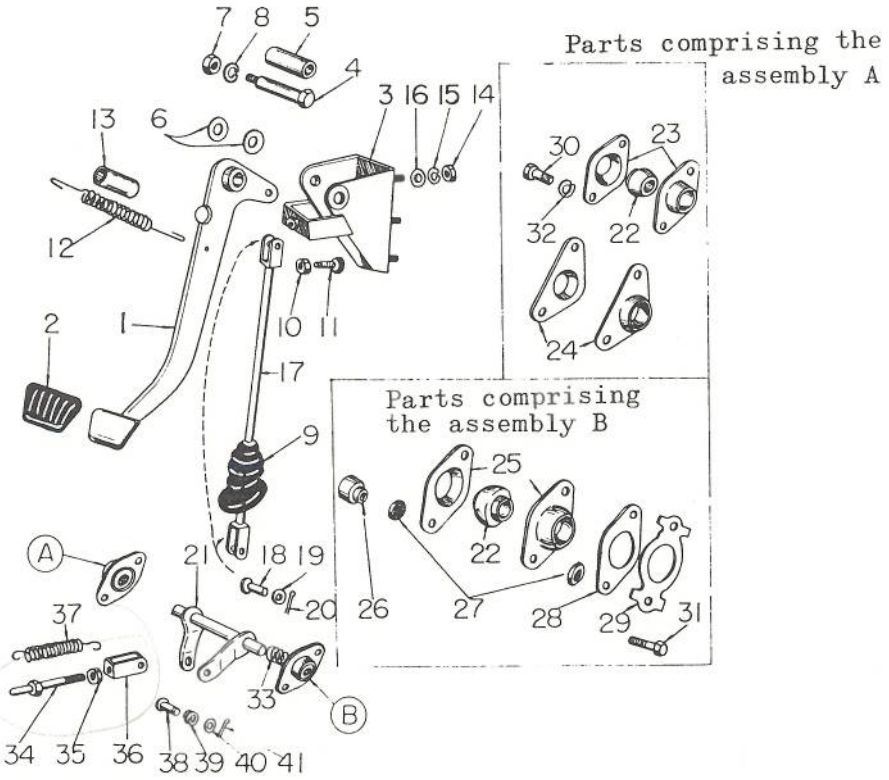
2. Clean the mating surface of the pressure plate. Then, align the punch marks applied prior to disassembly of the parts and refit the pressure plate into place together with the driven plate while matching the straight pins with the corresponding holes

in the clutch cover. The use of aligner (8524-1407) facilitates the work and help obtain best result.

3. Tighten each setting bolt a few turns in progression in diagonal sequence until they are all tightened to specified torque. The clutch cover set bolt tightening torque is 2.1 m-kg.

Clutch control (Mechanical)

THE CLUTCH CONTROL IN EXPLODED VIEW



Component parts of the clutch control

Fig. 22

1. Clutch pedal
2. Rubber pad
3. Pedal fulcrum bracket
4. Fulcrum pin
5. Fulcrum pin bush
6. Washer
7. Nut
8. Spring washer
9. Clutch control grommet
10. Nut
11. Checking bolt
12. Return spring
13. Rubber tube
14. Nut
15. Spring washer
16. Plain washer
17. Link
18. Pin
19. Plain washer
20. Split pin
21. Idle lever
22. Bush
23. Bush retainer
24. Bush retainer
25. Bush retainer
26. Distance piece
27. Rubber washer
28. Special washer
29. Lock washer
30. Bolt
31. Bolt
32. Spring washer
33. Idle lever spring
34. Push rod
35. Nut
36. Jaw
37. Withdraw lever spring
38. Pin
39. Double-coil spring
40. Plain washer
41. Split pin

DISASSEMBLY

1. Remove the spring from the withdraw lever and turn loose the lock nut on the push rod. Then, shorten the working length of the push rod in the manner illustrated in Fig. 23.

2. Remove the pin from the joint connecting the link rod with the idle lever. (Fig. 24)

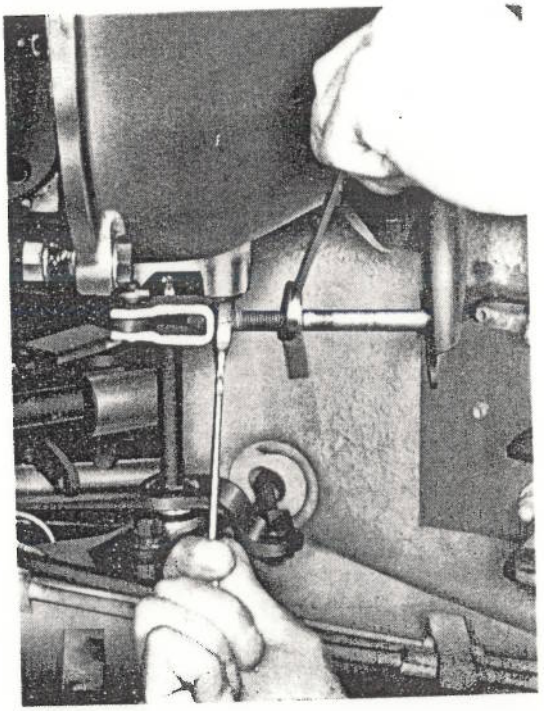


Fig. 23

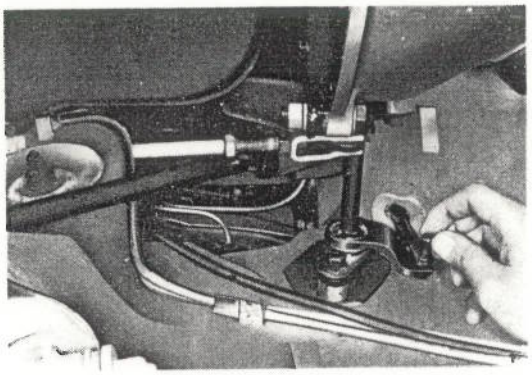


Fig. 24

3. When the retainer fixing bolt in the transmission side is removed, the idle lever can be disconnected. (Fig. 25)

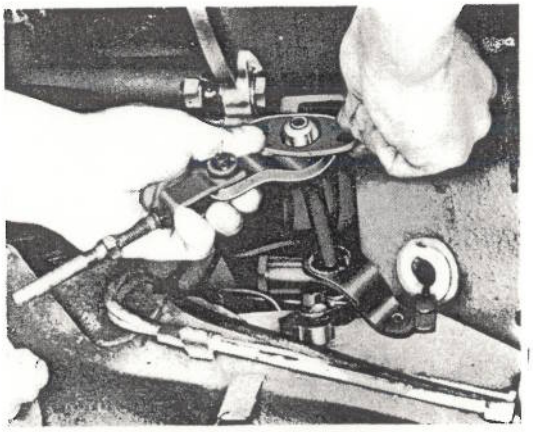


Fig. 25

4. Remove the retainer situated in the side of the body side member. (Fig. 26)

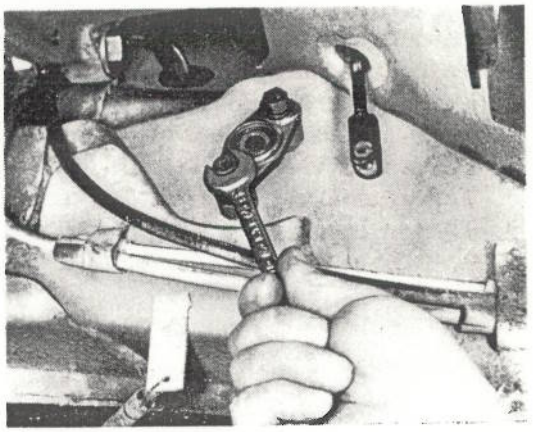


Fig. 26

INSPECTION

1. Bush and retainer

Wear in the contacting faces of the bush and retainer causes the noise to develop when the clutch is in operation. Hence the parts with considerable wear should be replaced. (Fig. 27)

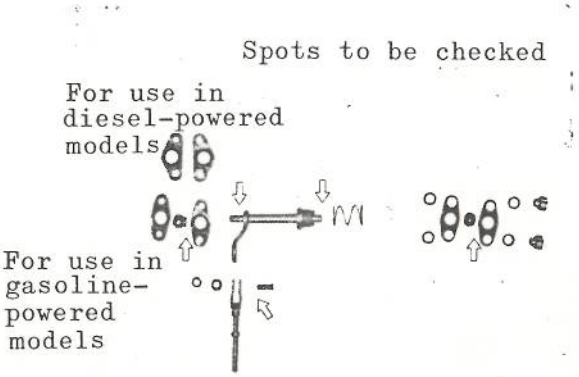


Fig. 27

2. Idle lever

If the part of the idle lever that comes into contact with the bush indicates excessive wear, the idle lever should be replaced. (Fig. 27)

3. Check pin and pin hole in the individual joint for wear and replace the joint if stepped wear is noted. (Fig. 27)

CAUTIONS TO BE OBSERVED WHEN REASSEMBLING THE CLUTCH CONTROL

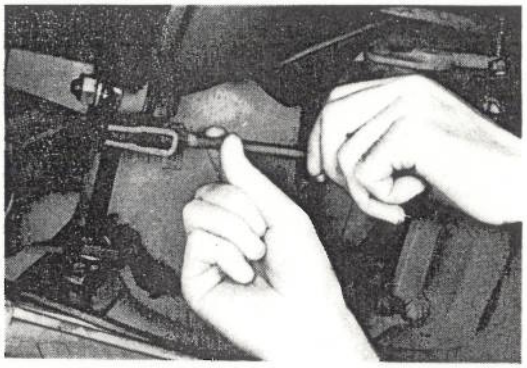
1. Reverse the disassembling procedure and note the following:-

a. Fit the retainer over the bush and check to make sure that there is no excess play between these parts. Then, grease contacting portions of these parts.

b. Spring washers are fitted to the retainer setting bolts in the transmission side while the lock plates are used to secure the retainer setting bolts in the body side member side so that the lock plates should be bent down to keep the bolts from being turned loose.

ADJUSTING THE CLUTCH PEDAL PLAY

1. Remove the return spring and turn loose the lock nut on the push rod. Then, pull the withdraw lever rearward with fingers until the release lever comes into contact with the bearing. (Fig. 28)



Adjusting the clutch pedal play

Fig. 28

2. Make adjustment by lengthening the push rod until it comes into contact with the withdraw lever and give it 1-2/3 ~ 1-3/4 turn back. (This adjustment gives about 1.5mm of clearance between the release lever and bearing). The clutch pedal should be provided with 20 - 30 mm of free play if adjustment is properly made.

3. When correct adjustment is obtained, tighten the lock nut securely and hook the spring back into place.

Clutch control (Hydraulic)

... Master cylinder in disassembled view

... Removing the master cylinder

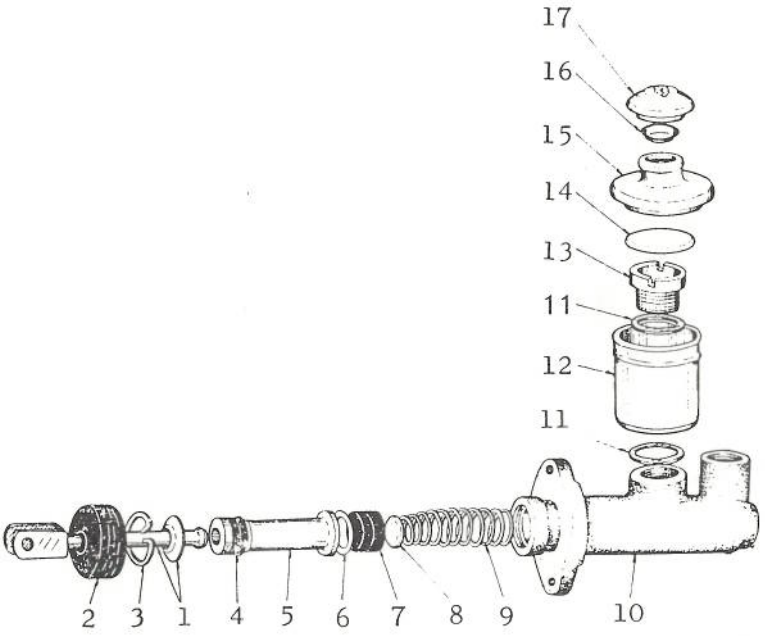


Fig. 29

1. Push rod
2. Boot
3. Circlip
4. Secondary cup
5. Piston
6. Spacer
7. Primary cup
8. Retainer
9. Return spring
10. Body
11. Washer
12. Oil reservoir
13. Adapter
14. Float
15. Cap
16. Buffle plate
17. Oil filler cap

REMOVING THE MASTER CYLINDER

1. Disconnect the oil pipe from the master cylinder.

2. Pull out the fulcrum pin from the pedal and disconnect the push rod from the pedal.

3. Take out the master cylinder fixing nuts on the dash panel in the engine compartment and remove the master cylinder.

DISASSEMBLING THE MASTER CYLINDER

1. Take out the rubber boot and circlip, and remove the push rod assembly.

2. Take out the piston, spacer, primary cup, retainer and return spring from the master cylinder in the order mentioned.

INSPECTING AND REPAIRING THE MASTER CYLINDER

Refer the subparagraph "Brake master cylinder" for detailed information.

REASSEMBLING AND REFITTING THE MASTER CYLINDER

1. Clean the internal part of the master cylinder and all the component parts, and refit return spring, retainer, primary cup, spacer and piston into the master cylinder in the order mentioned.

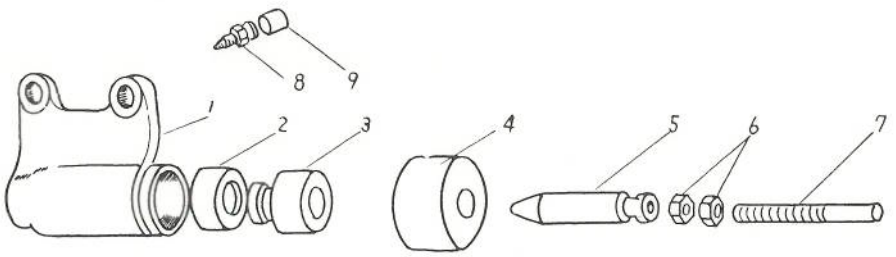
2. Reset the push rod and secure it in position with circlip. Refit the rubber boot correctly into position. Broken circlip and master cylinder with damage, score or scuffing should be replaced.

3. When the master cylinder in reassembled, depress the piston and release the finger pressure and see if the piston returns to original position smoothly with the return spring force.

4. Refit the master cylinder and connect the push rod to the clutch pedal.

5. Connect the pipe to the slave cylinder.

6. After the master cylinder is refitted, bleed the control system. (Refer the subparagraph "Slave cylinder" for correct bleeding procedure.)



1. Body
2. Piston cup
3. Piston
4. Boot
5. Push rod
6. Nut
7. Rod end
8. Bleeder
9. Cap

Slave cylinder in exploded view

Fig. 30

REMOVING THE SLAVE CYLINDER

1. Remove the return spring.

2. Take out the slave cylinder fixing bolts and remove the slave cylinder.

3. Disconnect the pipe from the slave cylinder.

DISASSEMBLING THE SLAVE CYLINDER

Take out the boot and pull out the piston. For removing the piston, choke the bleeder hole with finger and blow breath into the cylinder through the pipe joint hole. Care should be taken to prevent the piston from falling out. If this operation fails to remove the piston, lay a cloth or other suitable cushion on the work bench and hole the slave cylinder on it and lightly knock the slave cylinder. The piston cup should be renewed whenever the slave cylinder is disassembled.

REASSEMBLING THE SLAVE CYLINDER

Carry out the work in the reverse order of disassembly.

ADJUSTING THE SLAVE CYLINDER AFTER IT IS REFITTED

Adjust the push rod in the following manner after the slave cylinder is refitted. Loosen the lock nut on the push rod and turn the hexagonal adjusting nut to eliminate play of the withdraw lever. Turning back the adjusting nut three times after it is fully tightened provides the withdraw lever with optimum play.

BLEEDING

When all the component parts of the clutch are refitted, air-bleeding should be carried out in the following manner.

Connect a rubber hose to the bleeder valve on the slave cylinder and hold loose end of the rubber hose in a suitable glass vessel. Pump the clutch pedal a few times and depress it all the way in, and loosen the bleeder valve on the slave cylinder to bleed the fluid. Tighten the bleeder valve and release the foot from the clutch pedal.

Continue the above procedure until the fluid runs out of the rubber hose in a solid stream is free of air bubbles. Upon completion of bleeding, securely tighten the bleeder valve and disconnect the rubber hose. During the bleeding operation, always maintain the fluid above 1/2 level.

Reduction in fluid in the reservoir permits entry of air into the pressure system and leads to bleeding failure. When it is necessary to use the fluid that is bled from the system for topping up the reservoir, a time should be taken for air contained in the fluid to separate completely.

Trouble-shooting and correction

COMPLAINT

1. Slipping

If the clutch is in barely operable condition and it fails to transmit engine torque to the transmission in full extent, resulting in a trouble which falls into one of the following categories, immediate maintenance attention is necessary.

a. Dull in acceleration and slow in travel speed though engine speed increases in response to the throttle opening.

b. Automobile lacks power, giving out scorching smell when climbing a slope.

c. Undue increase in fuel consumption.

d. Engine tends to overheat.

TESTING

To test for a slipping clutch, start the engine, set the hand brake firmly and shift into low gear. Then slowly release the clutch pedal while accelerating the engine gradually. The engine should stall immediately if the clutch is not slipping. The engine continues running with the automobile in position if the clutch is slipping.

Cause of trouble	Correction
1. Insufficient clutch pedal play	Adjust the clutch pedal play to 20 - 30mm
2. Crooked pressure plate face and flywheel face due to wear	Turn down in a lathe or correct with emery cloth
3. Weakened clutch springs	Replace
4. Hardened driven plate	Rectify or replace
5. Oil, grease or other contaminant on the driven plate	Clean or replace
6. Worn facing	Replace if wear is beyond allowable limit

2. Dragging

If the clutch is in such condition, the engine torque is partially transmitted to the transmission even when the clutch pedal is fully depressed causing gear grating when gear-shifting is made.

Cause of trouble	Correction
1. Excessive clutch pedal play	Adjust clutch pedal play to 20 - 30mm
2. Maladjusted clutch release lever height or damaged clutch release lever	Adjust or replace
3. Worn or binding crankshaft bush	Replace
4. Warped driven plate	Replace or rectify the side deflection to 1.0mm at maximum
5. Excess wear in the driven plate spline	If play on the periphery is in excess of 2mm, replace
6. Stepped wear in the driven plate spline	Replace if wear is beyond correction

3. Chattering or noises

Cause of trouble	Correction
1. While the clutch is engaged	
a. Malaligned engine and transmission arrangement	Rectify
b. Weakened driven plate damper springs	Replace springs
c. Loosened driven plate rivets	Rectify or replace
d. Oil or grease on driven plate	Clean or replace
e. Crooked pressure plate face and flywheel face due to wear	Turn down in a lathe or correct with emery cloth
2. While the clutch is disengaged	
a. Damaged, worn or poorly lubricated release bearing	Replace
b. Maladjusted release lever height causes poor contact	Adjust
c. Worn or binding crankshaft bush	Replace
d. Worn release lever	Rectify or replace

PART 3

TRANSMISSION

CONTENTS

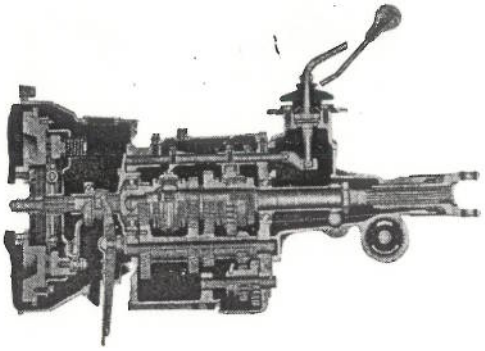
PART 3 TRANSMISSION

Transmission data

The transmission case is fabricated with aluminum alloy integrally with the clutch housing. The gear control systems are available in the following two different types, namely: A remote control system with a gear shift lever situated in the steering column and a direct control system with the gear shift lever arranged on the center floor. The quadrant box assembly on the upper part of the rear cover, shift rod for low, second, third and top gears and shift arm in the remote control system differ from those in the direct control system.

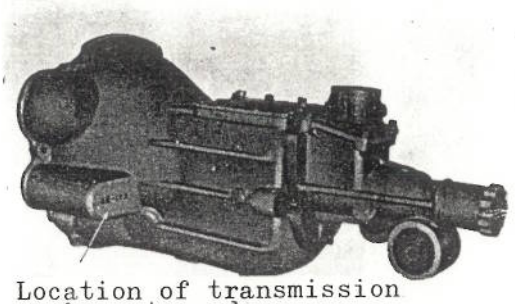
TRANSMISSION DATA

Model / Item	PR			KR
	Standard 4-speed transmission	3-speed transmission	4-speed transmission for GT	4-speed transmission
Type	Synchromesh on 2nd, 3rd, and 4th gear (For 3-speed transmission, synchromesh on 1st, 2nd and 3rd)			
Gear ratio 1st	3.746	3.263	3.444	4.449
2nd	2.320	1.631	2.133	2.991
3rd	1.508	1.000	1.387	1.656
4th	1.000		1.000	1.000
Reverse	4.994	4.395	4.593	5.932
Lubricant capacity	Engine oil SAE 30 2 ltr			



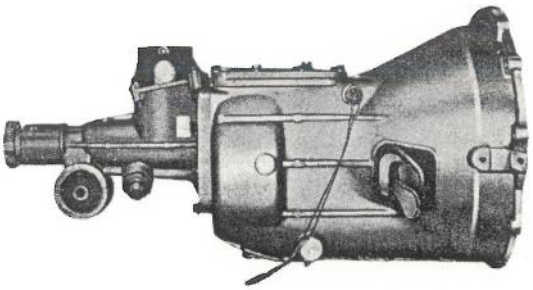
Cutaway view of the clutch and transmission

Fig. 1(a)



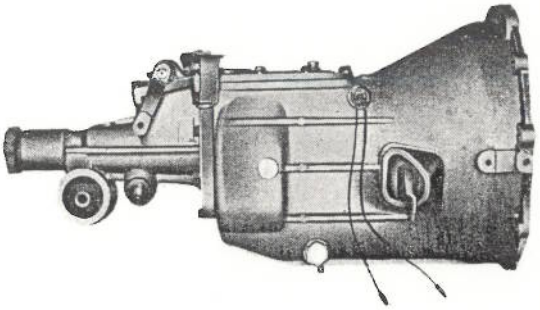
Location of transmission number stamped

Fig. 1(b)



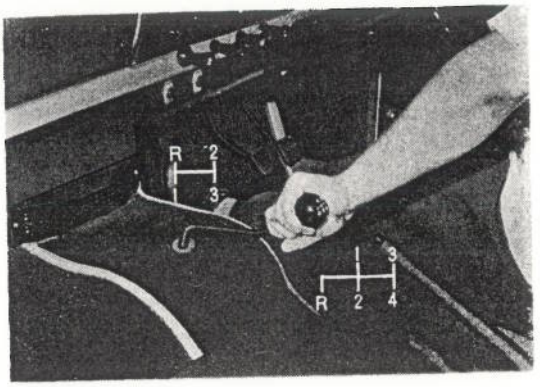
Direct control transmission

Fig. 2



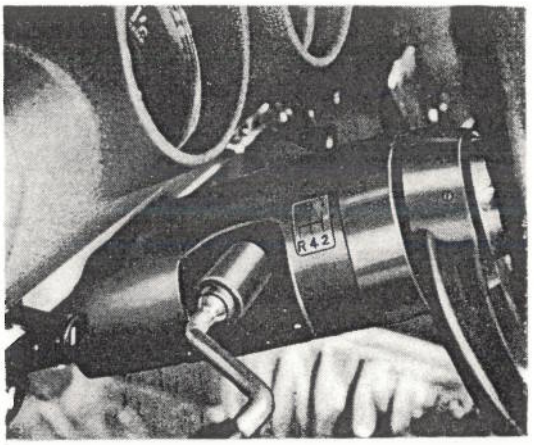
Remote control transmission

Fig. 3



Direct control gear shift pattern

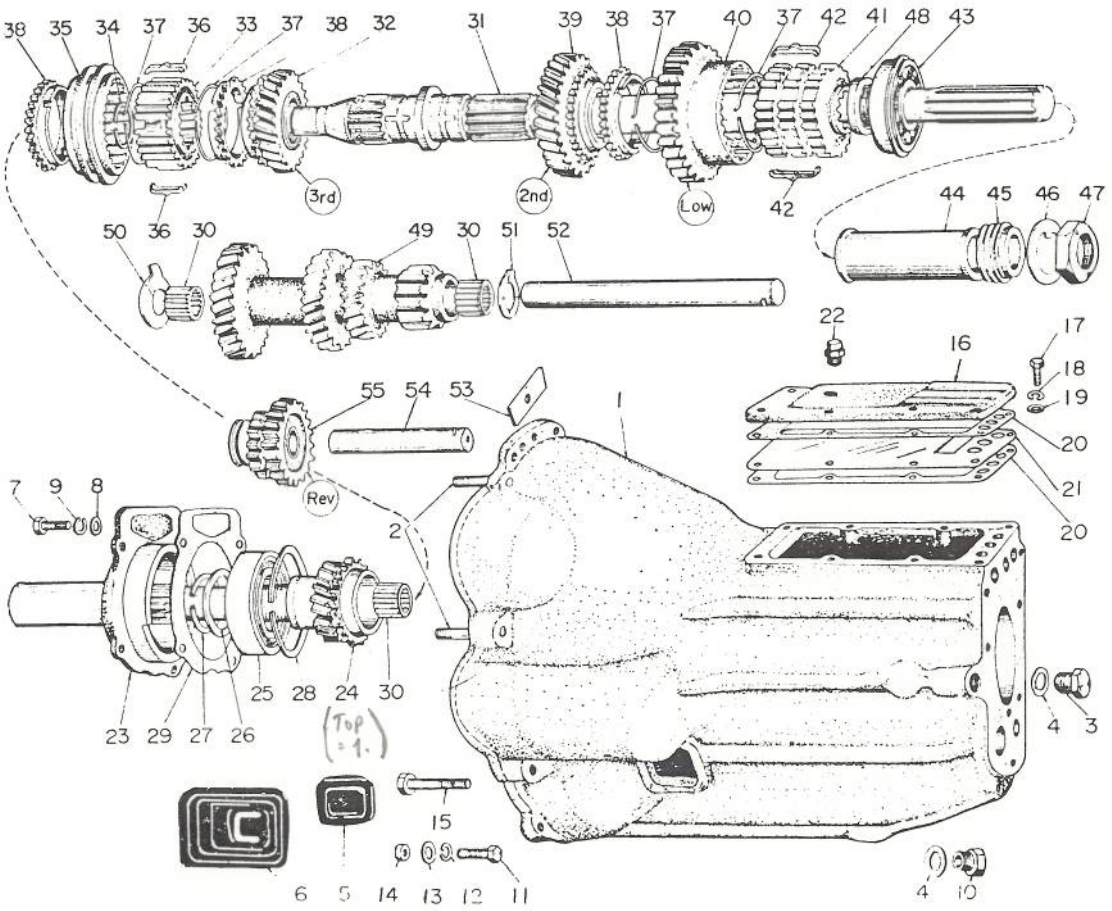
Fig. 4



Remote control gear shift pattern

Fig. 5

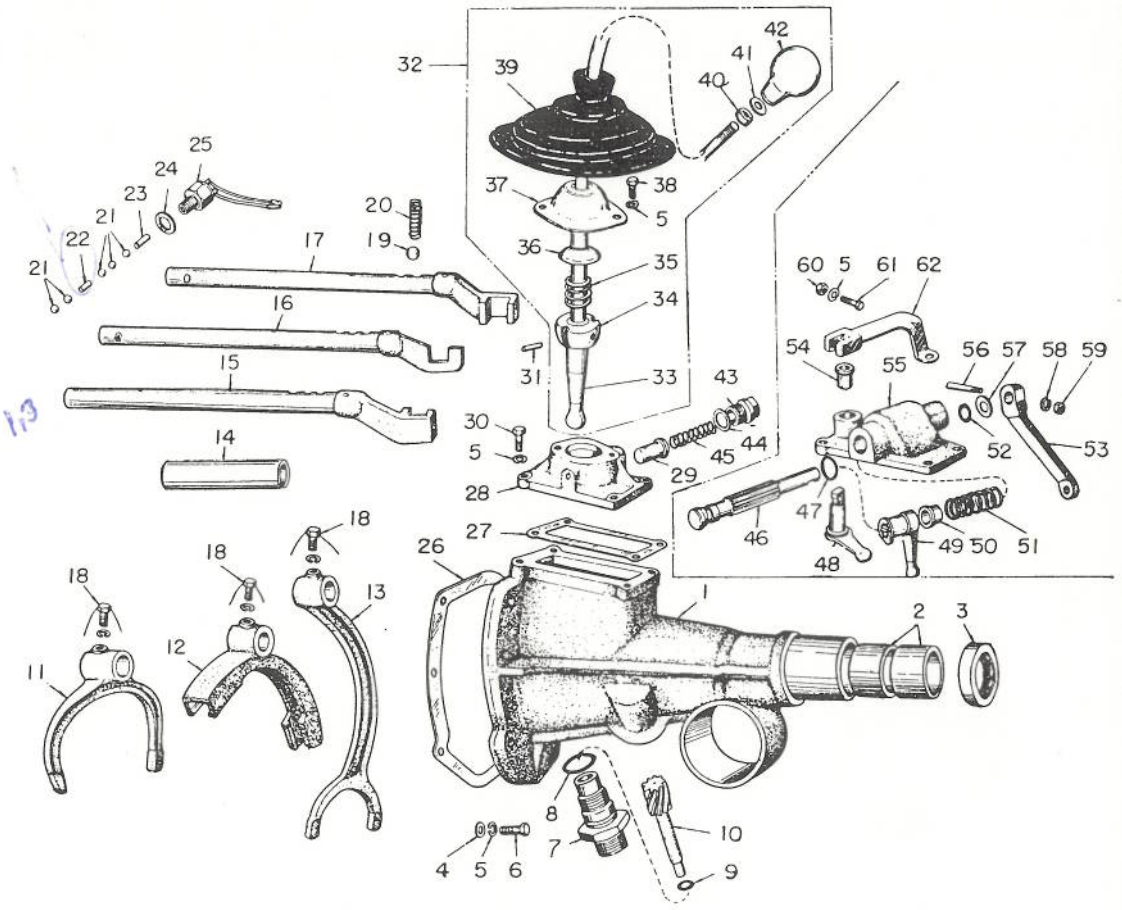
Transmission assembly in exploded view



Component Parts of the Transmission

Fig. 6(a)

1. Transmission case
2. Stud; starter set
3. Plug; filler
4. Gasket; plug
5. Cover; check hole
6. Cover; shift fork
7. Bolt; front cover set
8. Washer; plain
9. Spring washer
10. Plug; drain
11. Bolt
12. Spring washer
13. Washer; plain
14. Nut
15. Bolt; starter
16. Top cover
17. Bolt; top cover
18. Spring washer
19. Washer; plain
20. Packing; top cover
21. Packing plate
22. Breather; transmission case
23. Front cover
24. Top gear shaft
25. Bearing
26. Washer; bearing
27. Snap ring; bearing cover
28. Snap ring; gear cover
29. Gasket
30. Needle bearing
31. Mainshaft
32. Third gear
33. Clutch hub
34. Snap ring
35. Sleeve
36. Insert
37. Spring
38. Block ring
39. Second gear
40. Low gear
41. Clutch hub
42. Insert
43. Bearing
44. Distance piece
45. Speedometer drive gear
46. Lock washer
47. Nut; gear set
48. Distance piece
49. Cluster gear
50. Thrust washer; front
51. Thrust washer; rear
52. Countershaft
53. Lock plate
54. Reverse shaft
55. Reverse gear



Transmission Assembly in Exploded View

Fig. 6(b)

1. Rear cover assembly
2. Propeller shaft bush
3. Oil seal
4. Plain washer
5. Spring washer
6. Bolt
7. Speedometer driven gear bush
8. "O" ring
9. "O" ring
10. Speedometer gear
11. Shift arm; top and third
12. Shift arm; second and low
13. Shift arm; reverse
14. Spacer
15. Shift rod; top and third/ second and low
16. Shift rod; second and low/ top and third
17. Shift rod; reverse
18. Bolt, lock wire and spring washer
19. Lock ball

20. Lock spring
21. Interlock ball
22. Interlock pin
23. Plunger
24. Gasket
25. Reverse lamp switch
26. Rear cover gasket
27. Quadrant box gasket
28. Quadrant box
29. Reverse stop spring sleeve
30. Bolt
31. Straight pin
32. Gearshift lever assembly
33. Gearshift lever
34. Boss
35. Setting spring
36. Spherical cage
37. Cover
38. Bolt
39. Grommet
40. Lock nut
41. Shim
42. Knob
43. Cap
44. Washer
45. Reverse stop spring
46. Change speed shaft
47. "O" ring
48. Internal select lever
49. Internal shift lever
50. Sleeve
51. Reverse stop spring
52. "O" ring
53. Outer shift lever
54. Bush
55. Quadrant box
56. Bolt
57. Thrust washer
58. Spring washer
59. Nut
60. Nut
61. Bolt
62. Outer select lever

Transmission removal and refitting

REMOVAL

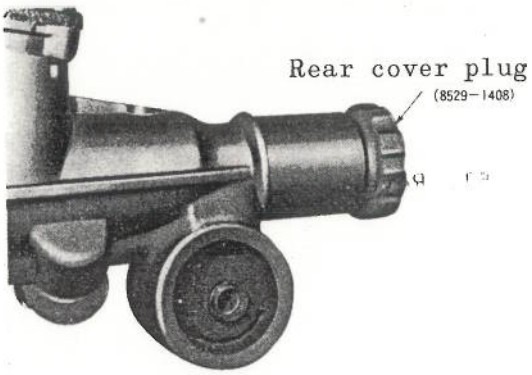
1. Raise the engine hood and disconnect the battery cord.

   Note: For model equipped with diesel engine, make sure to disconnect the ground cord from the right and left batteries.

2. Remove the flange bolts on the exhaust pipe.

3. Take out the bolts on the propeller shaft at the rear axle carrier side. Then disconnect the propeller shaft from the transmission.

   Fit a transmission rear cover plug (8529-1408) to the rear end of the transmission case to prevent oil leak. The work should be carried out with the lubricant in transmission. (Fig. 7)



Fitting the rear cover plug

Fig. 7

4. Remove gearshift control, speedometer cable and reverse lamp cord from the transmission side. For transmission equipped with direct control mechanism, take out the front carpet, raise the gearshift lever grommet and remove the two cover setting bolts. Then disconnect the gearshift lever assembly. Cover the opening of the transmission to prevent entry of foreign particles.

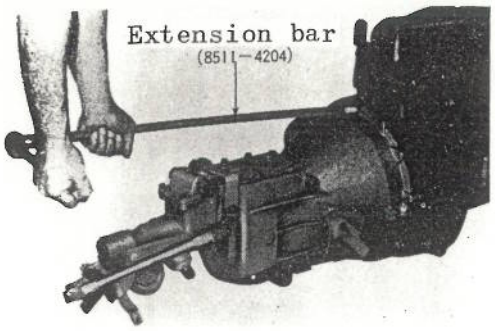
5. Remove the clutch control lever and retainer.

6. Take out the setting bolts from the clutch under cover and stiffener and remove the clutch under cover.

7. Take out the starter setting bolts and move the starter frontward.

8. Raise the engine block by means of a chain block hooked on the lifting hanger on the rear part of the engine. Then remove the rear mounting brackets while the rear part of the transmission is raised slightly above the level.

9. Lower the rear part of the engine while paying close attention to heater hose and oil pan to keep them from being damaged. Hold the transmission in suspension and take out the transmission case fixing bolts. The fixing bolt situated on the upper part in the mid section of the transmission should be taken out in the last place. The use of extension bar (8511-4204) facilitates the work.



Removing the clutch housing fixing bolt

Fig. 8

Remove the transmission from the engine while turning it slightly to prevent the starter mount on the transmission case from being damaged in contact with the floor.

CAUTION: During the work of removal and refitting, the gear box should always be moved along the center line of the engine. Careless handling of the gear box causes damage to the clutch driven plate.

REFITTING

Carry out the work in the reverse order of removal noting the following:

1. Check to make sure that the top gear shaft spline is clean before the gear box assembly is refitted.

2. Fit the topgear shaft spline into the driven plate and check for excess play or binding. Smear the driven plates spline with appreciable amount of chassis grease.

3. When refitting the gear box to the engine, aline the gear box with the engine and carefully move the gear box toward the engine to permit the tip end of the top gear shaft properly fit into the crankshaft bush.

4. When the transmission is disconnected from the engine, the crankshaft bush should be carefully examined for partial wear, for defective crankshaft bush gives direct influence upon the transmission.

5. Tighten each fixing bolt in progression when refitting the transmission case to the cylinder body.

Disassembly inspection and reassembly

DISASSEMBLY

QUADRANT BOX AND ITS ASSOCIATED PARTS

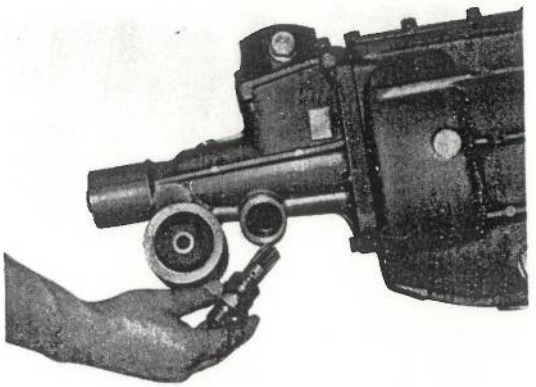
1. Remove the quadrant box on the upper part of the rear cover.

   Note: Refer subparagraph 3-8 for disassembly, inspection and reassembly of the quadrant box.

REAR COVER AND ITS ASSOCIATED PARTS

2. Remove the speedometer driven gear and driven gear bush from the rear cover. (Fig. 9)

3. Remove the rear cover from the case.



Removing the speedometer driven gear

Fig. 9

TOP COVER AND ITS ASSOCIATED PARTS

4. Take out the 8 fixing bolts from the top cover. Then remove the top cover, gasket plate and gasket.

   CAUTION: When removing the top cover, keep the lock spring and lock ball in the shift rod from being mislocated.

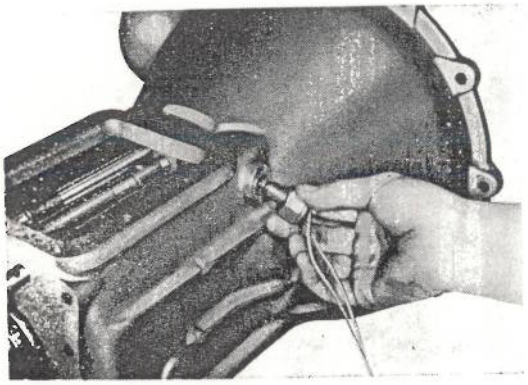
SHIFT ROD AND SHIFT ARM

5. Remove the wire from the set bolt on the shift arm and then take out the set bolt. (Fig. 10

Removing the set bolt

Fig. 10

6. Remove the reverse lamp switch and then take out the plunger and interlock ball. (Fig. 11)

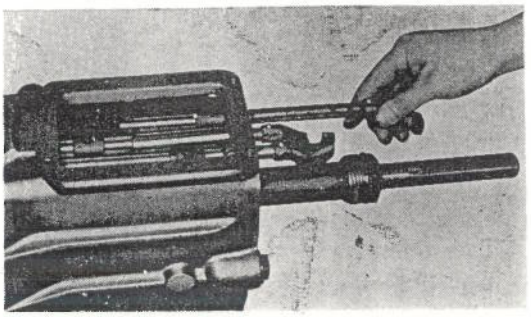


Removing the reverse lamp switch

Fig. 11

7. Withdraw the shift rod from the transmission in the rearward direction.

CAUTION: An interlock ball is provided between the shift rods to prevent double gear-meshing so that it should be carefully handled to keep it from being missed. The intermediate shift rod (this is for low/second in direct control transmission and for top/third in remote control transmission) is provided with interlock pin. Check the length and condition of the interlock pin when it is removed.



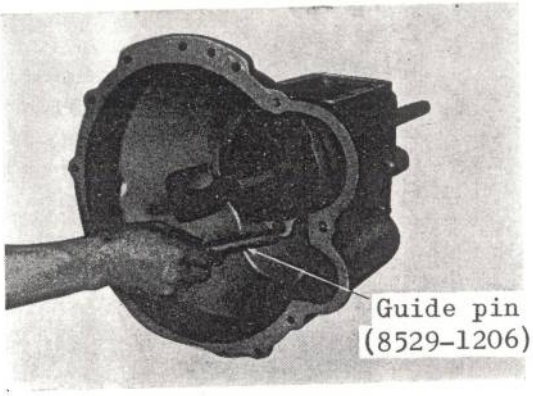
Removing the shift arm

Fig. 12

FRONT COVER ASSEMBLY

8. The front cover assembly will not come out unless the cluster gear is detached and allowed to rest on the bottom of the transmission case.

9. Withdraw the lock plate in sideway. Then put the countershaft guide pin (8529-1206) through the countershaft from forward and withdraw the countershaft. (Fig. 13)

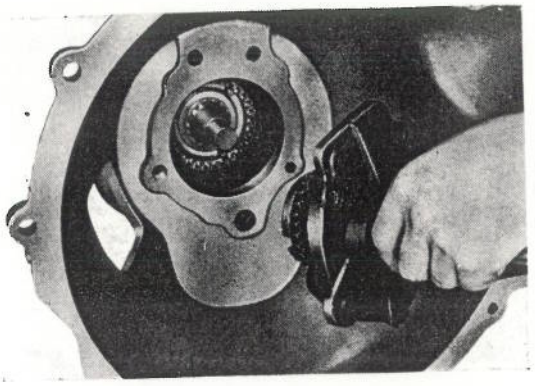


Inserting the guide pin

Fig. 13

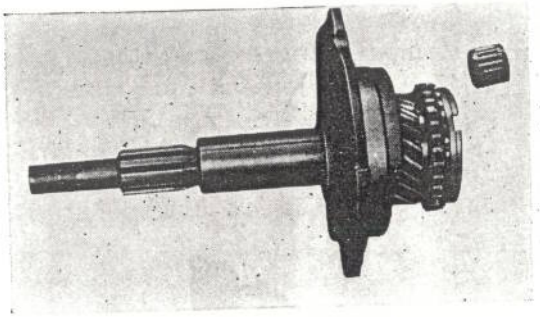
10. Insert the guide pin completely into the cluster gear and allow the parts to fall off into the bottom of the transmission case. Then take out the front cover fixing bolts and take out the front cover assembly toward the front side of the transmission case. (Fig. 14(a))

11. Remove the block ring and take out the needle roller bearing. (Fig. 14(b))



Removing the front cover

Fig. 14(a)



Front cover assembly and needle roller bearing

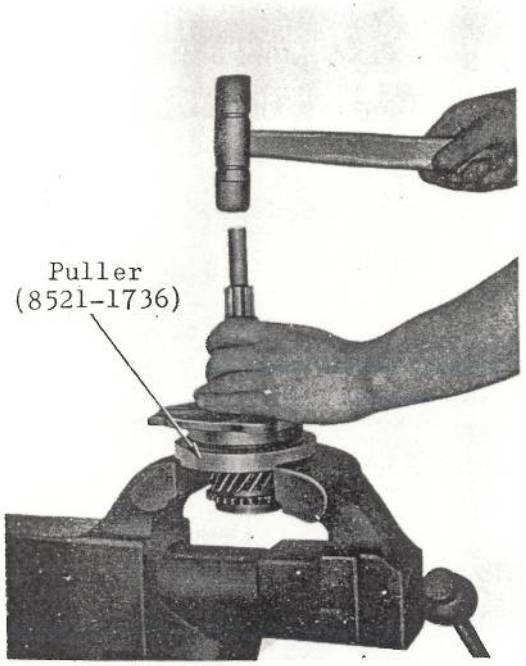
Fig. 14(b)

Note: The block ring plays an extremely important role in the function of the synchronizer. Carefully examine the insert groove and taper groove for abnormal condition and replace if the parts is defective.

12. Remove the snap ring which serves to secure the front cover bearing in position.

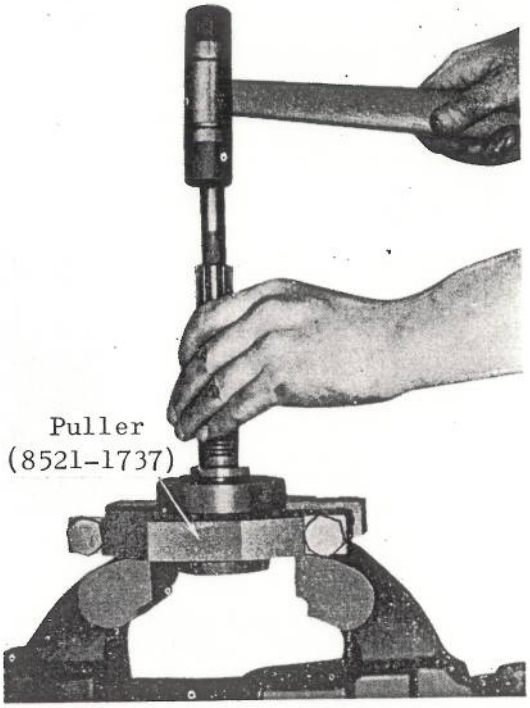
13. Drive out the top gear assembly with the aid of the front cover puller (8521-1736). (Fig. 15)

14. Take out the snap ring from the top gear and then remove the bearing washer. Then drive out the bearing with the aid of the top gearshaft puller (8521-1737). (Fig. 16)



Driving out the front cover

Fig. 15

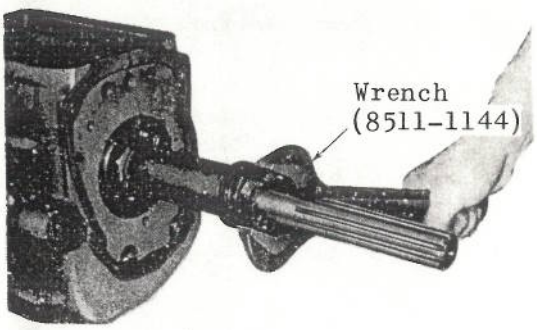


Driving out the top gearshaft

Fig. 16

MAIN SHAFT ASSEMBLY

15. Remove the main shaft from the transmission case and then remove the nut from the main shaft with the aid of the mainshaft nut wrench (8511-1144). (Fig. 17)



Removing the mainshaft nut

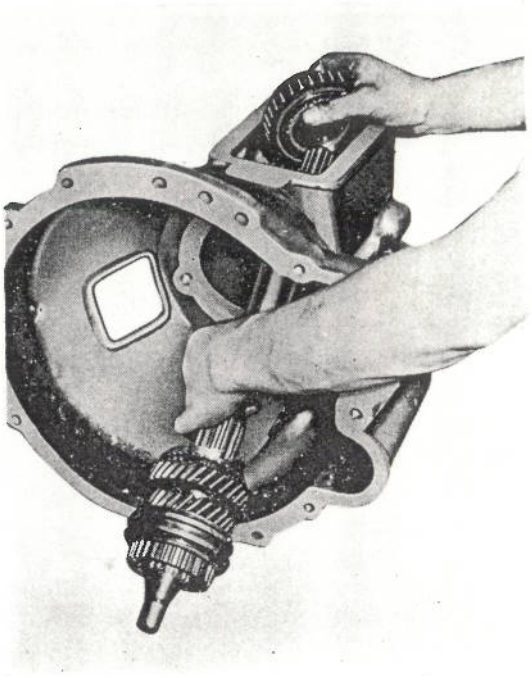
Fig. 17

16. Remove the speedometer drive gear and distance piece.

17. Hold the mainshaft assembly by the front end and drive out the mainshaft from the bearing in forward direction with the aid of a wooden hammer or a hide mallet.

18. Firmly hold the low/second clutch hub and low gear and withdraw the mainshaft through the aperture in the front side of the transmission case together with the third gear. (Fig. 18)

19. Take out low/second clutch hub and low gear through the opening on the upper part of the transmission case. (Fig. 18)



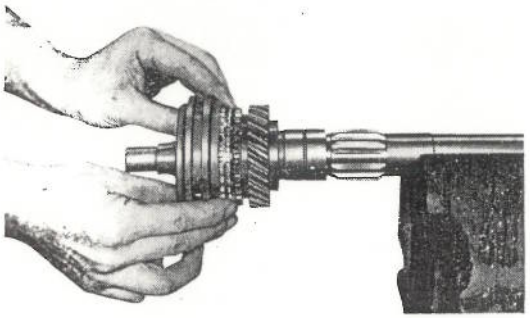
Removing the mainshaft assembly and gear

Fig. 18

20. After the mainshaft is removed take out the second gear from the mainshaft and then hold the mainshaft in vise with the use of a soft metal clamp.

21. Remove top/third clutch hub sleeve from the clutch hub. (Fig. 19)

Note: Attention should be directed to the insert as it becomes loose and falls off when the clutch hub sleeve is removed.



Removing the clutch hub and sleeve

Fig. 19

22. Take out the snap ring and remove clutch hub, block ring and third gear from the mainshaft.

LOW/SECOND CLUTCH HUB ASSEMBLY

23. Remove the low gear from the clutch hub and then, take out the insert and front and rear springs.

CLUSTER GEAR ASSEMBLY AND REVERSE GEAR

24. Take out the cluster gear assembly from the transmission case together with the needle roller bearing. To protect the bearing from being damaged, fit the countershaft guide pin (8529-1206) into the cluster gear assembly and take out the cluster gear assembly with the countershaft guide pin in place.

25. Withdraw the reverse gear shaft toward the gear case and take out the gear from the case.

REMOVING THE MAINSHAFT BEARING FROM THE GEAR BOX

26. Firmly hold the rear part of the gear box and drive out the mainshaft bearing outward.

INSPECTION

Clean the disassembled parts and carefully check each of them against the following. Rectify or replace the parts as necessary.

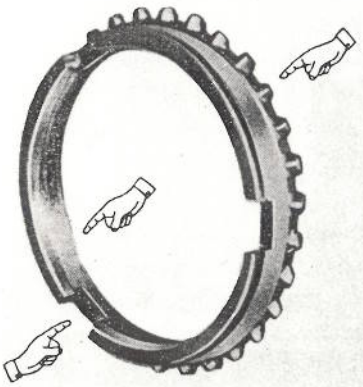
1. Bearings

   Carefully examine the bearings for restricted rotation, excessive wear or noise. Also check the needle rollers for cracking, wear or corrosion.

2. Gears

   Check gear teeth for crack, wear or damage and make necessary replacement.

3. Check the gear teeth on the block ring, thread on the tapered portion, contacting face of the insert for wear or damage and make necessary replacement. (Fig. 20)



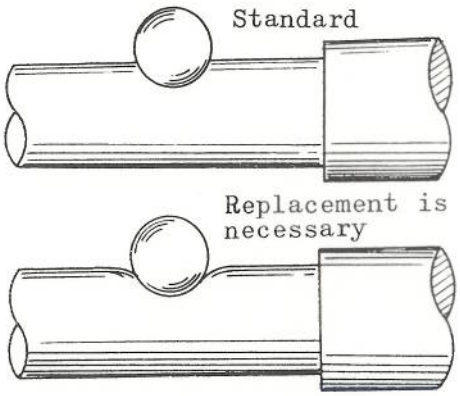
Inspecting the block ring

Fig. 20

4. Check the insert for deformation, damage or wear and make necessary correction or replacement.

5. Check the individual shift arm for deformation, sliding part for wear and make necessary rectification or replacement.

6. Check the groove in the shift rod, locking ball for wear, locking spring for weakness, interlock ball plunger for wear and make replacement if defective.



Checking the shift rod for wear

Fig. 21

7. Check the outer surface of th mainshaft at the tip end for wea or damage, splines and spring groove for damage. Also chec the mainshaft for bending and make replacement if wear, damage or bending is beyond rect fication. (Fig. 22)

Inspecting the mainshaft

Fig. 22

8. Check the speedometer driven gear and drive gear for wear. Also check the oil seal for the driven gear bush for wear and make necessary replacement.

9. Check the rear cover oil seal for evidence of oil leakage. Renew the oil seal whenever the disassembly is effected.

REASSEMBLY

Carry out the work in the reverse order of disassembly noting the following. Failure to follow correct order of reassembly and erroneous positioning of parts make the reassembly difficult and lead to failure.

1. Make sure to clean all the disassembled parts.

2. Renew all the oil seals and gaskets for reassembly.

3. Make sure always to use press machine for pressing parts into place. Smear the parts with engine oil before they are fastened together.

ORDER OF REASSEMBLY

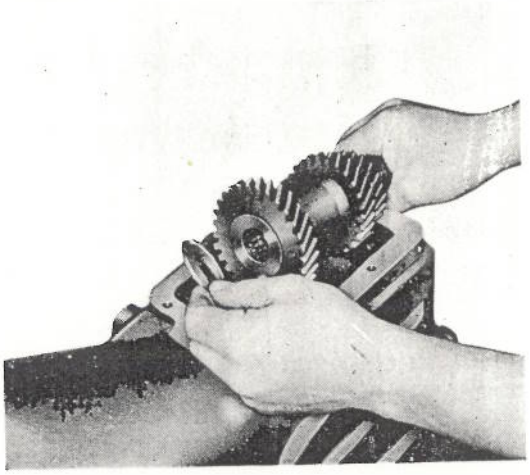
1. Fit the reverse gear into the transmission case and turn the gear with larger diameter toward the rear. Then hold the gear in suspension and put the shaft into the gear through the rear opening in the case with the grooveless end of the shaft turned toward the gear. The groove in the other end of the shaft should be turned toward the countershaft side.

2. Refitting the cluster gear

   a. With use of tacky grease, stick the larger thrust washer for the cluster gear to the front side of the transmission case and smaller thrust washer for the cluster gear to the rear side of the transmission case.

   b. Fit the needle roller bearings to the front and rear of the cluster gear and put all of these parts through the countershaft guide pin (8529-1206), and hold them in the

bottom of the transmission case. (Fig. 23)



Refitting the cluster gear

Fig. 23

c. The cluster gear end float is standard at 0.15 - 0.20mm. The end float should be measured at the front thrust washer. The end float is determined with the front and rear thrust washers to be fitted into the cluster gear. The deviation of the end float value from the standard value can be compensated for by the use of thrust washers with suitable thickness.

3. Refitting the mainshaft assembly

Refit the second synchro assembly noting the following.

a. Check to make sure that the low gear moves freely without binding when it is fitted to the clutch hub. Check these parts for wear and make necessary replacement.

b. Remove all burrs on the inner spline of the low gear to permit smooth operation.

c. Measure the third gear end float at the portion between snap rings at the end of the top/third clutch hub. Standard end float is 0.10 - 0.15 mm.

To obtain correct end float, the snap rings are available in the following different sizes. (Fig. 24)

Clutch hub snap ring	
Parts number	Thickness (mm
09952-085	2.90
09952-086	2.95
09952-037	3.00

Measuring the third gear end float

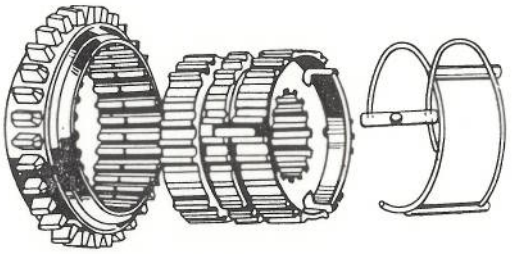
Fig. 24

d. Position the insert spring correctly into the lower part of the insert. Springs should not be hooked to the same insert. Springs should be so arranged that their tip ends face each other. (Fig.25(a) and (b))

e. As the minor modifications were effected on the model as of 1966, the variation in the design of the insert spring and clutch hub necessitated minor change in the procedure for fitting these parts.

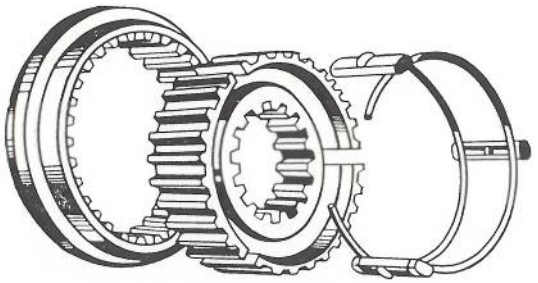
Fit the projection on the tip end of the insert spring into the hole in the internal face of the clutch hub before refitting the parts into position.

With the parts refitted into place, move the sleeve in axial direction to see that the projection on the tip end of the insert spring is secured in the corresponding hole.



Low/second clutch hub assembly

Fig. 25(a)



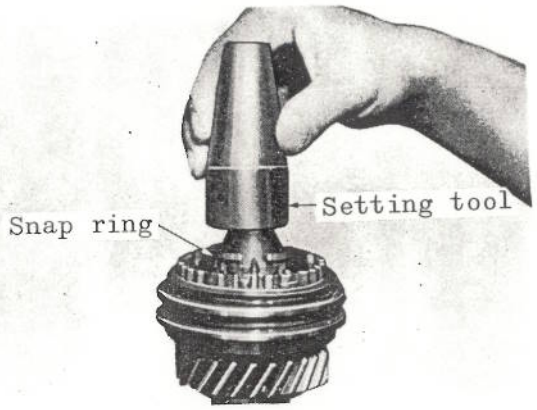
Third/fourth clutch hub assembly

Fig. 25(b)

4. Refitting the mainshaft assembly

Carry out the work noting the following points.

a. Always renew the snap rings. The use of setting tool (8522-1134) is essential to obtain best results. (Fig. 26)



Refitting the snap ring

Fig. 26

b. The parts are provided with two different kinds of inserts so that they should be carefully noted when they are refitted. The insert which is shorter in length is for third/fourth while the longer insert is for low/second.

c. For fitting the insert springs, hook the bent ends onto the insert and arrange them so that their ends face against each other.

d. The second gear end float is a factory setting and require no check-up.

5. From the upper part of the transmission, fit low gear, second gear and clutch hub assembly into the transmission case. From the front side of the transmission case, insert the mainshaft with the third gear and synchronizer assembly into the transmission case. Then fit the mainshaft into the rear bearing noting the following.

a. When fitting the mainshaft into the rear bearing hold the individual synchronizer assembly with hand to keep the block rings in their positions.

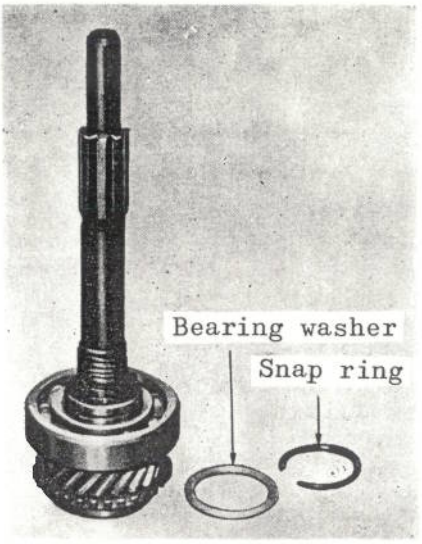
b. After the mainshaft is refitted into the rear bearing, move the gears to make sure that the inserts are properly fitted into the grooves in the block rings.

c. Move the mainshaft all the way until the circlip on the rear bearing comes into contact with the transmission case. Then fit the distance piece, speedometer drive gear and lock washer to the main shaft and tighten the nut over the lock washer and secure the nut from turning loose by bending the lock washer.

6. Fit the top gear shaft assembly into the transmission case. Then fit the front cover assembly noting the following points.

a. Make sure to renew the snap ring which serves to fasten the bearing with the top gear.

b. To compensate for variation in the given clearance caused by the bearing replacement, correct adjustment should be made with the use of abutment washer. (Fig.27)



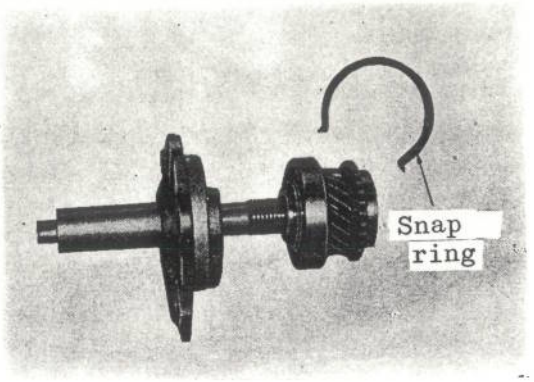
Refitting the top gear

Fig. 27

Abutment washers	
Parts number	Thickness (mm)
09851-231	14.5 ~ 1.52
09851-232	1.37 ~ 1.44
09851-233	1.30 ~ 1.36

c. Put the front cover through the top gear shaft and fit the snap ring into position. Always renew the snap ring and make sure to use the snap ring with suitable thickness which permit snug fitting. (Fig. 28)

Snap rings	
Parts number	Thickness (mm)
09950-149	2.12 ~ 2.17
09950-150	2.06 ~ 2.11
09950-151	2.00 ~ 2.05



Refitting the front cover

Fig. 28

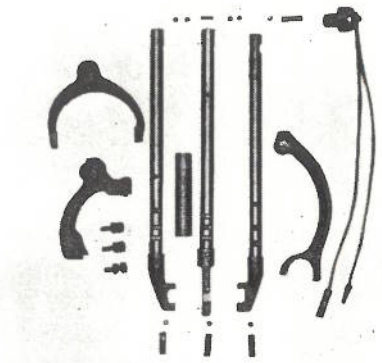
7. Put the needle roller bearing through the top gear shaft and fit the top gear assembly into place.

8. Refit the cluster gear into place.

After making sure that the thrust washers are properly fitted into positions on both sides of the cluster gear, press the countershaft into position. Coat the tip end of the countershaft with adhesive compound.

9. Fit the lock plates to the countershaft and reverse shaft. Pay close attention to the lock plates when refitting the rear cover as the lock plates easily come off the position.

10. From the upper part of the gear case, insert and arrange top/third, low/second and reverse shift arms in their respective positions. Then fasten these parts with the shift rods commencing with the one on the left hand side. (Commencing with top/third shift rod for direct control transmission and with low/second for remote control transmission). (Fig.29)



Component parts of the shift rod assembly

Fig. 29

a. Fit the interlock ball which serves to prevent double gear-meshing into space between shift rods at the front side of the gear box.

Note: Tacky grease may be used to hold the ball in position. After the shift rod is refitted and the interlock balls are inserted, hold the shift rod at neutral to permit refitting of the next shift rod.

b. Put the interlock pin through the intermediate shift rod (low /second shift rod for direct control transmission, and top/third for remote control transmission), then fit these parts into position. The length of the interlock pin is standard at 11.8 ± 0.05 mm).

c. Fit the reverse shift rod in the last place and insert the interlock ball and plunger into their respective positions. Then refit the reverse lamp switch.

d. A spacer is to be inserted into the top/third shift rod (in the third gear side). This is to prevent overshifting and therefore it is important to fit it into position. The length of the spacers varies according to their use:

Spacer ... (Fig. 6(b))

For use in direct control transmission ... 83.6 mm

For use in remote control transmission ... 81.9 mm

e. Fit the setting bolts to the shift arms and shift rods. Secure these bolts in position with use of lock wire.

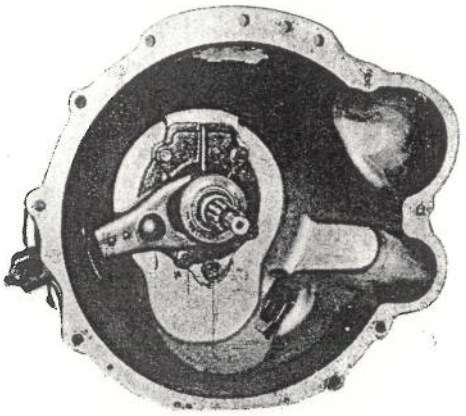
11. Refit the rear cover assembly.

Check to make sure that gear shifting takes place smoothly by operating the shift rods. Then refit the speedometer driven gear and speedometer gear bush.

12. Refit the quadrant box assembly

For remote control transmission, check to make sure that the internal select lever moves freely in the shift rod groove.

13. Refit the clutch withdraw lever and shift block.

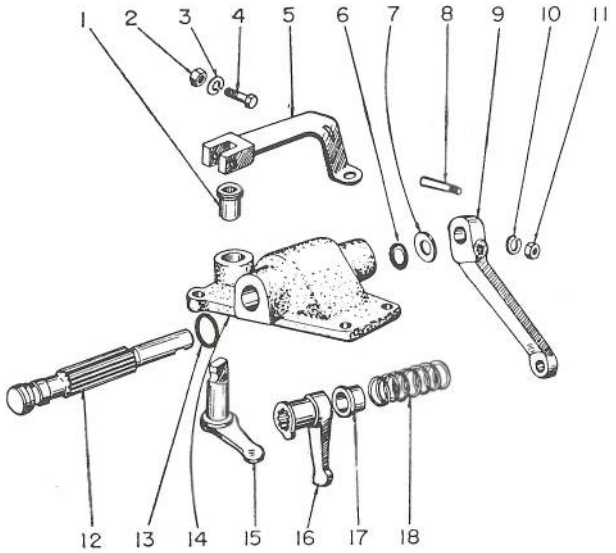


Refitting the shift block

Fig. 30

14. Upon completion of the reassembly, turn the mainshaft with hands to make sure that it rotates freely without binding. Bring the gears into engagement by operating the outer select lever and outer shift lever and turn the mainshaft with hand. If the mainshaft rotation is restricted, the trouble may be attributed to friction provided by the firm contact of the parts. Therefore, check the respective parts to establish the cause of trouble.

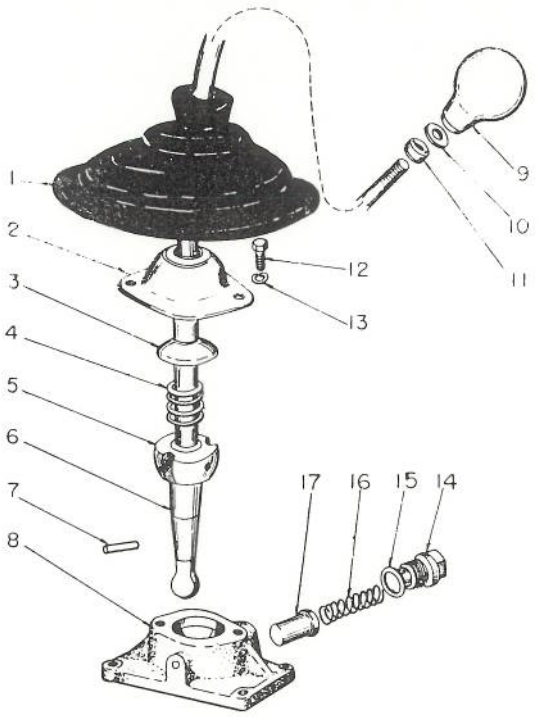
Quadrant box in exploded view



Component parts of the remote control quadrant box

Fig. 31(a)

1. Bush
2. Nut
3. Spring washer
4. Bolt
5. Outer select lever
6. "O" ring
7. Thrust washer
8. Bolt
9. Outer shift lever
10. Spring washer
11. Nut
12. Change speed shaft
13. "O" ring
14. Quadrant box
15. Internal select lever
16. Internal shift lever
17. Reverse stop spring sleeve
18. Reverse stop spring



Component parts of the direct control quadrant box

Fig. 31(b)

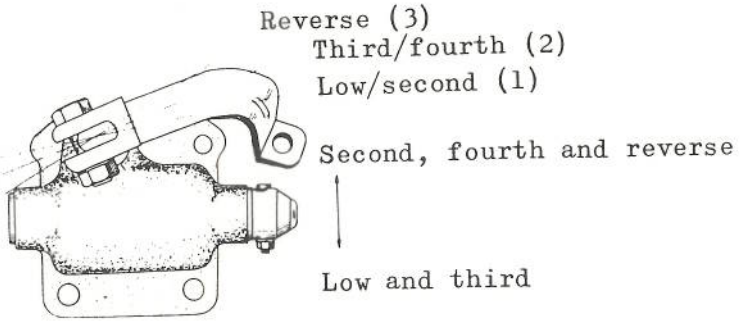
1. Gearshift lever grommet
2. Gearshift lever cover
3. Spherical cage
4. Setting spring
5. Boss
6. Gear shift lever
7. Straight pin
8. Quadrant box
9. Gearshift lever knob
10. Shim
11. Lock nut
12. Bolt
13. Spring washer
14. Reverse stop spring cap
15. Washer
16. Reverse stop spring
17. Reverse stop spring sleeve

Construction and function

FUNCTION OF THE QUADRANT BOX

1. Select mechanism

a. The position (1) in which the outer select lever is moved all way to rearward is for low/second.



Function of the outer select lever

Fig. 32

b. The position (2) in which the outer select lever is brought forward and the internal shift lever is held in light contact with the reverse stop spring sleeve is for third/fourth. (Fig. 32 and 33)

c. The position (3) in which the outer select lever is brought all the way forward and the reverse stop spring is depressed by the internal select lever is for reverse. (Fig. 32 and 33)

2. Shift

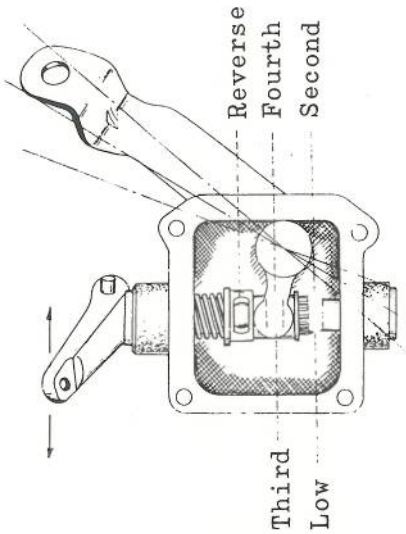
a. Operation of the outer shift lever in front and rearward after the gear-meshing is selected by the select lever actuates the internal shift lever to bring the gears into engagement by the movement of the shift rod.

b. Forward travel of the outer shift lever from the neutral position brings low or third gear into engagement. (Fig. 33)

c. Rearward travel of the outer shift lever from the neutral position brings second or fourth gear or reverse gear into engagement. (Fig. 33)

d. In the quadrant box for the direct control transmission, direct shifting or selecting can be made with the fulcrum on the gearshift lever boss and straight pin as illustrated in Fig. 4.

e. In the direct control transmission, tilting of the gearshift lever toward the left hand side gives selective position for low or second. When the gearshift lever is further moved toward the left hand side to depress the reverse stop spring and pulled rearward, reverse gear engagement takes place. The travel of the gearshift lever all the way toward the right hand side from the neutral position corresponds with the selective position for third and fourth.



Function of the outer select lever and internal shift lever

Fig. 33

Fitting the quadrant box

PROCEDURES FOR REFITTING

1. Make sure that the tip end of the internal shift lever is in alignment with the shift arm groove before the quadrant box is refitted.

2. Move the outer select lever to make sure that the internal shift lever operates freely in the shift rod groove before the setting bolts are tightened.

Component parts of the quadrant box

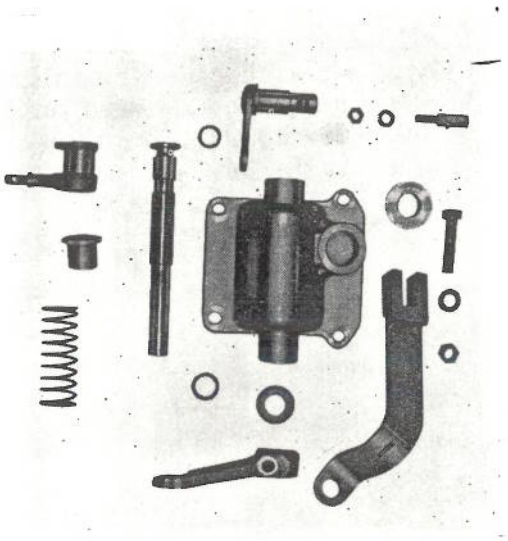


Fig. 34

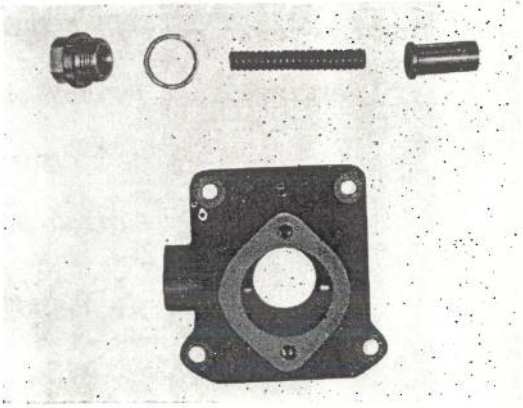


Fig. 35

Disassembly, Inspection and reassembly

DISASSEMBLY

Note: Disassembly of the quadrant box is unnecessary unless it fails to function properly.

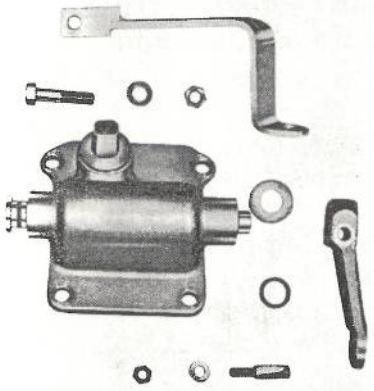
1. Take out the set bolts from the outer select lever and internal select lever. Then withdraw the internal select lever downward. (Fig. 36)

2. Take out the outer shift lever set bolts and the change speed shaft set bolts. Then withdraw the change speed shaft from the quadrant box. (Fig. 36)

3. Take out the internal shift lever, reverse stop spring and reverse stop spring sleeve from the quadrant box.

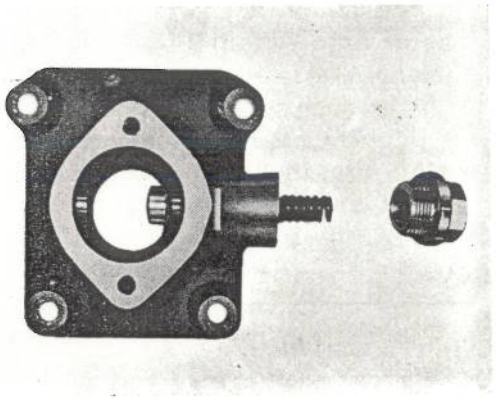
4. Withdraw the internal select lever bush toward the inside of the quadrant box.

5. In the disassembly of the quadrant box for the direct control transmission, the spring and sleeve can be pulled out by removing the reverse stop spring cap. (Fig. 37)



Removing the select lever and shift lever set bolts

Fig. 36



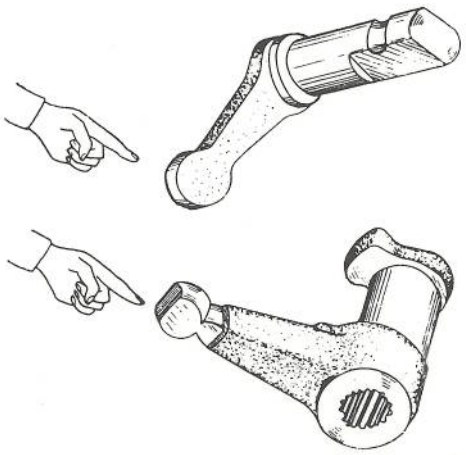
Removing the reverse stop spring cap

Fig. 37

INSPECTION

Clean and dry all the disassembled parts. Check them for wear or damage and make necessary replacement.

1. Inspect the spherical ends of the internal shift lever and internal select lever for wear or damage and replace if necessary. (Fig. 38)



Checking the spherical ends of the internal shift lever and internal select lever

Fig. 38

2. Check the change speed shaft spline and internal shift lever spline for wear or damage and make necessary replacement. (Fig. 38)

3. Wear of the "O" rings which are fitted to the right and left sides of the change speed shaft leads to oil leakage. Make sure to renew these parts whenever disassembly is effected.

4. Check the bush to internal select lever engagement for excess play and make necessary replacement.

REASSEMBLY

1. Carry out the reassembly work in the reverse order of disassembly and note the following.

Erroneous positioning of the change speed shaft and internal shift lever splines malaligns the position of the outer shift lever

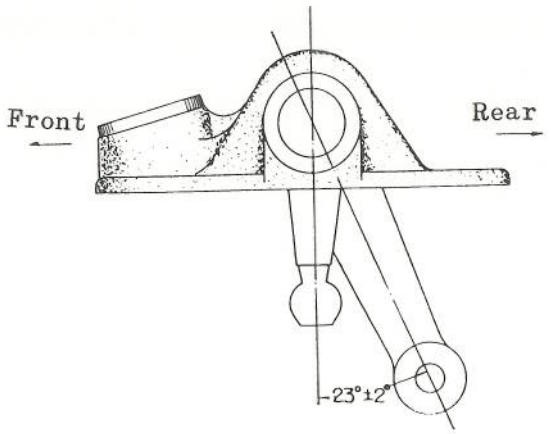
This makes it difficult to connect the link rod extending from the relay lever with the corresponding parts of the quadrant box when the transmission is refitted to the chassis.

Attention should therefore, be paid to the reassembly of these parts. The position of the outer shift lever as mounted in position may be regarded as standard if there is provided $23° \pm 2°$ of angle between the outer shift lever and internal

shift lever when the parts are turned upside down with the internal shift lever in vertical plane. (Fig. 39)

2. Securely tighten the outer shift lever fixing bolts and outer select lever fixing bolts to keep them from being turned loose during refitting work.

3. Upon completion of reassembly, operate the outer select lever and outer shift lever to make sure that each parts functions properly.



Relative positions of the internal shift lever and outer shift lever

Fig. 39

Transmission Trouble-shooting and correction

CAUSE OF TROUBLE

1. Noise within the transmission

If noise arises from around the transmission, disengage the clutch to see if noise continues to arise. If noise stops when the clutch is disengaged, a judgement may be made that the noise was coming from the transmission itself.

Cause of trouble	Correction
1. Improper gear-engagement	Rectify gear meshing
2. Insufficient gear oil level or deteriorated gear oil	Refill, or replace with specified oil
3. Worn or damaged gears, splines or rings	Replace if wear or damage is serious

2. Hard shifting

Trouble of hard gear shifting may be attributed to the remote control failure or the trouble in the transmission. However, several types of hard shifting are often caused by the clutch dragging so that the function of the clutch should be carefully tested before inspecting the remote control and transmission for operating failure.

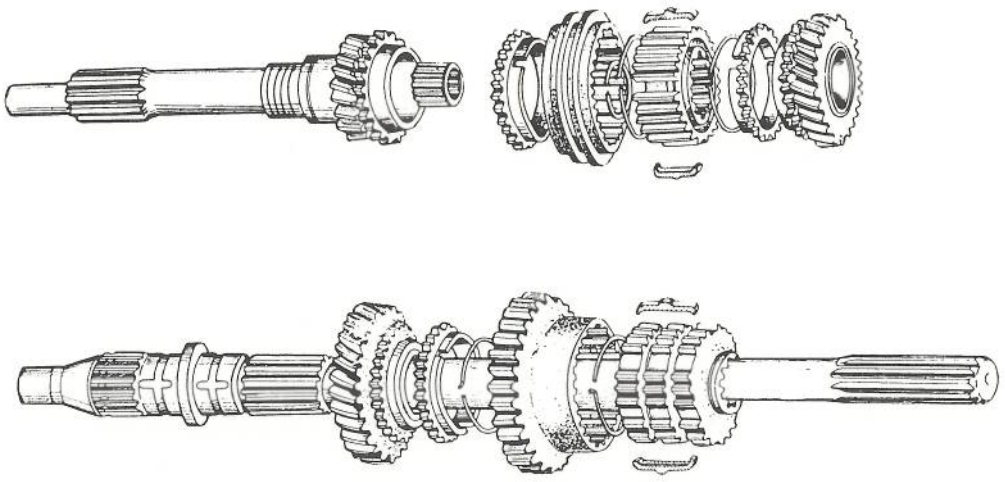
Cause of trouble	Correction
1. Misadjusted gear control mechanism	Readjust the linkage
2. Poor contact between block ring and gear cone or wear	Rectify or replace
3. Worn or deformed interlock pin	Rectify or replace

3. Slipping out of gear

Cause of trouble	Correction
1. Gear shift rod wear or damaged or weakened lock ball spring	Replace if wear is considerable
2. Poor gear-meshing due to maladjusted gear control linkage	Readjust and rectify
3. Worn or damaged bearings	Replace
4. Worn gears	Replace if wear is considerable
5. Wear in the spline at portions subjected to meshing or sliding	Replace if wear is considerable

Construction and operating principles of synchronizer

The synchronizer incorporates a type of cone clutch generally referred to "block ring" and designed to synchronize the rotating speeds of the gears which are to be brought into engagement thereby facilitating the gear meshing with a minimum of effort.



Gears and synchronizers in exploded view

Fig. 40

CONSTRUCTION AND FUNCTIONAL ORDER OF THE SYNCHRONIZER

1. When the shift rod is operated, the motion is transmitted to the clutch hub sleeve through the shift arm. This motion, in turn, moves the clutch hub sleeve in the axial direction. The three inserts fitted into the grooves in the internal part of the clutch hub move in the axial direction along with the movement of the clutch hub sleeve and press the edge on the block ring groove. The relative movement of these parts brings the cone of the block ring into engagement with the cone of the gear. (Fig. 42)

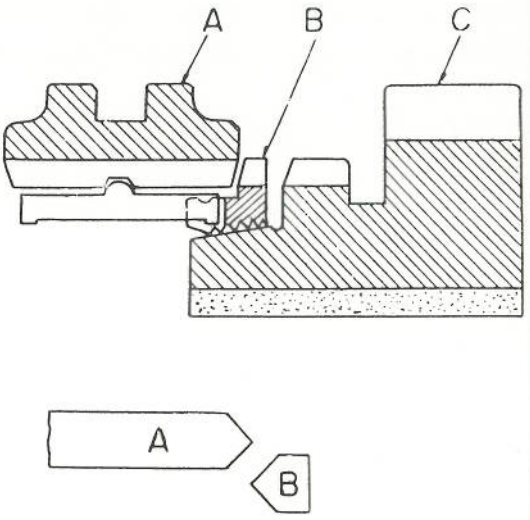
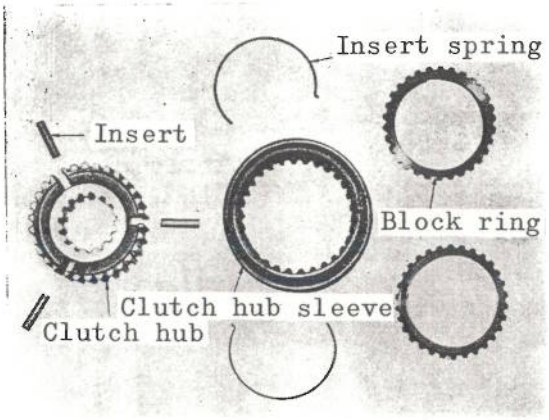


Illustration showing the function of the synchronizer (prior to function)

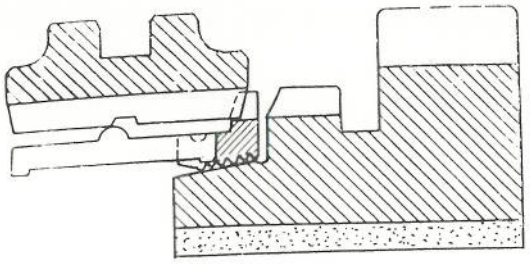
Fig. 42



Construction of the synchronizer

Fig. 41

2. When the clutch hub sleeve is further moved in axial direction, the insert refuses to move beyond the point allowing the clutch hub sleeve to move further. The center projection in the insert releases from the groove in the clutch hub sleeve and chamfered portion of the gear teeth on the inside of the clutch hub sleeve comes into contact with the chamfered portion of the teeth on the block ring. (Fig. 43)



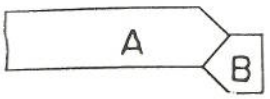


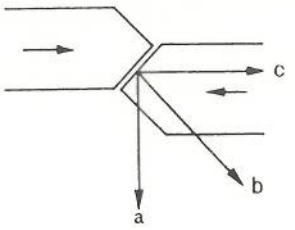
Illustration showing the function of the synchronizer (at the beginning of function)

Fig. 43

The teeth on the clutch hub sleeve come into firm contact with the teeth on the block ring by the product (b) of the forces (c) and (a) acting upon the teeth in direction indicated by arrows. The product (b) facilitates the transmission of rotating torque which in turn strengthens the thrust force acting upon the cone of the block ring gear. This results in synchronization of rotating speeds of the gears. (Fig. 44)

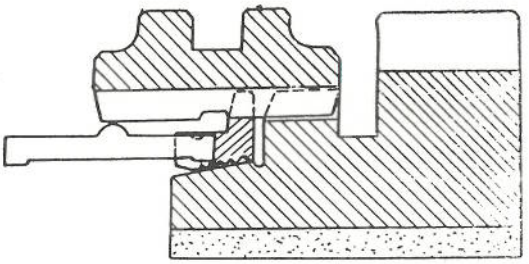
3. Synchronous effect of the clutch hub sleeve and block ring gear eliminates the resultant force (b).

As the clutch hub sleeve is



Direction of the force acting upon the parts at the beginning of synchronization

Fig. 44



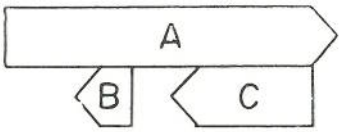


Illustration showing the function of the synchronizer (at the end of function)

Fig. 45

pressed against the gear side, the block ring and gear slide in the rotational direction along with the tapered portion of the gears and come into engagement. (Fig. 45)

PART 4

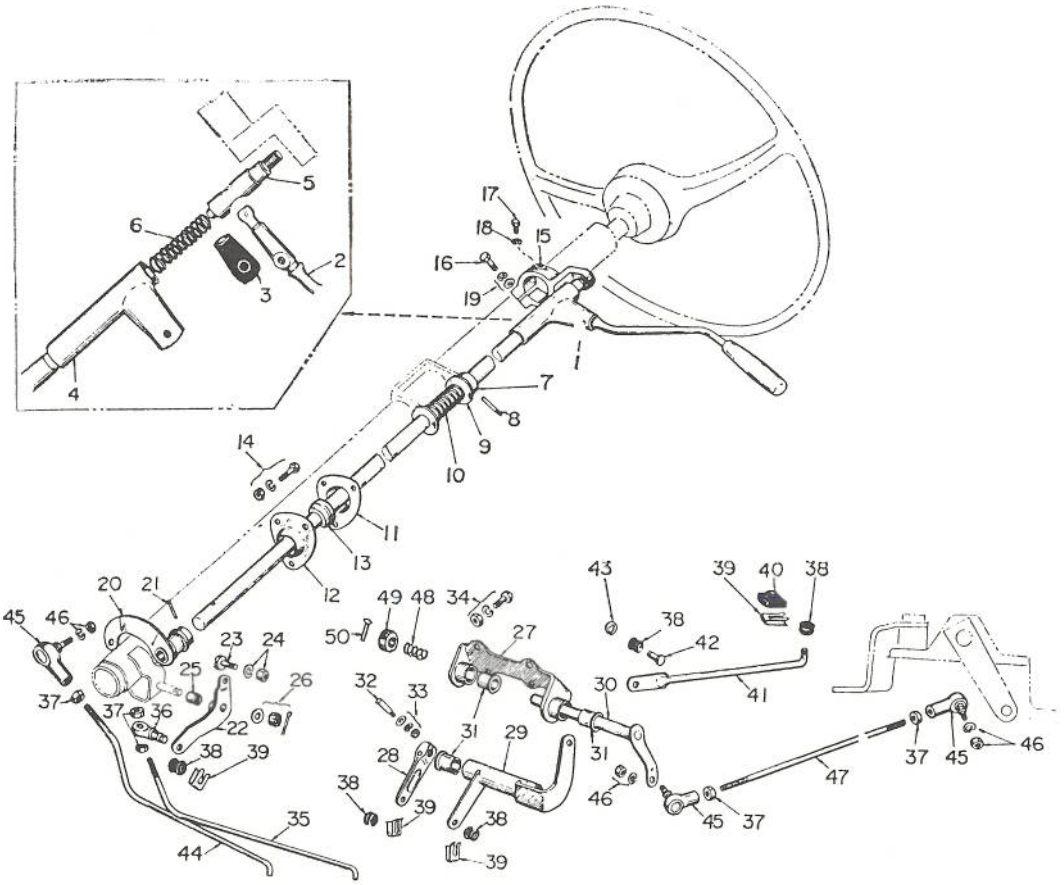
GEAR CONTROL MECHANISM

CONTENTS

PART 4 GEAR CONTROL MECHANISM

Remote control mechanism in exploded view

Bellett's gear control systems are available in the following two different types, namely: a remote control system with a gear shift lever situated in the steering column and a direct control system with the gear shift lever arranged on the floor.



Component parts of the remote control

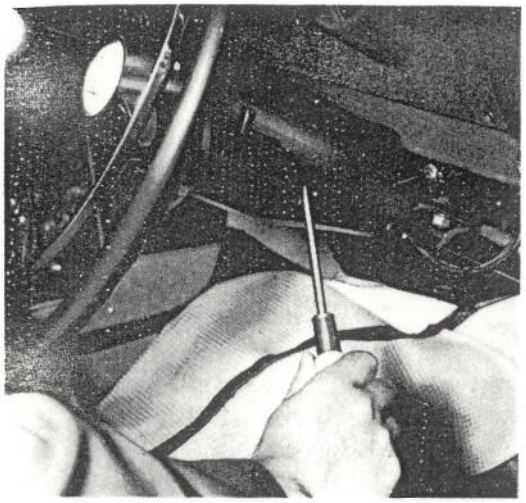
Fig. 1

1. Control shaft assembly
2. Hand lever
3. Dust cover
4. Control shaft
5. Pivot pin
6. Spring
7. Boss
8. Tension pin
9. Washer
10. Spring
11. Housing: inner
12. Housing: outer
13. Spherical bushing
14. Bolt, nut and spring washer
15. Support bracket
16. Bolt
17. Set screw
18. Spring washer
19. Spring washer and plain washer
20. Shift lever
21. Tension pin
22. Select lever
23. Operating pin
24. Nut and spring washer
25. Bushing
26. Nut, washer and split pin
27. Bracket
28. Relay lever: shift
29. Relay lever: select
30. Relay lever shaft
31. Bushing
32. Pin
33. Nut and washer
34. Bolt and washer
35. Link rod
36. Boss
37. Nut
38. Rubber bushing
39. Clip
40. Dust cover
41. Link rod
42. Pin
43. Snap ring
44. Link rod
45. Ball joint
46. Nut and spring washer
47. Link rod
48. Spring
49. Collar
50. Knock pin

Removing, inspecting and refitting the remote control linkage

REMOVING

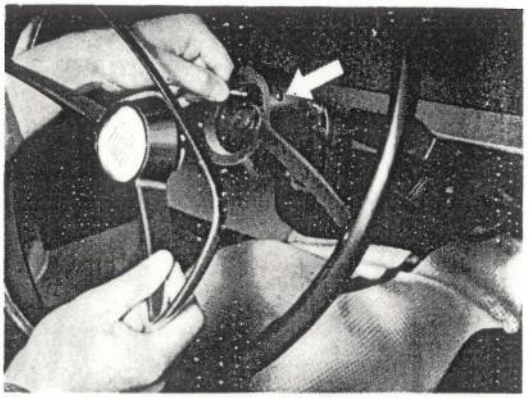
1. Remove the screws fixing the steering cowl and remove the cowl. (Fig. 2)



Removing the cowl

Fig. 2

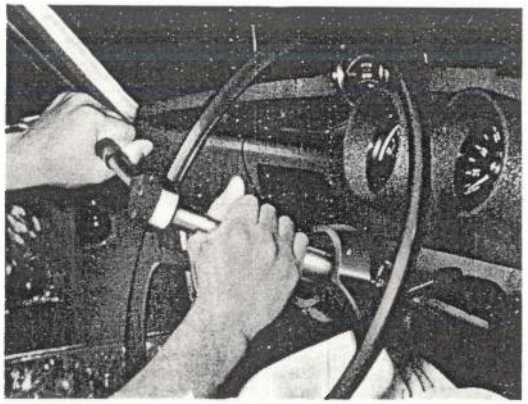
2. Remove the horn ring by releasing the screw indicated by an arrow and then, disconnect the cord from the horn. (Fig. 3)



Removing the horn ring

Fig. 3

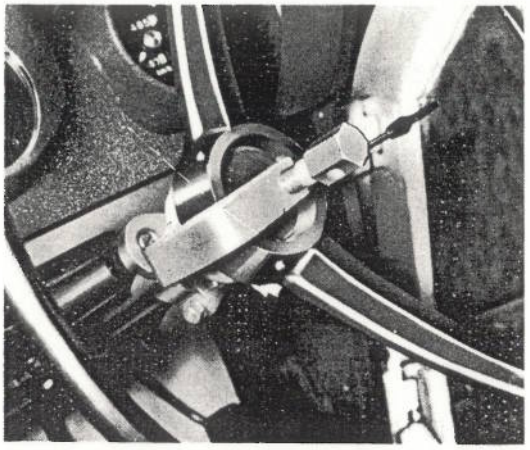
3. Remove the nut clamping the steering wheel. (Fig. 4)



Removing the clamping nut

Fig. 4

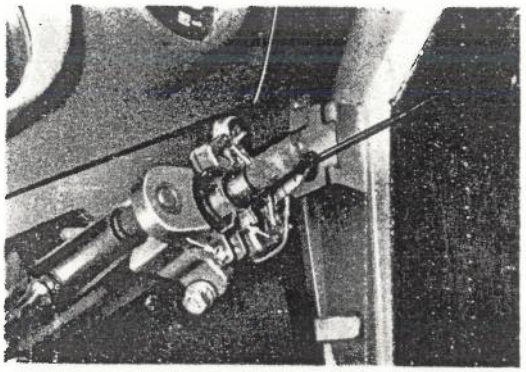
4. Remove the steering wheel with the aid of a puller (8521-0079). (Fig. 5)



Removing the steering wheel

Fig. 5

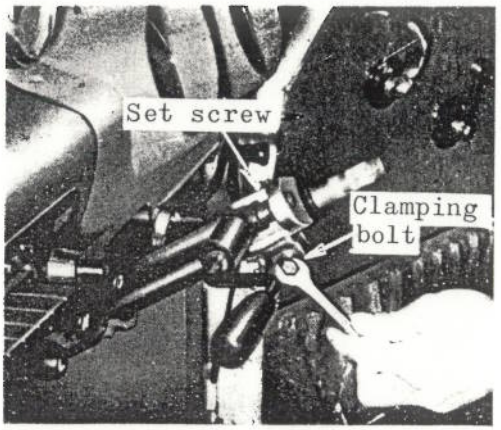
5. Remove the flasher switch by releasing the screws indicated by an arrow. (Fig. 6)



Removing the flasher switch

Fig. 6

6. Slacken the support bracket clamping screw and set screw: (Fig. 7)

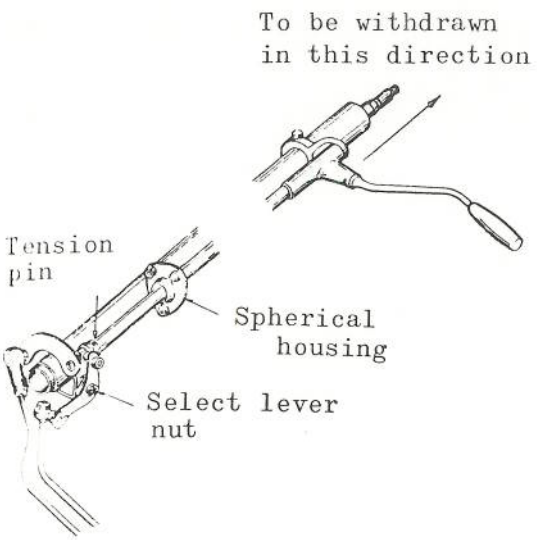


Removing the clamping bolt

Fig. 7

7. Remove the tension pin from the shift lever and then, withdraw the gear control shaft toward the drivers seat together with the support bracket. (Fig. 8)

Caution: Prior to withdrawal of these parts, the gear control shaft should be thoroughly cleaned, other wise, foreign materials accumulated on the shaft may cause damage to the spherical bushing.



Removing the gear control shaft

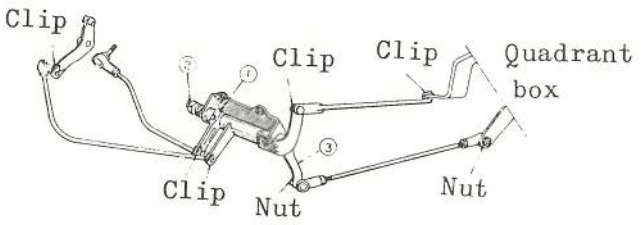
Fig. 8

8. The select lever and shift lever can be released when the select lever nut (indicated by an arrow) is removed. (Fig. 8)

9. The spring and washer can be removed when the gear control shaft is pulled out.

10. Remove the spherical housing from the dashboard.

11. Disconnect the link rods from their corresponding joints.



Disassembling the control link

Fig. 9

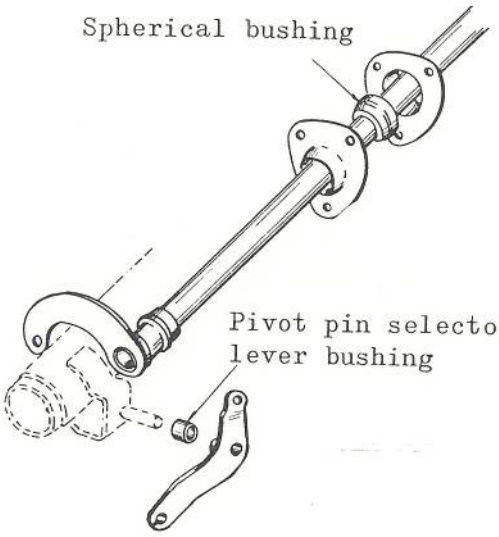
12. Remove the relay lever by releasing the nut fastening the relay lever to the floor panel.

13. Disassembling the relay lever. (Fig. 11)

a. Pull out the pin 1 by releasing the nut.

b. Pull out the collar by removing the caulking on the knock pin 2 serving to hold the collar.

c. Pull out the shift relay lever 3 .



Inspecting the control shaft

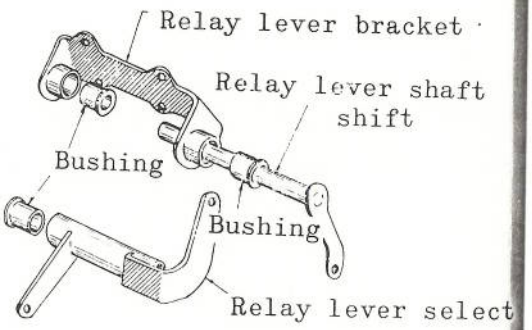
Fig. 10

INSPECTING

Disassembled parts should be cleaned and checked for wear or damage and necessary repair or replacement should be made accordingly.

1. Check the spherical bushing and selector lever bushing for wear and replace them if wear is notable. (Fig. 10)

2. Excessive wear on the relay lever bushing and shaft will often invite a trouble such as the gear slipping off the position and hence, worn bushing should be replaced as a means of a precautionary maintenance. (Fig. 11)



Inspecting the relay lever

Fig. 11

3. Check the ball joints on the link rods for excessive play and make necessary adjustment or replacement.

REFITTING

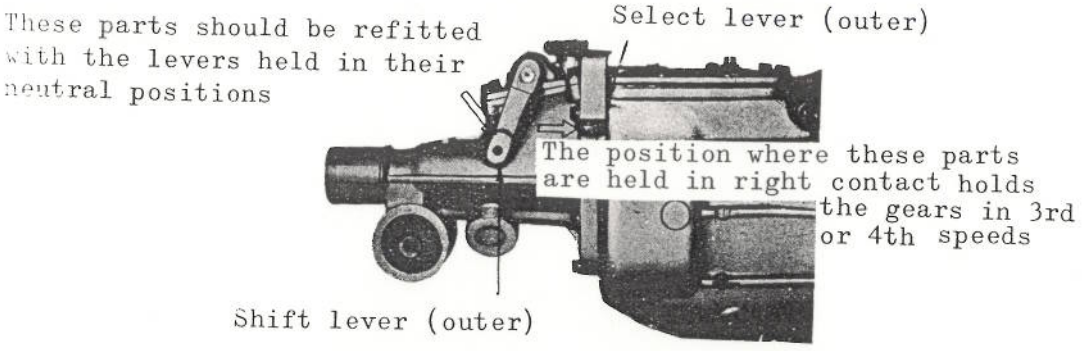
The parts should be reassembled by reversing the procedure for disassembly after the bushing and joints on the links are well lubricated.

Control linkage adjustment

SHIFT LINK AND ITS ASSOCIATED PARTS

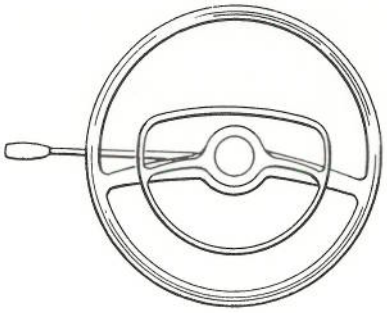
1. Hold the shift levers of the transmission and quadrant box in neutral position. (Fig. 12)

2. The ball joints on the link rods should be adjusted so as to bring the hand lever in horizontal plane, before the parts are refitted to their original places.



Adjusting the link

Fig. 12



The gear shift lever should be held in horizontal plane when the gears are in neutral position

Fig. 13

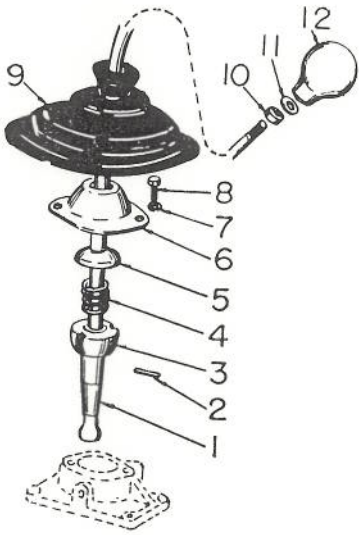
SELECT LINK AND ITS ASSOCIATED PARTS

1. Lightly push the select lever (outer) of the transmission quadrant box in frontward direction and hold the select lever (inner) in light contact with the reverse stop spring sleeve and then, adjust the length of the link rod by adjusting the ball joint before the parts are refitted. (Fig. 12)

   Caution: The select levers when held in the relative position, hold the gears in 3rd or 4th speed.

2. On completion of refitting and adjustment, operate the hand lever to see if gears can be brought into proper engagement.

Gearshift lever assembly in exploded view



1. Gear shift lever
2. Pin
3. Boss
4. Spring
5. Spherical cage
6. Cover
7. Spring washer
8. Bolt
9. Grommet
10. Lock nut
11. Shim
12. Knob

Component parts of the gear shift lever

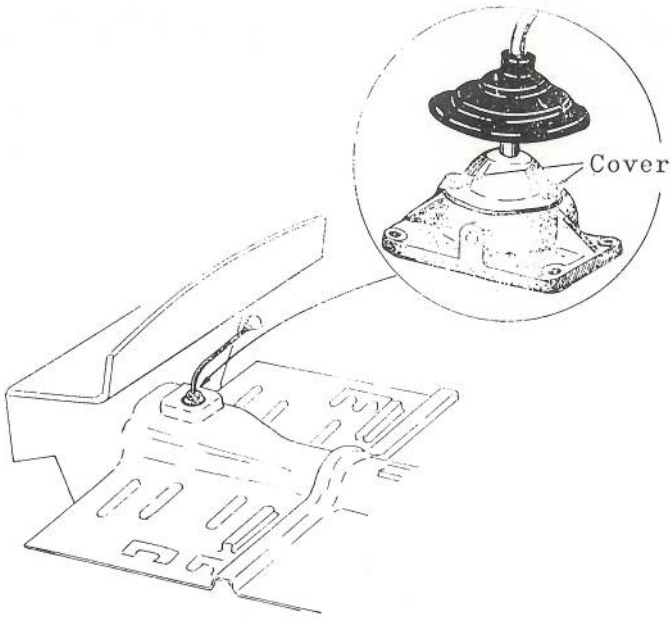
Fig. 14

Disassembling inspecting and reassembling the direct control

DISASSEMBLING

1. Remove the floor mat and then remove the grommet.

2. Remove the gear shift lever by releasing the cover clamping bolts. (Fig. 15)



Removing the gear shift lever

Fig. 15

INSPECTING AND REASSEMBLING

1. Check the tip end and spherical portion of the gear shift lever for wear and make necessary repair or replacement.

2. Reverse the procedure of disassembly for reassembling the parts.

bolts

PART 5

PROPELLER SHAFT

CONTENTS

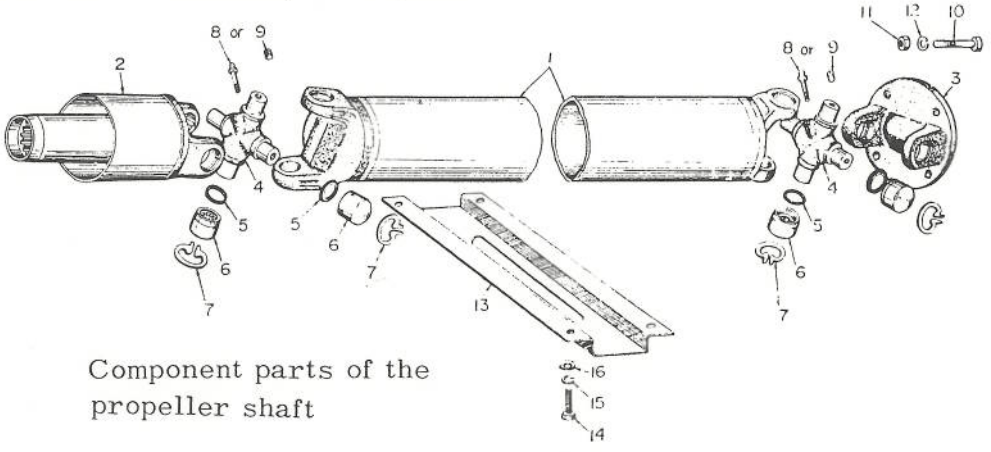
PART 5 PROPELLER SHAFT

Propeller shaft data

Propeller shaft data

Item \ Model	PR	KR
Construction	Steel hollow shaft	Same as left
Length x outside diameter x inside diameter (mm)	1177 x 63.5 x 60.2	1249 x 63.5 x 60.2
Outside diameter of the spider pin (mm)	14.724	Same as left
Needle roller bearing		
Outside diameter of the cover (mm)	23.8	"
Inside diameter (mm)	14.7	"

Propeller shaft assembly in exploded view



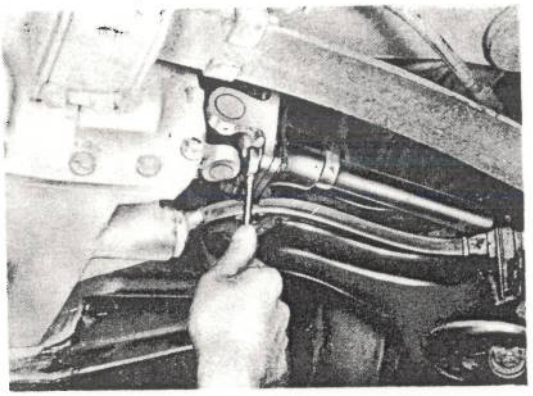
Component parts of the propeller shaft

Fig. 1

1. Propeller shaft
2. Spline yoke
3. Flange yoke
4. Spider
5. Joint ring
6. Needle roller bearing
7. Snap ring
8. Grease nipple
9. Plug
10. Bolt
11. Nut
12. Spring washer
13. Propeller shaft guard
14. Bolt
15. Spring washer
16. Plain washer

Propeller shart removal and refitting

1. Remove the bolts fastening the flange yoke with the driving coupling and disconnect the flange from the propeller shaft. (Fig. 2)



Removing the flange yoke

Fig. 2

2. Withdraw the propeller shaft assembly from the transmission rear cover in the rearward direction.

Note: Fit transmission rear cover plug (8529-1408) to the transmission to prevent lubricating oil from flowing out. (Fig.3)

Transmission rear cover plug

Fig. 3

3. For refitting, reverse the order of removal. Flange set bolts should be securely tightened.

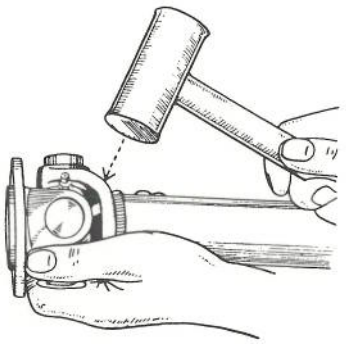
Flange set bolt tightening torque is 2.3 - 2.6 m-kg.

Disassembly, inspection and reassembly of the universal joint

DISASSEMBLY

1. With a pliers, contract the snap ring by holding its ends and then take out the snap ring. If the snap ring refuses to come out from the groove in the yoke, remove the paint from the hole in the yoke or tap the edge of the bearing with a wooden hammer. This will free the snap ring from binding.

2. Hold the universal joint with one hand and tap the yoke lightly with a copper hammer or with a wooden hammer. (Fig. 4)



Removing the bearing

Fig. 4

3. Tapping motion gradually loosens the needle roller bearing, allowing it to be pulled out easily with fingers. (Fig.5)

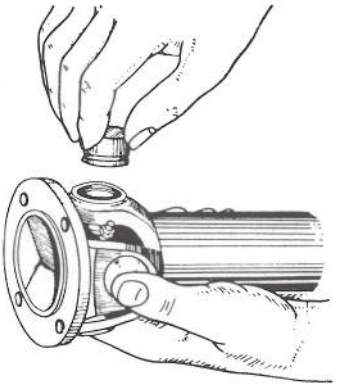


Fig. 5

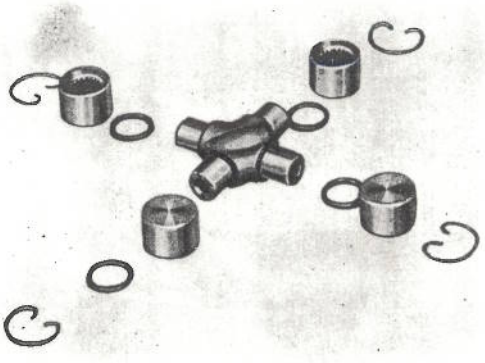
INSPECTION

Wash all the disassembled parts with gasoline or detergent oil and check them for breakage, wear or deformation. Replace the parts if necessary. Carefully check the parts against the following.

1. Spline in the spline yoke for damage or wear.

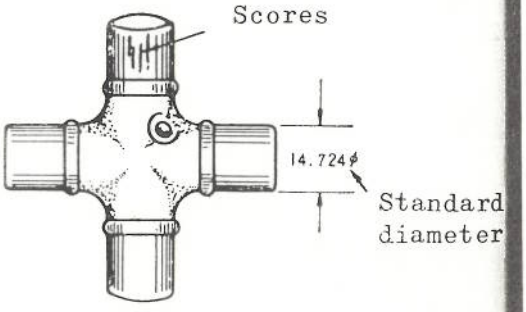
2. Measure the propeller shaft deflection and make necessary rectification to hold the deflection to 0.5 mm at a maximum.

3. Check the journal face of the spider for wear and score. Replace the spider if the wear of the journal face is in excess of 0.15 mm or there is scores in the journal face. (Fig. 7)



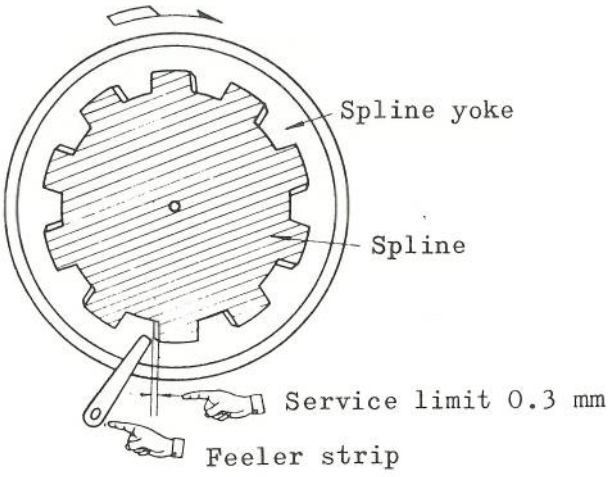
Component parts of the spider assembly

Fig. 6



Wear of the spider

Fig. 7



Fit of spline in the spline yoke

Fig. 8

4. Check the needle roller for rust, wear and cracking.

5. Check the spline for wear and replace the yoke if the end play is in excess of 0.3mm. (Fig. 8)

6. Off-balance weight should be held to 18 cm-gr at a maximum at the rotating speed of 3,200 rpm.

REASSEMBLY

1. Upon completion of the above inspection and necessary rectification, apply chassis grease to the parts which are subjected to friction. Then carry out the reassembling work in the reverse order of disassembly.

2. Before refitting the universal joint, check the snap rings for breakage and weakness and make necessary replacement.

3. Apply ample amount of lubricant to the needle rollers through the grease nipple on the spider.

Trouble-shooting and corrections

CAUSE OF TROUBLE

1. Propeller shaft vibration and noise

Cause of trouble	Correction
1. Propeller shaft dent or bending	Rectify or replace
2. Defective needle roller bearing	Replace
3. Loosened propeller shaft spline yoke mounting	Re-tighten to the specified torque Replace the parts if the play of the spline in the rotational direction is in excess of 0.3m
4. Excessive play between the main shaft spline and spline yoke	Needle roller bearing lacks lubricant
5. Needle roller bearing lacks lubricant	Apply ample amount of grease t the bearing
6. Unbalanced propeller shaft	Restore the balance or replace the propeller shaft

PART 6

DIFFERENTIAL

CONTENTS

PART 6 DIFFERENTIAL

Data of the differential

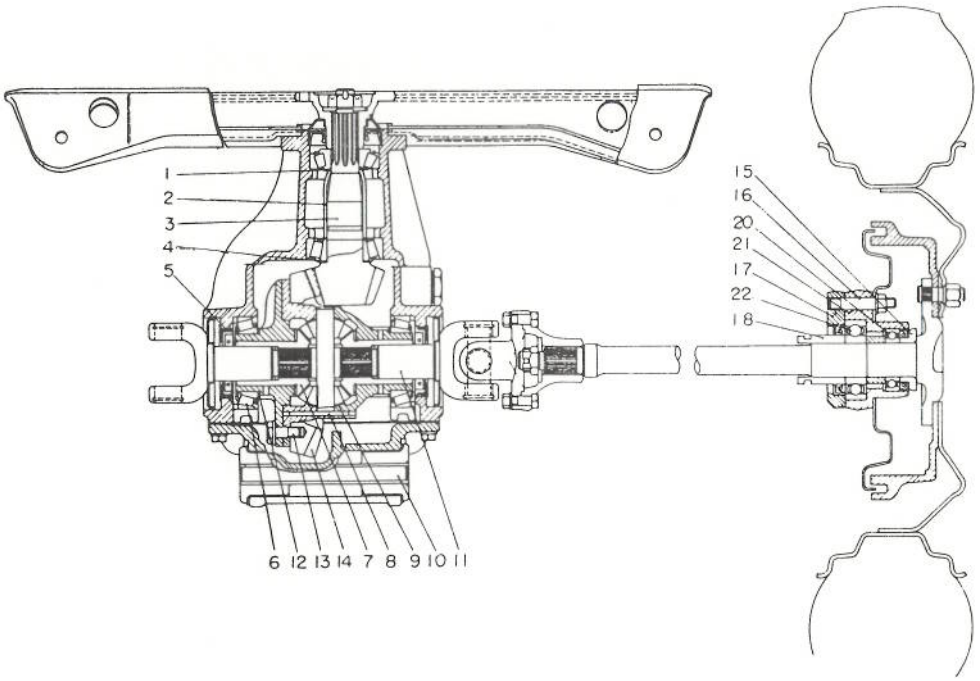
Type	Hypoid gear	Single stage reduction
Gear ratio	3.778 (9/34)	PR 20, PR 90
	4.111 (9/37)	PR 20, PRD 10, PR 10
	4.625 (8/37)	PRD 10, PR 10 (Equipped with 3-speed transmission)

Note: 1. Since the individual gear has no interchangeability, a complete set of gears should be used for replacement.

2. Recommended lubricant for use in the differential is P15A. The lubricant capacity is 0.7 ltr (up to the lower face of the oil level plug hole).

Construction of the differential

The rear axle carrier assembly is rigidly mounted to the chassis for the use of independent rear suspension which differ in construction from the type which is generally referred to as banjo type. The differential carrier and rear cover are fabricated with aluminum alloy for weight reduction. The use of hypoid gear in the final drive system contributes to the improved stability through the lowered floor. (Fig. 1)

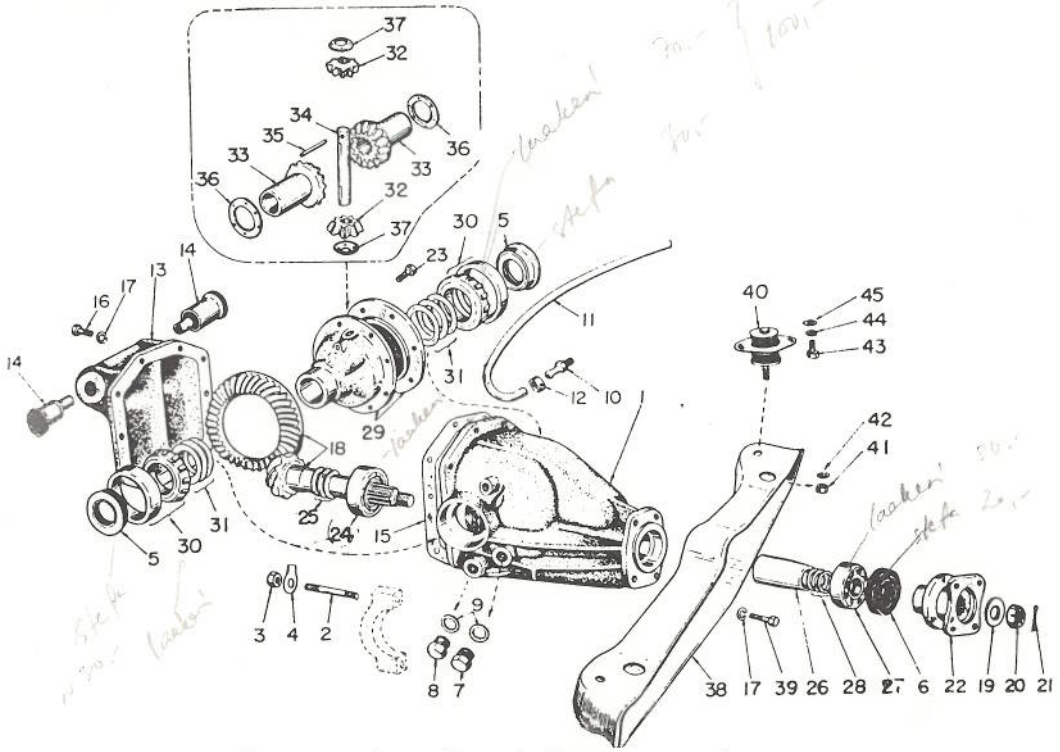


Component parts of the differential and rear axle

Fig. 1

1. Shim A
2. Distance piece
3. Pinion shaft
4. Shim B
5. Oil seal
6. Side bearing
7. Side gear
8. Knock pin
9. Differential cage
10. Differential rear mounting
11. Axle shaft (inner)
12. Shim C
13. Setting bolt
14. Crown gear
15. Collar
16. Stud
17. Diagonal link flange
18. Sleeve
19. Distance piece
20. Bearing (outer)
21. Bearing holder
22. Bearing (inner)
23. Axle shaft (outer)

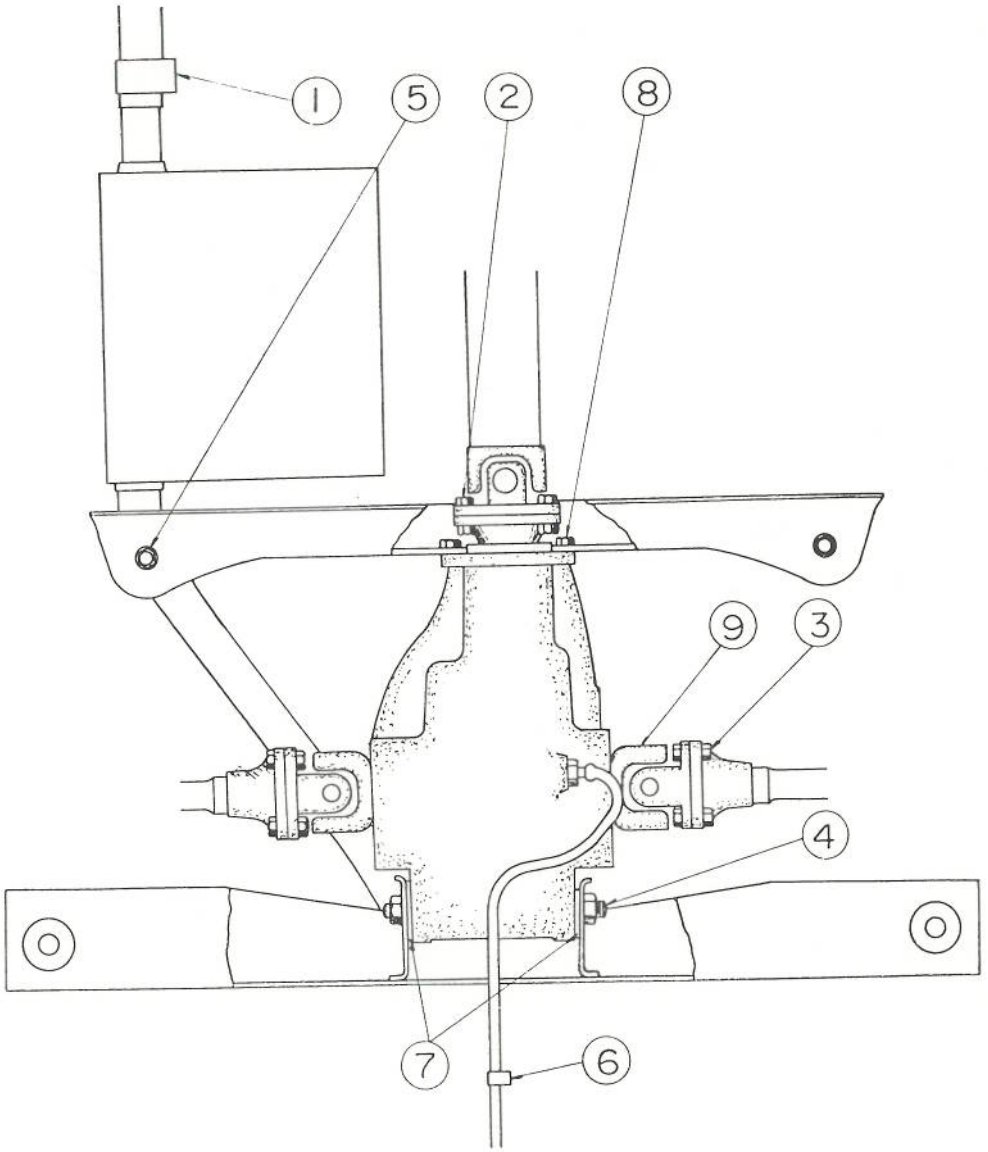
Differential unit in exploded view



Component parts of the rear axle

Fig. 2

1. Carrier assembly
2. Stud
3. Nut
4. Lock plate
5. Oil seal
6. Oil seal
7. Plug; oil filler
8. Plug; Magnetized drain plug
9. Gasket
10. Breather
11. Vinyl pipe
12. Clip
13. Rear cover
14. Bush
15. Gasket
16. Bolt
17. Spring washer
18. Gear set; final gear
19. Washer
20. Nut
21. Split pin
22. Flange
23. Bolt
24. Bearing
25. Shim
26. Distance piece
27. Bearing
28. Shim
29. Differential cage
30. Bearing
31. Shim
32. Pinion
33. Side gear
34. Cross pin
35. Pin
36. Thrust washer
37. Thrust washer
38. Mounting bracket
39. Bolt
40. Cushion rubber assembly
41. Nut
42. Spring washer
43. Bolt
44. Spring washer
45. Washer



Removing the differential

Fig. 3

Removal

1. Disconnect the exhaust pipe at the clip ① situated at the front part of the muffler.

2. Take out the bolts ② and disconnect the propeller shaft.

3. Remove the flange bolts ③ from the right and left flanges.

4. Support the differential on a jack with a piece of board placed on it.

5. Take out the rear mounting bolts. ④

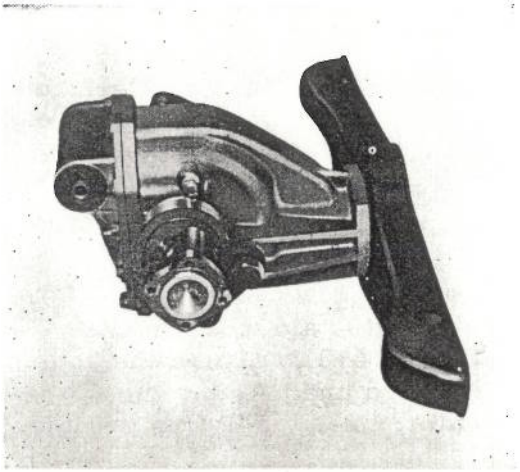
6. Take out the nuts ⑤ from the front mounting bracket and then remove the front mounting bracket.

7. Disconnect the air breather vinyl pipe from the clip ⑥ .

8. With the aid of a tire lever or other suitable tool, move the differential assembly forward so as to release it from the rear mounting brackets ⑦ .

9. Take out the bolts ⑧ and remove the front mounting brackets.

10. Pull out the right and left inner axle shafts ⑨ . (See Fig. 3 for correct sequence of removal)



Differential assembly

Fig. 4(a)

Gear ratio marking

Fig. 4(b)

Disassembly

1. Hold the differential assembly with the rear cover faced up and remove the rear cover.

2. Drain the lubricant and remove the bearing caps.

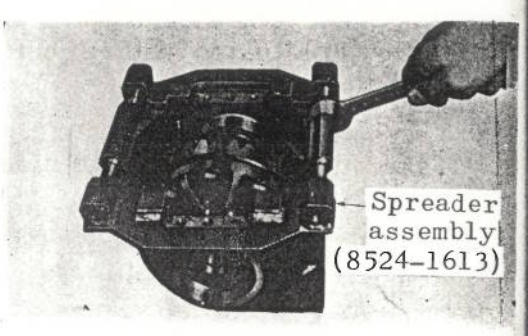
   Note: When removing the bearing caps, carefully note their relative positions in order to refit them correctly into their original positions.

3. With the aid of a spreader (8524-1613), expand the housing outward and take out the differential unit. (Fig. 5)

   Cautions: 1. The housing should not be expanded beyond 1 mm.

   2. The spreader should be loosened immediately after the differential unit is taken out. The housing should not be held with the spreader working on it for a long period of time.

   3. The positions of the right and left bearing outer laces should be carefully noted before the disassembly.



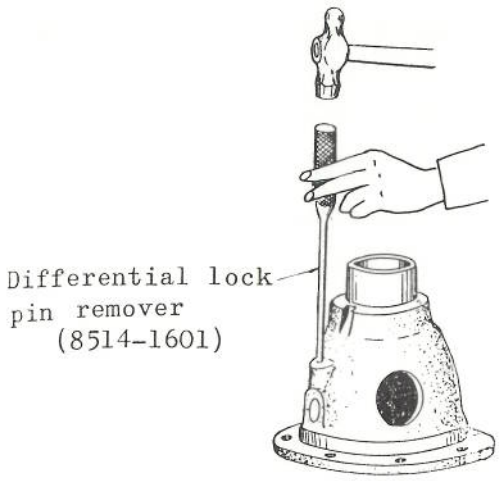
Removing the differential unit

Fig. 5

4. Take out the crown gear set bolts (left-hand thread).

5. The crown gear and differential cage can be divided into two units after the set bolts are removed. Take out the side gears in the left-hand side and thrust washer.

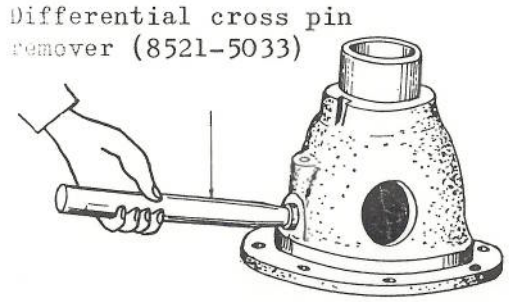
6. With the aid of a remover (8514-1601), take out the lock pin fastening the cross pin to the differential cage. (Fig. 6)



Driving out the lock pin

Fig. 6

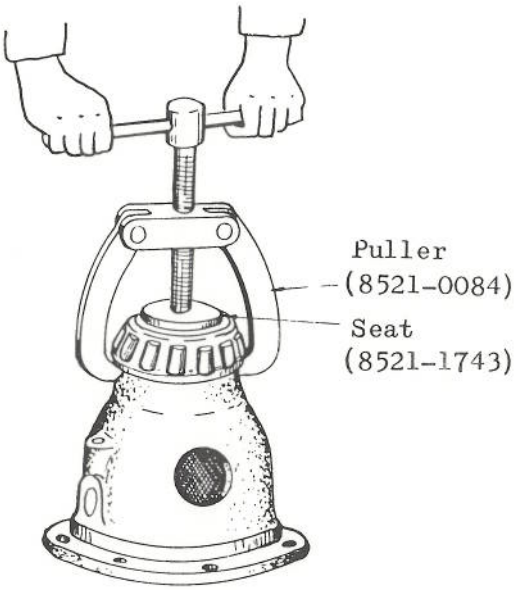
7. Take out the cross pin and then remove the two differential pinions, thrust washers, side gears in the right-hand side and thrust washers. (Fig. 7)



Removing the lock pin

Fig. 7

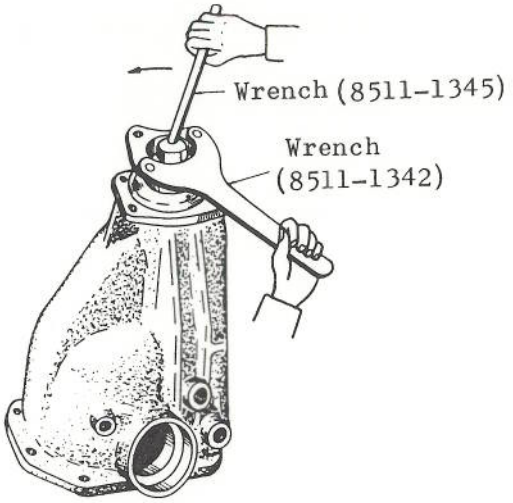
8. With the use of the puller (8521-0084) and seat (8521-1743), remove the side bearing and shim from the differential cage. (Fig. 8)



Removing the side bearing

Fig. 8

9. Take out the split pin, nuts and washers. Then remove the flange with the aid of wrenches (8511-1345) and (8511-1342). (Fig. 9)

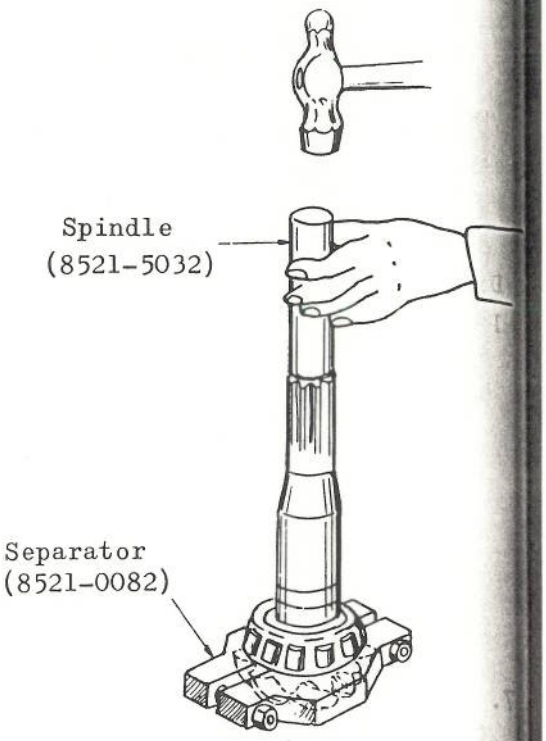


Removing the flange

Fig. 9

10. With the aid of a brass rod, drive out the pinion toward the crown gear side.

11. Remove the shim and distance piece. Then drive out the inner bearing with the aid of a separator (8521-0082) and spindle (8521-5032). Take out the backlash adjusting shims. (Fig. 10)

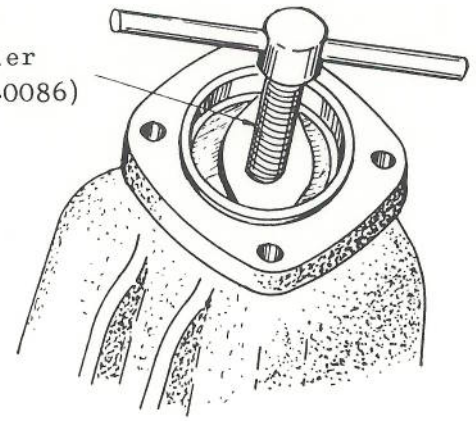


Driving out the pinion inner bearing

Fig. 10

12. Remove the oil seal.

13. With the use of a puller (8521-0086), pull out the bearing outer lace. (Fig. 11)



Removing the outer lace

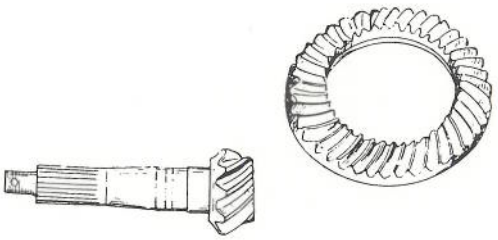
Fig. 11

Inspection

Wash the disassembled parts with detergent oil and check them for wear or damage and make necessary rectification or replacement.

1. Check each set of bearing for evidence of wear, damage or seizure.

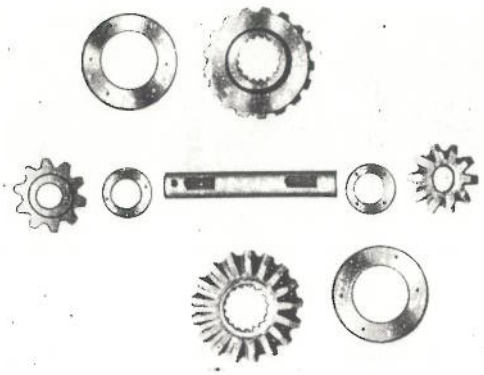
2. Inspect the teeth of the crown gear and final pinion for evidence of wear, damage or seizure. If either of the crown gear or the final pinion is found defective, always make sure to replace the mating gear. (Fig. 12)



Inspecting the crown gear and final pinion

Fig. 12

3. Inspect the side gears, pinions, thrust washers, cross pin and lock pin for evidence of wear, damage or seizure. (Fig. 13)



Inspecting the component parts

Fig. 13

4. Inspect the differential cage for cracks.

5. Inspect the differential carrier and oil seals for damage.

Adjustment and reassembly

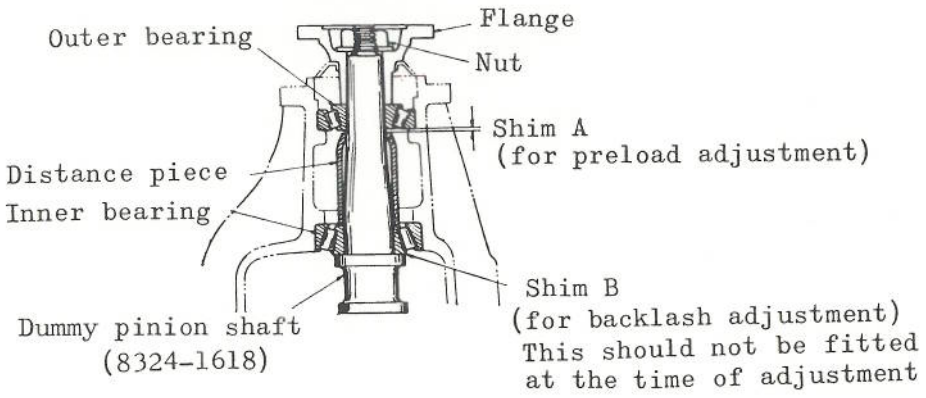
ADJUSTING THE PINION BEARING PRELOAD

1. Refit the pinion bearing outer lace.

2. Fit the inner bearing, distance piece and shim A which has been taken out at the time of disassembly, into the dummy pinion shaft (8324-1619).

   Note: Shim B should not be refitted at this stage of adjustment. Carefully treat the distance piece, shim and bearing to avoid entry of dust or other foreign particles into the dummy pinion shaft.

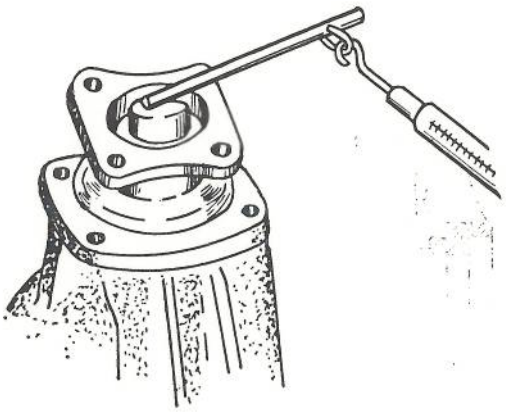
3. Fit the dummy pinion shaft into the differential carrier, and refit the outer bearing, flange, washer and nut into position in the order mentioned. Tighten these parts to specified torque. (18 - 21 m-kg) (Fig. 14)



Preload adjustment

Fig. 14

4. Mount a box wrench to the nut in the flange. Hook a spring balance to the wrench handle at a position illustrated and pull the spring balance in the direction right angle to the axial line of the wrench handle and note the reading. (Specified preload is 12 cm-kg) (Fig. 15)



Measuring the preload

Fig. 15

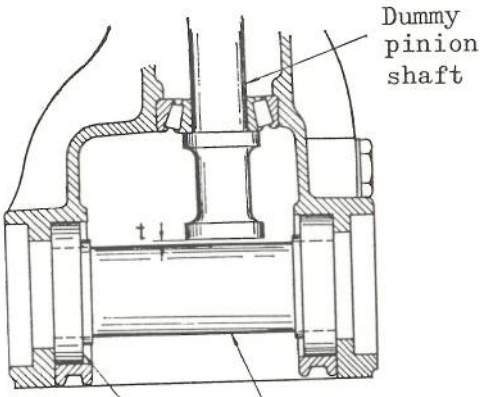
5. Adjust the preload by varying the number of shim A to be fitted until the correct preload is achieved. The preload decreases with increase in the thickness of shims A to be fitted and increases with the decrease in the number of shims A.

BACKLASH ADJUSTMENT

When the correct preload is obtained, adjust the backlash with the assembly in correctly adjusted condition.

1. Fit two dummy bearings to the dummy shaft and fit these parts into the housing. Refit the bearing caps into position and tighten them to 7 - 8 m-kg torque.

2. When fitting the pinion having the gear ratio of 3.727 (gear: 41, pinion: 11), the thickness of the shim B should be obtained by adding 1 mm to the clearance (t). (Fig. 16)

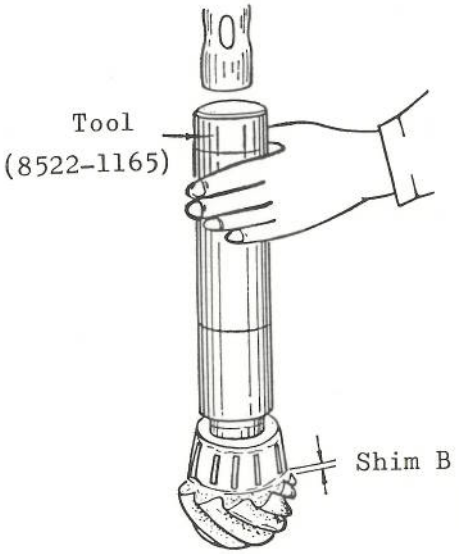


Measuring the backlash

Fig. 16

3. When the thickness of the shim B to be fitted is determined, take out the dummy bearing, dummy shaft and dummy pinion shaft.

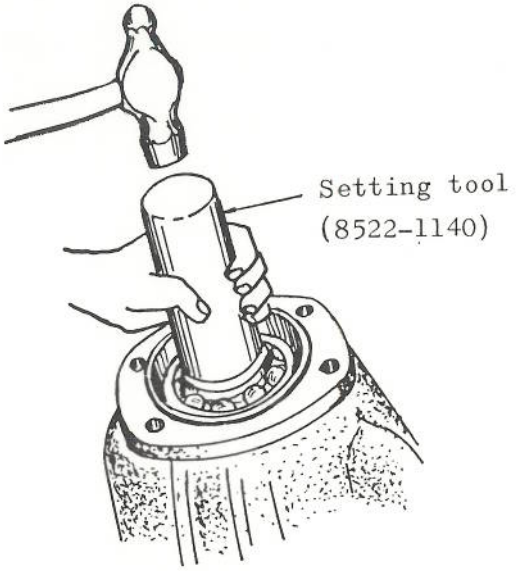
4. Fit the shim B to the hypoid pinion and then refit the inner bearing into position with the aid of a special tool (8522-1165). (Fig. 17)



Refitting the inner bearing

Fig. 17

5. Fit the distance piece and shim A to the final pinion in the order mentioned and fit these parts into position from the inside of the differential carrier. Then fit the outer bearing into position from the other side with use of a setting tool (8622-1140). (Fig. 18)



Driving the outer bearing into position

Fig. 18

Driving the oil seal into the differential carrier

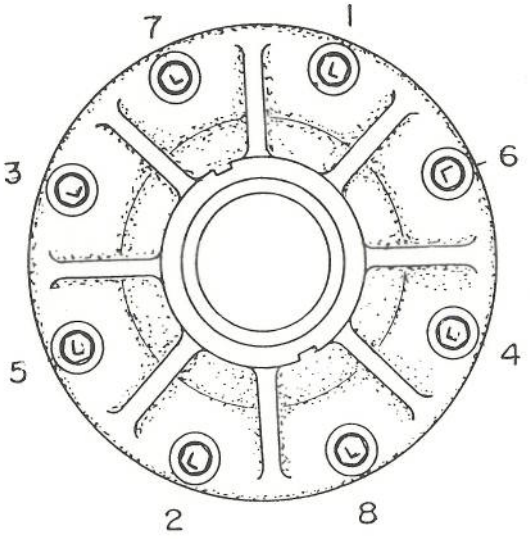
Fig. 19

6. With the aid of a setting tool (8522-1142), drive the oil seal into the differential carrier. (Fig. 19)

7. Fit the flange and washer into position in the order mentioned and tighten these parts to specified torque. (18 - 21 m-kg). Then fit split pin into place.

BACKLASH ADJUSTMENT

1. Fit the side gears, pinion and cross pin into the differential cage and then mount the crown gear in place.



Crown gear set bolts tightening sequence

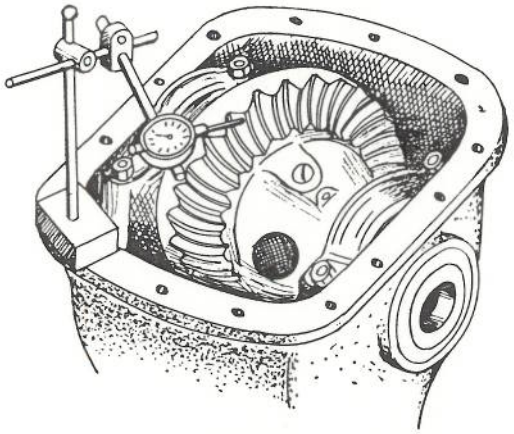
Fig. 20

Caution: Clean the threaded part of the set bolt and

crown gear and apply sealing compound (lock-tight D) to these parts.

2. Fit dummy bearing to the differential cage and mount these parts in the differential carrier.

3. Hold the tip end of the backlash measuring dial gage against the crown gear teeth. (Fig. 21)



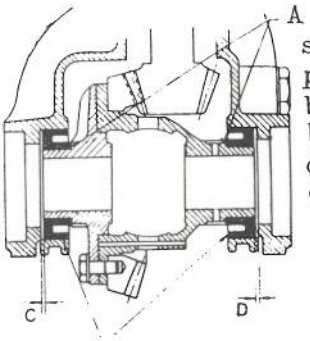
Measuring the backlash

Fig. 21

4. Adjust the backlash to specified value (0.13 - 0.18 mm) by moving the crown gear as required. The backlash decreases as the crown gear is moved toward the pinion and increases as the crown gear is moved away from the pinion.

Note: The dummy bearings should be abutted against the portions of the differential cage to eliminate clearance between mating faces.

5. When the specified backlash is obtained, measure the clearances C and D with the aid of a feeler gage. (Fig. 22)



Adjusting the backlash

Fig. 22

6. The thicknesses of the shims to be fitted can be obtained by adding the differences between the respective bearing width and dummy bearing width to the clearances C and D. However, it is necessary to add another 0.025 mm of allowance to the values obtained by the above calculation in order to provide the bearings with optimum preloads.

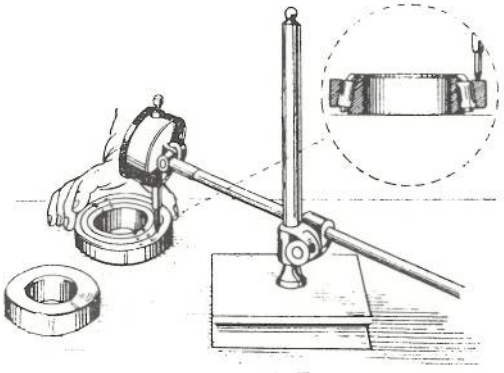
Note: The thicknesses of the shims C and D can be calculated by the following formula:

where E, E' = the width of dummy bearing

F, F' = the width of the bearing

Shim C = C + E - F + 0.25

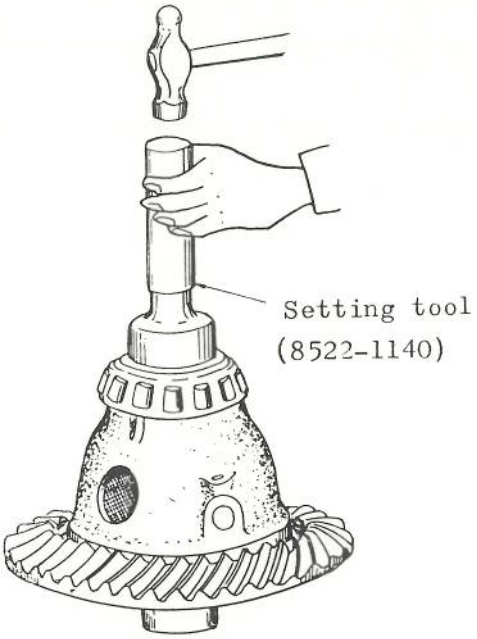
Shim D = D + E' - F' + 0.025



Measuring the bearing width

Fig. 23

7. Remove the differential cage from the differential carrier and take out the dummy bearings. With the aid of a setting tool (8522-1140), fit the right and left bearings in place together with the shims C and D.



Refitting the side bearing

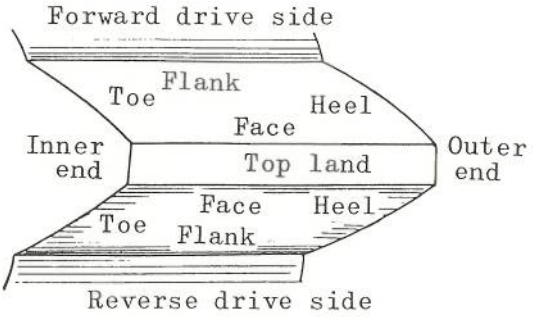
Fig. 24

INSPECTING THE FINAL GEAR TEETH CONTACT

The above adjustment should normally give correct final gear teeth contact. The gear teeth contact can be checked in the following manner.

1. Apply thin coat of perussian blue to 4 - 5 teeth of the crown gear.

2. With a light load applied to the crown gear, turn the pinion flange about ten times to get impression of the gear teeth contact. Clockwise rotation of the flange gives the impression on the teeth at forward drive side, while the counter-clockwise rotation of the flange gives impression on the teeth at the reverse drive side.



Gear tooth nomenclature

Fig. 25

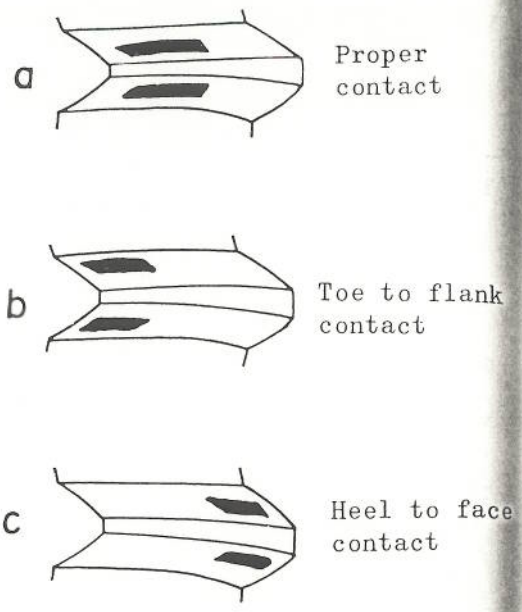


Fig. 26

Note: Correct backlash adjustment should normally give the gear teeth contact impression as illustrated in Fig. (a). If the gear teeth contact impression gives a pattern illustrated in Fig. (b), readjust the gear teeth contact by reducing the number of shims B. Readjust the gear teeth contact by increasing the number of shims B if the gear teeth contact impression gives a pattern illustrated by Fig. (c). Adjustment of gear teeth contact necessitates the readjustment of backlash.

REASSEMBLY

Upon completion of the inspection and adjustment, reassemble the parts in the reverse order of disassembly. Then fill the lubricant to the specified level.

1. Always renew the gaskets. Apply hermetic sealing compound to the surfaces to be fastened together.

2. When reassembling the crown gear and differential cage, apply lock quick primer Q to the crown gear thread and set bolts then allow them to dry. (The primer stays effective for one hour after drying and effective for 48 hours after application). When the primer is completely dry, apply lock-tight D to the crown gear thread and set bolt over the coating of the primer and then reassemble the parts. The reassembled parts should be kept free from stress for at least one hour after the reassembly.

3. Adjusting shims

Sort of adjusting shims / Thickness of the shim	Shim; for pinion outer bearing (Shim A for preload adjustment)	Shim; for pinion inner bearing (Shim B for gear tooth contact adjustment)	Shim; for differential side bearing (Shim C for backlash adjustment)
0.16	41229-107	41519-043	41519-045
0.23	41229-086	41519-038	41519-030
0.35	41229-108	41519-044	41519-046
0.50	41229-087	41519-039	41519-031

Trouble-shooting and corrections

Cause of trouble	Corrections
1. Steady noise on pull	If the noise tends to develop with the increase in the travel speeds, check the gear oil level, use of improper oil and crown gear teeth contact and make necessary correction.
2. Gear noise that arises when the car is turning a corner	Inspect the side gears, pinion, cross pin and thrust washers for evidence of wear or damage and make necessary replacement.
3. Other noises	Maladjusted bearing preloads or defective bearings. Readjust the preloads or replace the defective parts.

PART 7

REAR AXLE

CONTENTS

PART 7 REAR AXLE (for model PR)

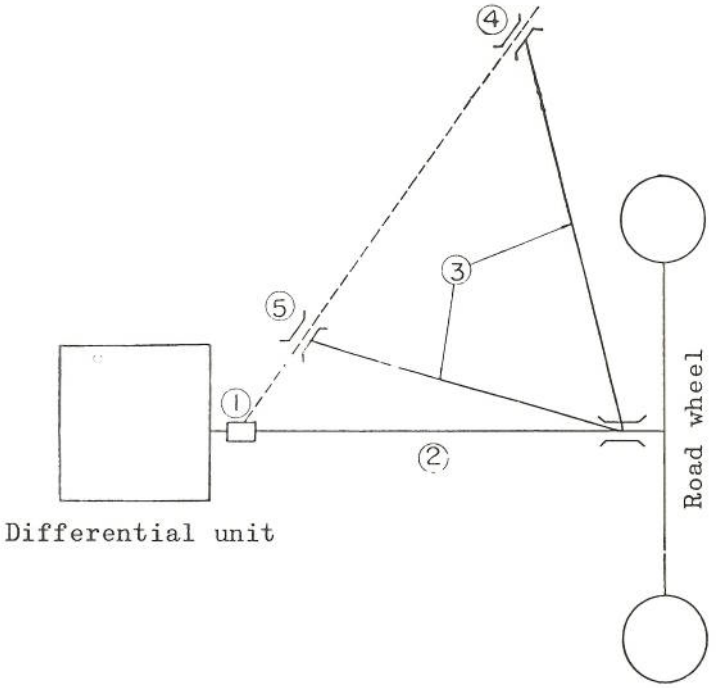
Rear axle data

Type	Swing axle with diagonal links

Note: The grease in the bearings of the rear axle should be replaced with the specified bearing grease (P15.B) after every 18,000 km of road service. The amount of grease required for lubricating the bearing in one side of the rear axle is 54 grams.

Construction of the rear axle

The rear axle comprises the inner and the outer axle shaft which are connected together with an universal joint. The inner axle shaft is splined to the differential unit rigidly mounted to the floor. The outer shaft which extends through the bearing supported by the bearing holder is connected to the diagonal links. The two fulcrums on the diagonal link and the center line of the universal joint are aligned in a straight line and so arranged as to provide the outer axle shaft and the diagonal link with unristricted swinging motion. (Fig. 1)

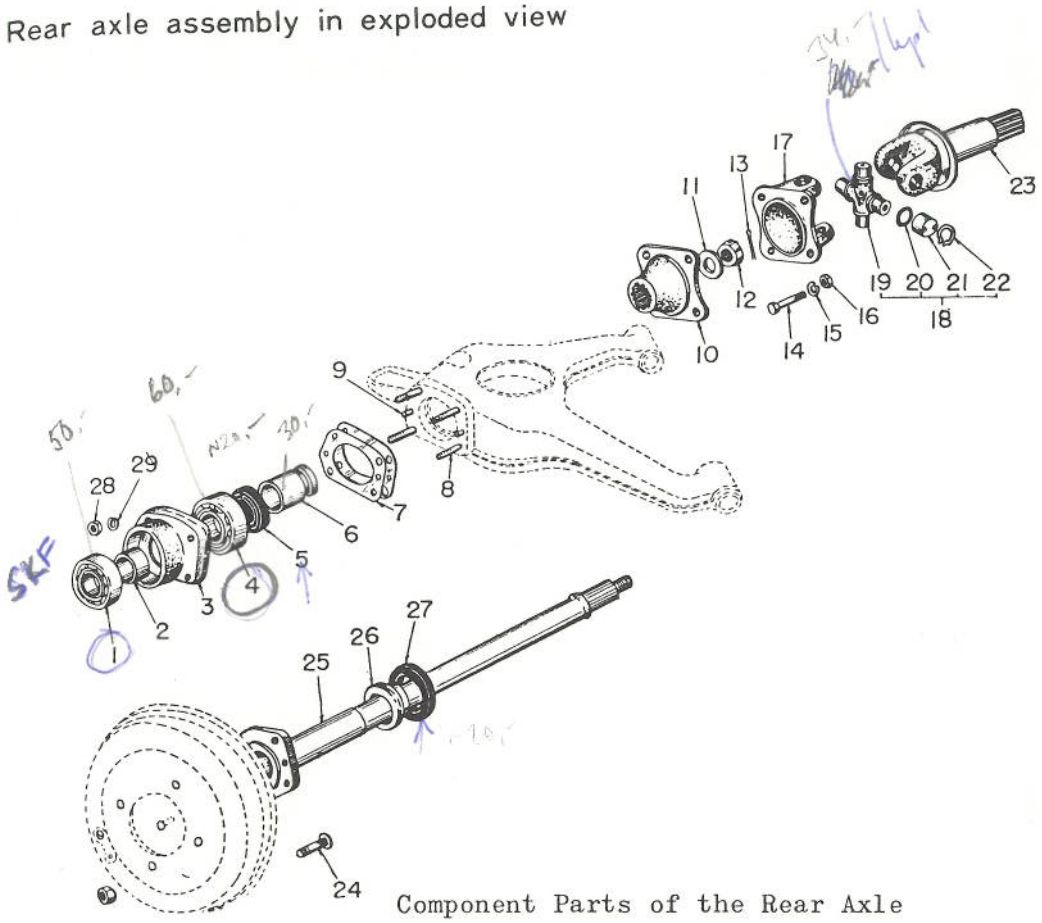


① Universal joint
② Axle shaft; outer
③ Diagonal link arm
④ Diagonal link arm setting pin
⑤ Diagonal link arm setting pin

A Drawing Illustrating the Rear Axle Arrangement

Fig. 1

Rear axle assembly in exploded view



Component Parts of the Rear Axle

Fig. 2

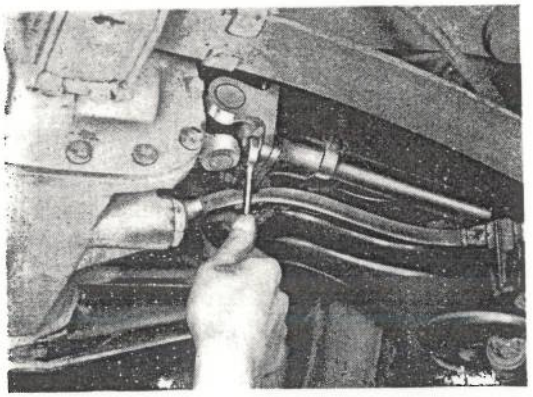
1. Bearing; outer
2. Distance piece
3. Bearing holder
4. Bearing; inner
5. Oil seal; inner
6. Sleeve
7. Shim
8. Stud
9. Straight pin
10. Flange
11. Washer; plain
12. Nut
13. Split pin
14. Bolt
15. Spring washer
16. Nut
17. Yoke
18. Universal joint kit
19. Spider
20. "O" ring
21. Needle roller bearing
22. Snap ring
23. Inner axle shaft
24. Wheel pin
25. Outer axle shaft
26. Puller
27. Oil seal; outer
28. Nut
29. Spring washer

Removal and disassembly

1. Jack up the rear wheels clear of the ground and remove the wheels and brake drums.

2. Disconnect the brake pipe from the wheel cylinder and detach the hand brake cable joint. (Refer the paragraph "Brakes" for the above procedures.)

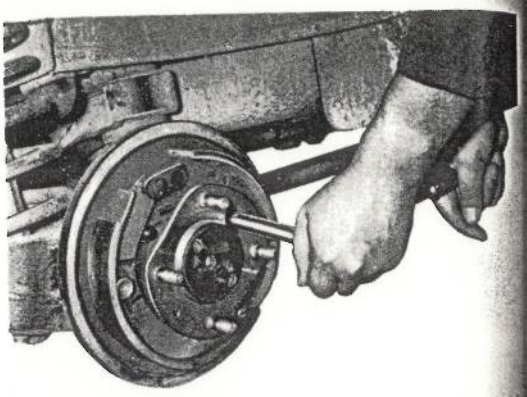
3. Take out the flange yoke setting bolts and remove the flange yoke from the axle shaft.



Removing the flange yoke

Fig. 3

4. Remove the nuts fastening the bearing holder with the diagonal link. (Fig. 4)



Removing the outer axle shaft

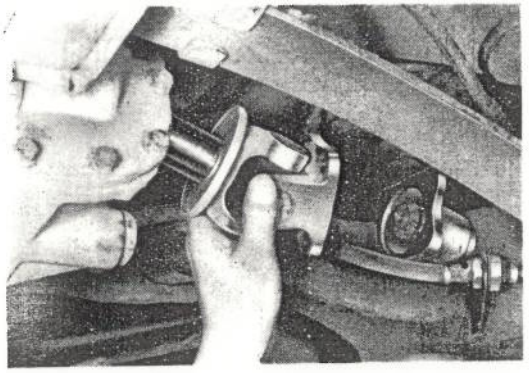
Fig. 4

5. Pull out the outer axle shaft with the aid of the remover (8521-0083). (Fig. 5)

Removing the outer axle shaft

Fig. 5

The bearing holder and back plate can be removed together with the outer axle shaft, but the flange fitted to the outer axle shaft forms an effective block behind the diagonal link which prevent the outer axle shaft from being pulled out completely. Hold these parts suspended in position, and pull out the inner axle shaft from the differential carrier. (Fig. 6)



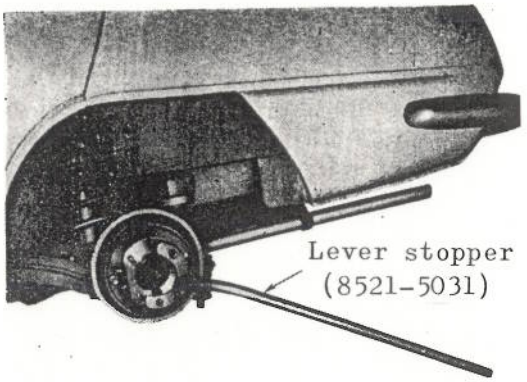
Removing the inner axle shaft

Fig. 6

Note: When removing the outer axle shaft, care should be taken not to damage the inner oil seal fitted into the diagonal link.

6. Refit the outer axle shaft and bearing holder assembly to the stud bolts on the diagonal link.

7. With the aid of a lever stopper (8521-5031), hold the flange in position and take out the flange setting nuts. Then remove the flange. (Fig. 7)



Pulling out the outer axle shaft

Fig. 7

Note: The remover and the lever stopper for model PS may be modified to eliminate the need for the similar tools.

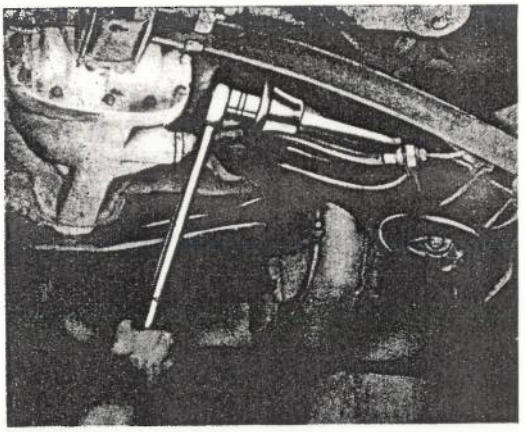
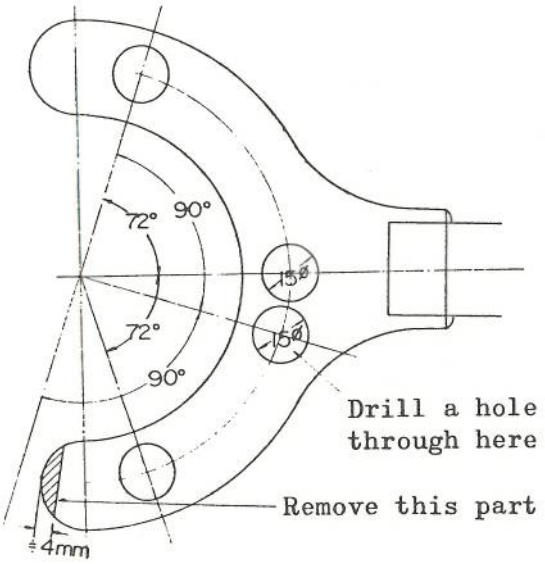


Fig. 8

a. Method for modifying the lever stopper

The lever stopper for the axle shaft fitted to the model PS may be used in common with that for the model PR after a 15 mm diameter hole is drilled at a spot indicated in Fig. 9. The modified lever stopper may be used in the same manner as in the case of the model PS by engaging the holes thereof with the wheel pins to hold the rear axle shaft from being rotated.

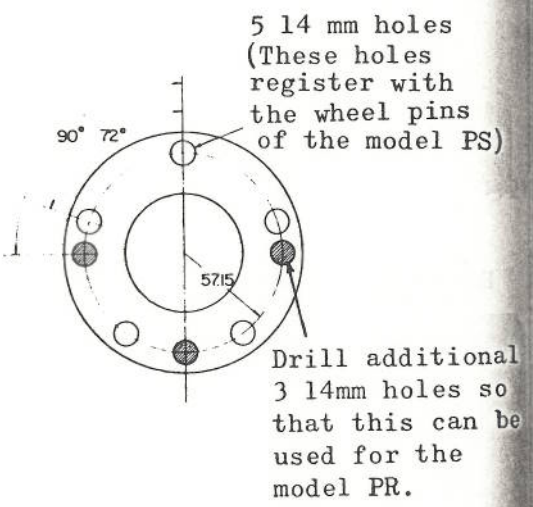


Manners in which the lever is to be modified

Fig. 9

b. Method for modifying the remover

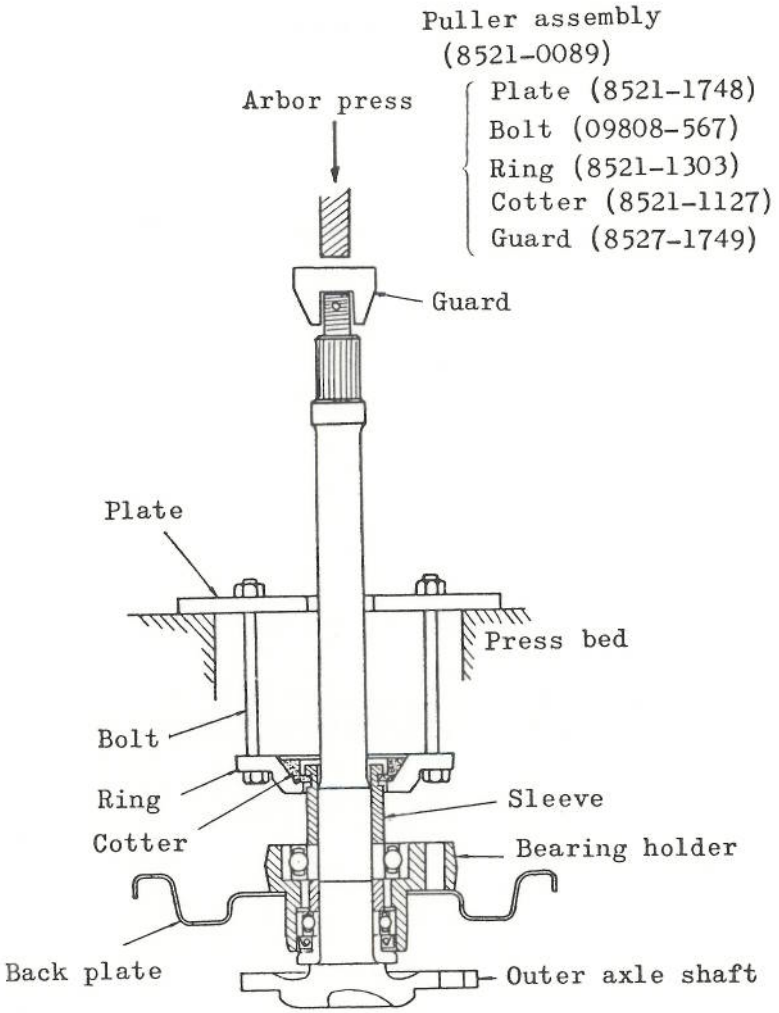
The remover (8521-0083) for the rear axle shaft fitted to the model PS may be used in common with that for the model PR when the three additional 24 mm holes are drilled through the flange of the remover at the spots indicated in Fig. 10. The modified remover may be used to drag the rear axle shaft by fitting the holes in the remover to the wheel pins. The use of such tools facilitate the removal of the axle shaft outer.



The method for modifying the remover

Fig. 10

8. Pull out the outer axle shaft assembly from the diagonal link and then, take out the sleeve with the aid of a puller assembly and arbor press. (Fig. 11)



Method for removing the sleeve

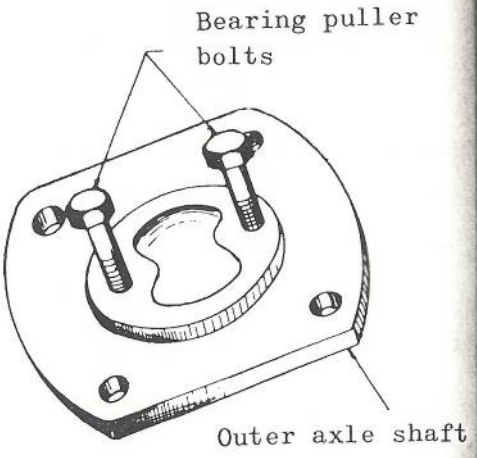
Fig. 11

9. For removing the outer axle shaft bearing, fit two bolts into holes and turn these bolts into holes alternately to release the bearing together with the puller. The bolts in the puller assembly (8521-0089) may be used for this operation. (Fig. 12)

10. Bearing fit in the bearing holder is so loose that the bearing can be easily taken out from the bearing holder.

11. Disassemble the inner axle shaft universal joint. (For disassembly of the universal joint, see paragraph "Propeller shaft" for correct information.

12. Take out the oil seal from the diagonal link.



Bearing puller

Fig. 12

Inspection and reassembly

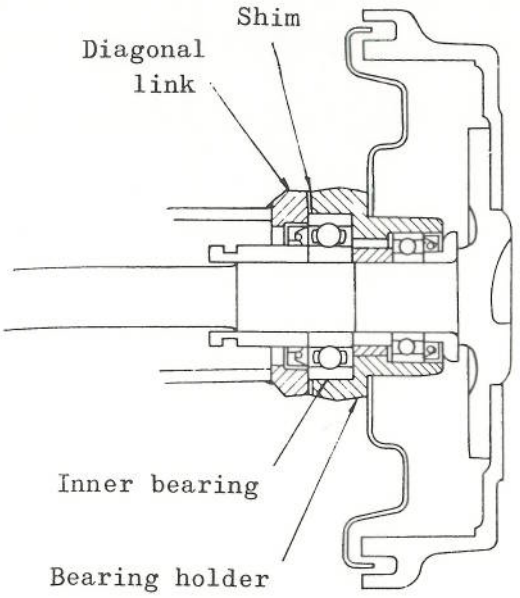
Wash all the disassembled parts with detergent oil and check them for evidence of wear or damage. Rectify or replace the parts if necessary.

1. Inspect the inner and outer axle shaft for damage or bending. Also inspect the serration for evidence of wear.

2. Inspect the bearing and oil seal for wear or damage.

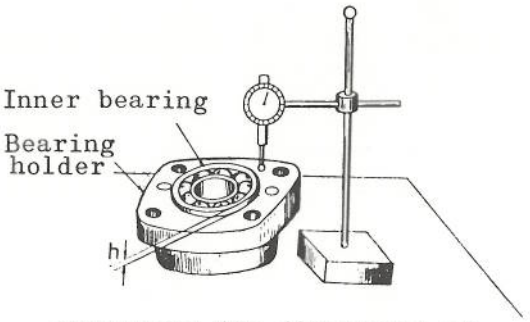
3. Carry out the reassembly in the reverse order of disassembly.

4. When fitting the bearing holder to the diagonal link, use the adjusting shims to compensate for projection of the inner bearing lace from the level of the bearing holder. (Fig. 13 (a)). For determining the thickness of the shims to be fitted, measure the height of the bearing from the level of the bearing holder. (Fig. 13(b))



Adjusting the thickness of the shim

Fig. 13(a)



Measuring the thickness of the shim

Fig. 13(b)

Note: Sort of the bearing holder shim available.

Parts number	Thickness (mm)
42119-082	0.03
42119-083	0.05
42119-084	0.10

5. When refitting the flange to the outer axle shaft, apply thin coat of lock quick primer Q to both the mating face of the serration and allow them to dry. (The lock quick primer takes approximately one hour for drying and stays effective for 48 hours after application). Apply thin coat of lock tight CV (sealing compound) to the serration of the outer axle shaft and then fasten the parts together. The reassembled parts should be kept completely free from any external force at least for one hour after the reassembly.

6. Refit the flange to the outer axle shaft. The nut tightening torque is 18 - 21 m-kg.

Trouble-shooting and corrections

Cause of trouble	Corrections
1. The puller fitted to the shaft is allowed to rotate along the periphery of the shaft	Check and refit the sleeve tightly into position
2. Abnormal noise arises from the bearing	Relubricate or replace the bearing
3. Wear in the inner and outer axle shaft flange serration causes abnormal noise to develop as the car starts from the rest	Replace if wear is considerable

Carefully inspect the component parts for evidence of damage or other defects and make necessary replacement.

REAR AXLE (for model KR)

Rear axle data and specifications

Type	Semi-floating
Axle case	Pressed steel, Banjo type
Final drive	Hypoid single-stage reduction
Final gear ratio	5.125 KR10 4.556 KR20, KRD10
Hypoid pinion bearing	Tapered roller
Differential and crown wheel assembly bearing	Tapered roller
Hub bearing	Tapered roller
Backlash between crown wheel and hypoid pinion	0.13 ~ 0.23mm
Number of teeth	
Crown wheel	41 } 5.125 KR10 ; 41 } 4.556 KR20 KRD10
Hypoid pinion	8 } 5.125 KR10 ; 9 } 4.556 KR20 KRD10
Adjustment	
Hypoid pinion	Shim
Differential assembly	Shim
Lubricant capacity	1.2 lit.

Construction of the rear axle

The final drive system comprises the hypoid gear giving a single stage reduction. The rear axle is of semi-floating type, the component of which is supported by the roller bearing.

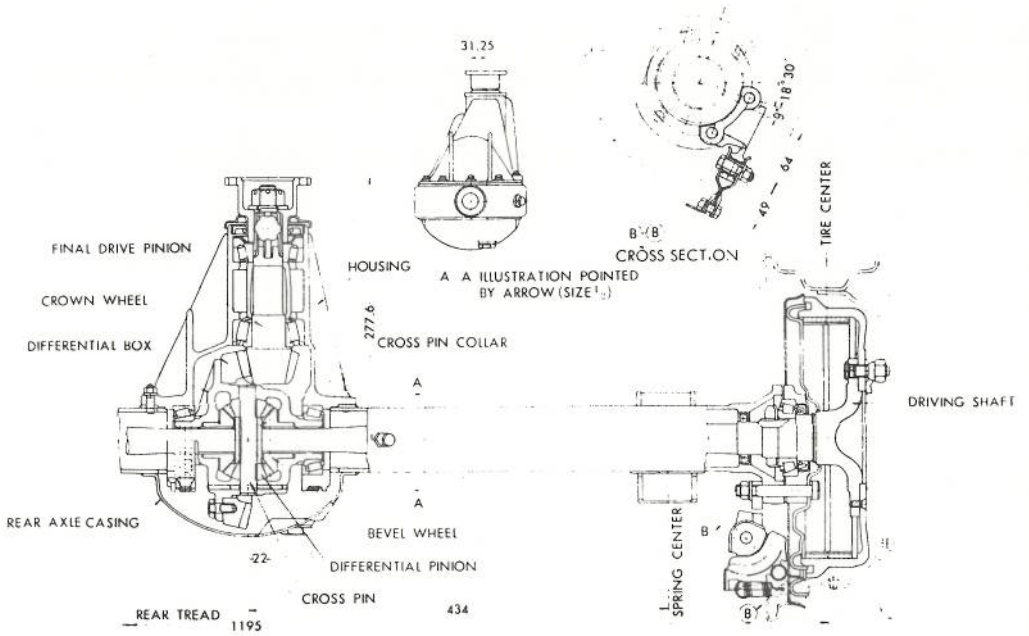

31.25
FINAL DRIVE PINION
CROWN WHEEL
DIFFERENTIAL BOX
HOUSING
A A ILLUSTRATION POINTED BY ARROW (SIZE 1:1)
CROSS SECTION
TIRE CENTER
CROSS PIN COLLAR
277.6
DRIVING SHAFT
REAR AXLE CASING
BEVEL WHEEL
22
DIFFERENTIAL PINION
CROSS PIN
REAR TREAD
1195
434
SPRING CENTER

Fig. 14

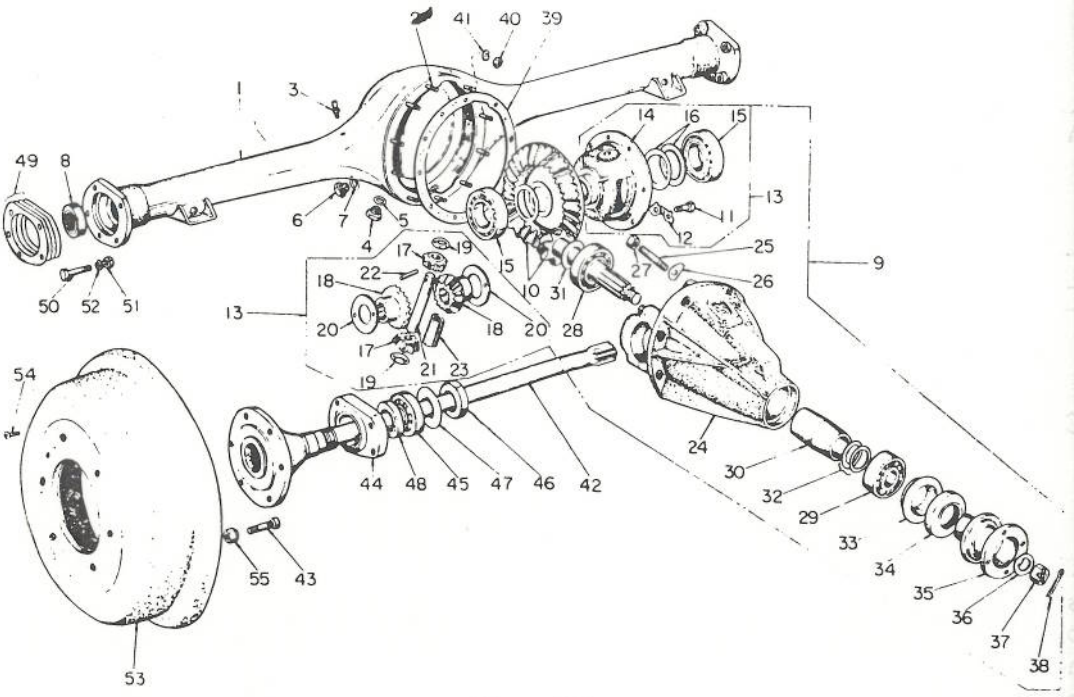

41
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Fig. 15

1. Rear axle case assy.
2. Stud; rear axle case
3. Breather; "
4. Plug; drain magnetic
5. Packing; drain plug
6. Plug; oil level
7. Packing; oil level plug
8. Oil seal
9. Final gear & diff. assy.
10. Gear set; final gear
11. Set bolt; .. crown wheel to diff.
12. Washer
13. Diff. box assy.
14. Diff. cage
15. Brg.; diff. box side
16. Shim; diff. box t=0.25mm
17. Pinion; diff.
18. Bevel wheel
19. Thrust washer; pinion
20. " ; bevel wheel
21. Cross pin; diff. pinion
22. Lock pin; cross pin
23. Thrust block; diff. box
24. Housing assy.
25. Stud; brg. cap
26. Tab washer;
27. Nut
28. Brg.; hypoid pinion, inner
29. " " outer
30. Distance piece
31. Shim; brg. inner t=0.05mm
32. " outer t=0.130mm
33. Oil thrower
34. Oil seal
35. Driving coupling assy.
36. Washer; coupling driver to pinion
37. Nut
38. Split pin
39. Packing; rear axle housing
40. Nut; .. housing to casing
41. Spring washer; .. housing to casing
42. Axle shaft
43. Bolt; road wheel, hub
44. Brg. holder; axle shaft
45. Brg.; axle shaft
46. Nut; .. brg. fix.
47. Washer; .. brg. fix.
48. Oil seal; brg. holder
49. Shim; brg. holder t=1.00mm
50. Bolt; reamer brg. holder
51. Nut
52. Spring washer
53. Brake drum
54. Screw; brake drum
55. Wheel nut

Rear axle unit in exploded view

The rear axle removal procedure can be divided into the following three groups according to the type of repair involved.

1. Where it is necessary to remove the rear axle assembly completely from the chassis, e.g., replacement of rear axle case.

2. Where it is necessary to remove the driving shaft assembly from the rear axle, e.g., replacement of driving shaft, bearing, oil seal, brakes, back plate or replacement of road wheel fixing bolts.

3. Where it is necessary to remove the differential housing assembly from the rear axle, e.g., replacement of hypoid pinion and crown wheel, differential gear, differential box bearing or gasket.

Removing the rear axle assembly from the chassis

1. Loosen the wheel bolt nuts.

2. Jack up the rear wheels clear of the ground and support the automobile in position by inserting suitable axle stands underneath the front part of the leaf springs near the shackle. Support the rear axle case on a garage jack.

3. Drain the differential gear oil if necessary.

4. Disconnect the flexible hose at the brake pipe connector on the frame.

   Note: With suitable cloth, cover the loose end of the brake pipe and hose to prevent entry of foreign particles.

5. Disconnect the propeller shaft at the flange yoke on the differential side.

6. Remove the shock absorbers.

7. Remove the "U" bolt.

8. Take out the shackle pin on the rear part of the springs and lower the rear part of the spring assembly. Lower the jack and withdraw the rear axle case rearward.

9. On release of the rear axle from the chassis, mount the rear axle on suitable stands to facilitate following operation.

REMOVING THE DRIVING SHAFT ASSEMBLY

1. Loosen the wheel nuts.

2. Jack up the rear wheels clear of the ground and support the axle case on stands.

3. Remove the wheels.

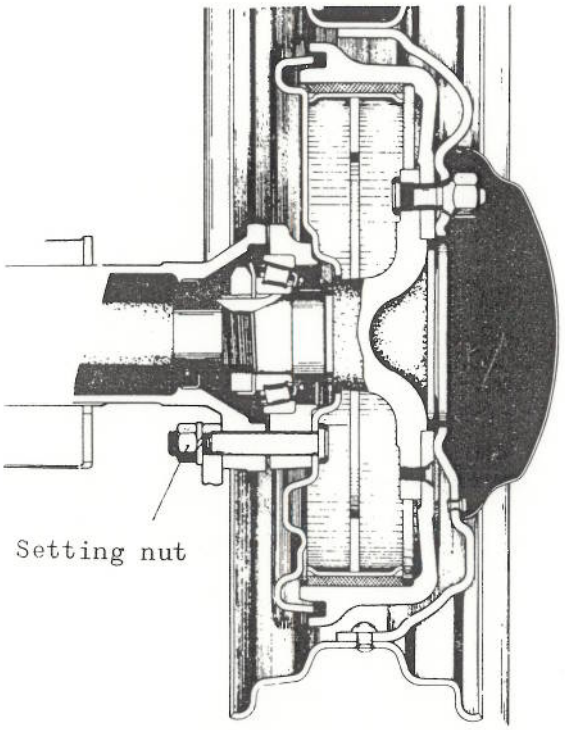


Fig. 16

4. Disconnect the brake pipes at the wheel cylinders.

5. Take out the setting nuts on the bearing holder.

6. Pull out the shaft assembly with the aid of the driving shaft remover. (8529-1403)

Caution: Back plate of the brake should not be knocked with a hammer or the like for removing the driving shaft.

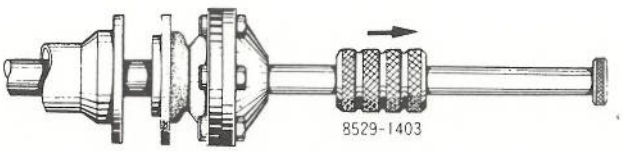


Fig. 17

REMOVING THE DIFFERENTIAL HOUSING ASSEMBLY

1. Drain the differential gear oil.

2. Remove the driving shaft (See subparagraph "Removing the driving shaft assembly" for correct procedure of removal) and disconnect the propeller shaft at the coupling on the differential side.

3. Remove the differential housing. The differential housing should be supported by a garage jack prior to removal.

Driving shaft assembly

DISASSEMBLING THE DRIVING SHAFT ASSEMBLY

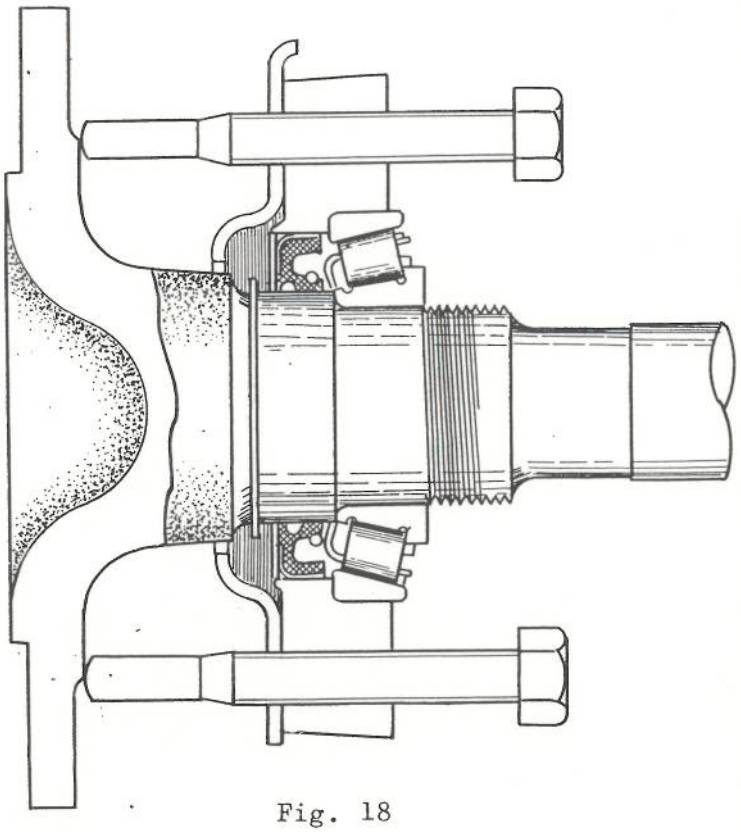


Fig. 18

1. Take out the fixing nuts on the driving shaft bearing.

2. Insert two push bolts (Special tool) into the bolt holes diagonally situated on the bearing holder and bring the tip ends of the push bolts into direct contact with wheel bolt heads on the shaft flange. Screw in the push bolts alternately in progression and remove the bearing holder from the shaft.

3. Remove the oil seal. With the aid of the remover ( ) drive out the outer lace of the bearing. Exercise extreme care to safeguard the fitting faces of the bearing holder and axle case against damage or deformation.

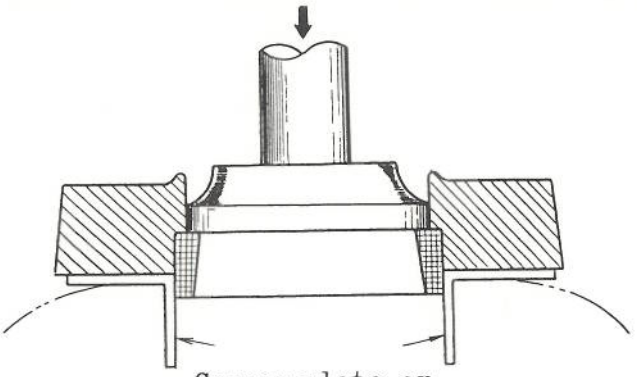


Fig. 19

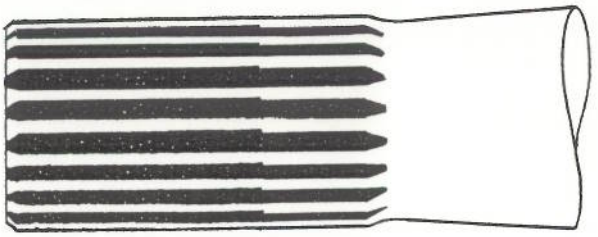
Inspection and rectification

Wash the disassembled parts with detergent oil before inspection or rectification.

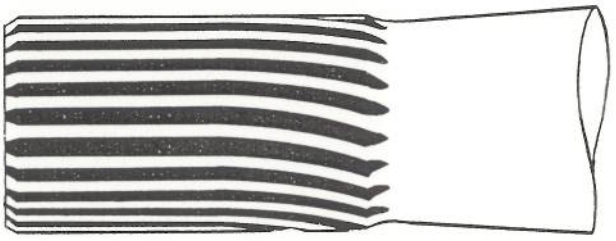
INSPECTING AND RECTIFYING THE DRIVING SHAFT

1. Check the shaft entirely for distortion, crack and wear carefully noting the distortion and step wear of the spline. Replace the parts with any distortion or crack. Slight step wear may be rectified with a grinding machine or oil-stone.

2. Inspect the shaft for bending in the following manner. Fit the shaft into a lathe between centers. Slowly turn the



Stepped wear



Distorsion

Fig. 20

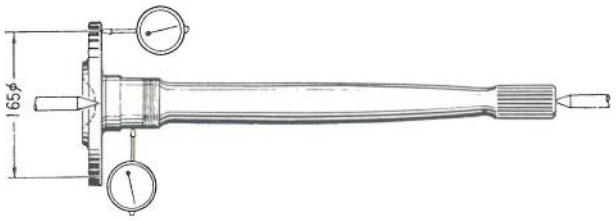


Fig. 21

shaft while holding a dial gage against the part of the shaft to which the bearing is fitted and note the reading.

The meter reading should be lower than 0.125 mm. The shaft with bending above this limit should be rectified with a press machine. Shaft with slight bending may be rectified but the shaft with serious bending should be replaced. Heat should not be applied to the shaft for rectification.

3. Check the shaft flange for deviation from right angle in the following manner. With the dial gage held against the shaft flange as illustrated in figure, slowly turn the shaft and note the meter reading. The meter reading should be lower than 0.125 mm. The shaft flange with distortion above this limit should be replaced.

INSPECTING AND RECTIFYING THE DRIVING SHAFT BEARING

Wash the bearing with clean detergent oil or gasoline and submerge the bearing in kerosene. Carefully check the inner lace, outer lace, tapered rollers and cage for evidence of wear, seizure disintegration or crack and replace defective parts. Bearing with any defective parts should be replaced as a complete assembly and no attempt made to recondition the bearing by the replacement of defective parts.

INSPECTING AND RECTIFYING THE BEARING HOLDER

1. Check the face of the bearing holder that comes into contact with the rear axle case, portion to which the bearing is fitted and portion to which the oil seal is fitted for evidence of wear or damage and make rectification or replacement of parts as necessary.

2. If there is no interference provided in the engagement of the outer lace of the bearing and holder, the bearing holder should be replaced.

INSPECTING THE WHEEL BOLT

Wheel bolt with damaged thread or other defective thread should be replaced.

Reassembly and adjustment

Renew the gasket, oil seal and lock washers when reassembling.

REASSEMBLING THE DRIVING SHAFT ASSEMBLY

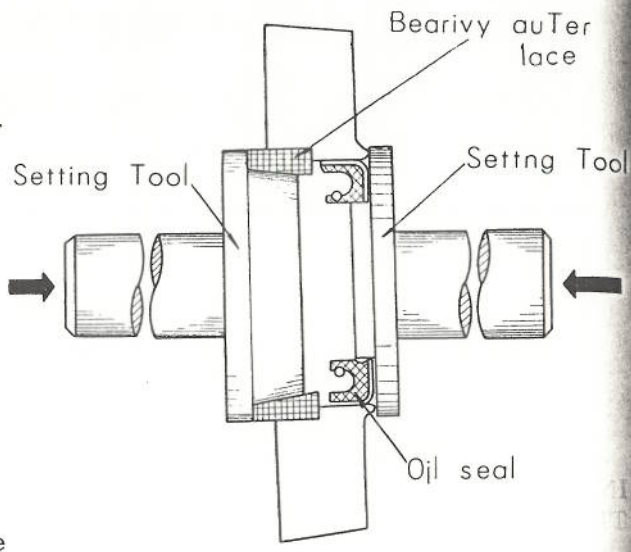


Fig. 22

1. With the aid of special setting tools (and), fit the outer lace and oil seal into the bearing holder.

2. Refit the brake back plate, bearing holder and inner lace of the bearing to the driving shaft in the order mentioned and then, refit the inner lace with the aid of special setting tool. Lubricate the bearing rollers with ample amount of quality hub grease.

3. After the inner lace of the bearing is refitted, fit the lock washer and secure the inner lace of the bearing with the fixing nut by tightening it to 12-15 m-kg torques. Bend down the lock washer in the following manner to prevent the nut from being turned loose. The lock washer should be fitted with its concaved face turned toward the bearing and the portion of the lock washer opposed to the lug bent down.

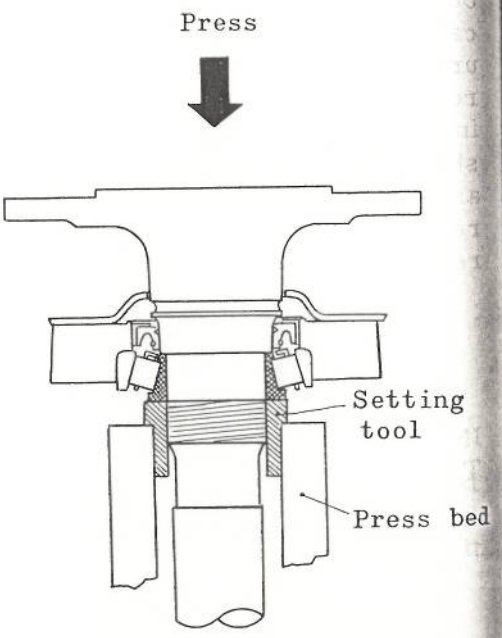


Fig. 23

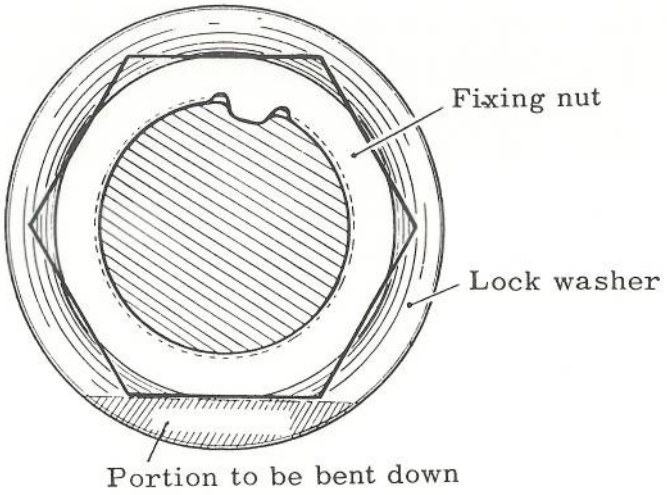


Fig. 24

REFITTING THE DRIVING SHAFT ASSEMBLY

1. With the aid of special setting tool ( ), fit oil seal into the rear axle case. Smear the inner face of the axle case with quality hub grease. The amount of grease required is about 40 gr.

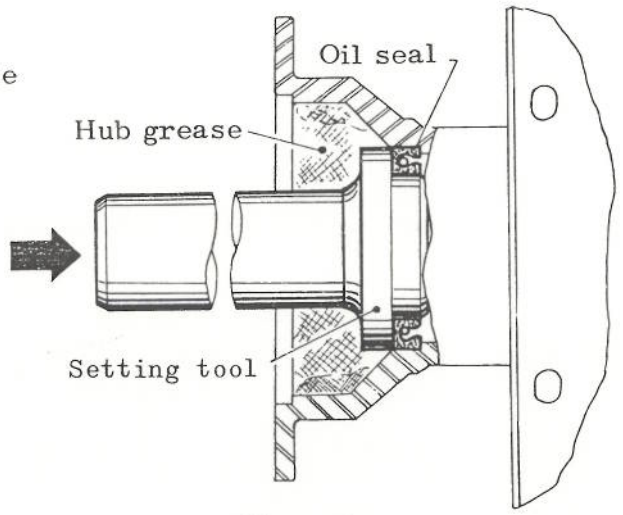


Fig. 25

2. Fit a 2 mm shim into clearance between axle case flange and either the right or left bearing holder and refit the driving shaft assembly to the axle case. Tighten the setting bolts evenly to the torque of 1.8-2.1 m-kg. Shims are available in the following 5 different thicknesses: 1.0, 0.5, 0.13, 0.076 and 0.05.

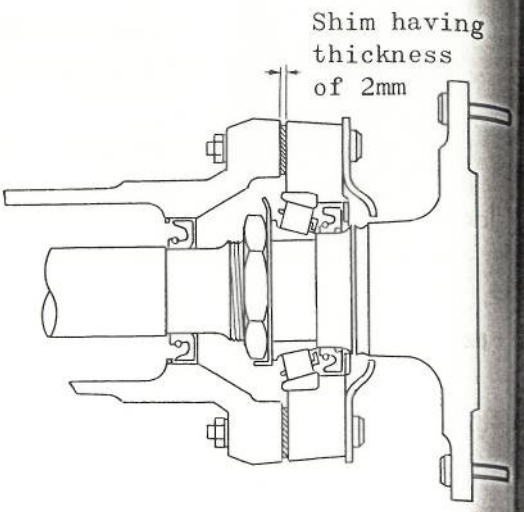


Fig. 26

3. Fit the opposed end of the driving shaft assembly into position until it abuts against the thrust block in the differential. Measure the clearance between the bearing holder and rear axle case flange. Determine the thickness of the shim by adding 0.05-0.07 mm to the measured value. Fit the shim having the determined thickness into clearance between bearing holder and rear axle case flange and tighten the setting bolts in the same manner used on the other end of the driving shaft.

4. Reconnect the brake pipes and carry out air bleeding.

Disassembling the differential housing assembly

REMOVING THE DIFFERENTIAL BOX

1. Apply setting mark to the side bearing holder and cap and remove the cap. Then take out the differential box assembly. When diasssembling the bearing, scribe marks on the right and left bearing outer lace and inter lace to avoid erroneous interchanging of the parts.

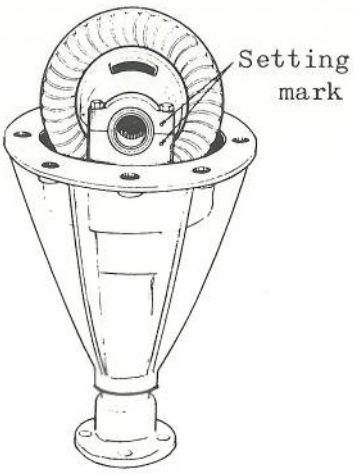


Fig. 27

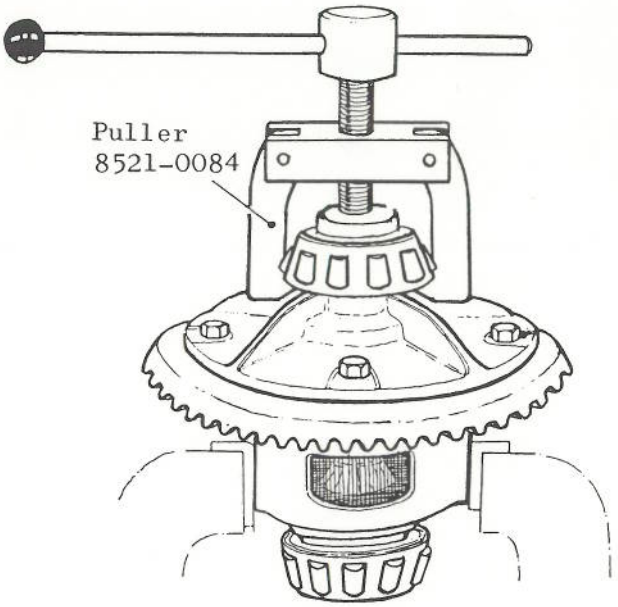


Fig. 28

2. With the aid of side bearing puller (8521-0084) and seat (8521-1743), take out the inner lace from the differential box. The projections on the bearing puller should be hooked on the inner lace and not on the bearing cage.

Carefully note the fitting position and thickness of the shim taken out.

REMOVING THE CROWN WHEEL

1. Take out the fixing bolts on the crown wheel.

2. Remove the crown wheel from the differential box by lightly knocking the edge of the crown wheel with a copper hammer. Hammer should be carefully used to prevent damage to the gears and differential box. A chisel should not be used to drive out the crown wheel.

REMOVING THE CROSS PIN AND DIFFERENTIAL PINION

1. With use of differential lock pin remover (8514-1601), drive out the lock pin toward the direction indicated in figure.

2. With use of cross pin remover (8521-5033), drive out the cross pin and then, take out the thrust block, differential pinion, bevel wheel and thrust washers. Arrange the disassembled parts in good order to facilitate reassembly of them into original positions.

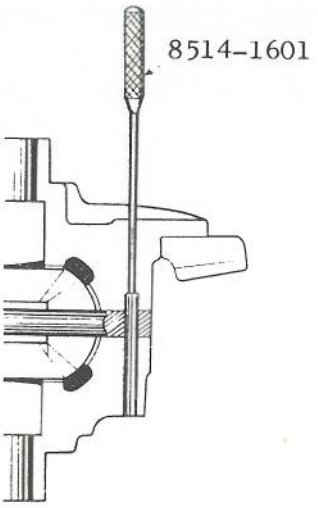


Fig. 29

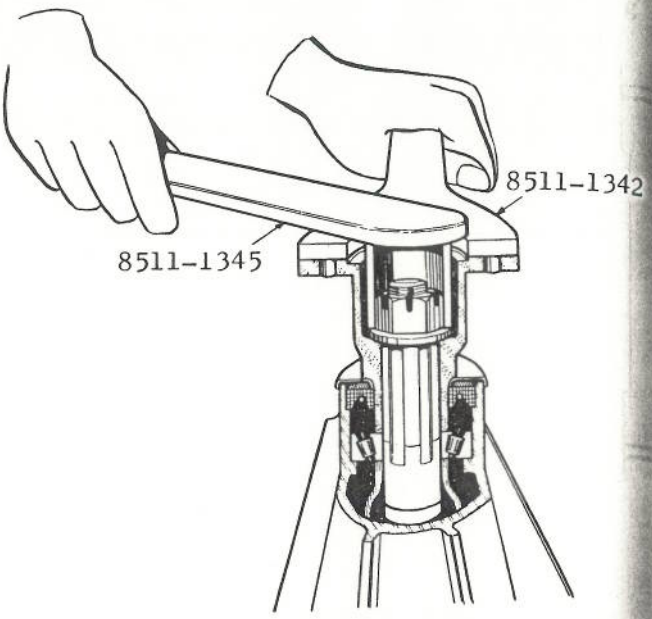


Fig. 30

REMOVING THE HYPOID PINION

1. With the aid of special wrenches (8511-1345) and (8511-1342), remove the nut and take out the coupling driver.

2. Take out the oil seal and fit the bearing separator spindle (8521-5032) over the tip end of the hypoid pinion and drive out the hypoid pinion with a copper hammer. Carefully note the thickness of the shim fitted into clearance between distance tube and outer bearing.

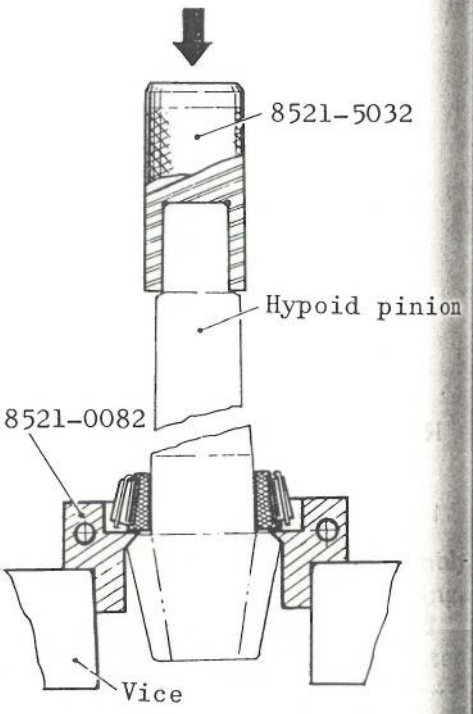


Fig. 31

3. With the aid of bearing separator (8521-0082) and spindle (8521-5032), take out the inner lace from the hypoid pinion inner bearing removed from the differential housing. Carefully note the thickness of the shim fitted between hypoid pinion and inner bearing.

4. With the aid of special puller assembly (8521-0086) take out the two bearing outer laces remaining in the differential housing. Fit the lugs of the plates (C) and (B) into the grooves in the fitting faces of the outer lace of the inner side and outer lace of the outer side respectively and fit puller assembly into the plates (B) and (C). Then turn the handle (A) to remove the laces. The following manner may also be applied for removing the outer lace. Release a lug on the plate from the groove and fix it against the projection on the inner wall of the housing and hook the other plate on the outer lace and turn the handle (A).

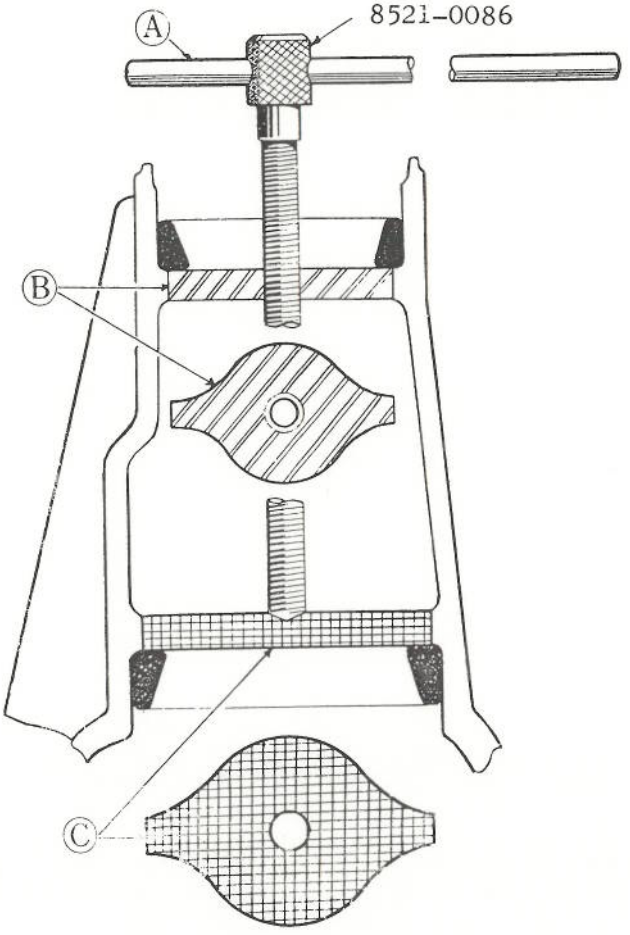


Fig. 32

Inspection and rectification

INSPECTING THE CROSS PIN AND DIFFERENTIAL PINION

Visually check the cross pin and differential pinion for evidence of wear, crack or disintegration and make necessary replacement. To assess amount of wear, fit the differential pinion to the cross pin and measure the clearance between these parts with a feeler strip. The clearance should be within 0.15 mm. The parts with considerable wear should be regarded due for replacement.

INSPECTING THE LOCK PIN

Visually check the lock pin for bending, denture or other damage and make necessary replacement.

CHECKING AND RECTIFYING THE DIFFERENTIAL BEVEL WHEEL

1. Replace wheel with considerable wear or damage on the teeth.

2. Fit the bevel wheel into the spline on the driving shaft and check the play in the rotational direction. The play should preferably be within 0.2 mm. If the play is in excess of 0.5 mm, recondition the parts to hold the play within 0.2 mm by replacing the driving shaft or bevel wheel.

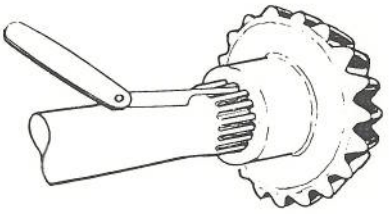


Fig. 33

3. Check the engagement of the differential box and bevel wheel. The clearance between these parts are standard at 0.050 mm - 0.115 mm. If the clearance is in excess of this value replace either of the parts with larger wear.

INSPECTING THE THRUST WASHER

Check the differential pinion and differential bevel wheel thrust washers for wear and make necessary replacement.

CHECKING AND RECTIFYING THE DIFFERENTIAL BOX

1. Check the crown wheel fitting face and side bearing inserting face for scores or roughness. Slight damage to these parts may be rectified with fine oil-stone or with fine emery cloth.

2. Check the cross pin fitting hole for partial wear, thrust washer fitting face for roughness and wear. Check the entire box for evidence of crack and replace if defective.

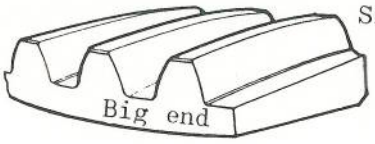


Fig. 34

2. Check the hypoid pinion spline for distortion or crack and make necessary replacement.

Note: The crown wheel and hypoid pinion should be replaced as an assembly even if either of the parts is found to be in reusable condition.

CHECKING AND RECTIFYING THE HYPOID PINION AND CROWN WHEEL

1. Visually inspect the both face of individual gear tooth carefully for wear, breakage, crack, pitting or irregular contact and replace if defective.

Appreciable step wear or roughness on the big end or small end of the tooth may be rectified with fine grinder or oil-stone.

INSPECTING THE BEARING

(Refer the subparagraph "Inspecting the driving shaft assembly)

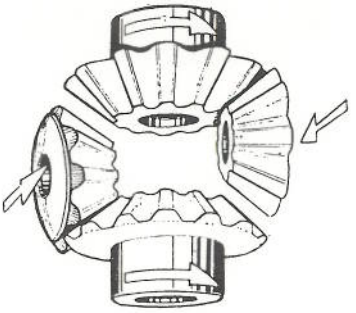
THRUST BLOCK

Replace the thrust block if wear of the portion which is held against the tip end of the driving shaft is considerable.

Reassembly and adjustment

Reassembling of the differential and drive gear without careful cleaning of the parts and correct means of adjustment will often result in abnormal operating noise and abnormal wear of the parts. Extreme care should be exercised for reassembling and adjusting to prevent such failure.

Always renew oil seal, gasket, split pin and lock washer whenever the parts are disassembled. Crown wheel setting bolts should also be renewed when reassembling.



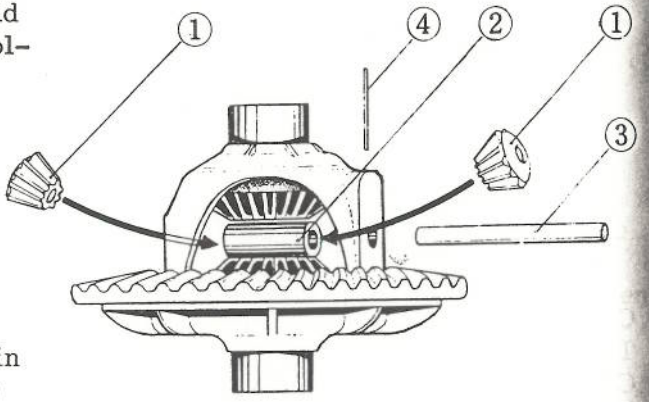


Fig. 35

DIFFERENTIAL BOX

1. Submerge the bevel wheel in gear oil and then fit this into the differential box together with the thrust washer.

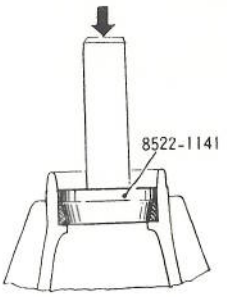
2. Adhere a thrust washer to the differential pinion (1) with grease. Fit this to the bevel wheels in opposite directions and turn the opposed bevel wheels in opposite directions and turn the opposed bevel wheels in a direction simultaneously to fit the differential pinion into the original position.

3. Fit thrust block (2), drive the cross pin (3) into position and lock these parts with lock pin (4). The cross pin should be properly aligned with the lock pin hole in the differential box.

CROWN WHEEL

1. Clean the fitting face of the differential box and crown wheel and fit these parts to proper engagement. With use of new lock washers, tighten the fixing bolts (preferably new ones) evenly in diagonal sequence to the torque of 6.0 - 7.8 m-kg.

Caution: Tab on the lock washer should not be bent down at this stage of work.



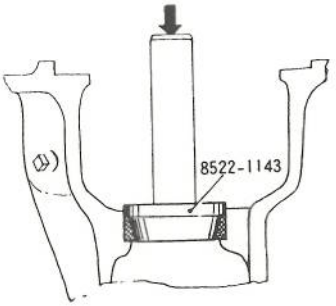


Fig. 36

HYPOID PINION

For reassembly of hypoid pinion, the use of special tools is essential for obtaining correct adjustment.

1. Clean the portions of the differential housing to which the outer laces of the inner and outer bearings are fitted.

2. With the aid of setting tool (8522-1141) refit the outer lace of the outer bearing into position. With the use of another setting tool (8522-1143) refit the outer lace of the inner bearing into position.

3. Fit distance piece, inner bearing inner lace, distance tube and shim with thickness equal to that previously used to the dummy pinion shaft (8322-1139) in the order mentioned and fit these parts to position in place of the hypoid pinion.

Fit the inner lace of the outer bearing, coupling driver and washer to the dummy pinion shaft in the order mentioned and tighten these parts with a nut to 18-21 m-kg torques.

Note: A shim should not be fitted to the clearance between inner lace of the inner bearing and dummy pinion shaft head.

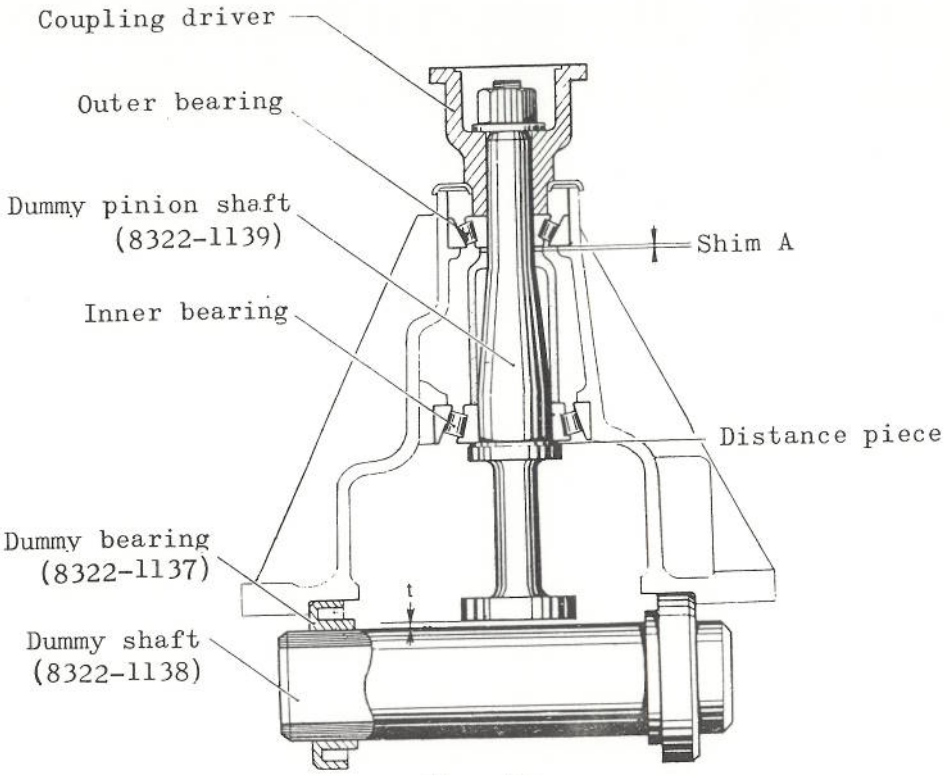


Fig. 37

4. Measure the hypoid pinion bearing preload in the following manner. Hook a spring balance to a bolt hole in the coupling driver and pull the balance in tangential direction and note the reading when the coupling driver started to rotate. With the use of adjusting shim A, adjust the preload to give reading on a spring balance of 4.5-5.6 kg when new bearing is used, and to give 3.5-4.5 kg reading with the original bearing. The preload decreases with an increase in the thickness of the shim A and increases with decrease in the thickness of the shim.

5. Fit dummy bearing (8322-1137) and dummy shaft (8322-1138) in place of the differential side bearing and tighten the bearing cap. Measure the clearance (t) between the dummy pinion shaft and dummy shaft and take the reading. This value is equivalent to the thickness of the shim fitted to

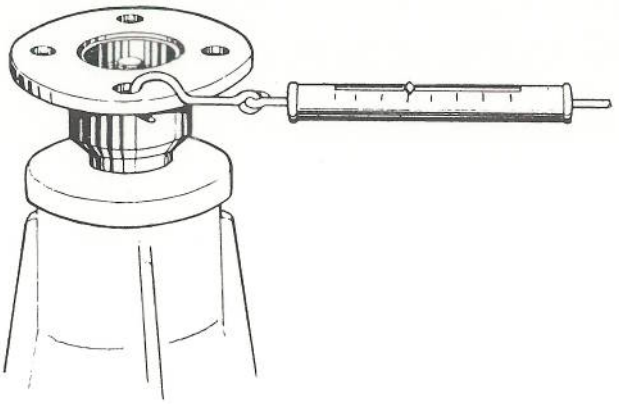
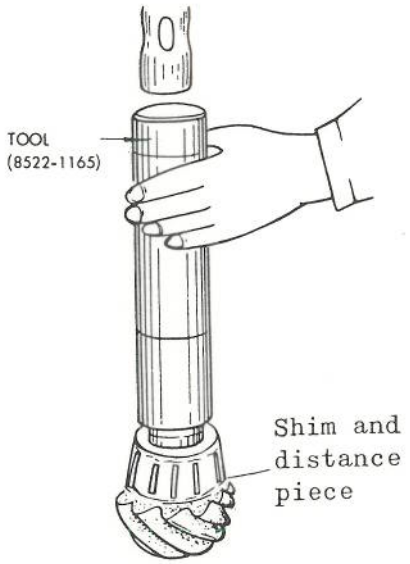


Fig. 38

the hypoid pinion flange. The shims are available in the following 6 different thicknesses. 0.10, 0.5, 0.25, 0.13, 0.076 and 0.05.

6. When the above measurement is taken, take out the dummy pinion shaft and dummy bearing and fit the hypoid pinion in place in the following manner. Fit distance piece and a shim with thickness equivalent to the clearance (t). Then, with the aid of setting tool (8522-1165) fit the inner lace of the inner bearing into position with a copper hammer. The inner lace should be allowed to travel all the way in to provide the shim fitted between the hypoid pinion and inner lace with optimum pressure. Fit the distance tube, shim A (measurement has been taken) and inner lace of the outer bearing into position in the order mentioned with the aid of setting tool (8522-1166) and a copper hammer.



Assembling the hypoid pinion bearing

Fig. 39

7. With the aid of setting tool (8522-1142) fit the oil seal, and then fit the coupling driver and washer. Tighten this parts with a nut to 18-21 m-kg torques.

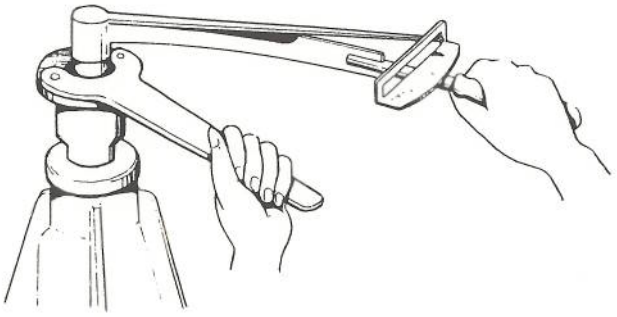


Fig. 40

8. When the hypoid pinion is reassembled, recheck the bearing preload. Fit split pin and secure the hypoid pinion.

Application of the specified tightening torque may fail to bring the pin hole in the pinion shaft in alignment with the pin groove in the nut. In such instance, alignment can be obtained by reducing the lower face of the nut with a file or emery cloth. No attempt should be made to bring the pin hole into alignment with the pin groove by increasing the tightening torques.

BACKLASH ADJUSTMENT

Failure to obtain correct backlash between the hypoid pinion and crown wheel may result in abnormal noise, poor tooth-to-tooth contact or abnormal wear of the parts.

1. Fit dummy bearing (8322-1137) in place of differential box side bearing and fit these parts into the differential housing. The bearing cap should be tightened after matching the setting marks previously applied.

2. Mount a dial gage to the differential housing and set the gage probe at right angle to the big end of the tooth on the crown wheel at its face used for reversing.

3. With the hypoid pinion stationary, carefully move the crown wheel in forward and rearward direction and measure the backlash with the dial gage. The dial gage reading should fall within 0.13 - 0.18 mm.

4. If the backlash is found to be excessive, loosen the side bearing cap and move the crown wheel toward the hypoid pinion to reduce the backlash. The crown wheel should be moved away from the hypoid pinion to increase the backlash.

5. The backlash should be measured at least three portions on the periphery of the crown wheel. Each of the measured value should fall within the range of 0.13 - 0.18.

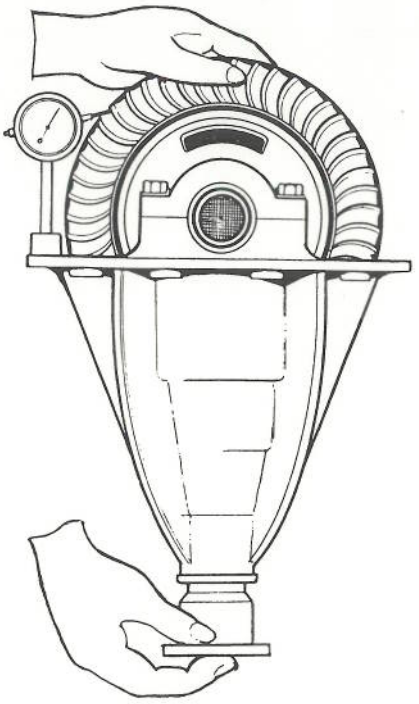


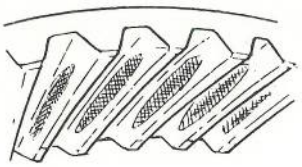
Fig. 41

CHECKING TOOTH CONTACT AND PROCEDURE OF ADJUSTMENT

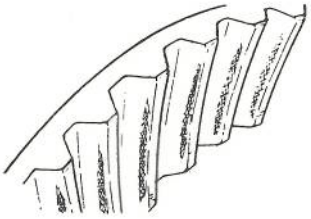
1. Apply red lead to 7-8 teeth on the crown wheel.

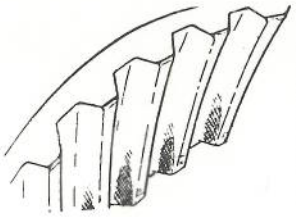
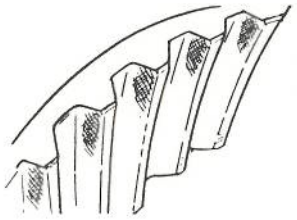
2. Apply hand pressure to the crown wheel so as to impose a load upon the parts and turn the hypoid pinion both in forward and rearward directions to get impression of the tooth contact.

3. Tooth contact and procedures of adjustment are as follows:



Correct tooth contact

Tooth contact	Cause	Method of adjustment A .. adjusting tooth contact B .. adjusting backlash
	Hypoid pinion is too far away from the crown wheel	 (1) Move the hypoid pinion toward the crown wheel. (2) Move the crown wheel away from the hypoid pinion and adjust the backlash correctly.
	Hypoid pinion is too close to the crown wheel	 (1) Move the hypoid pinion away from the crown wheel. (2) Move the crown wheel toward the hypoid pinion and adjust the backlash correctly.

	Crown wheel is too close to the hypoid pinion		(1) Move the crown wheel away from the hypoid pinion. (2) Move the hypoid pinion toward the crown wheel and adjust the backlash correctly.
	Crown wheel is too far away from the hypoid pinion		(1) Move the crown wheel toward the hypoid pinion. (2) Move the hypoid pinion away from the crown wheel and adjust the backlash correctly.

REFITTING THE DIFFERENTIAL SIDE BEARING

1. Upon completion of the backlash adjustment and tooth contact adjustment, measure the clearance between dummy bearing and differential box with a feeler strip in the manner illustrated.

Fig. 42

2. Take out the dummy bearing and measure the difference between the thickness of the dummy bearing and the side bearing which is to be fitted.

   If the side bearing is found to be thicker than dummy bearing, deduct the difference of thickness between side bearing and dummy bearing from the clearance obtained by measurement. If the side bearing is found to be thinner than dummy bearing, add the difference in the thickness between the side bearing and dummy bearing to the clearance obtained by measurement. Comparison should be made between right and left dummy bearings and between right and left side bearings.

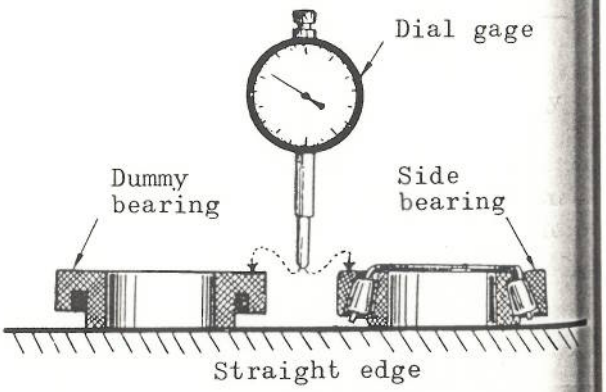


Fig. 43

The clearance between the side bearing and differential box is obtained in the above mentioned manner. To obtain the thickness of the shim that is actually fitted, 0.05 mm should be added to the clearance obtained in the above mentioned manner.

Typical example of calculation for determining the thickness of the shim.

Clearance t

Measured value of the clearance (t)	+0.85 mm
Supposing that the side bearing is (thinner) thicker than dummy bearing by 0.05 mm	-0.05 mm (+0.05 mm)
Additional thickness as preload	+0.05 mm
Thickness of the shim that is to be fitted	0.85 mm (0.95 mm)

As it is clear from the above calculation, the shim with thickness of 0.85 mm (0.95 mm) should be fitted to the clearance t'. The shim for the side bearing on opposite side should be determined in the same manner.

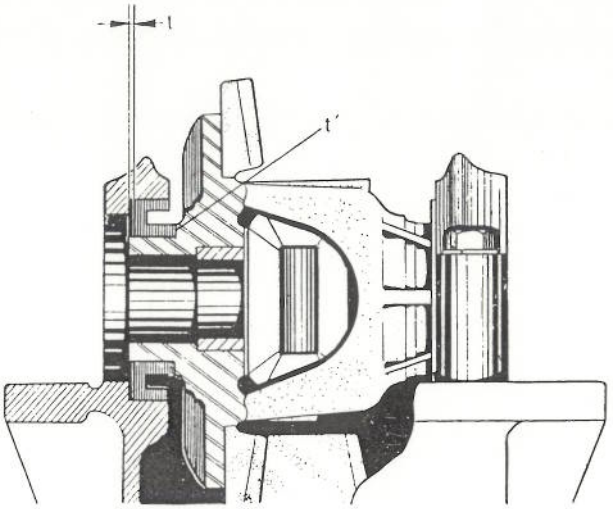


Fig. 44

The shims are available in the following 3 different thicknesses:

0.25, 0.13 and 0.076

3. When the thickness of the shim is determined, fit this into position and fit the inner lace of the side bearing into differential box with the aid of setting tool. (8522-1164)

Fit these parts to the differential housing and align the setting marks applied to the bearing cap. Tighten the setting bolts to 8-9 m-kg torques.

4. Upon completion of the reassembly, recheck the backlash. If the backlash is found to be greater than 0.13-0.18,

move the crown wheel toward the hypoid pinion, and move the crown wheel away from the hypoid pinion if the backlash is smaller than the above value. These adjustment should be made by increasing or decreasing the number of shims fitted to the side bearings.

Note: The total thickness of the shims should not be varied for this adjustment, that is, the shim taken away from the right side should be added to the left side and the shim taken away from the left side should be added to the right side.

INSPECTING THE CROWN WHEEL DISTORTION

When the differential housing assembly is reassembled, check the crown wheel distortion in the following manner.

Mount the dial gage to the differential housing and check the distortion in the back face of the crown wheel in the manner as illustrated. The dial gage reading should be lower than 0.08 mm. If the reading is above 0.08 mm, it is attributed to unevenly tightened setting bolts or to foreign matter binding between the crown wheel and differential box so that the parts should be again disassembled to remove the cause of trouble. If the measurement indicates that the parts are in good order bend down the lock washers on the crown wheel and bearing cap to secure the bolts.

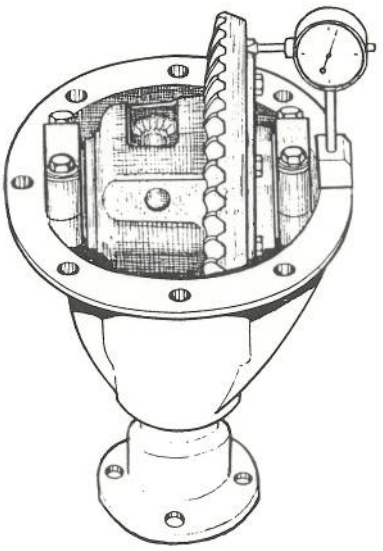


Fig. 45

REFITTING THE DIFFERENTIAL HOUSING ASSEMBLY

1. Clean the fitting faces of the rear axle case and differential housing, and apply grease or sealing compounds to these faces and adhere new gaskets to them. Fit the differential housing and tighten the bolts evenly to 4.5 - 5.0 m-kg torques.

2. Refit the driving shaft assembly. (Refer the subparagraph "Refitting the driving shaft").

3. Connect the coupling driver with the propeller shaft. Setting bolt tightening torque is 4.5 - 5.0 m-kg.

4. Put about 1.2 ltr of gear oil into the differential housing.

5. Bleed the brake system.

Upon completion of the reassembly, trouble-shooting and corrections, inspection and adjustment, confirm the adjustment in the following manner.

Operate the automobile on a pavement with quiet surrounding at the following speeds and see if noise arises: 20, 30, 40, 50 and 60 km. The noise that arises from the road wheels (tires) should not be confused with the noise of the differential unit.

Trouble-shooting and corrections

REAR AXLE NOISES

Complaint		Cause of trouble	Corrections
Steady hum	Noise on acceleration	Worn gears	Replace or readjust the backlash
		Hypoid pinion and crown wheel which are set up too tightly	
	Noise on high-speed operation	Worn gears	
		Excess backlash between hypoid pinion and crown wheel	

Steady hum	Steady noise on coast	Insufficient gear oil	Replenish with hypoid gear oil
		Worn gears	Replace
		Loosened or worn bearing	Readjust preload or replace
		Loosened crown wheel	Replace bolts and washers and retighten
	When turning a corner	Worn differential gears and worn thrust washers	Replace
Consecutive thumping sound	Steady noise on coast	Damaged gears	Replace
		Foreign matters in axle case	Inspect and remove
		Excess play in driving shaft spline	Replace

OIL LEAKAGE

Complaint	Cause of trouble	Corrections
Oil leaks from driving coupling of the differential housing	Excessive oil	Check and adjust
	Defective oil seal	Replace
Oil leaks from axle case	Loosened differential housing setting bolts	Tighten
	Defective gasket	Replace
	Cracked case	Replace
Oil leaks into brake drum	Excessive oil	Check and adjust
	Defective oil seal	Replace
	Clogged oil catcher hole	Clean

NO TRACTION ON DRIVE WHEELS

Complaint	Cause of trouble	Corrections
Propeller shaft is in normal function	Broken driving shaft or deviated driving shaft	Rectify or replace
	Damaged or worn gears	Replace
	Defective parts in differential	Replace

PART 8
FRONT SUSPENSION

CONTENTS

PART 8 FRONT SUSPENSION (for model PR)

Introduction

The use of newly improved independent suspensions in front and rear contributes to the excellent road-holding with improved riding comfort even at high-speed motoring. The lowered center of gravity with reduced under spring loads add to the stability of the Bellett.

Data and specifications of the front suspension

Type	Wishbones with coil springs	
Toe-in (mm)	3	(when fully laden)
Camber	1° 30' ± 15'	
Caster	30' ± 15'	
King pin inclination	7° 30' ± 15'	
Shock absorber	Telescopic, double-acting hydraulic	

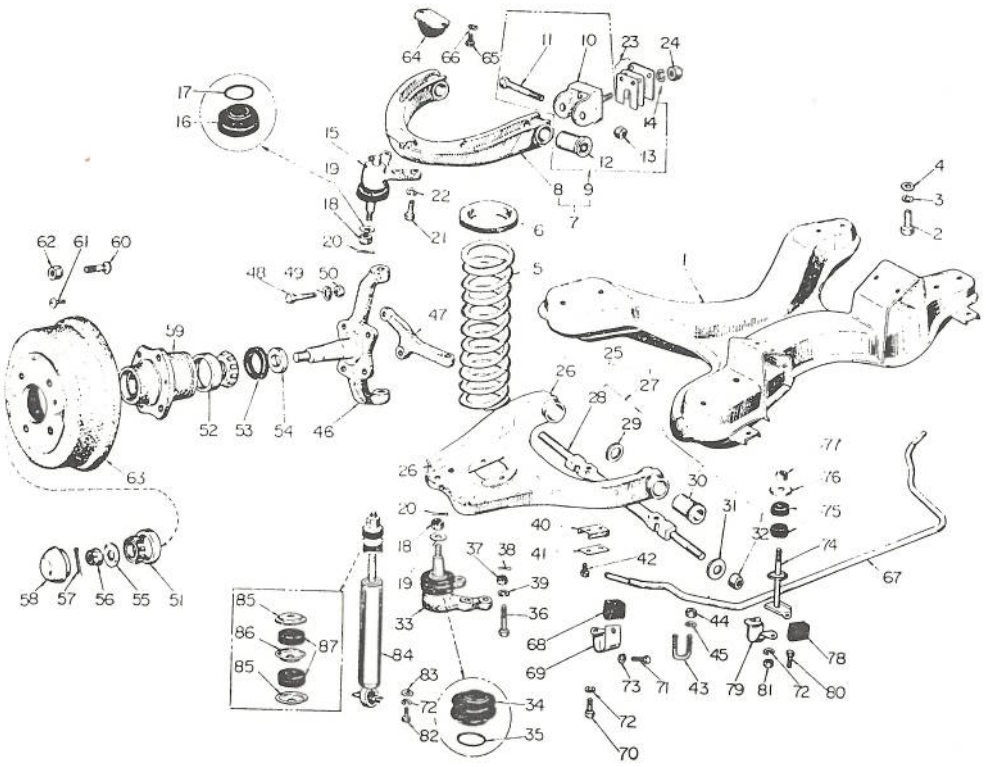
Data and specifications of the front coil spring

Model	PR 20	PRD 10	
Fitting position	Both right and left	Right-hand side	Left-hand size
Parts number	51211-094	51211-095	51211-096

Free length (mm)	378.5	384	367
Wire diameter (mm)	13.5	14	14
Spring constant (kg-m)	3.0	3.5	3.5
Color marking	White, yellow and red	White, yellow and red	White/blue, yellow/blue and red/blue
Range of load acceptable	White 509 493	White 613 594	White 549 532
	Yellow 492 477	Yellow 593 575	Yellow 531 514
	Red 476 461	Red 574 555	Red 513 497

Note: The coil springs are identified with color marking.
The insulator rubbers are used in the model PR 20 and PRD 10 in common.

Front suspension unit in exploded view



Component parts of the front suspension

Fig. 1

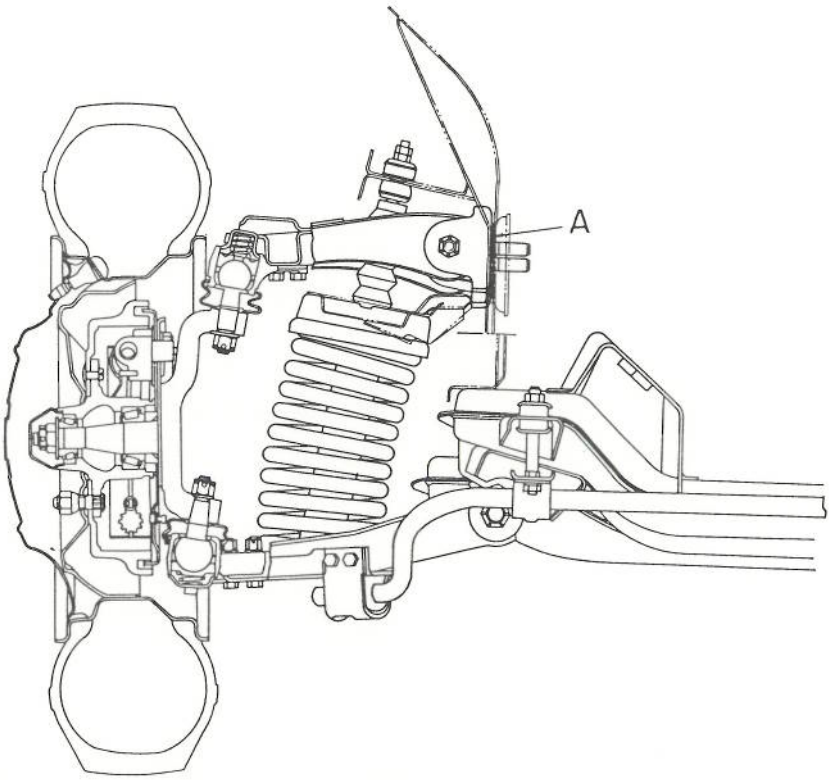
1. Front cross member
2. Bolt; cross member
3. Spring washer
4. Washer; plain
5. Coil spring
6. Insulator
7. Upper link assembly; pin
8. Upper link
9. Fulcrum pin assembly
10. Bracket; fulcrum pin
11. Bolt; fulcrum pin
12. Bush; fulcrum pin
13. Oddie nut
14. Spring washer
15. Upper link end assembly
16. Boot
17. Spring
18. Nut
19. Washer
20. Split pin
21. Bolt
22. Spring washer

23. Shim;
24. Nut
25. Lower link assembly; pin
26. Lower link
27. Fulcrum pin assembly
28. Fulcrum pin
29. Distance piece
30. Bush
31. Washer
32. Nut
33. Lower link end assembly
34. Boot
35. Spring
36. Bolt
37. Nut
38. Split pin
39. Spring washer
40. Clamp bracket
41. Lock plate
42. Bolt
43. "U" bolt
44. Nut
45. Spring washer
46. Knuckle
47. Knuckle arm
48. Bolt
49. Spring washer
50. Nut
51. Bearing; outer
52. Bearing; inner
53. Oil seal
54. Distance piece
55. Lock washer
56. Nut
57. Split pin
58. Cap; hub
59. Hub
60. Wheel pin
61. Screw
62. Wheel nut
63. Brake drum
64. Bump rubber
65. Bolt
66. Spring washer
67. Stabilizer bar
68. Bush; stabilizer
69. Clip
70. Bolt
71. Bolt
72. Spring washer
73. Spring washer
74. Hanger assembly
75. Cushion rubber
76. Washer
77. Nut
78. Rubber bush
79. Cap
80. Bolt
81. Nut
82. Bolt
83. Washer
84. Shock absorber
85. Retainer washer; outer
86. Retainer washer; inner
87. Rubber bush

Construction of the front suspension

The wishbones with coil springs are adopted in the front suspension. This suspension comprises the upper and lower links of different length mounted to the side member and cross member, respectively.

The double-acting shock absorbers used in this suspension include the oil lock device in their tensile sides for providing better damping effect with minimized operating noise when compared with the effect of the conventional shock absorbers with rebound rubbers. The camber and castor can be adjusted by varying the thickness of the adjusting shims fitted into the upper link. (Position A in Fig. 2)



Construction of the front suspension

Fig. 2

Front suspension unit removal

1. Disconnect the steering shaft from the coupling.

2. Remove the stabilizer bar.

3. Take out the nut from the shock absorber in the engine compartment.

4. Jack up the front part of the car and support it on the suitable stands fitted to the jacking tube on the lower part of the under-frame.

5. Remove the wheels, brake hoses and shock absorbers.

   Note: To prevent the brake fluid from flowing out through the disconnected joint, the loose end of the joint should be covered with a clean rag and temporarily fastened to the convenient part of the frame at a level higher than the master cylinder.

6. Disconnect the track rod end from the knuckle arm. The use of a puller (8521-0078) is essential for this operation. (See the paragraph "Steering")

7. Clips (8523-1544) should be used for removing the coil springs. Hold a jack against the lower link end and compress the coil spring. Fit three clips, with the larger hooks turned up, to the periphery of the coil spring in the axial direction. Then fasten the spring with a band and bolt.

   Loosen the oddie nut on the lower fulcrum pin and disconnect the upper link end from the upper link. Gradually lower the jack and remove the spring. Compress the spring with the aid of an arbor press or the like and remove the clips and band.

Removing the coil spring

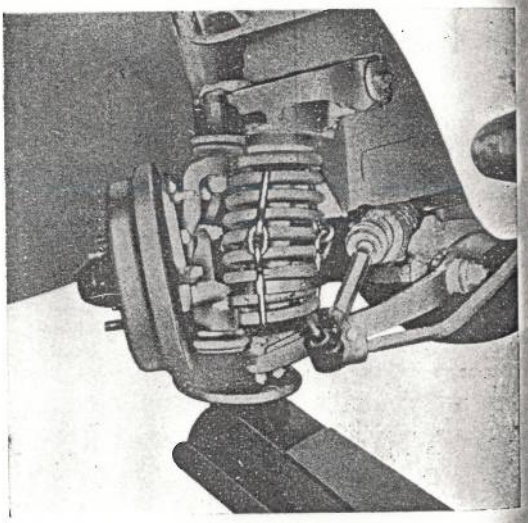


Fig. 3(a)

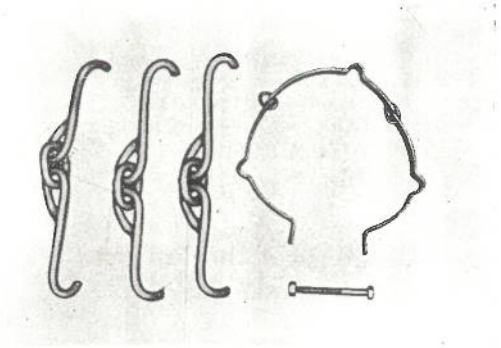


Fig. 3(b)

8. As the upper link is mounted to the side member, it can not be removed unless the double nuts on the fulcrum pin bracket in the engine compartment are taken out.

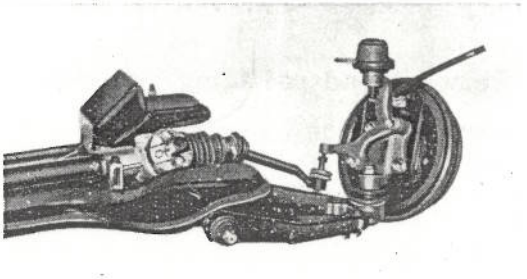
Note: When removing the upper link, note the number of camber and caster adjusting shims found in their positions.

9. Lift the engine with a hoist.

10. Remove the engine mounting rubber setting bolts from the cross member.

11. Disconnect and take out the battery.

12. Remove the bolts fixing the cross member to the under frame and dismount the suspension unit by gradually lowering the jack.



Removing the steering unit

Fig. 4

Refitting the front suspension unit

Refit the front suspension in the reverse order of removal.

Securely tighten the cross member set bolts with the specified torque. Front cross member set bolt tightening torque is 6 m-kg.

Removing the lower and upper link

1. Remove the knuckle from the lower link end.

2. Loosen the lower fulcrum pin fixing bolts and remove the lower link.

3. Remove the upper fulcrum pin assembly.

4. Disconnect the knuckle from the upper link end.

Removal and refitting the upper fulcrum pin bush

1. Parts name and parts numbers of the special tools.

Attachment	8523-1385
Adapter	8523-1386
Guide pipe	8523-1380
Push bar	8523-1394
Attachment	8523-1384

2. Use of the tools

a. Method for pulling out

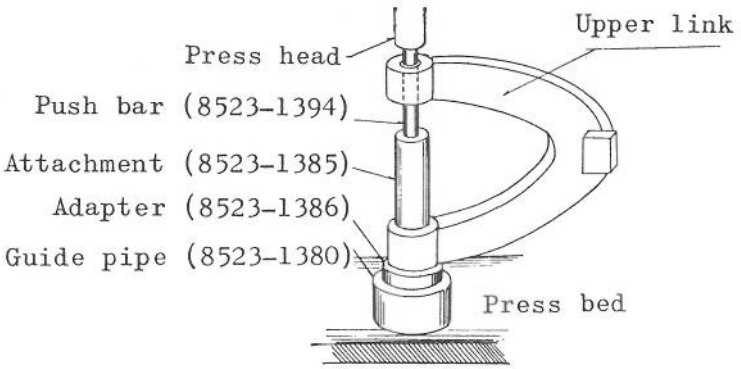
i. Mount a guide pipe (8523-1380) on the press bed and place the adapter (8523-1386) over the guide pipe.

ii. Place the fulcrum pin bush on the adapter and mount the attachment (8523-1385) over the fulcrum pin bush. Then fit the push bar (8523-1394) into the bush from upward and press it out downward.

iii. Apply the same procedure for removing the bush on the other side.

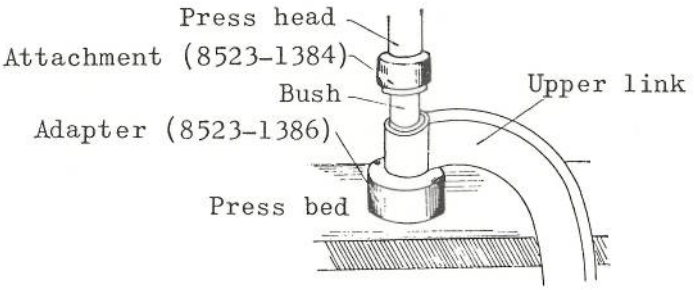
b. Method for fitting

i. Place the upper link on the adapter as illustrated in Fig. 6. Then mount the bush on the upper link and fit the attachment (8523-1384) and apply pressure.



Removing the upper fulcrum pin bush

Fig. 5



Refitting the upper fulcrum pin bush

Fig. 6

Removal and refitting the lower fulcrum pin bush

1. Parts name and parts number of the special tools.

Guide pipe	8523-1380
Distance tube	8523-1382
Plate	8523-1383
Attachment	8523-1384
Adapter	8523-1386

2. Method for use

a. Method for pulling out

i. Mount a guide pipe (8523-1380) on the press bed and place the adapter (8523-1386) over the guide pipe with the flange on the fulcrum pin bush properly aligned with the groove in the adapter.

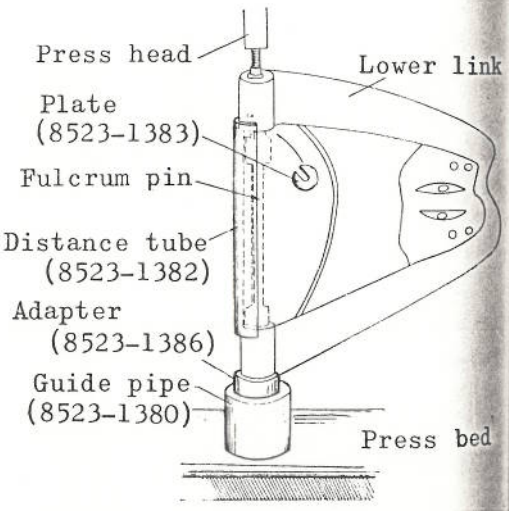
ii. Fit the distance tube (8523-1382) between the two boss on the lower link to prevent the link from deformation.

iii. With the arbor press, apply pressure to the fulcrum pin from upward until the fulcrum pin extends about 7mm from the fitting position.

iv. Fit a plate (8523-1383) into the clearance between the projection on the fulcrum pin and the upper bush.

v. Turn the lower link upside down and apply pressure to the fulcrum pin from the side to which the plate is not fitted and remove the bush and pin.

vi. When removing the bush on the other side of the lower link, carry out the above operation (1) and (2) and then remove the bush by using the fulcrum pin as a substitute for attachment.



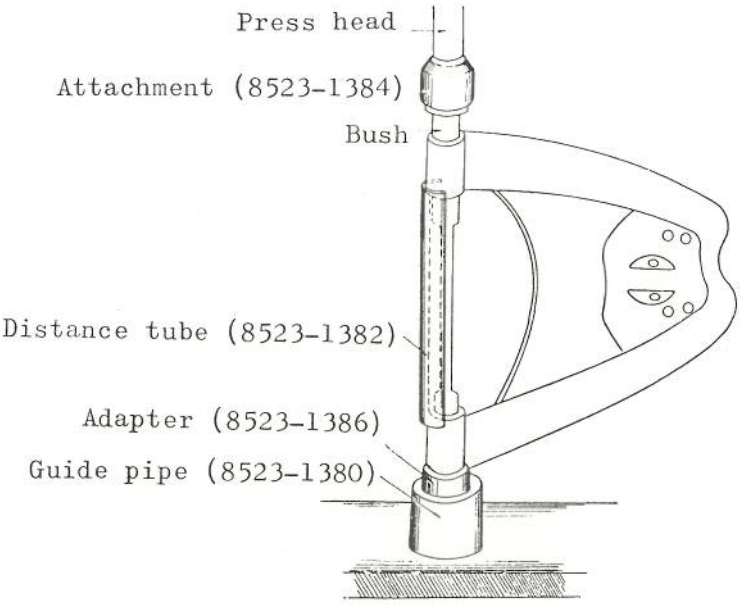
Removing the lower fulcrum pin bush

Fig. 7

b. Method for fitting the bush

i. After carrying out the above operation (1) and (2), align the bush with the link boss and mount the attachment (8523-1384) over the bush. Then apply pressure with the aid of an arbor press.

ii. When refitting the bush into position on the other side of the lower link, fit the fulcrum pin into one of the bush and carry out the operation (1) above.



Refitting the lower fulcrum pin bush

Fig. 8

Refitting the lower and upper link

Carry out the refitting work in the reverse order of removal. These parts should be securely tightened with the specified torque as they play an extremely important role in assuring the automobile of safety.

1. Fit the upper link fulcrum pin assembly to the body side. Tightening torque is 9.0 - 10.5 m-kg.

2. Fit the upper link end to the knuckle. Tightening torque is 7.0 m-kg.

3. Fit the upper link end to the upper link. Tightening torque is 1.5 - 2.5 m-kg.

4. Fit the lower link fulcrum pin assembly to the cross member. Tightening torque is 5.3 m-kg (for "U" bolt) 5.0 - 6.0 m-kg (for bolts).

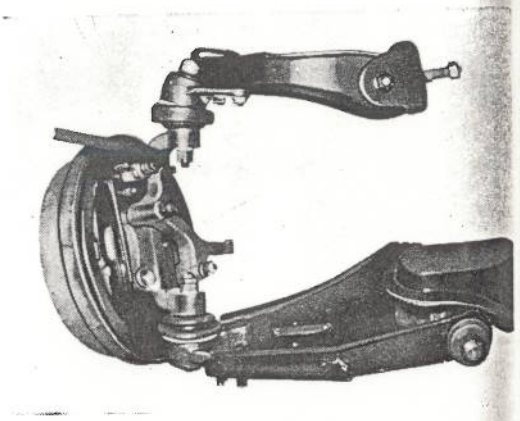
5. Fit the lower link end to the knuckle. Tightening torque is 7.0 m-kg.

6. Fit the lower link end to the lower link. The bolt should be fitted with its head turned toward the ground and tightened by turning the nut. The bolt tightening torque is 2.0 - 3.5 m-kg.

7. Tighten the oddie nut on the upper link fulcrum pin. The tightening torque is 9.0 m-kg.

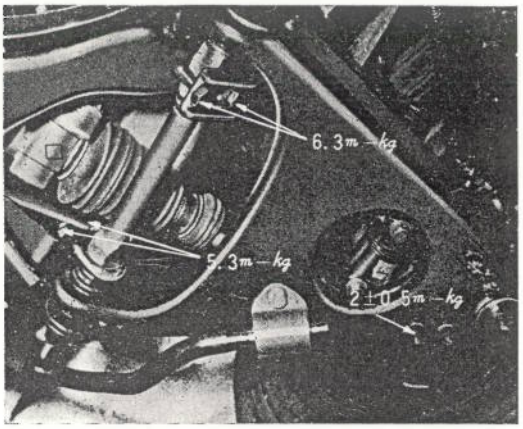
8. Tighten the oddie nut on the lower link fulcrum pin. The tightening torque is 15 m-kg.

Note: The oddie nuts in sub-paragraph (7) and (8) above should be tightened with the specified torque while the automobile is subjected to the standard loads. The nuts, if previously loosened, should be retightened in the same manner.



Upper and lower link

Fig. 9



Tightening torques

Fig. 10

Inspecting the front suspension

Clean the parts with detergent oil and inspect them for evidence of wear, damage or cracking and replace if necessary.

1. Check the upper and lower link for cracks or deformation.

2. Check the coil springs for weakness, cracks or bending.

3. Check the coil spring insulators and bumper rubbers for weakness and damage.

4. Check the stabilizer bar and rubber bushes for wear.

5. Check the upper and lower link end for wear.

6. Check the upper and lower fulcrum pin and rubber bushes for wear and weakness.

7. Check to see if abnormal noise comes from the shock absorbers when they are operated. Check the rods for bending and examine the external part of absorbers for evidence of oil leakage and cushion rubbers for wear or damage.

Removal, inspection and refitting of the front hub

REMOVAL

1. Loosen the wheel nuts, jack up the front wheels clear of the ground and support the car on suitable stands. Then remove the wheels and brake drums.

   Cautions: When disassembling the hub without removing the brake shoe and drum cover assembly, extreme care should be taken not to contaminate the brake lining with the grease in the front hub.

2. Remove the hub cap and take out the split pin, hub nuts and lock washers.

3. Remove the front hub.

   Caution: Care should be taken not to allow the outer bearing to fall off.

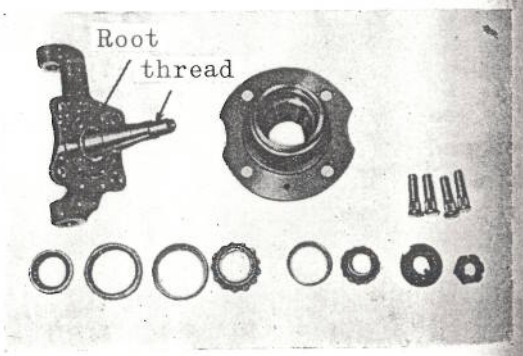
INSPECTION

1. Remove the distance piece, oil seal, inner bearing and outer lace in the order mentioned and check them for wear, discoloration and damage.

2. Replace the parts as a complete assembly if wear, discoloration or damage is noted.

3. When removing the inner and outer bearing outer laces, fit a suitable block or the like to the groove in the hub and drive out the laces with a wooden manner.

4. Carefully examine the end of the knuckles and their thread for evidence of wear or damage.



Inspecting the parts

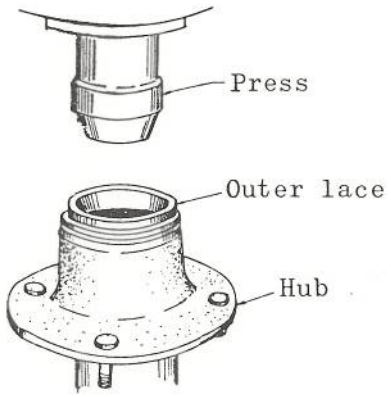
Fig. 11

REFITTING

1. Fitting the front hub into the knuckle requires special attention for greasing and adjustment so that the refitting work should be carried out in the order described below.

2. With the aid of an arbor press, fit the outer lace of the inner bearing into the hub. The outer lace should be fitted into position with the side having larger inside diameter faced outward.

3. Fit the outer lace of the outer bearing in the same manner.



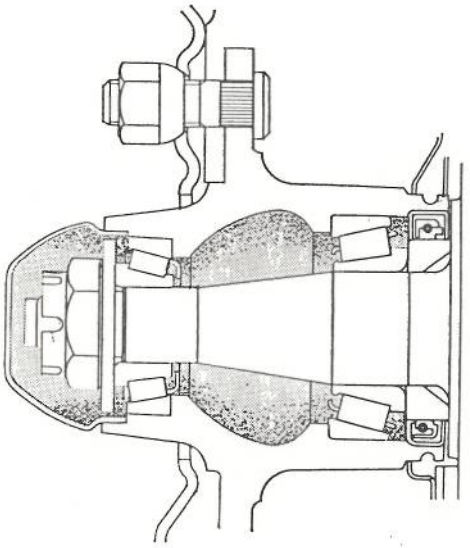
Fitting the outer lace

Fig. 12

4. Pack grease in the internal part of the hub. Remove the excessive grease by inserting a metal strip or the like into the center part of the hub and moving it along the inner circumference of the outer lace.

Note: The genuine hub grease (Sunlite grease) should be used in the bearing. The mount required to fill a bearing is 65 - 70gr.

5. Apply 15-20gr of grease to the hub cap. The internal part of the cap should be cleaned before reassembly.



Amount of lubricant

Fig. 13

6. In order to allow ample amount of grease enters into the internal part of the bearing, hold grease on the palm of the hand and rub it into the bearing while turning the bearing with another hand.

7. Fit the hub to the knuckle and put lock washer and nut back into their positions. Then adjust the bearing preload.

ADJUSTING THE FRONT HUB BEARING

1. Adjusting method

The front hub bearing preloads should only be adjusted in the following manner as it is extremely important for obtaining optimum adjustment.

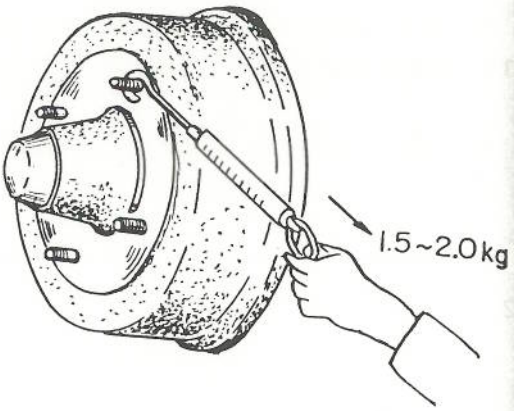
a. Tighten the hub nuts to 4.0 m-kg torque and again turn them loose.

b. Turn the hub several times in both directions to allow the bearing rollers to rest in their positions.

c. Re-tighten the hub nuts to 3.0 m-kg torque and turn them back 30°-60°, then fit the split pins.

d. A force required to rotate the drum is 1.5-2.0 kg when measured at the position of the wheel pin.

Note: 1. For measuring the torque, hook the spring balance to a wheel pin and pull it in tangential direction.



Measuring the torque required to rotate the drum

Fig. 14

2. Before making this measurement, the drum should be carefully inspected to see if its rotation is restricted by the brake shoe.

Readjustment is necessary if the measured value does not fall within the specified range.

Inspecting and adjusting the front wheel alignment

Front wheel alignment

Toe-in (mm)	3
Camber	1° 30' ± 15'
Caster	30' ± 15'
King pin inclination	7° 30' ± 15'

Sort of adjusting shims available

Parts number	Thickness (mm)
51249-072 (116)	0.8
51249-073	1.6
51249-074	2.3
51249-102	4.5

PREPARATIONS FOR INSPECTION AND ADJUSTMENT

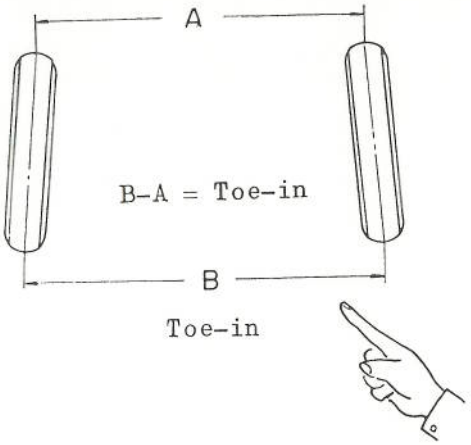
Prior to inspecting and adjusting the wheel alignment, the following should be carefully observed as any minor variations would often lead to malalignment.

1. The wheel alignment should be adjusted with a rated load placed on the automobile.
2. The disk wheel and the front hub should be carefully checked for proper tightness and optimum play.
3. Check the upper link and lower link clamp for tightness.
4. Check the tires for deflection and proper air pressure.
5. Park the automobile on a level for measurement.

TOE-IN ADJUSTMENT

The front wheels are so arranged that when viewed from an elevated position, the front wheel track of the front part of the wheel appears slightly narrower than that of the rear part of the wheel.

Malaligned toe-in gives a rise to tire wear, often results in heavy steering operation and further causes shimmy or vibration of the front wheels. The toe-in can be properly adjusted to specification by turning the track rod adjusting tube for the steering. The standard toe-in with rated load is 3 mm.



Toe-in

Fig. 15

Note: The steering system of the Bellett is so arranged that the lock nuts for the rack shaft hold the steering from excess travel as the lock nuts serve as stoppers for regulating the turning angle of the front wheels. (The lock nuts are provided with rubber washers to protect the lock nuts from steering shock). For this reason, the effective steering angle and the turning circle should be correctly adjusted after the toe-in alignment is adjusted by adjusting the length of the track rod. (Special attention should be invited to adjusting the track rod properly to avoid the contact of the stabilizer bar with the inner face of the front tires. The toe-in adjustment should only be carried out in the following manner. The paragraph "Steering" should be used as a reference for adjusting the travel of the rack.)

1. Jack up the front suspension and bring the steering wheel into intermediate position by turning it one time and a half back from the extreme end of its rotation.

2. Align the front wheels to straight-driving position. This adjustment provides the same length at the right-hand and left-hand side of the track rod. (About 203 mm).

3. Apply mark to the center of the tire treads along their periphery by turning the tires.

4. Mount the front tires on the turn tables. (This is necessary to obtain correct toe-in alignment).

5. Shake the car several times and allow it to set back into normal condition.

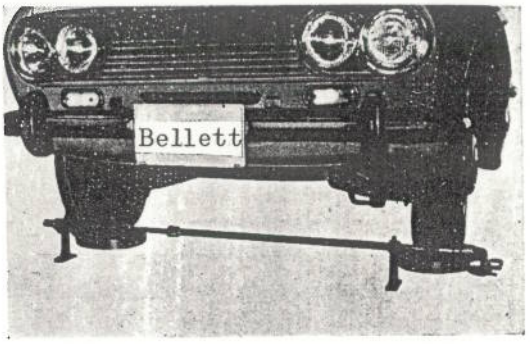
6. To bring the car on level, insert wood blocks having the height identical to the turn table underneath the rear wheels.

   Note: As the Bellett is so arranged that the camber of the rear wheels varies with the varying load.

To hold the camber in correct alignment, the car should be supported on suitable stands in normal operating condition. The use of a jack should be avoided.

7. Set the tip end of the toe-in gage pointer to the center line of the wheel.

8. Bring the tip end of the toe-in gage pointer into contact with the mark applied for measurement. Measure the distances between wheels denoted by A and B.



Toe-in measurement

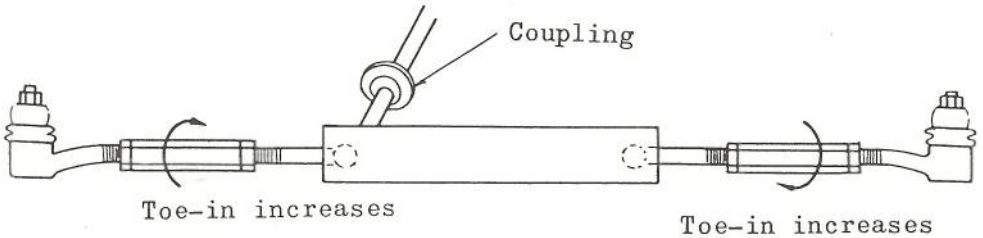
Fig. 16

9. For adjusting the toe-in, loosen the right and left outer track rod adjust tube lock nuts and turn the adjust tube the same amount until 3 mm toe-in is obtained. Turning the adjust tubes in directions reverse to those indicated by arrows in Fig. 17 gives toe-out.

10. Turn the steering wheel all the way in both directions and check the steering angles.

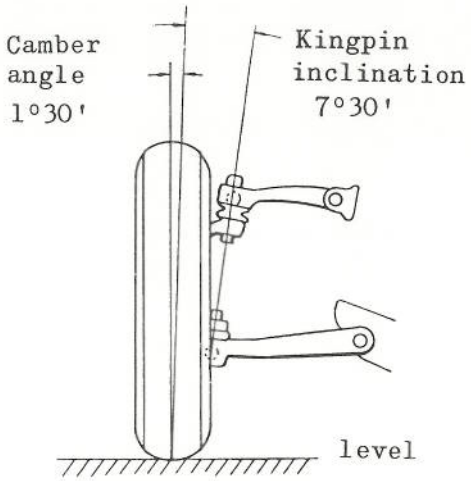
Inside 36°

Outside 33°



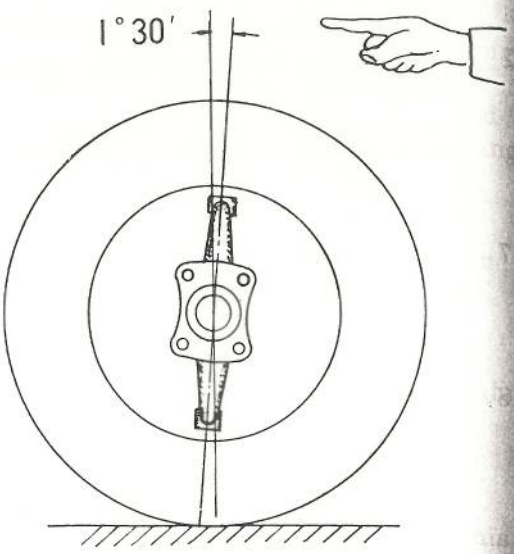
Method of toe-in adjustment

Fig. 17



Camber and Kingpin inclination

Fig. 18



Caster

Fig. 19

ADJUSTING THE CAMBER AND CASTER

1. Camber

As the front wheels are provided with camber, the wheels are farther apart at the top than at the bottom when viewed from the front side. The purpose of the camber is to provide easier steering with improved steering stability together with the effect of Kingpin inclination.

2. The Kingpin inclination has the close relation to the camber.

The Kingpin inclination is the inward tilt of the knuckle from the vertical while the camber is the outward tilting of the wheels from the vertical.

3. Caster

Caster is the backward tilt of the knuckle from the vertical.

For adjusting the camber and caster, loosen the upper link fulcrum pin bracket nut in the engine compartment side and adjust the number of shims fitted into the clearance between the body and upper link bracket.

1. Increase the thickness of the shims fitted to increase the tilting angle toward positive direction. (The same amount of increase should be given to both front and rear wheels. 7 mm of shim thickness corresponds with 10 of camber angle).

2. For increasing the caster angle toward positive direction, increase the thickness of the adjusting shims fitted to the front and reduce the same amount from the shims in the rear.

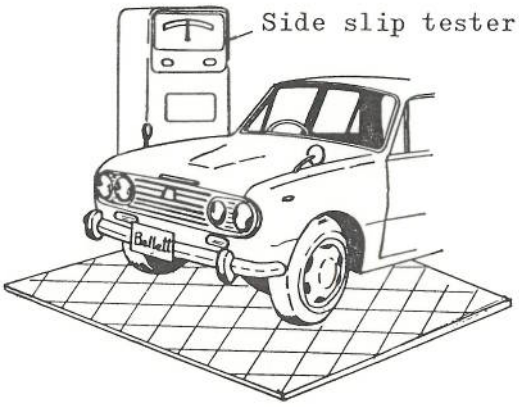
   For example, to increase the caster angle toward positive direction by 1° add 3.26 mm of thickness to the front and deduct 3.26 mm from the total thickness of the shim at the rear.

   Note: Failure to adjust both front and rear shims gives maladjusted camber angle. The camber, caster and toe-in have the close relation to the front-end geometry and therefore, resetting of the caster and camber necessitates the readjustment of the toe-in.

CHECKING THE FRONT WHEEL ALIGNMENT WITH THE USE OF SIDE SLIP TESTER

1. Heavy steering

   Upon completion of adjustments on toe-in, camber and caster, measure the side slip with the aid of the side slip tester. If the tester reading does not fall within the standard value, readjustment is necessary.



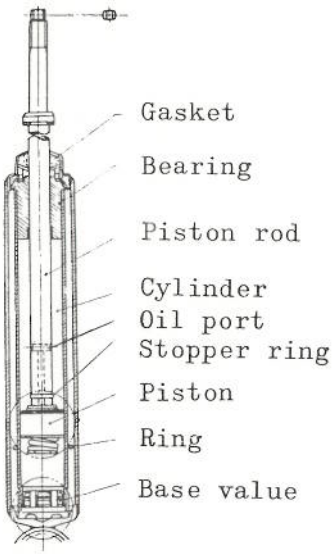
Measuring the side slip

Fig. 20

Data and specification of the shock absorbers

	Front	Rear
Parts number	51630-205	51630-207
Length at maximum (mm)	360	350
Length at minimum (mm)	250	235
Stroke (mm)	110	115
Damping Compression side kg/m/sec	130 ± 20	105 ± 16
Rebound side kg/m/sec	20 ± 4	20 ± 4
Oil lock stroke	27	27
Parts identification (front and rear) (End bolt is provided with groove)	with groove	without groove

Sectional cut-away view of the shock absorbers



Component parts of the shock absorber

Fig. 21

Inspecting the shock absorbers

The shock absorber should be checked in the cases where:

1. Considerable amount of oil is leaking.

   Note: An appreciable amount of oil leak indicates that the rod and gasket are well lubricated and hence this is not detrimental to normal operation.

2. Worn cushion rubbers at the lower and the upper mount of the shock absorbers cause noise

to develop and lead to damage of the shock absorber when they are subjected to road shocks continuously. (Replace the shock rubbers)

3. If serious vibration or rocking motion occurs and continues when the automobile is on travel. This can be easily tested by shaking the body of the automobile a few times with hands and see if rocking motion continues when hands are released.

4. Immediately after the driving, touch and feel if the internal temperature of the shock absorbers has increased. Under normal working condition, the vibration energy absorbed by the shock absorber is turned into heat and dissipated thereby causing an increase in the internal temperature of the shock absorber. For checking the function of the shock absorber, remove it from the car reciprocally move it several times by holding the pin on the lower part of the mount, again reciprocally operate the shock absorber quickly and feel the resistance of the internal oil pressure. The shock absorber should be regarded as worn out if it is not provided with resistance.

Trouble-shooting and corrections

TROUBLE AND CORRECTIONS

1. Heavy steering

For detecting the cause of heavy steering, jack up the front wheels clear of the ground and turn the steering wheels in both directions.

STEERING WHEEL VIBRATION

Cause of trouble	Correction
1. Maladjusted front wheel alignment	Inspect and adjust
2. Insufficient tire pressure	Adjust to proper pressure
3. Poorly lubricated ball joints	Re-lubricate
4. Defective housing	Readjust or rectify
5. Ball joint binding	Rectify or replace

STEERING WHEEL PULLS

1. Maladjusted front wheel alignment	Inspect and adjust
2. Use of tires with unequal outside diameters	Replace
3. Dragging wheel on one side	Adjust
4. Unbalanced tire pressures	Adjust to specified pressure
5. Broken or weakened coil spring	Replace
6. Worn front hub bearing or maladjusted bearing preload	Adjust or replace
7. Irregular wheel-bases	Rectify

EXCESSIVELY WORN AND PARTIALLY WORN TIRES

1. Improper tire pressure	Adjust to specified pressure
2. Maladjusted front wheel alignment	Adjust
3. Loosened front hub bearing	Re-tighten and adjust
4. Deflected wheels	Rectify or replace
5. Unsuitable tire-interchanging	Practice in period indicated
6. Unbalanced tires	Inspect and adjust

FRONT SUSPENTION (for model KR)

Main data of front shock absorber

	KR 10 & 20	KRD 10
Type	Independent suspension, torsion bar type	
Torsion bar measurements		
Length x Dia.	796mm x 20.5mm	796mm x 21.2mm
Twist rigidity ratio	3.02 kg-m/deg	3.45 kg/deg
Shift (phase)	33.2°	32.1°
Toe-in (in ( ) indicates value when unladen	2 ~ 4mm (4 ~ 6mm)	
Camber (")	1° ± 15' (0° 40' ± 15')	
Caster (")	1° 30' ± 15' (0° 13' ± 15')	
King pin inclination (")	7° (7° 20')	

Main data of front suspension

Type	Cylindrical double-acting hydraulic
Part No.	51630 - 128
Stroke	130
Maximum length	355 ± 3
Minimum length	225 ± 3
Damping force	
Extension side (kg)	49 ± 7
Compression side (kg)	33 ± 7
(At piston speed of 0.3 m/sec)	

Illustration component parts of front suspension

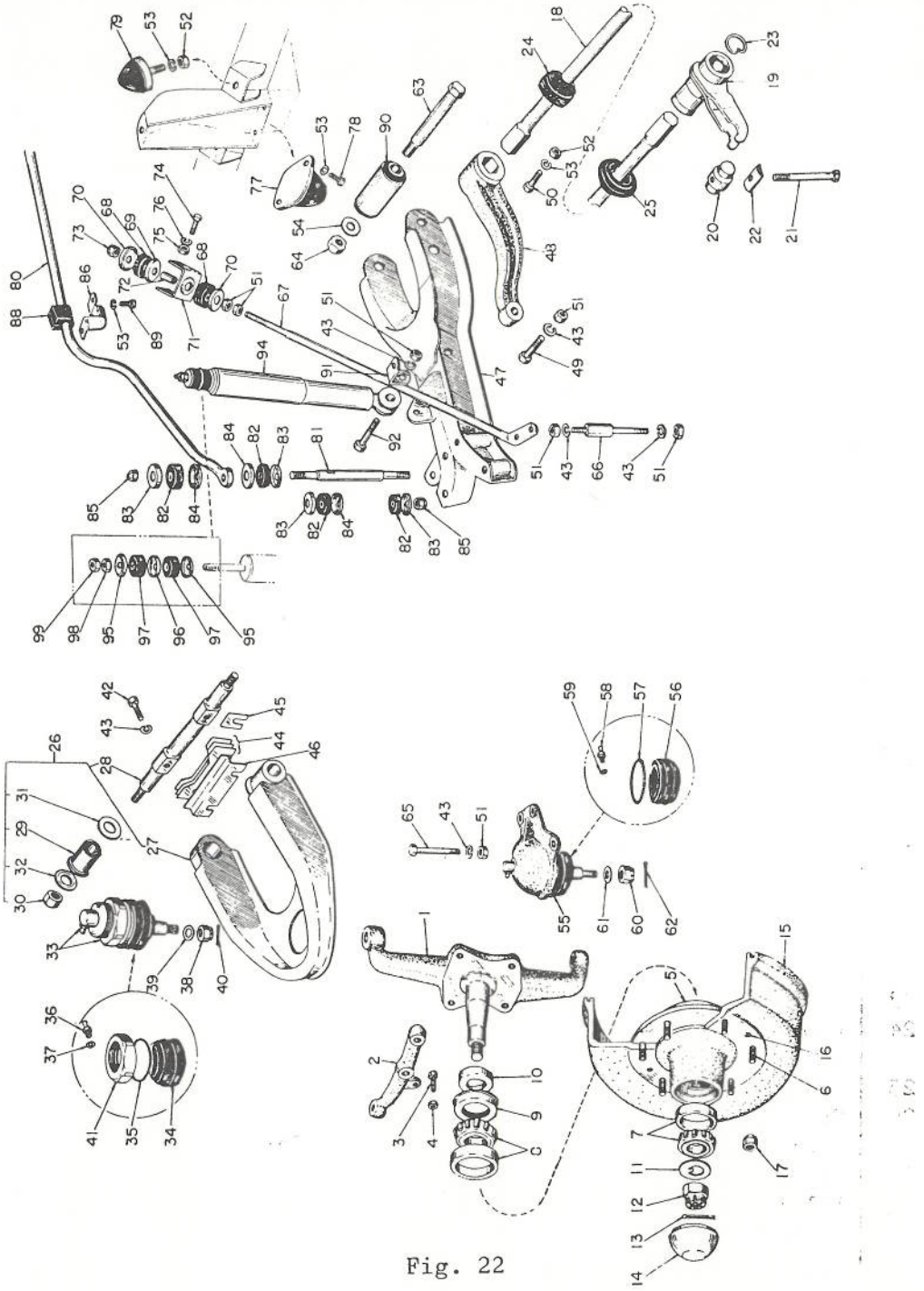


Fig. 22

Key	Part Name	Per Veh.	Key	Part Name	Per Veh.
1	Knuckle; right	1	29	Rubber bush; ...	
	" left	1		upper link	4
2	Knuckle arm; right	1	30	Oddie nut	4
	" left	1	31	Distance piece	4
3	Stopper bolt	2	32	Washer	4
4	Nut; stopper bolt lock	2	33	Upper link end assy.	2
5	Hub; front axle	2	34	Boot; upper link end	2
6	Bolt; front hub road		35	Garter spring	2
	wheel	12	36	Grease nipple;	
7	Brg.; front hub outer	2		straight	2
8	" inner	2	37	Packing	2
9	Oil seal; inner hub		38	Nut; ... link end to	
	brg.	2		knuckle	2
10	Distance piece;		39	Washer; ... "	2
	inner hub brg.	2	40	Split pin	2
11	Washer; hub to knuckle	2	41	Nut; link end to	
12	Nut	2		upper link	2
13	Split pin	2	42	Bolt; special,	
14	Cap; hub	2		upper link fix.	4
15	Brake drum	2	43	Spring washer	20
16	Screw; slotted	2	44	Shim; upper fulcrum	
17	Wheel nut	12		pin t=1.5mm	10
18	Torsion bar; right	1	45	" t=0.4mm	8
	"	1	46	Shim holder	2
	" left	1	47	Lower link; right	1
	"	1		" left	1
19	Arm; right height		48	Arm; lower link	2
	control	1	49	Bolt; reamer	2
	" left "	1	50	Bolt	2
20	End piece; height		51	Nut	16
	control	2	52	Nut	8
21	Bolt; ... height		53	Spring washer	14
	control	2	54	Collar	2
22	Seat; ... "	2	55	Lower link end assy.	2
23	Snap ring	2	56	Boot; lower link end	2
24	Boot; rear end tor-		57	Garter spring	2
	sion bar	2	58	Grease nipple	2
25	"	2	59	Packing	2
26	Upper link &		60	Nut	2
	pin assy.	2	61	Washer; plane	2
27	Upper link	2	62	Split pin	2
28	Fulcrum pin; ...		63	Bolt; lower link fix.	2
	upper link	2	64	Oddie nut	2

Key	Part Name	Per Veh.
65	Bolt; reamer	4
66	" strut bar setting	4
67	Strut bar; right	1
	" left	1
68	Cushion rubber	4
69	Washer; ... strut bar setting	2
70	" "	4
71	Bkt. ... "	2
72	Distance piece	2
73	Oddie nut	2
74	Bolt	4
75	Nut	4
76	Spring washer	4
77	Bump rubber; front	2
78	Bolt	4
79	Rebound rubber	4
80	Stabilizer bar	1
81	Rod; stabilizer	2
82	Cushion rubber	8
83	Washer; special	8
84	"	6
85	Oddie nut	4
86	Bkt.; stabilizer bar	2
88	Rubber bush	2
89	Bolt; bkt. to frame	4
90	Rubber bush; lower link	2
91	Stay; flex. hose clip front brake	2
92	Bolt; ... shock absorber fix.	2
94	Shock absorber; front	2
95	Washer; retainer	4
96	Washer; "	2
97	Rubber washer	4
98	Nut	2
99	"	2

Illustration of front suspension assembly

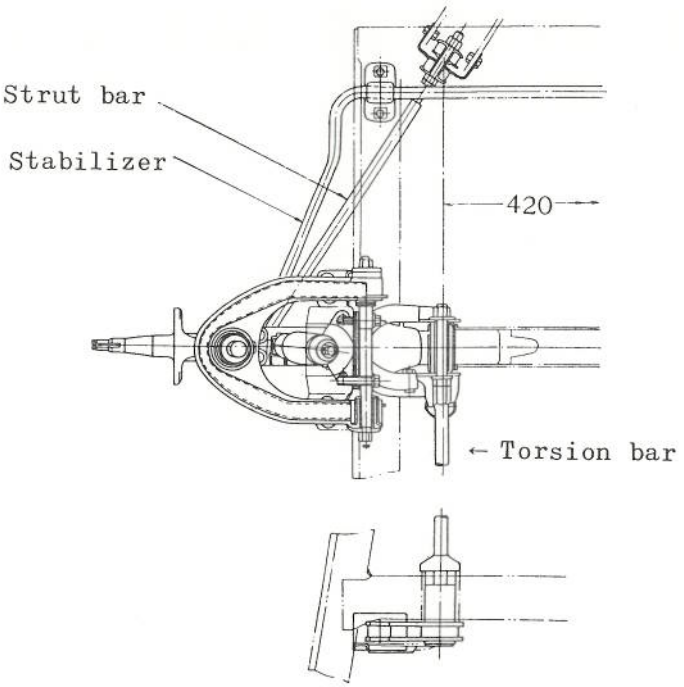


Fig. 23 (From above)

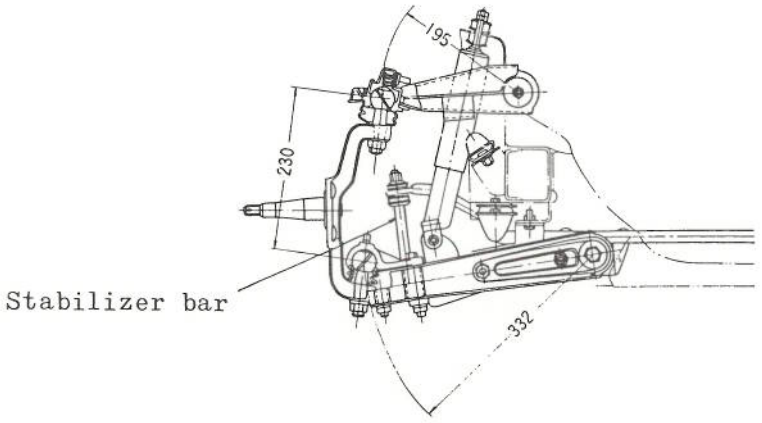


Fig. 24 (From front)

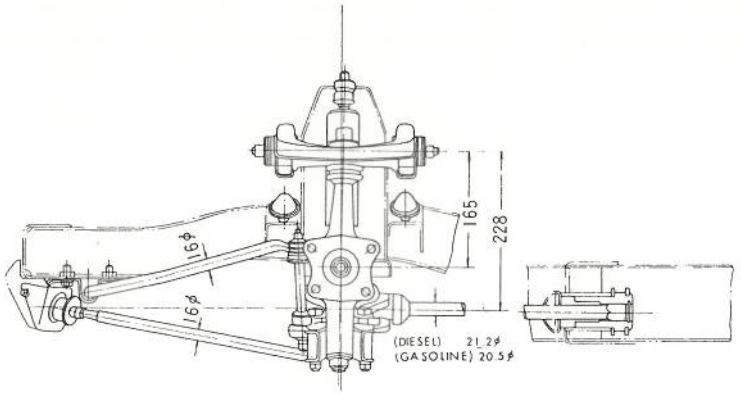


Fig. 25 (Side view)

General description of front suspension

Torsion bar type independent suspension mechanism is adopted. To the torsion bar, which utilizes the twist elasticity of steel bar, double acting cylindrical type hydraulic shock absorber is used in combination. This type, maintaining spring functions to the torsion bar, by the upper and lower link fitted to the side frame, it enables independent movements for left and right. Camber, caster adjustments follow a method whereby adjustment is performed by shim located between upper fulcrum pin and side frame. Also, the lower link to maintain stability, it is fitted to the frame by strut bar. This fixing point at frame side, unless it is on the center continuation line of torsion bar, proper functions are unobtainable and may lead to damages. Therefore when fitting, special care if necessary.

Furthermore, there are 2 kinds of torsion bar; namely, diesel engine powered vehicle (outside diameter 21.2ϕ) and gasoline engine powered vehicle (outside diameter 20.5ϕ).

To remove and refit component parts of front suspension

TO REMOVE AND FIT TORSION BAR

1. Jack up and remove height control arm set bolts ① .

2. Pull out height control arm ② from torsion bar ③ .

3. Pull out torsion bar ③ from lower link arm ④ .

4. To fit reverse the procedures of foregoing.

Note: Pre-set is made in right returning for right side bar and left returning left side conditions, therefore left and right are not interchangeable. To distinguish, at rear end of each bar R for right side and L for left side are marked.

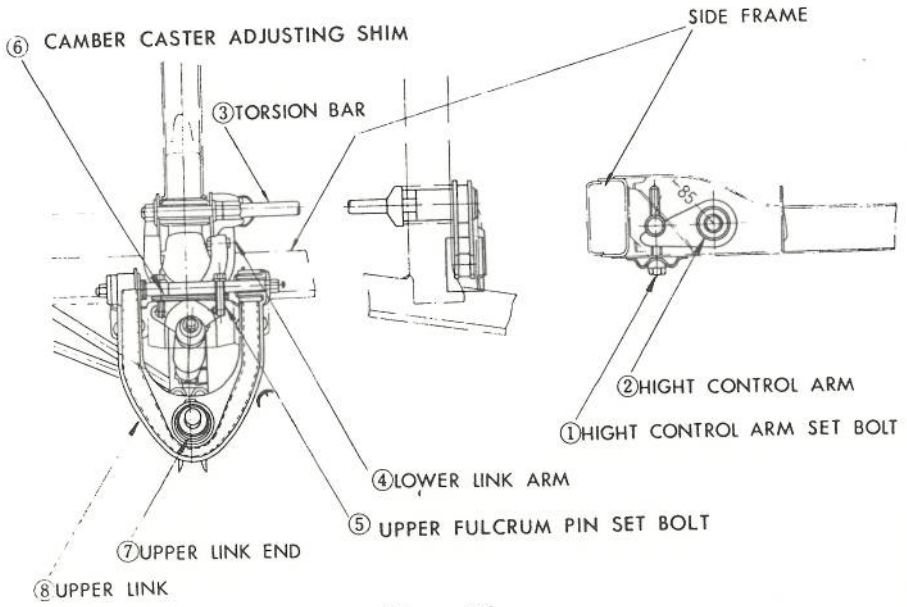


Fig. 26

TO REMOVE AND FIT UPPER LINK

1. Jack-up the car and remove the wheels.

2. Remove upper link end from knuckle. (Refer Fig. 26)

3. From inside the engine room, remove the ② bolts ⑤ that fixes the upper fulcrum pin to the shock absorber bracket. At this instant, pay close attention to the camber, caster adjusting shim ⑥ numbers and its position. (Refer Fig. 26)

4. To fit perform in reverse procedures.

Note: Be careful not to damage the threads of ball joint.

TO REMOVE AND FIT LOWER LINK, SHOCK ABSORBER AND STRUT BAR

1. Jack-up the car and remove the wheels. (For following refer Fig. 27)

2. Remove stabilizer bar ① from rod stabilizer bar, loosen the bracket ③ while holding down the rubber bush and make it float.

3. Remove strut bar initially from the strut bar setting bracket ⑤ and then remove from the lower link.

4. Remove torsion bar according to procedures described in "To remove and fit torsion bar" clause.

5. After removing the bracket side ⑧ of shock absorber ⑦ from inside the engine room, loosen and remove the side.

6. Remove lower link fixing bolt ⑨ to separate the connection with lower link end 10 and then remove lower link ⑥ .

Note: Be careful not to damage the ball joint threads.

7. To fit, perform by reversing the procedures. Regard to the tightening of the strut bar.

Note: Frame side fitting point should be on the center continuation line, unless so, it shall not function and shall lead to damages, so when fitting the strut bar, cares are necessary.

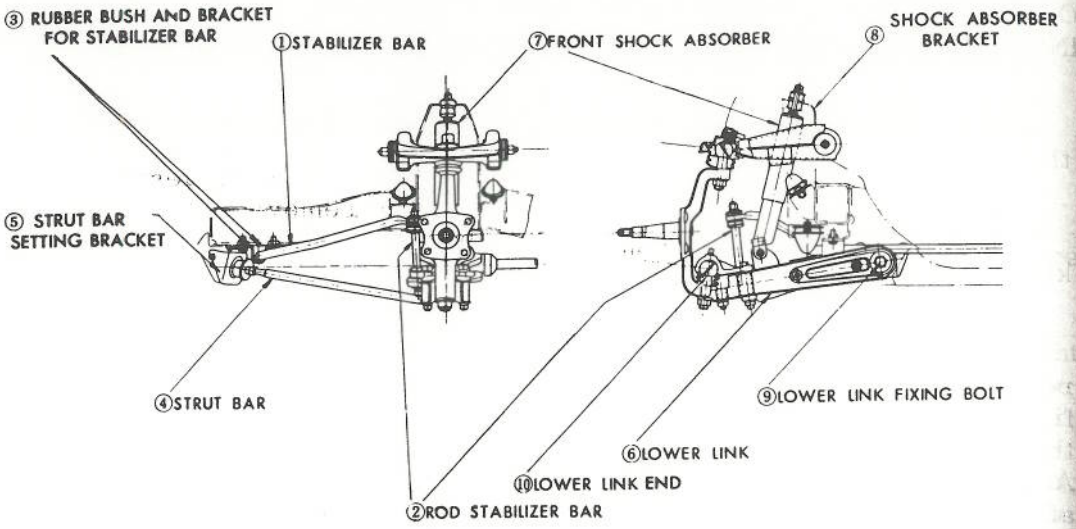


Fig. 27

REMOVAL AND FITTING OF UPPER LINK BUSH

1. Parts name and parts number

Plate: Fulcrum pin bush	8523-1383
Attachment; Fulcrum pin bush	8523-1384
Adaptor	8523-1386
Guide pipe	8523-1380

2. How to use

a. To pull out

i. Place guide pipe ④ and adaptor ③ one upon another on a press stand. Next place fulcrum pin bush portion on top the adaptor ③ .

ii. Press the upper end portion of fulcrum pin and when the fulcrum pin has been pushed out about 7 mm, insert plate 1 to the gap. (Fig. 28)

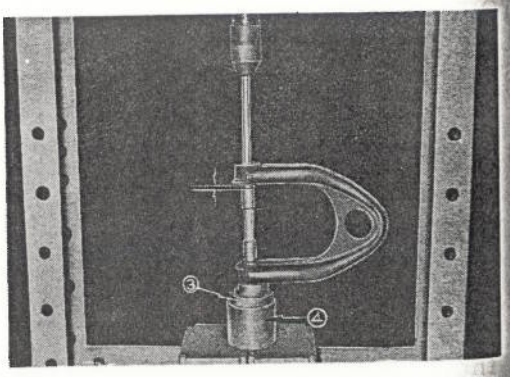


Fig. 28

iii. With plate ① in inserted condition, turn over the upper link. (Fig. 29) Next, utilizing fulcrum pin. pull out one side bush.

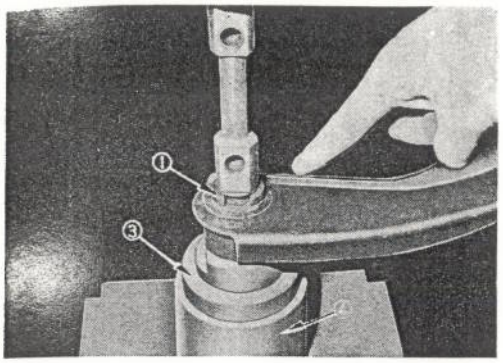


Fig. 29

iv. When pulling out the opposite side bush, pull out by inserting the plate ① .

b. To press-in

i. Place adaptor ③ on press stand and first of all, press-in one side bush by using attachment ② .

ii. Prior to press-in the opposite side bush, insert stopper (to prevent deformation of upper link). Under such condition, press-in the bush by utilizing attachment ② . (Fig. 30)

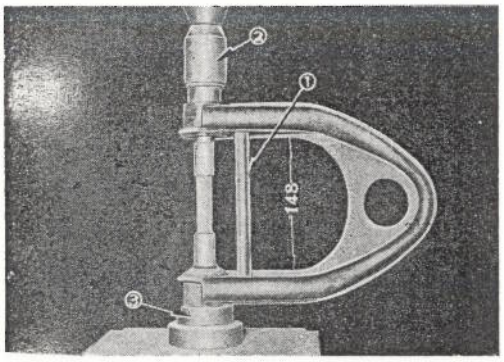


Fig. 30

REMOVAL AND FITTING OF LOWER LINK BUSH

1. Part name and part number

Replacer assembly; lower link bush 8523-1701

Components -

1. Screw shaft	8523-1702
2. Nut; large	8523-1703
3. Guide plate; large	8523-1704
4. Adaptor pipe	8523-1705
5. Guide plate; small	8523-1706
6. Bearing	0005-1104
7. Nut; small	

2. How to use

a. To pull out

i. Have the guide plate ⑤ and nut ⑦ removed.

ii. In condition with ① ② ③ ④ ⑥ fitted, insert screw shaft ① to the bush, fit guide plat ⑤ and nut. Tighten nut large ② to pull out.

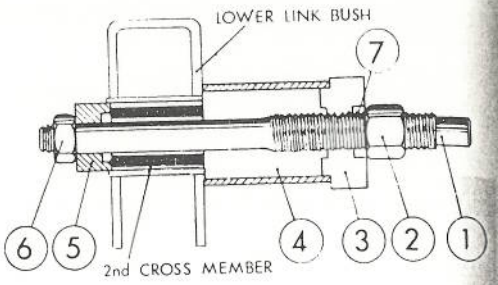


Fig. 31

iii. To press-in (Do not use guide pipe ④ (8523-1705)).

1) Similar as for to pull out, have guide plate ⑤ and nut ⑦ removed.

2) In condition with ① ⑤ ③ ⑥ fitted, pass screw shaft ⑦ through cross member and insert bush.

3) Fit guide plate ⑤ and nut that were removed, tighten the nut large ② to press-in.

Note: Striking tool should not be used, because it may bend the cross member.

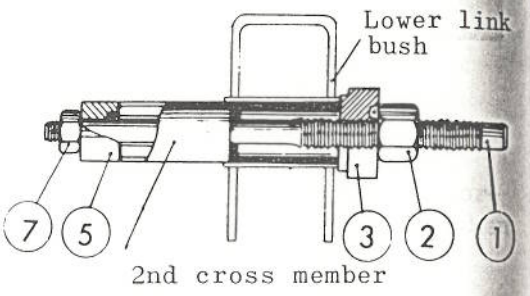


Fig. 32

TIGHTENING TORQUE OF EACH SECTION

When installing, since each section is important security part, it should be tightened securely under regulated torque.

1. Upper link relations

a. Upper fulcrum pin ⟷ shock absorber bracket fixing bolt tightening torque = 7.0 ~ 8.0 kg-m.

b. When oddie nut is loosened, tighten securely under regulated torque.

Tightening torque = 9.0 ~ 10.0 kg-m.

c. Upper link end ↔ upper link fixing nut.

Tightening torque = 21.0 ~ 22.0 kg-m.

d. Upper link end ↔ knuckle fixing nut.

Rightening torque = 11.0 ~ 12.0 kg-m. (Fig. 33)

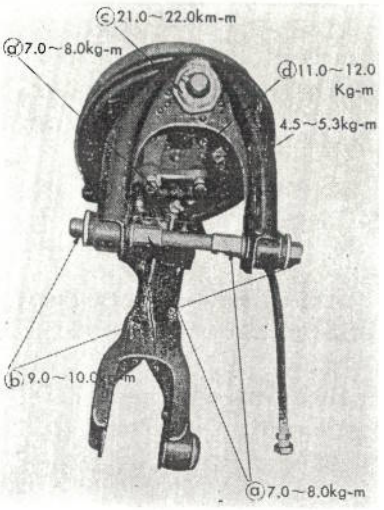


Fig. 33

2. Knuckle relations

a. Knuckle arm ↔ knuckle fixing bolt.

Tightening torque = 4.5 ~ 5.3 kg-m. 7.0 ~ 8.0 kg-m. (Refer Fig. 33)

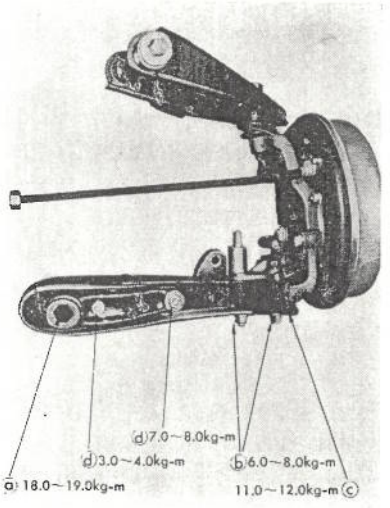


Fig. 34

3. Lower link relations

a. Lower link fixing bolt oddie nut fixing.

Tightening torque = 18.0 ~ 19.0 kg-m.

b. Lower link end ↔ lower link fixing nut.

Tightening torque = 6.0 ~ 8.0 kg-m.

c. Lower link end ↔ knuckle fixing nut.

Tightening torque = 11.0 ~ 12.0 kg-m.

d. In case lower link arm is removed, tighten under regulated torque. Lower link arm ⟷ lower link fixing nut.

Tightening torque = 7.0 ~ 8.0 kg-m. 3.0 ~ 4.0 kg-m.

e. Strut bar ⟷ strut bar setting bracket fixing oddie nut.

Tightening torque = 7.0 ~ 8.0 kg-m. (Refer Fig. 34)

WHEEL FIXING NUTS

Tightening torque = 9.0 ~ 10.0 kg-m.

To check each component parts of suspension

After cleaning parts with cleaning solvent, check them for wear, damage or crack and make necessary replacement.

1. Cracks of upper link and lower link.

2. Crack, twist or fatigued torsion bar.

3. Worn or damaged bump rubber and rebound rubber.

4. Fatigued stabilizer bar and worn rubber bush.

5. Worn or cracked ball joint.

6. Check strictly the base of knuckle and threaded portion.

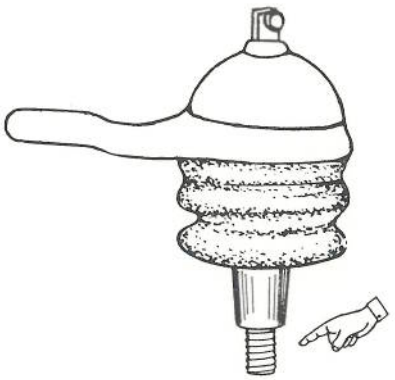


Fig. 35

7. Unusual noise of front shock absorber, bent rod, oil leaks from packing, wear and damage of cushion rubber.

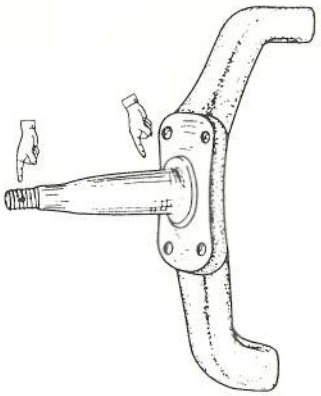


Fig. 36

To remove, check and fit front hub

TO REMOVE

1. Loosen wheel nuts and jack-up the front of the car. Place stand underneath to support and remove wheels and drums.

   Note: When hub disassembly operations are to be performed without removing brake shoe and back plate assembly, be careful so that the front hub grease does not adhere to the brake linings.

2. Remove hub cap and then remove split pin, hub nut and lock washer.

3. Remove front hub.

   Note: At this instant, be careful not to drop the outer bearing.

4. When removing the outer race of inner bearing, tap lightly with a suitable wooden hammer.

TO CHECK

1. Bearing worn or discolored and or oil seal is damaged, replace in an assembly.

2. Replace bolts if they are found to be defective.

TO FIT

When fitting front hub to knuckle arm, particular attention is required to grease packing and adjustments. Therefore, be sure to follow according to following procedures.

1. Using a press, press-in the outer race of inner bearing to the hub. Fit so that the larger side of inside diameter is facing outward.

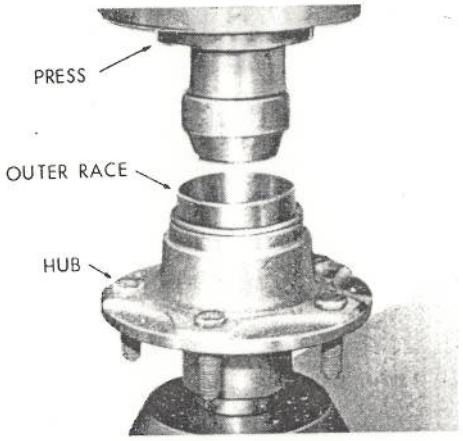


Fig. 37

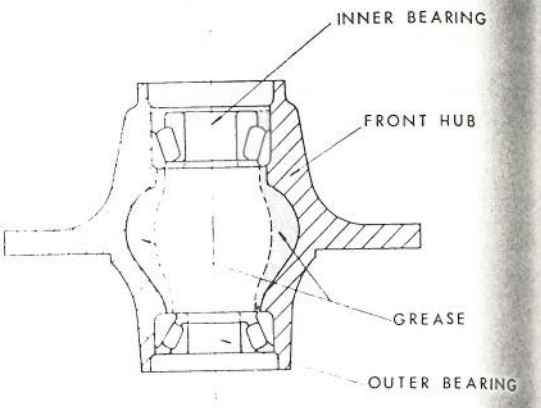


Fig. 38

2. Pack grease to the inner side of hub. Then with a narrow piece of board or metal piece, insert in the center and scrape out the grease along the outer race inside diameter inside of hub.

   Hub (inside) = 60 ± 10g

   Hub cap (inside) = 17 + 5g

   Note: use genuine hub grease.

3. Pack grease to the rollers of both bearings. First of all, insert inner bearing only to the hub together with distance piece and oil seal.

Fit hub to knuckle and after fitting lock washer and nut, adjust according to "To adjust front hub" clause.

Note: Do not pack grease to the hub cap. If so done, it shall be excessive causing grease to come round to brake lining and becomes dangerous.

TO ADJUST FRONT HUB

ADJUSTING METHODS

Adjustment of front hub bearings is very important. Be sure to adjust as follows.

1. After tightening the hub nut at 4.0~5.0 kg-m, loosen.
2. Revolve the hub several times back and forth, enabling the bearing rollers to settle.
3. Retighten the hub nut at 3.0 kg-m and in between 30°~60° returning, lock with split pin.
4. At this instant, check whether the bearing pre-load is 8.5 ~11.5 kg-cm or not.
5. Revolving drive force of drum is within 1.2~1.6 kg at wheel pin position.

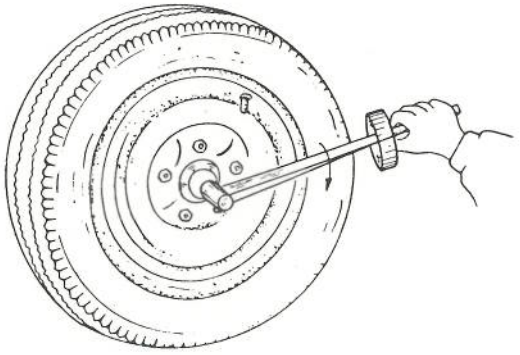


Fig. 39

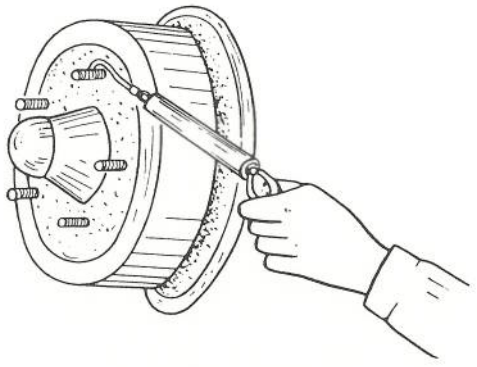


Fig. 40

Adjustments of height control arm

CAR HEIGHT ADJUSTMENT PROCEDURES BY HEIGHT CONTROL ARM

1. Maintain tire pressure properly.

   Front wheels:
   1.7 kg/cm^2 (24 lbs/in^2)

   Rear wheels:
   2.7 kg/cm^2 (38 lbs/in^2)

2. Position car on a flat surface, shake up and down the front part of car and where it has settled, adjust so that the car height shall become as shown in Fig. 18 with the adjust bolt located at rear end portion of torsion bar.

3. In case car height is to be raised, tighten the bolt clockwise and when lowering the car height, turn the bolt anticlockwise.

4. Refrain from tightening or loosening one side only first, but perform little by little alternately left and right.

5. Perform operations by oiling the adjust bolt.

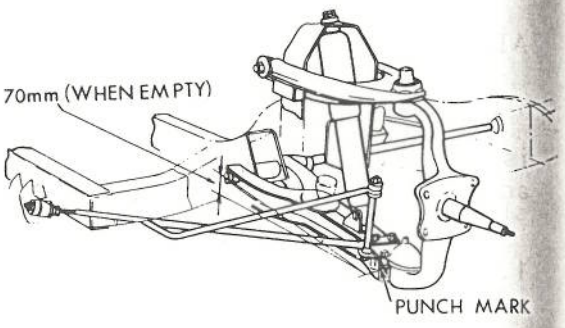


Fig. 41

To check and adjust front wheel alignment

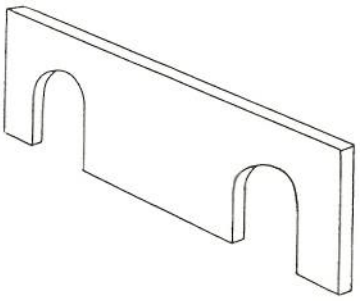
FRONT WHEEL ALIGNMENT

Toe-in (Inside ( ) is when empty)	2 4 mm	(4 6 mm)
Camber (")	1° ± 15'	(0°40' ± 15')
Caster (")	1°30' ± 15'	(0°13' ± 14')
King pin inclination (")	7°	(7°20')

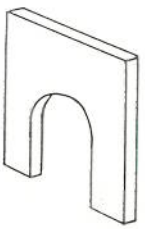
KINDS OF ADJUSTING SHIM

For camber		For caster	
Part No.	Thickness (mm)	Part No.	Thickness (mm)
51249-112	1.6	51249-111	0.4

Shape illustration



Shape illustration



PREPARATIONS PRIOR TO CHECK UP AND ADJUSTMENTS

1. Place vehicle on flat grounds and check whether too much play of disc wheel fixing and of front hub are present or not.

2. Check for tire swings and air pressures. Standard air pressures are -

   Front wheels:
   1.7 kg/cm^2 (24 lbs/in^2)

   Rear wheels:
   2.7 kg/cm^2 (38 lbs/in^2)

3. Confirm the fixings of upper link and lower link ends.

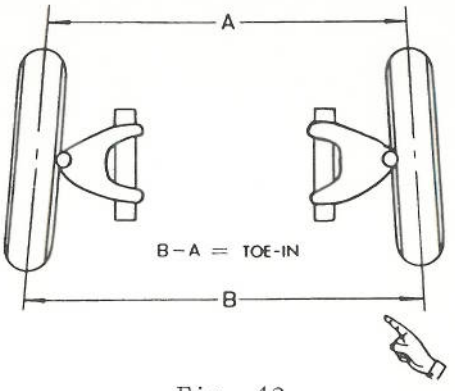


Fig. 42

Fig. 43

TOE-IN

Toe-in is the condition where the front wheels when viewed from above, the distance between left and right wheels is narrower on the front side than the rear side.

Maladjusted toe-in will hasten tire wears, unusual wears and makes steering wheel operations heavy, finally leading to front wheel vibrations.

TOE-IN ADJUSTMENTS

1. Have the front wheels properly in straight-driving condition.

2. Put measuring marks to toe-in gauge height position of left and right tires rear side tread and then place the tips of toe-in gauge to the left and right tire marks to measure the distance.

3. Advance the vehicle and place the gauge tips to the measuring marks to measure "A" distance.

B-A = 2~4 mm ...
Standard with load.
(4~6mm) ...
When empty.

4. To regulate toe-in, loosen the lock nut of adjust tube and adjust by turning the adjust tube. The revolving direction of adjust tube is performed according to Fig. 21.

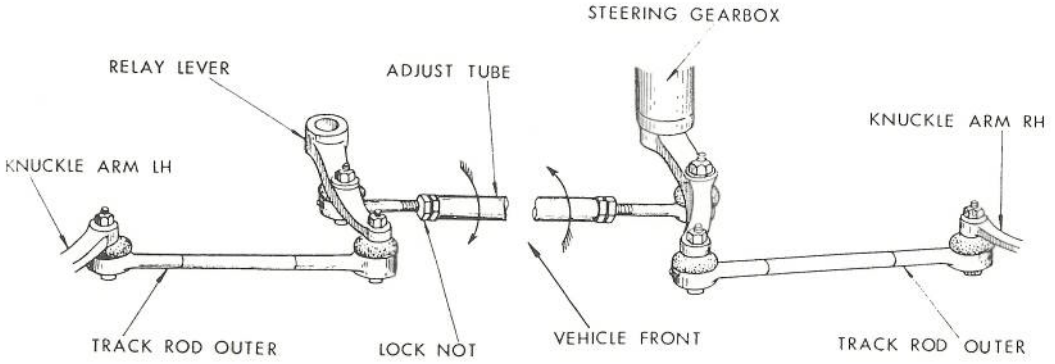


Fig. 44

CAMBER

By the camber, the front wheels when seen from front, the upper side is lightly wider than the lower side. Camber together with the king pin inclination, is the angle which enables easy steering and stable front wheels.

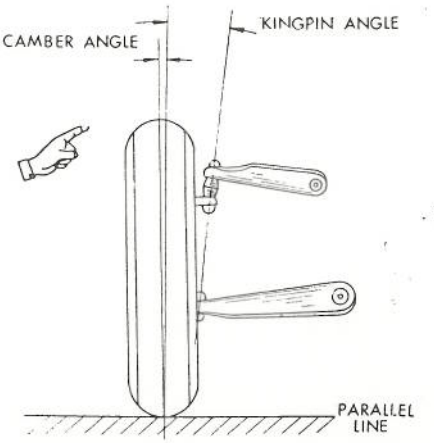


Fig. 45

CASTER

When front wheels is viewed from the side, knuckle slightly inclines to the rear.

This inclination is called caster.

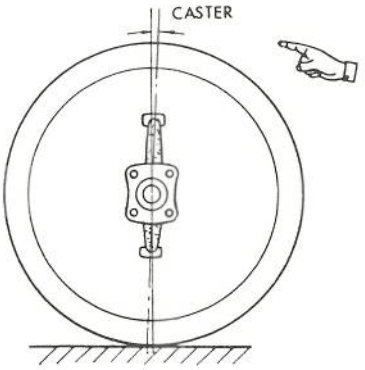


Fig. 46

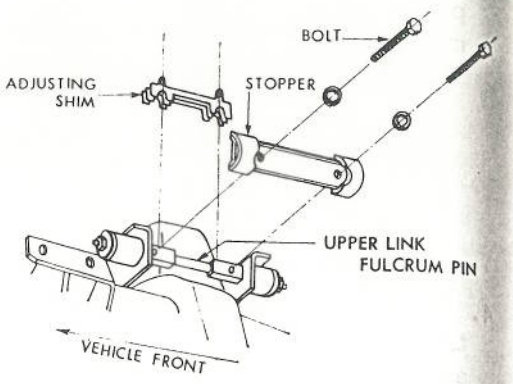


Fig. 47

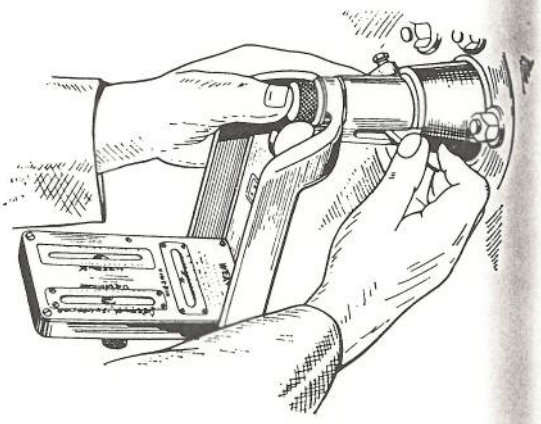


Fig. 48

CAMBER, CASTER ADJUSTMENTS

1. Camber, caster adjustments are performed by the adjusting shim inserted in between upper link fulcrum pin and shock absorber bracket.

2. To increase camber decrease shim thickness. Camber 1° is equivalent to shim thickness of 4 mm.

3. To increase caster, increase rear portion shim as compared to the front portion.

Caster 1° is equivalent to the difference between the front and rear shim thickness, which is 1.6 mm.

4. Camber and toe-in have delicate relations, therefore everytime camber is set, be sure to check toe-in.

KING PIN ANGLE

King pin angle and camber have very delicate relations. King pin angle is the angle where knuckle inclines inward. (Refer Fig. 22)

SIDE SLIP

After toe-in, camber and caster are adjusted, measure side slips by using the side slip tester. In case the tester indications are beyond the scope of standard, readjustment is necessary.

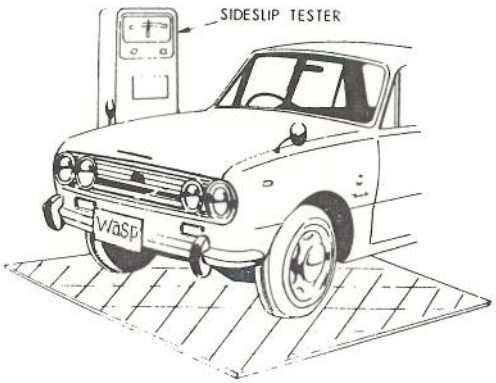


Fig. 49

STEERING ANGLE OF STEERING

To have the steering angle of front wheels meet its standards, adjust with the knuckle stopper bolt. Knuckle stopper bolt is fitted to knuckle arm.

Steering angle standard value:

Inside:	36°30'
Outside:	29°00'

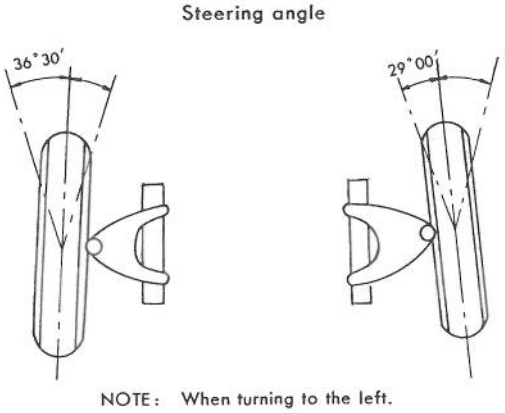


Fig. 50

Troubles and countermeasure of front suspension and steering systems

Refer the subparagraph "Front suspension and steering - trouble shooting and corrections" of model PR.

PART 9

REAR SUSPENSION

CONTENTS

FOR MODEL PR

FOR MODEL KR

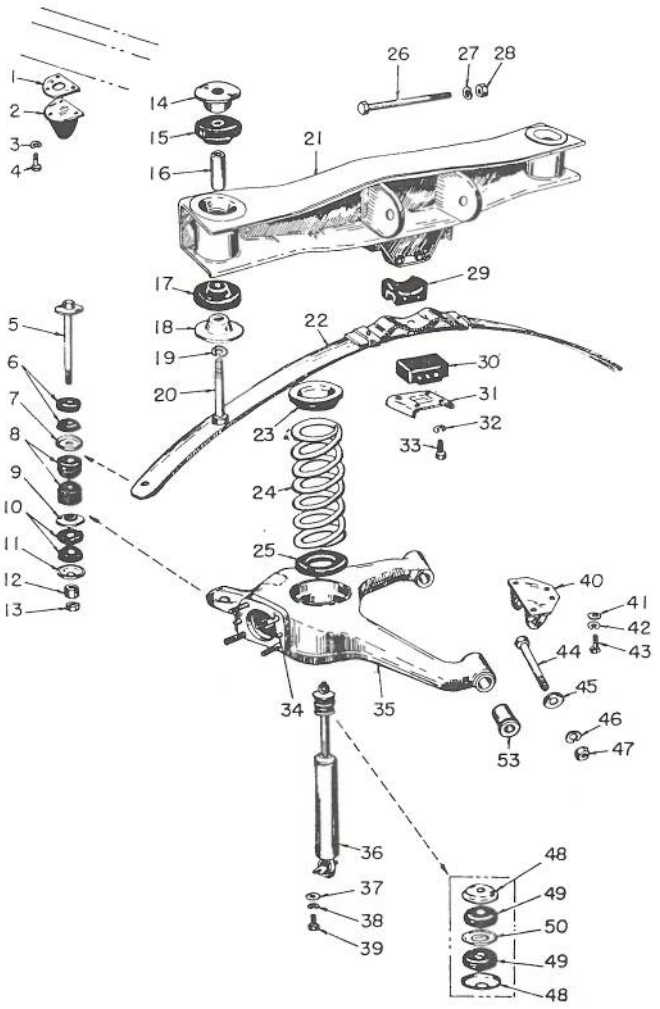
PART 9 REAR SUSPENSION (for model PR)

Data and specifications of rear suspension

Type	Independent suspension comprising coil springs with leaf springs in horizontal arrangement
Camber angle	4° (Without load) -2° 30' (When fully laden)
Shock absorber	Telescopic double-acting hydraulic
Coil spring data	
Wire diameter x free length x number of coil	14.0 x 285 x 5.75
Spring constant (kg/mm)	5.65
Color marking	White, yellow and red
Range of load acceptable (kg)	White 463 - 449 Yellow 448 - 433 Red 432 - 419
Leaf spring data	
Length x width x thickness x number of spring	969 x 50 x 6 x 1
Spring constant	0.94

The independent rear suspension comprises coil springs with leaf springs in horizontal arrangement. In the rear suspension, the diagonal links are used to take up the torque counter-acting upon the suspension when the brakes are applied or when the traction power is transmitted to the drive wheels thereby eliminating the tendency of automobile to sway back and forth, while the leaf springs are adopted to give better road-holding when cornering. Double-acting shock absorbers with oil lock device in tensile side which are identical to those in the front suspension are used in the rear suspension.

Rear suspension unit in exploded view



Component parts of the rear suspension

Fig. 1

1. Distance piece
2. Bump rubber
3. Spring washer
4. Bolt
5. Shackle rod
6. Cushion rubber
7. Washer
8. Cushion rubber
9. Washer
10. Cushion rubber
11. Washer
12. Nut
13. Nut
14. Seat
15. Cushion rubber
16. Sleeve
17. Cushion rubber
18. Seat
19. Spring washer
20. Bolt
21. Mounting bracket
22. Leaf spring
23. Insulator
24. Coil spring
25. Insulator
26. Bolt
27. Spring washer
28. Nut
29. Clamp rubber
30. Clamp rubber
31. Clamp
32. Spring washer
33. Bolt
34. Pin
35. Diagonal link
36. Shock absorber
37. Washer
38. Spring washer
39. Bolt
40. Bracket
41. Washer
42. Spring washer
43. Bolt
44. Bolt
45. Distance piece
46. Spring washer
47. Nut
48. Retainer
49. Cushion rubber
50. Retainer

Rear suspension removal

1. Jack up the rear suspension by placing a jack underneath the leaf spring and then support the side frame on suitable stands.

   Caution: A jack should not be placed underneath the differential housing for lifting the suspension to prevent damage to the differential housing.

2. Remove the rear wheels.

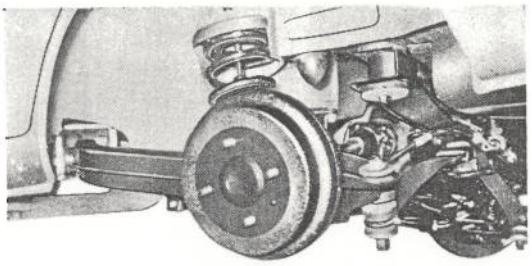
3. Remove the shock absorbers.

4. Disconnect the hand brake joint, wheel cylinder lever, clip and brake pipes.

Rear suspension

Fig. 2

5. Remove the cushion rubber and shackle rod from the leaf spring.



Shackle rod

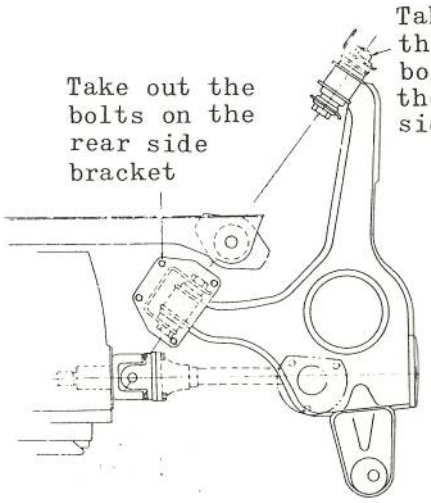
Fig. 3

6. Loosen the rubber bush clamping bolts on the diagonal link and remove the coil spring and insulator while pressing the diagonal link downward.

7. Remove the flange yoke fixing bolts (4) on the outer axle shaft.

8. Remove the rear side bracket of the diagonal link from the floor together with the link.

9. Take out the front side bolts on the diagonal link. When the front and rear bolts are removed the link assembly can be removed. (Fig. 4)



Removing the diagonal link

Fig. 4

Note: The pin bolt can not be removed in an erroneous order of removal.

10. Remove the outer axle shaft assembly from the diagonal link.

Inspecting the diagonal link for deformation and malalignment

1. Parts name and parts number

   Center:
   diagonal link 8543-1501

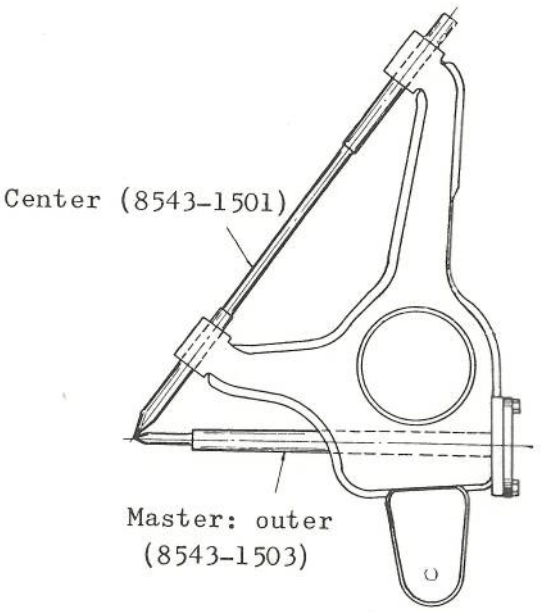
   Master:
   inner axle shaft 8543-1502

   Master:
   outer axle shaft 8543-1503

2. Uses

   a. For measuring diagonal link deformation

      Fit the master: outer (8543-1503) to the diagonal link and insert center (8543-1501) into the bush and check the alignment of the tip ends of the outer (8543-1503) and center (8543-1501).

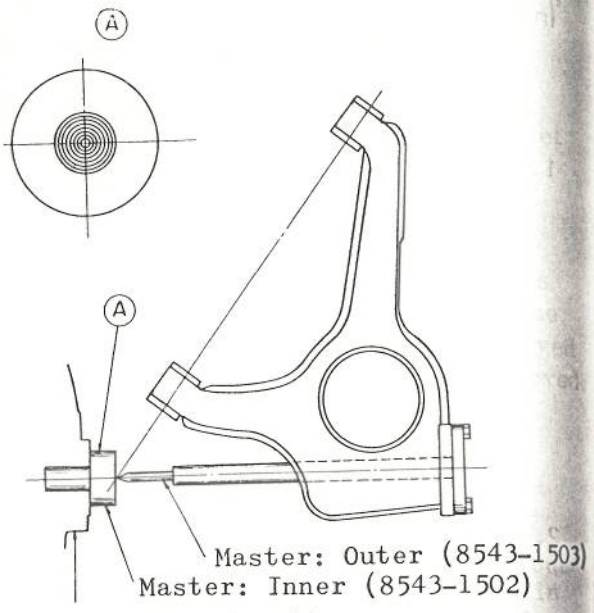


Checking the diagonal link for deformation

Fig. 5

b. For checking the alignment of the diagonal link as fitted into position.

With the diagonal link fitted to the body as illustrated in Fig. 6, fit the master: inner (8543-1502) and master: outer (8543-1503) into the diagonal link. Then check the alignment of the test pieces at their tip ends. The master: inner is provided with concentric circles for correct reading. (Fig. 6)



Checking the alignment of the diagonal link as fitted into position

Fig. 6

Removing and refitting the diagonal link bush

1. Parts name and parts number

Guide pipe	8523-1380
Attachment	8523-1381
Adapter	8523-1390
Replacer	8523-1391
Attachment	8523-1392
Push bar	8523-1393

2. Uses

a. Method for removing the bush

i. Mount the guide pipe (8523 -1380) on a bench and place adapter (8523-1390) on the guide pipe.

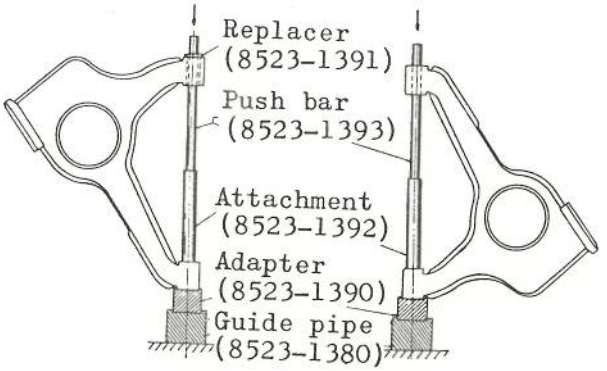
ii. Then place the link on the adapter with the bush turned down. Fit the attachment (8523-1392) over the bush and put the push bar (8523-1893) through the upper bush and apply pressure with the aid of arbor press to press out the bush downward.

iii. For removing the bush on the other side of the link, fit a replacer (8523-1391) in place of the bush to use it as a push bar guide and press out the bush in the same manner used in paragraph i. above. The use of replacer (8523-1391) is essential to protect the push bar from being deformed.

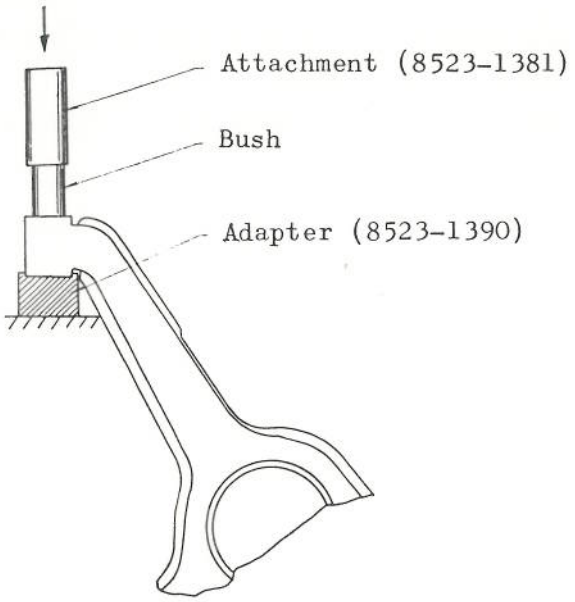
b. Method for fitting the bush

i. Mount the guide pipe (8523-1380) on a bench and place adapter (8523-1390) on the guide pipe. Place the link on the adapter with the bush fitting hole at bottom then mount the bush on the link. Then press the bush into the link with the aid of an arbor press.

ii. Apply the same procedure for fitting the bush on the other side of the link.



Removing the bush
Fig. 7



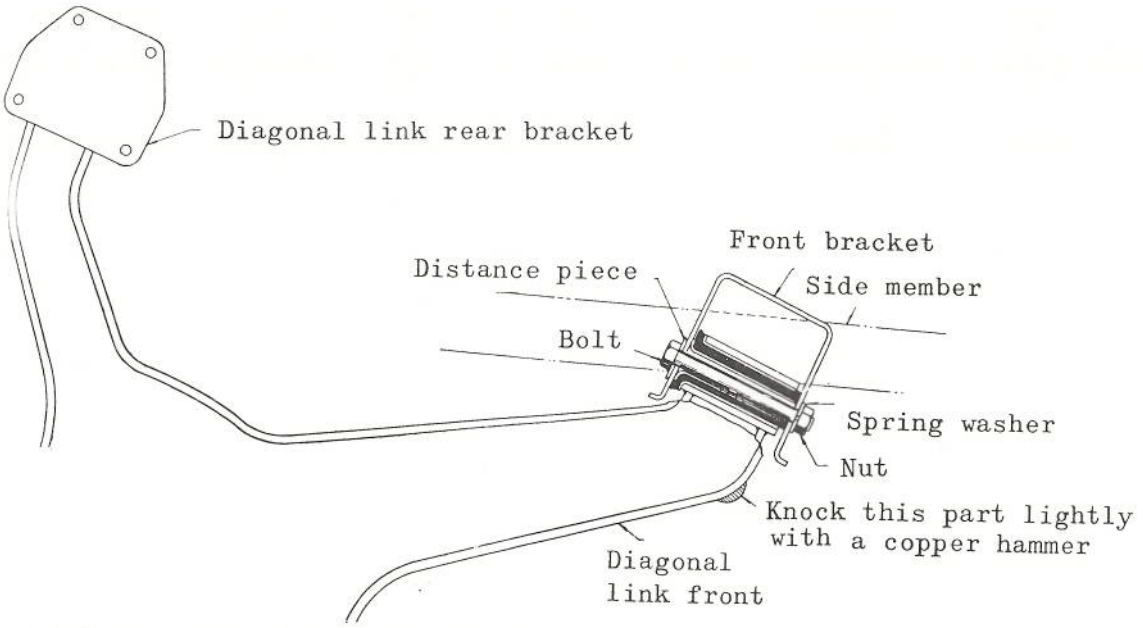
Fitting the bush

Fig. 8

Refitting the rear suspension

1. Put the bolt through the universal joint on the outer axle shaft and fit nut to the bolt. (During this operation, the outer axle shaft should be held from coming out the inner shaft).

2. Fit the diagonal link rear side bracket to the body side and leave the bolts semi-tight. Then fit the front side bracket and tighten the bolts on the rear side bracket after fitting the bolts to the front side bracket.



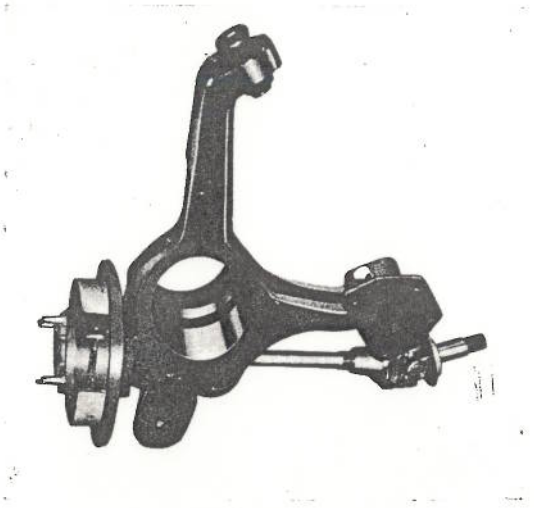
Refitting the diagonal link

Fig. 9

3. Carry out the rest of the work in the reverse order of removal.

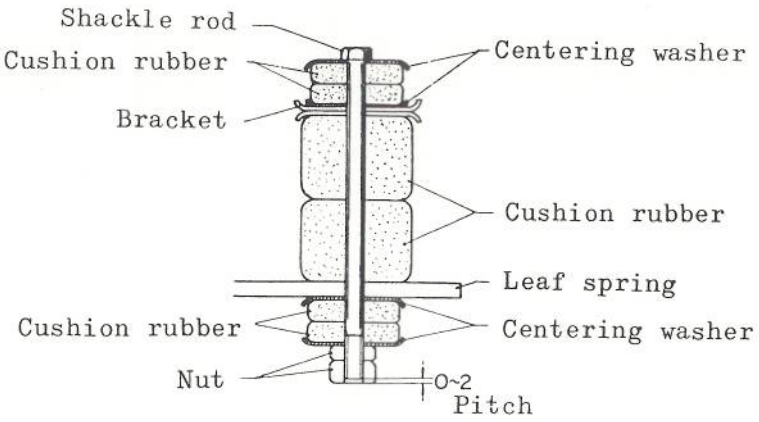
Note: (1) For refitting the shackle rod, See Fig.11.

Note: (2) When refitting the coil spring, the groove and projection on the body side of the coil spring and on the insulator should be properly matched. (Fig. 12)



Diagonal link assembly

Fig. 10



Refitting the shackle rod

Fig. 11

Note: (3) The lock nut should be so tightened that the shackle rod does not extrude the face of the nut.

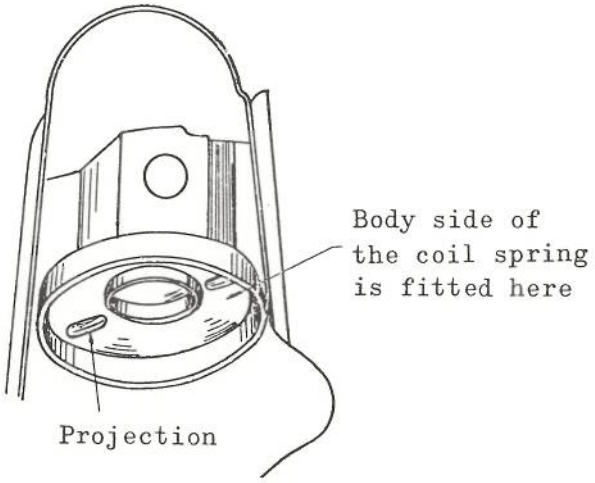


Fig. 12(a)

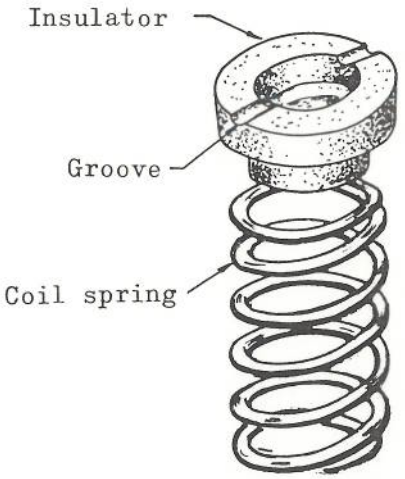
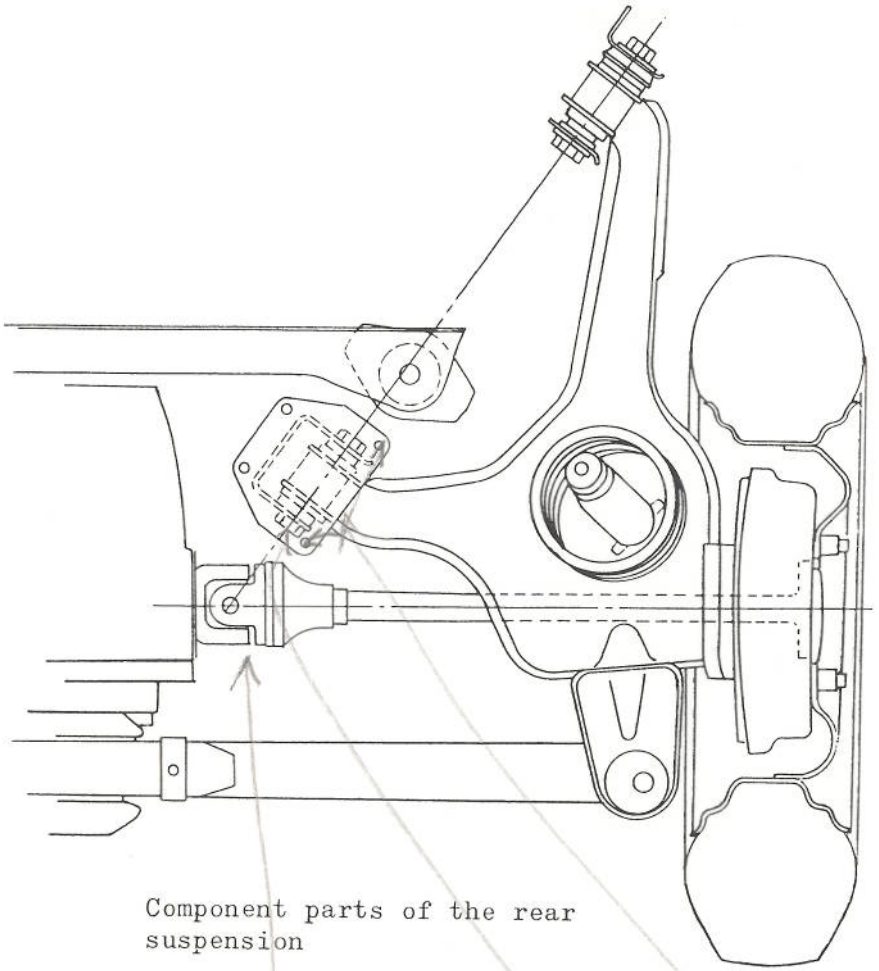


Fig. 12(b)

Refitting the coil spring

Schematic drawing illustrating the construction of the rear suspension



Component parts of the rear suspension

Fig. 13

The parts should be tightened to the specified torques.

1. Axle shaft flange yoke bolts tightening torque .....
2.3-2.6 kg-m

2. Diagonal link rear bracket bolts tightening torque .....
1.5-2.5 kg-m

3. Diagonal link rear bush pin bolt tightening torque .....
11 - 13 kg-m

4. Diagonal link front side bush pin bolt tightening torque ..... 11 - 13 kg-m

5. Wheel pin tightening torque ..... 8.0-9.0 kg-m

Note: Referring the subparagraphs 3. and 4. above, the rubber bush should only be tightened to specified torque after the wheels are fitted and suspension held under normal load condition.

REAR SUSPENSION (for model KR)

Date and specifications of the rear suspension

	KR10, KRD10	KR10V
Type	Semi-elliptical leaf springs	
Dimensions of the leaf springs (Length x width x thickness - number of spring	1200 x 60 x $\frac{6-4}{12-1}$	1200 x $\frac{60 \times 6-4}{50 \times 11-1}$
Helper rubber (outside diameter x height)	80 x 98 - 1	80 x 98 - 1
Shock absorber	Single-acting telescopic	Double-acting telescopic

Rear suspension unit in disassembled view

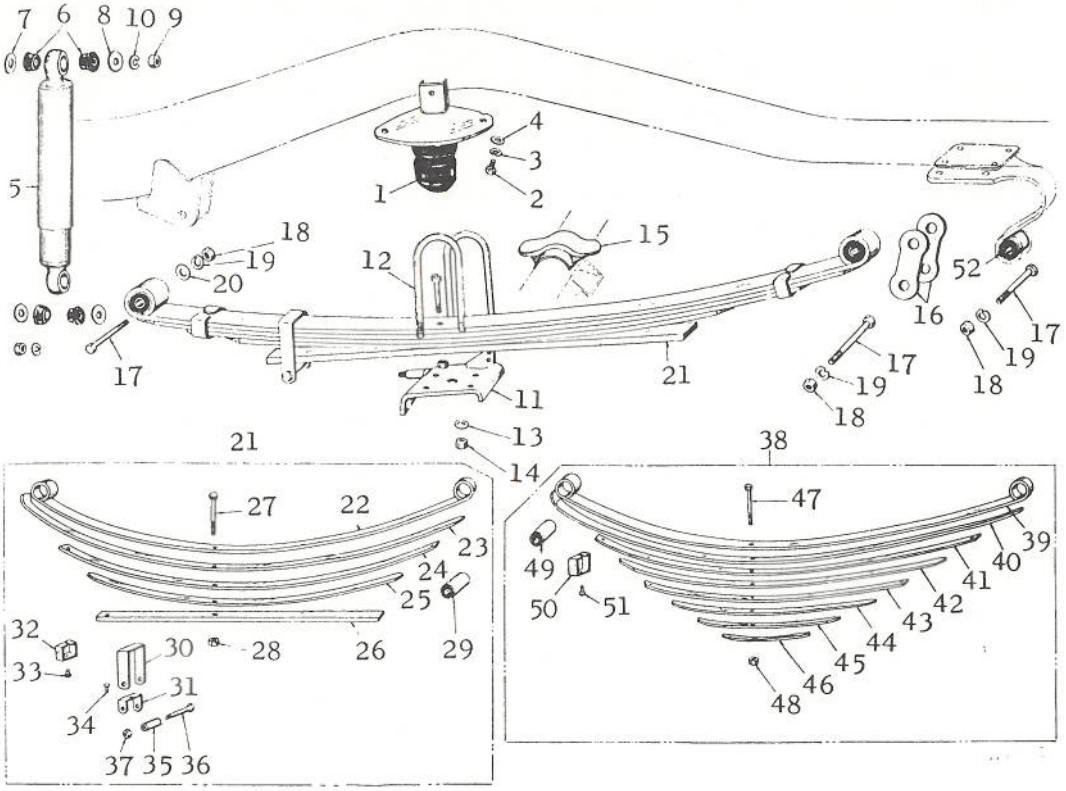


Fig. 14

1. Helper rubber; rear spring
2. Bolt; .. rubber fix.
3. Spring washer; .. rubber fix.
4. Washer; plane .. rubber fix.
5. Shock absorber; rear
6. Rubber bush;
7. Washer; 'A' absorber fix.
8. Washer; 'B' absorber fix.
9. Nut
10. Spring washer
11. Clamp assy.; RH. rear spring
12. U bolt; light weight
13. Spring washer
14. Nut; U bolt
15. Seat; helper rubber
16. Shackle
17. Pin; .. shackle to frame & spring eye
18. Nut; shackle to frame & spring eye
19. Spring washer
20. Washer; plane
21. Leaf spring assy.
22. Spring leaf; No. 1
23. " No. 2
24. " No. 3
25. " No. 4
26. " helper

27. Center bolt; rear spring
28. Nut
29. Bush
30. Spring clip; inner
31. Spring clip; inner
32. Spring clip; outer
33. Rivet
34. Rivet
35. Dist tube
36. Bolt; .. spring fix.
37. Nut; .. spring fix.
38. Leaf spring assy.
39. Spring leaf; No. 1
40. " No. 2
41. Spring clip; No. 3
42. " No. 4
43. " No. 5
44. " No. 6
45. " No. 7
46. " No. 8
47. Center bolt
48. Nut
49. Bush
50. Spring clip; inner
51. Rivet
52. Bush; rear bkt.

Removing the springs

1. Loosen the wheel pin nuts and jack up the wheels clear of the ground. Then support the frame by inserting chassis stands underneath the frame at the rear part of the rear bracket.

2. Remove the wheels.

3. Remove the shock absorbers.

4. Take out the nuts on the "U" bolt.

5. Jack up the axle case slightly and remove the axle case from the leaf spring assembly.

6. Take out the front and rear shackle nuts.

7. With use of protective metal piece, drive out the rear shackle pin and lower the rear end of the spring.

8. In the same manner, drive out the front shackle pin and remove the spring.

Disassembling the leaf spring assembly

1. Prior to disassembling, apply marking to the side of the individual leaf spring to facilitate reassembly of them into their original positions.

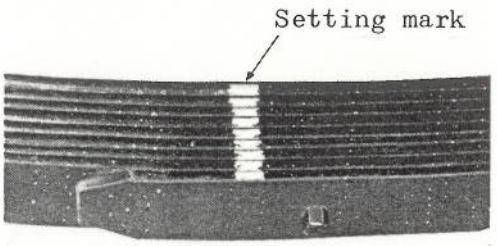


Fig. 15

2. With use of protective metal, fit mid-section of the springs into press machine and hold the upper and lower springs firmly in position.

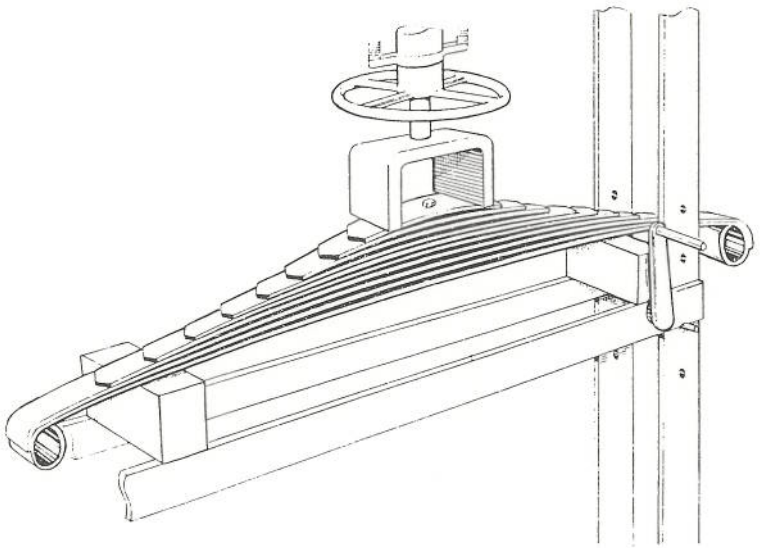


Fig. 16

3. Remove the spring clips and center bolts.

4. Gradually release the pressure of the press machine and remove the springs.

5. For clips peened to the springs with rivets, take down the rivet heads with use of grinding machine and remove the clips. When using a chisel, exercise extreme care to prevent leaf springs from being damaged.

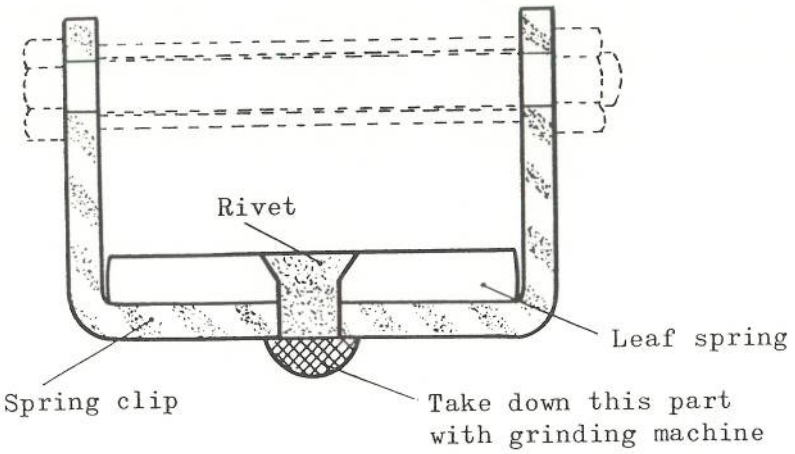


Fig. 17

Inspection

Carefully examine the disassembled parts for wear or damage and make necessary replacement. Broken or damaged spring cause damage to adjacent springs so that extra care should be taken for checking the leaf spring assembly with defective spring.

Reassembling the leaf springs

1. Smear both sides of individual leaf spring with grease and reassemble leaf springs into their original positions noting the marks previously applied. Silencers should be inserted between leaf springs.

2. Put a guide piece through the center bolt hole in the leaf springs. Apply pressure to the leaf springs over a protective metal piece with a press machine. While aligning the sides of the springs, continuously apply the pressure to the springs until they are integrated. Then pull out the

guide pin and fit center bolt in place and tighten them with the nut.

3. Tighten the spring clips.

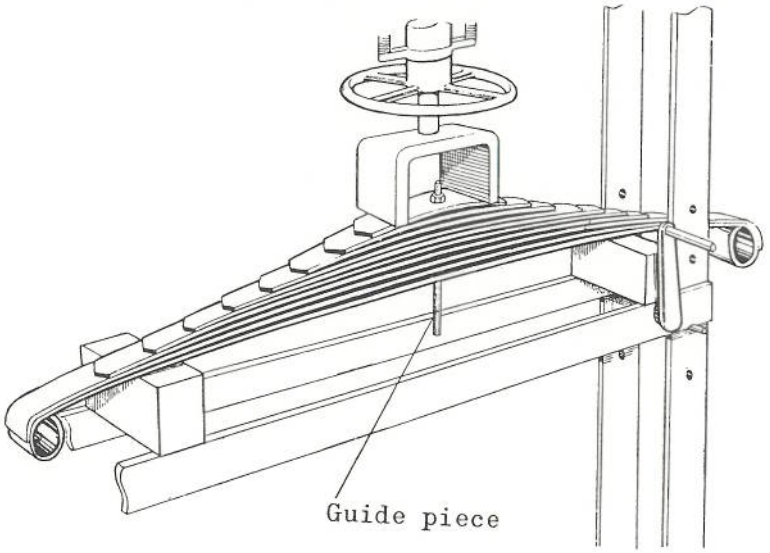


Fig. 18

Refitting the leaf spring assembly

Refit the leaf spring assembly in the reverse order of removal. "U" bolt and shackle pin tightening torques are 5-6 kg-m and 17-20 kg-m, respectively.

Shock absorber

The shock absorbers can not be disassembled for servicing, and therefore must be replaced as a complete unit if found to be defective upon conduction of the following tests:

1. Examine the external part of the shock absorber for evidence of oil leakage. Oil seepage on the external part of the shock absorber is not detrimental to normal function of the shock absorber but considerable oil leakage indicates that the shock absorber is defective.

2. Immediately after the automobile is operated on road with rough surface, hand feel the inner cylinder of the shock absorber for elevated temperature. In normal function of the absorber, the vibration energy absorbed is turned into heat and dissipated resulting in an increase in temperature. Therefore, shock absorber without temperature increase may be regarded due for replacement.

3. For testing the shock absorber already removed from the chassis, hold one end of the shock absorber in vise. Hold the other end with fingers and reciprocally operate the shock absorber a several times to bleed the air in the cylinder. Double-acting shock absorber, when reciprocated in quick motion, should give greater resistance when extended and give less resistance while collapsed to minimum length. Single-acting shock absorber, should give great resistance only when it is extended. Reduction in resistance indicates that the shock absorber is in failure.

4. If noise arises from the shock absorber when it is operated, check the shock absorber mounting and bush for aging or other failure and thread, eye and other part for deformation or wear and make necessary replacement.

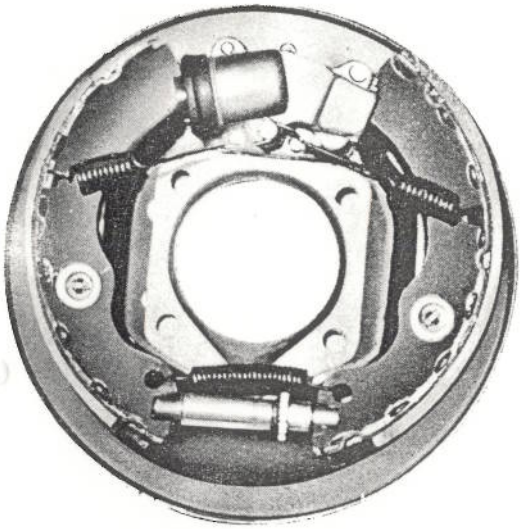
PART 10

BRAKES

CONTENTS

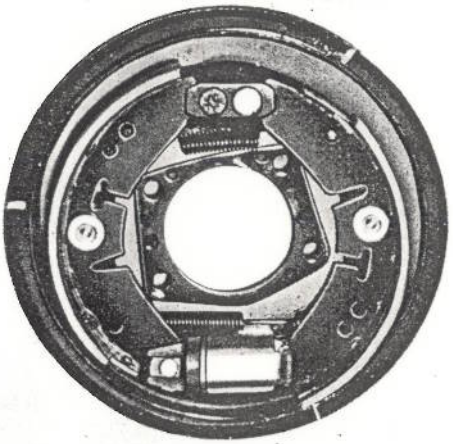
PART 10 BRAKES (for model PR)

Introduction



Front brake

Fig. 1



Rear brake

Fig. 2

The Bellett is equipped with hydraulically operated foot brakes on 4 wheels and mechanically operated hand brakes on rear wheels. The Uni-servo brakes mounted on the front wheels utilize self-energizing effect acting on the primary shoes to provide the secondary shoes with increased frictional drag thereby improving the brake performance. The leading/trailing type rear brakes contribute to the improved braking efficiency with quick response for additional safety in emergency as well as in reversing.

The brake pedal is suspended in juxtaposition to the clutch pedal and the master cylinder is situated in the engine compartment at the dash panel side.

The position of the hand brake control lever is subject to change with the type of the gear control

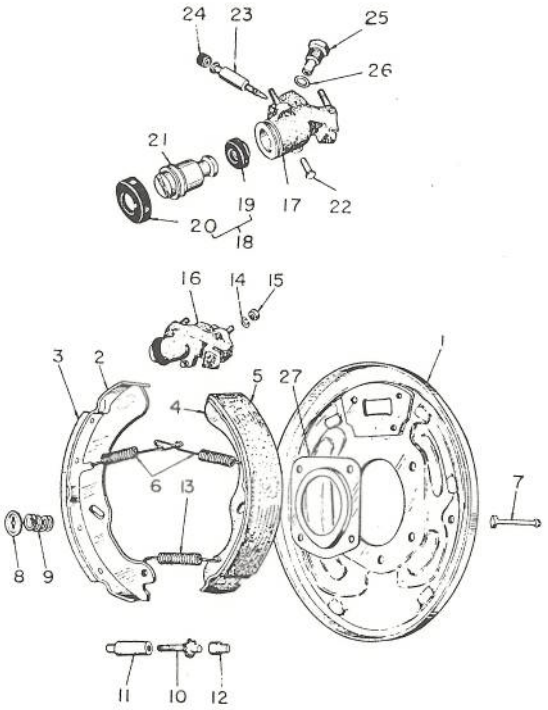
used; center-floor mounted lever for direct control and right side mounted lever for remote control. The travel of the hand brake lever moves the brake shoes outward against the brake drums through the link rod, flexible wire, compensator and wheel cylinders thereby mechanically actuating the hand brakes.

Data and specifications

Sort	Foot brakes	Hydraulic internal expanding
	Hand brake	Mechanical interanl expanding
Type	Front	Uni-servo
	Rear	Leading and trailing
Diameter of master cylinder bore (mm)		19.05
Diameter of wheel cylinder bore (mm)		
	Front	19.05
	Rear	22.20
Lining width (mm)		37.1
Lining length	Front	Front side 158 (95°) Rear side 204 (115°)
	Rear	Front side 195 (110°) Rear side 195 (110°)
Thickness	Front	4.8
	Rear	4.8
Brake drum diameter (mm) (Both front and rear)		203.2
Number of teeth on adjuster x screw diameter x pitch		10 x 10 x 1.5

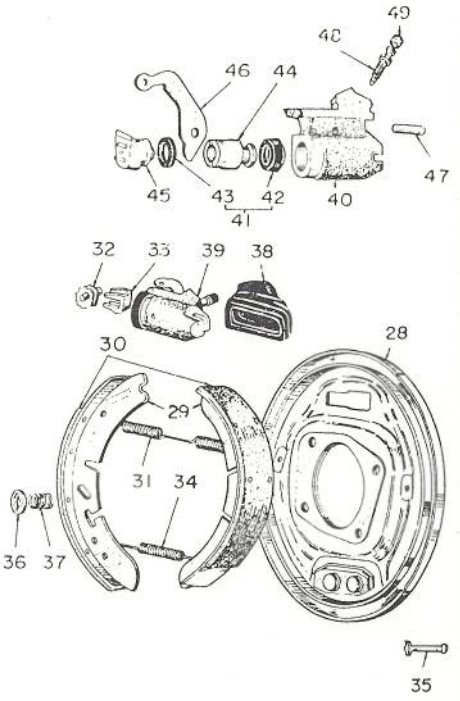
Adjusting method	Front	Turn the adjuster all way in until wheel drags and turn back the adjuster 6 - 9 notches
	Rear	Turn the adjuster all way in until wheel drags and turn back the adjuster 2 notches
Brake fluid		15 D
Oil pressure at maximum (kg/cm^2)		142

Front and rear brakes in exploded view



Component part of the front brake

Fig. 3



Component part of the rear brake

Fig. 4

1. Drum cover; front
2. Brake shoe assembly; front
3. Lining; primary
4. Shoe
5. Lining; secondary
6. Spring; return
7. Pin; holding
8. Seat; holding
9. Spring; holding
10. Adjuster
11. Nut; adjuster
12. Socket; adjuster
13. Spring; return
14. Spring washer
15. Nut
16. Wheel cylinder assembly; front
17. Body; wheel cylinder
18. Repair kit; wheel cylinder
19. Piston cup; wheel cylinder
20. Boot; wheel cylinder
21. Piston; wheel cylinder
22. Pin; wheel cylinder

23. Bleeder; wheel cylinder
24. Cap; bleeder
25. Pipe joint; wheel cylinder
26. Gasket; pipe joint
27. Oil catcher; front hub
28. Drum cover; rear
29. Brake shoe assembly; rear
30. Lining; rear
31. Spring; return
32. Adjusting cam; rear
33. Seat; adjusting cam
34. Spring; return
35. Pin; holding
36. Seat; holding
37. Spring; holding
38. Boot; rear wheel cylinder
39. Wheel cylinder assembly; rear
40. Body; wheel cylinder
41. Repair kit; wheel cylinder
42. Piston cup; wheel cylinder
43. Seal; dust
44. Primary piston; rear
45. Secondary piston; rear
46. Lever; piston
47. Pin; piston
48. Bleeder screw; rear
49. Cap; bleeder

Removing, inspecting and refitting the front brakes

REMOVING

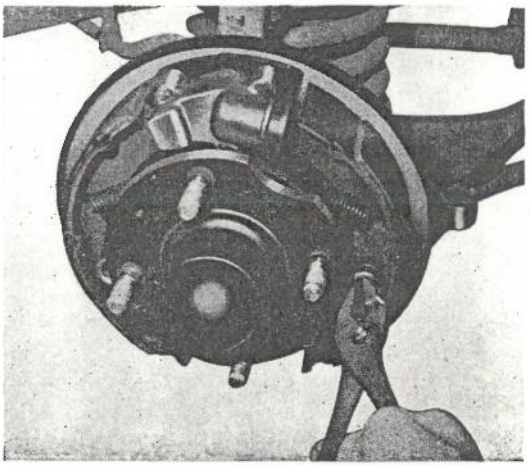
1. Jack up the car and support it on suitable stands and remove the front wheels.

2. Take out the drum set screws and remove the brake drum.

3. Remove the brake shoes, holding springs, return springs and remove the front and rear shoe together with the adjuster.

4. Remove the flexible hose and fixing bolts from the wheel cylinder and then remove the wheel cylinder from the drum cover.

5. Remove the front hub, take out the bolts and then remove the drum cover.



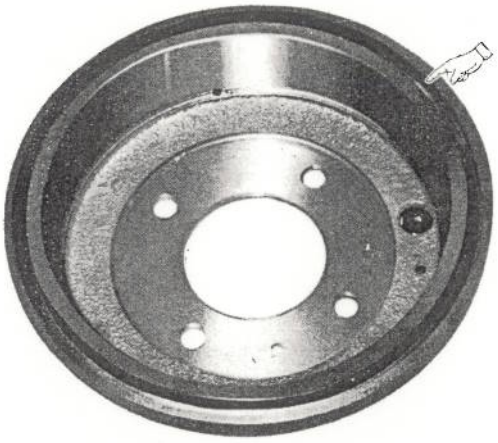
Removing the holding spring

Fig. 5

INSPECTING

Inspect the parts against the following.

1. Check the internal face of the brake drum for partial wear, scores and cuts and turn down in a lathe if necessary. Serviceable limit is 205 mm



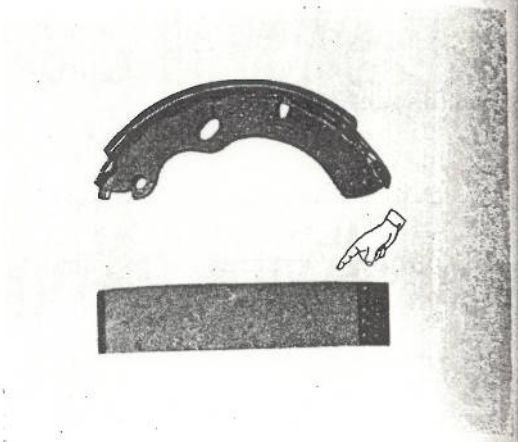
Inspecting the brake drum

Fig. 6

2. Check the lining for wear and replace if necessary.

3. If the lining to drum contact is defective, rectify the lining.

4. Check the return spring, brake shoe and holding spring for weakness and make necessary replacement.



Inspecting the brake lining

Fig. 7

Inspecting the spring

Fig. 8

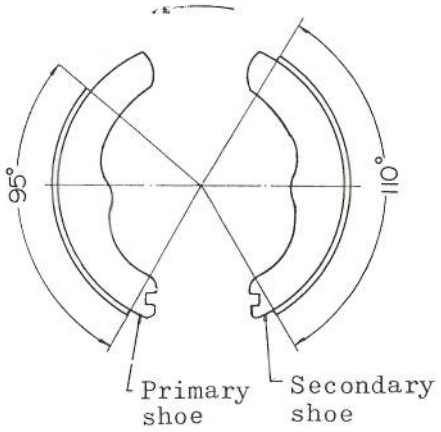
REFITTING

Carry out the refitting work in the reverse order of removal, noting the following.

1. When refitting the shoe assembly, carefully note the position of primary and secondary shoe to fit them properly into their original positions.

Length of the front brake shoe lining

Primary	95°
Secondary	110°



Refitting the brake lining

Fig. 9

2. Refit the brake shoe with its end properly fitted into the groove in the wheel cylinder, piston and in the adjuster.

3. Refit the return spring, brake shoe and holding spring correctly into their original positions.

4. When installing the lining, exercise extreme care to prevent oil or grease from contacting the lining.

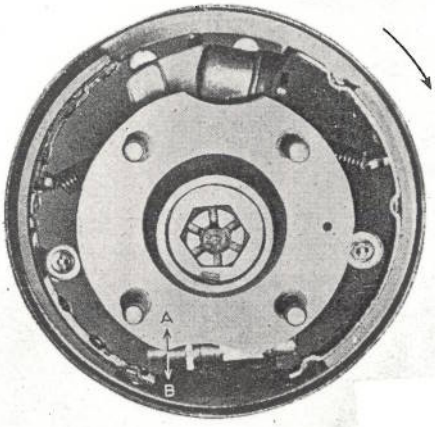
5. Tighten the brake drum cover to the specified torque. The brake drum cover bolt tightening torque is 4.5 ± 0.5 m-kg.

6. Install the front wheel cylinder on the brake drum cover and tighten it to the specified torque. The torque required is 2.3 - 2.6 m-kg.

BRAKE ADJUSTMENT

1. Jack up the front wheels clear of the ground and check the wheel bearing for excess play and make necessary corrections before adjusting the brake.

2. Adjuster rod is situated on the lower part of the brake. Insert a screwdriver through the adjusting hole and turn the adjuster as required. Turning the adjuster in direction A decreases the clearance.



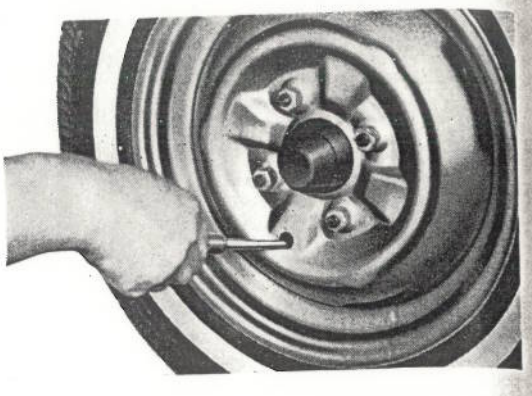
A...shoe moves outward

B...shoe moves inward

Front brake adjustment

Fig. 10

3. Turn the adjuster all way until the wheel drags and turn the adjuster back 6-8 notches.



Brake adjustment

Fig. 11

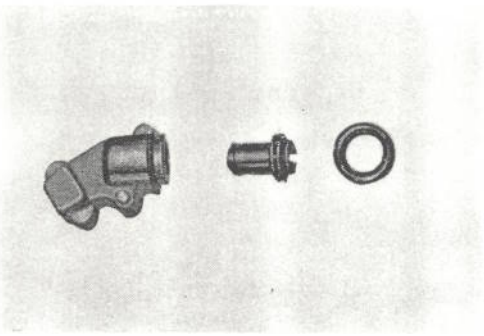
4. Upon completion of the adjustment, turn the wheel and depress the brake pedal firmly to make sure that the adjustment is correct.

5. The correct clearance is 0.25 mm.

DISASSEMBLING THE FRONT WHEEL CYLINDER

1. Take out the boot and pull out the piston from the body.

2. Remove the piston cup from the piston.



Disassembling the front wheel cylinder

Fig. 12

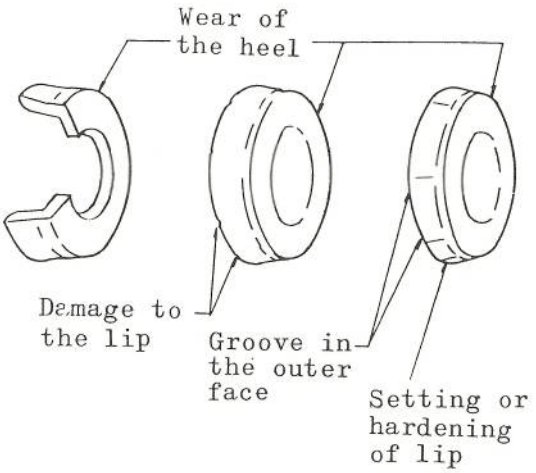
INSPECTION

Wash the disassembled parts with detergent oil and dry them with compressed air. The piston cup should be washed only with alcohol or brake fluid.

Caution: Piston cup and boot should not be submerged in alcohol for more than thirty seconds.

1. Check the cylinder wall for evidence of step wear, corrosion, score or scuffing and replace if defective.

2. Check the boot and piston cup for damage or crack and replace if necessary.



Inspecting the piston cup

Fig. 13

3. Replace the parts if the clearance between the cylinder and piston is in excess of 0.15 mm.

Note: It is essential to use genuine piston cup for replacement.

4. Check the contacting face of the wheel cylinder and brake shoe for evidence of step wear.

REASSEMBLY

Carry out the reassembling work in the reverse order of disassembly. Lubricate all the sliding parts in the cylinder with clean brake fluid.

Removing, inspecting and refitting the rear brakes

REMOVING

1. Jack up the car and support it on suitable stands and remove the rear wheels.

2. Take out the drum set screws and remove the brake drum.

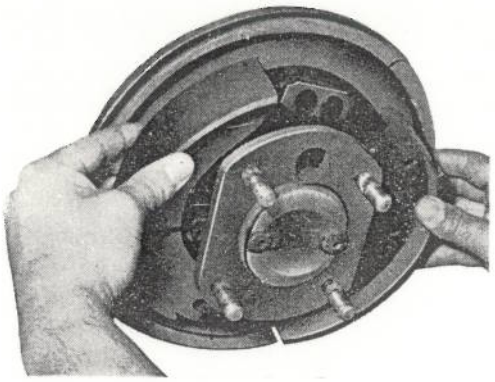
3. Remove the brake shoe, holding spring, return spring and adjust cam and then remove the front and rear shoes.

4. Disconnect the brake pipe from the wheel cylinder. Remove the hand brake cable from the wheel cylinder lever.

5. Remove the wheel cylinder boot and remove the wheel cylinder from the brake drum cover.

Removing the holding spring

Fig. 14



Removing the brake shoes

Fig. 15

6. Pull out the outer axle shaft and take out the bearing holder. Then remove the drum cover. (See paragraph "Rear axle" for detailed information).

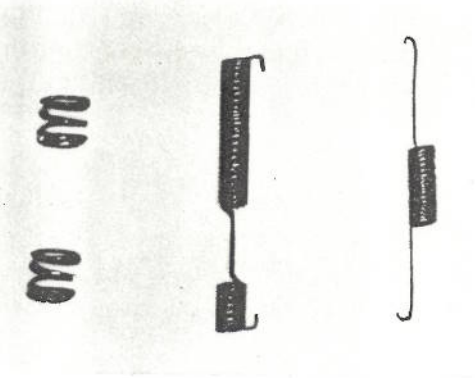
INSPECTION

1. Check the inner face of the brake drum for partial wear, scores or cuts and turn down in a lathe if necessary.

2. Replace the lining if wear is considerable.

3. If the lining to drum contact is defective, rectify the lining.

4. Check the return spring, brake shoe and holding spring for weakness and replace as necessary.



Checking the springs

Fig. 16

REFITTING

Carry out the refitting work in the reverse order of removal noting the following.

1. Correctly install the shoes.

2. Install the shoe with its end properly fitted to the wheel cylinder and adjusting cam.

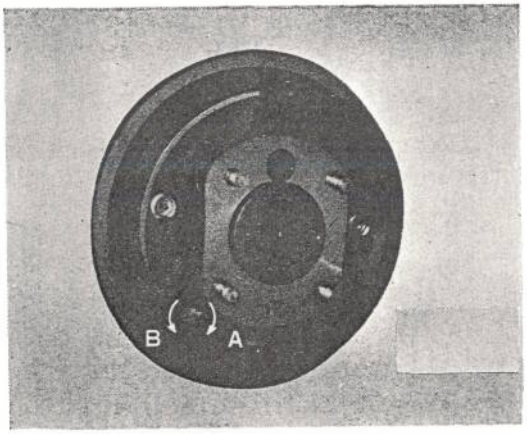
3. Fit the return spring, brake shoes and holding springs properly into their original positions.

When installing the lining, exercise extreme care to prevent oil or grease from contacting the lining.

5. Tighten the brake drum cover to the specified torque. The brake drum cover bolt tightening torque is 4.5 ± 0.5 m-kg.

BRAKE ADJUSTMENT

1. Before adjustment, jack up the car and release the hand brake completely. Turn the wheels to make sure that they rotate freely.



A...shoes move outward

B...shoes move inward

Rear brake adjustment

Fig. 17

2. Adjusting cam is situated on the lower part of the brake.

3. Insert a screwdriver through the adjusting hole and turn the adjuster in direction A until the wheel drags.

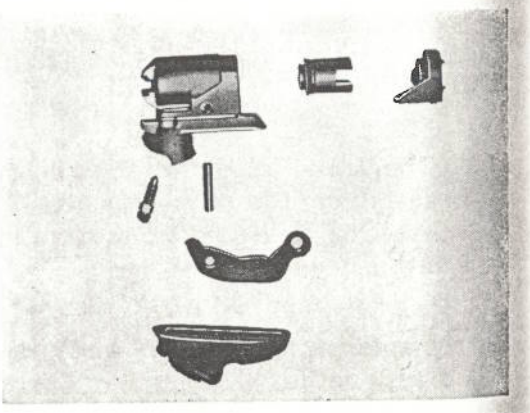
4. Turn the adjuster back 2 notches in direction B and check to make sure that wheel rotates freely.

DISASSEMBLING THE REAR WHEEL CYLINDER

1. Take out the secondary piston and remove the dust seal.

2. Pull out the pin and take out the lever.

3. Pull out the primary piston and remove the piston cup.



Disassembling the rear wheel cylinder

Fig. 18

INSPECTION

Wash the disassembled parts with detergent oil and dry them with compressed air. The piston cup should be washed only with alcohol or brake fluid.

Caution: Piston cup and boot should not be submerged in alcohol for more than thirty seconds.

1. Check the cylinder wall for evidence of step wear, corrosion, score or scuffing and replace if defective.

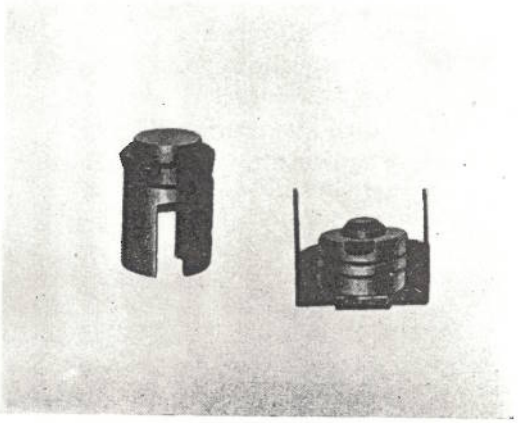
2. Check piston cup, dust seal and boot for crack or damage and replace if necessary.

3. Check the lever and pin for wear and corrosion and replace if defective.

Checking the lever and pin

Fig. 19

4. Replace the parts if the clearance between the cylinder and piston is in excess of 0.15 mm.



Inspecting the piston

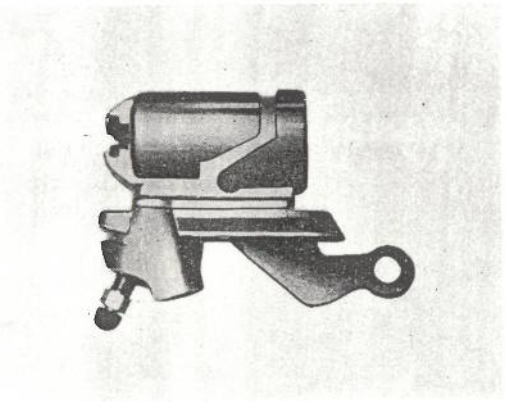
Fig. 20

REASSEMBLY

Carry out the reassembling work in the reverse order of disassembly noting the following.

1. Refit the rubber boot properly into the groove in the wheel cylinder wall and in the outer face of the union boss. Incorrectly seated boot prevents the proper function of the cylinder.

2. The rear wheel cylinder actuates the piston to move one of the shoes outward in response to the oil pressure applied thereto or movement of the lever, while the cylinder also slides to move the other shoe outward. The cylinder should therefore, be carefully installed to provide unristricted movement. Defective cylinder should either be rectified or replaced.



Inspecting the wheel cylinder

Fig. 21

Removing, inspecting and refitting the master cylinder

MASTER CYLINDER IN
EXPLODED VIEW

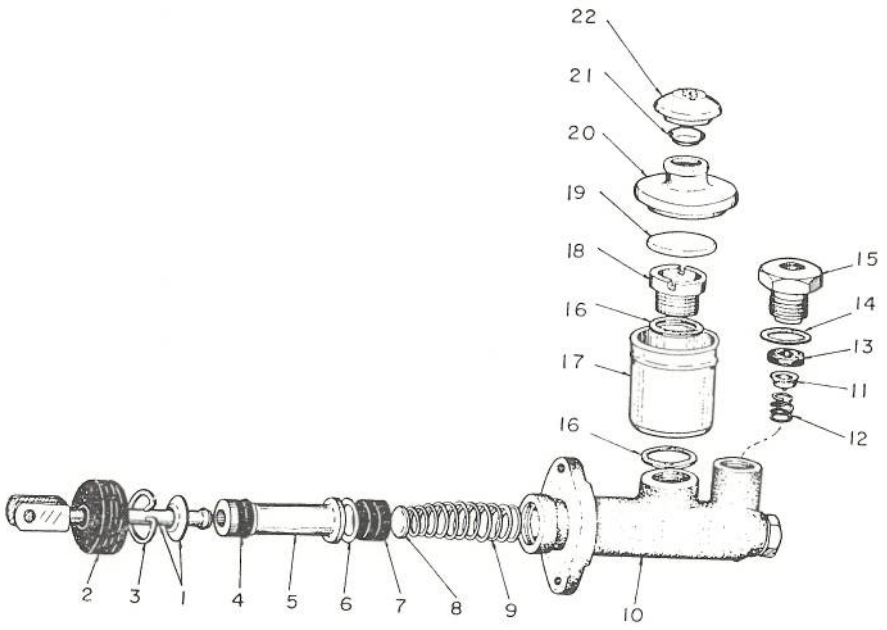


Fig. 22

1. Push rod
2. Boot
3. Circlip
4. Secondary cup
5. Piston
6. Spacer
7. Primary cup
8. Retainer
9. Return spring
10. Body
11. Valve
12. Return spring
13. Spring seat
14. Gasket
15. End plug
16. Washer
17. Oil reservoir
18. Adapter
19. Float
20. Cap
21. Buffle plate
22. Oil filler cap

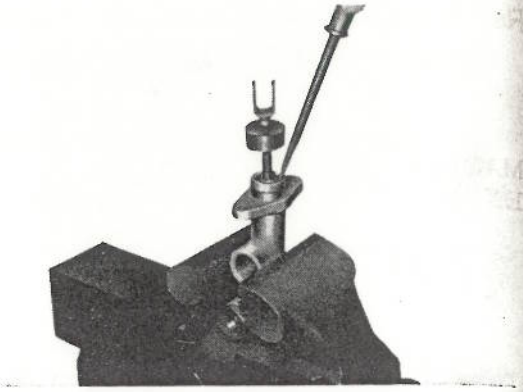
REMOVAL

1. Disconnect the brake pipe at the master cylinder.

2. Take out the brake pedal return spring.

3. Pull out the fulcrum pin from the brake pedal and disconnect the push rod from the brake pedal.

4. Remove the master cylinder fixing nut in the engine compartment to remove the master cylinder.



Removing the push rod

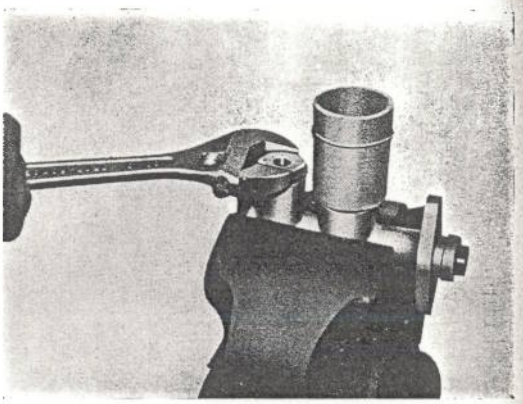
Fig. 23

DISASSEMBLY

1. Take out the boot from the cylinder body and remove the circlip. Then remove the push rod together with the stopper.

2. Remove the piston, spacer, piston cup, retainer, and return spring from the master cylinder.

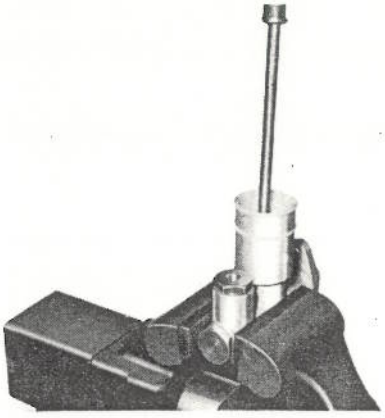
3. Remove the plug and take out the valve, return spring, spring seat and packing.



Removing the plug

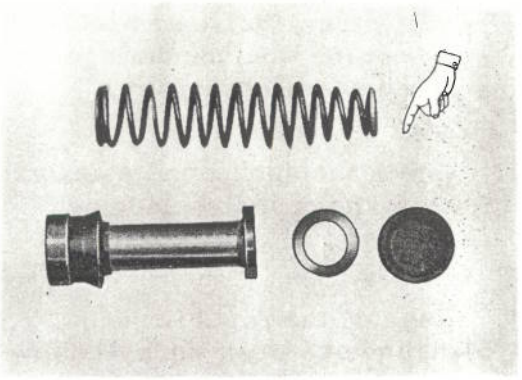
Fig. 24

4. Remove the oil filler cap and take out the float. Then remove the adapter for removing the oil reservoir from the cylinder body.



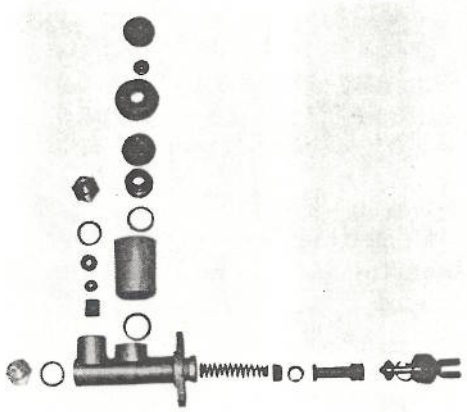
Removing the oil reservoir

Fig. 25



Inspecting the parts

Fig. 27



Master cylinder in disassembled view

Fig. 26

INSPECTION

Wash the disassembled parts with detergent oil and dry them with compressed air. The piston cup should be washed only with alcohol or brake fluid.

Caution: Piston cup and boot should not be submerged in alcohol for more than thirty seconds.

1. Check the master cylinder wall for evidence of step wear, corrosion, score or scuffing and replace if defective.

2. Check the primary cup, secondary cup, valve assembly and boot for wear or damage and replace if necessary.

3. Check the spring and spacer for weakness and replace as necessary.

4. Replace the parts if the clearance between the cylinder and piston is in excess of 0.15 mm.

REASSEMBLY

Lubricate all the sliding parts in the cylinder with clean brake fluid.

1. Fit the secondary cup to the piston.

   Caution: When fitting the secondary cup to the piston exercise extreme care to prevent lip of the cup from being damaged.

2. Fit the return spring, with its smaller diameter side turned toward the retainer and its end with larger diameter to the inlet valve. Then fit these into the cylinder.

3. Install the primary cup with its lip side turned forward.

   Caution: When installing, exercise extreme care to prevent the lip from being twisted.

4. Hold the piston against the push rod and fit the piston carefully into position to prevent the secondary cup from being twisted. Then fit the circlip properly into the groove.

5. Upon completion of the reassembly, fill the reservoir with the brake fluid. Then push in the piston and see if it is forced to return to its original position by the spring tension. Check also to see if the fluid comes out through the feed port as the piston is reciprocated 2 or 3 times.

6. Apply adhesive compound (Cemedine No. 333) to the contacting face of the master cylinder assembly and fit these to the dash board. The tightening torque is 2.3 - 2.6 m-kg.

Brake pedal

REMOVAL

1. Disconnect the pedal return spring.

2. Pull out the pin from the pedal and disconnect the pedal from the master cylinder.

3. Remove the master cylinder fixing nut on the dash panel in the engine compartment and also remove the pedal fulcrum bracket fixing nuts. Then remove the pedal fulcrum and fulcrum bracket.

4. Take out the fulcrum pin nut and pull out the pin. Then disconnect the pedal from the fulcrum bracket.

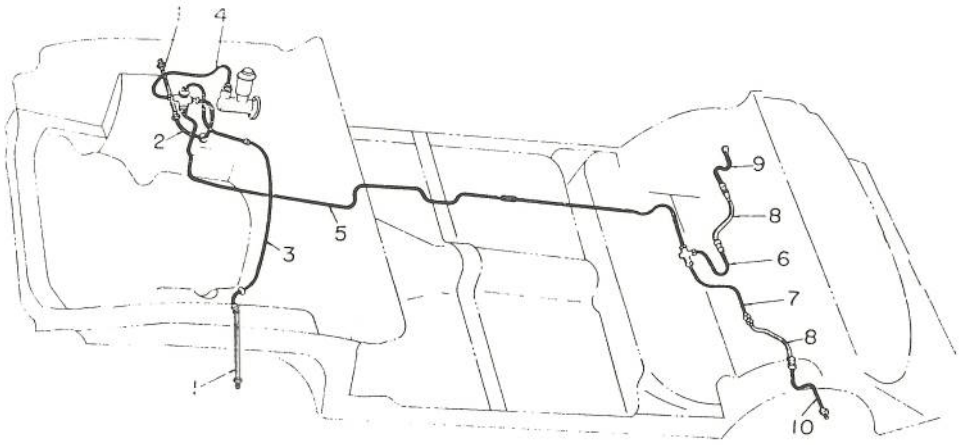
REFITTING

1. Reverse the order of removal for refitting.

2. After refitting, adjust the height of the brake pedal with the jaw on the push rod.

Brake pipe line and air-bleeding

BRAKE PIPE LINE AS INSTALLED



Component parts of the brake pipe line

Fig. 28

1. Front brake flexible hose
2. Brake pipe; way - front (right)
3. Brake pipe; way - front (left)
4. Brake pipe; way - master cylinder
5. Brake pipe; way - 4-way
6. Brake pipe; way - rear (right)
7. Brake pipe; way - rear (left)
8. Rear brake flexible hose
9. Brake pipe; flexible hose - wheel cylinder (right)
10. Brake pipe; flexible hose - wheel cylinder (left)

INSPECTION

1. Check the flexible hose for damage, expansion or oil seepage and replace if defective. The hose should be kept from contacting with adjacent parts when fitted.

2. To prevent accidental damage or crack to the pipe, steel pipes are used for brake piping. However, if they are found defective they should be immediately replaced.

AIR-BLEEDING

It is necessary to carry out air-bleeding if the work (repair) involves the brake line or if the air is admitted into the brake system.

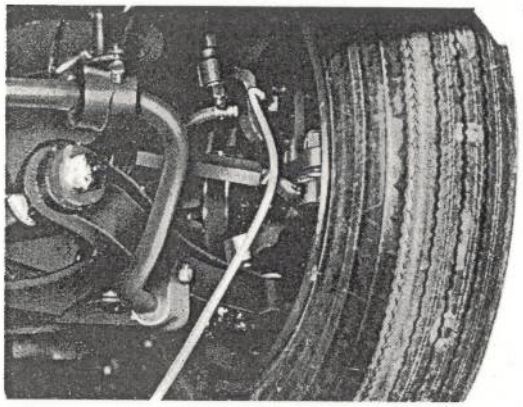
1. Fill the master cylinder brake fluid reservoir with brake fluid.

   Caution: During the air-bleeding the fluid reservoir should be frequently checked and top up made to keep it always filled.

2. Remove the cap from the bleeder screw on the wheel cylinder and connect vinyl pipe in place. Hold the other end of the vinyl pipe in a vessel half-way filled with brake fluid.

Note: (1) Carry out the bleeding commencing with the wheel cylinder farthest from the master cylinder.

(2) Exercise extreme care to prevent the brake fluid from contacting the paint finish.



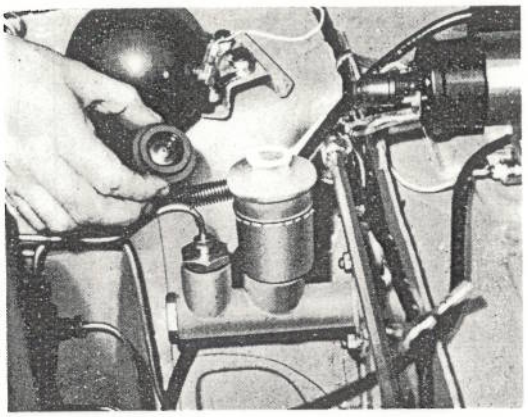
Bleeding the brake

Fig. 29

3. Pump the brake pedal several times and keep foot pressure applied. Turn loose the bleeder screw a one full turn or 1/2 and tighten it back before the cylinder loses internal pressure.

4. Repeat the above operation until the air bubbles disappear from the brake fluid that is bled through the vinyl pipe. Then fully depress the brake pedal and securely tighten the bleeder screw.

5. Refit the cap to the bleeder screw and fill the master cylinder brake fluid reservoir up to the level mark.



Topping-up the brake fluid reservoir

Fig. 30

Isuzu genuine brake fluid

BRAKE FLUID

The brake fluid must have very definite characteristics as follows:

1. Less liable to vapor lock, must have high boiling point with low solidifying point.

2. It must be chemically inert and not swelling or contracting the rubber parts.

3. It must act as lubricant with suitable viscosity.

4. It must not include metal corrosive agent.

5. It must not give sediments by deterioration.

GENUINE HG AND AA BRAKE FLUID COMPARISON TABLE

Genuine HG brake fluid

Range of service - High performance (for service in mountainous area and in long-range service)

Item	Test records
Reaction	Neutral
Specific gravity	0.946
Color	Brownish orange - transparent
Viscosity 20°C (Redwood)	96.0
Acidity (KOHmg)	0.13
Solidifying point °C	-45°C
Distillation test	
First drop	188.5°C
10%	192.5°C
40%	195°C
Stability	Passed
Weight variation on rubber test	+0.6%
Volumetric variation	+0.4%
Metal corrosion test	Passed

Genuine AA brake fluid

Range of service - for normal economical operation

Item	Test records
Reaction	Neutral
Specific gravity	0.892
Color	Pale yellow - transparent
Viscosity 20°C (Redwood)	72.0
Acidity (KOHmg)	0.33
Solidifying point °C	Below -45°C
Distillation test	
First drop	78°C
10%	80°C
40%	148°C
Stability	Passed
Weight variation on rubber test	+0.9°%
Volumetric variation	+0.5°%
Metal corrosion test	Passed

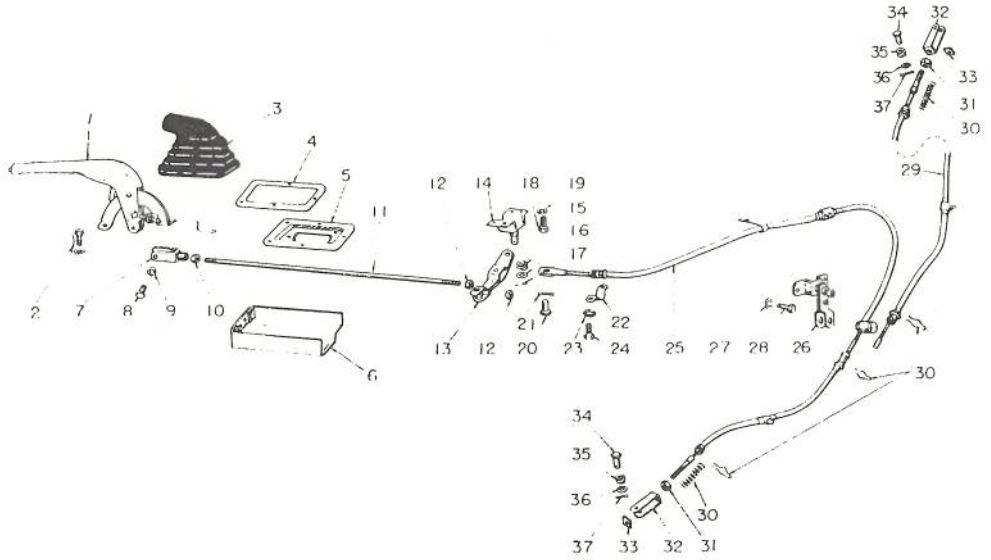
Note: The use of improper brake fluid result in corrosion to major component parts in brake system, affecting rubber parts and lead to brake failure.

Mineral oil should never be used in the brake system for it will cause the rubber parts to swell and disintegrate.

For best results, the use of Isuzu genuine brake fluid in the brake system is essential. The brake fluid with the same quality should always be used for topping-up and replacement.

Hand brakes in exploded view

HAND BRAKES IN EXPLODED VIEW



Component parts of the hand brake

Fig. 31

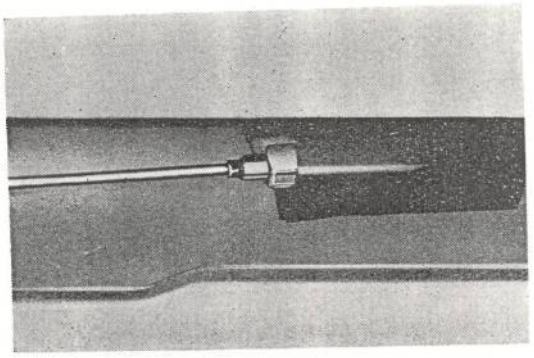
1. Hand brake lever
2. Bolt and lock washer
3. Dust cover
4. Retainer
5. Shield plate
6. Shield plate
7. Jaw
8. Pin joint
9. Snap ring
10. Nut
11. Link rod
12. Nut
13. Relay lever
14. Bracket
15. Spring washer
16. Plain washer
17. Split pin
18. Bolt
19. Spring washer
20. Pin
21. Split pin
22. Abutment clip
23. Lock washer
24. Bolt
25. Cable
26. Compensator
27. Spring washer
28. Bolt
29. Cable
30. Clip
31. Nut
32. Jaw
33. Nut; jaw
34. Pin; joint
35. Spring washer
36. Washer; plain
37. Split pin
38. Spring

Removing, inspecting and refitting the hand brakes

REMOVAL

Remove the floor mat and take out the retainer.

1. Remove the under cover and disconnect the pin joint on the jaw. Then disconnect the link rod from the lever.

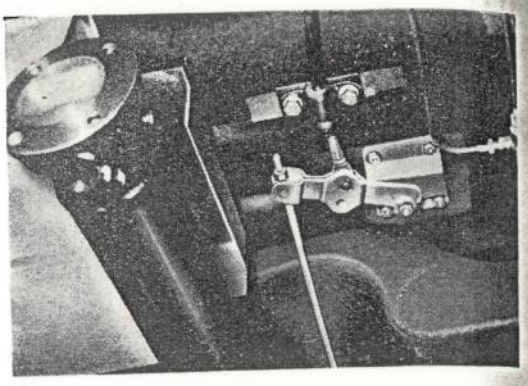


Removing the under cover

Fig. 32

2. In case of center mounted hand brake lever: Remove the fixing bolt on the propeller shaft and remove the link rod.

3. Disconnect the warning lamp switch cord and take out the fixing bolts. Then remove the hand lever together with the shield plate.



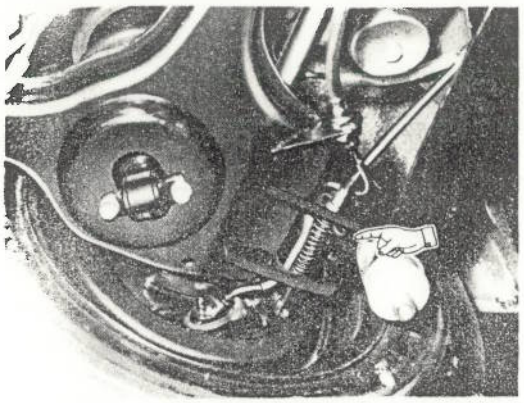
Removing the link rod (for direct control)

Fig. 33

4. Disconnect the brake cable from the right and left rear wheel cylinder levers.

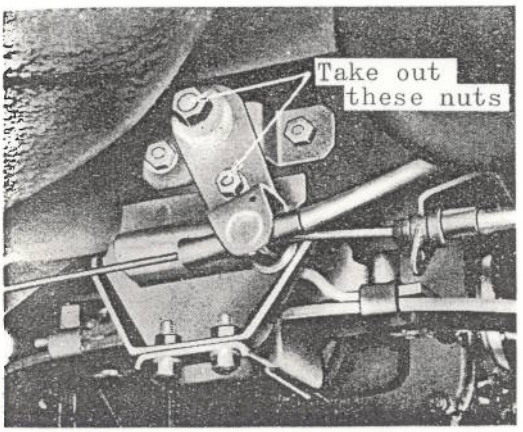
5. Remove the jaw and spring from the brake cable and take out the clip from the cable.

6. Remove the compensator nut and disconnect the cable.



Removing the cable clip

Fig. 34

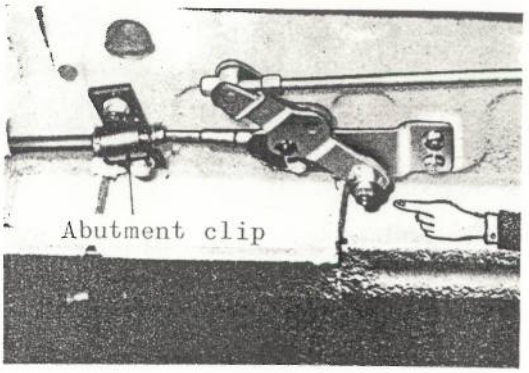


Removing the compensator

Fig. 35

7. Remove the abutment clip.

8. Remove the relay lever and pull out the pin. Then take out the cable clip and remove the cable.



Removing the cable and relay lever

Fig. 36

9. Disconnect the link rod from the relay lever.

INSPECTION

1. Check the hand brake cable for damage and replace if necessary.

2. Check the compensator with bush lever and cable joint for wear and make necessary replacement.

3. Check the relay lever mount and cable to link rod joint for wear and replace if necessary.

REFITTING

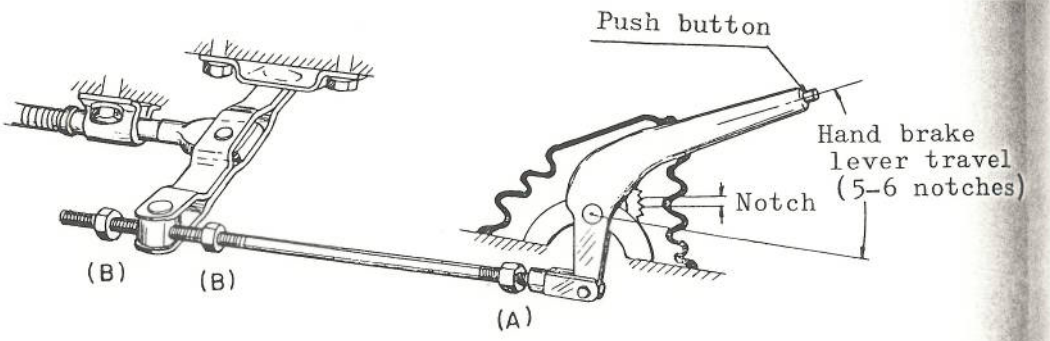
Carry out the refitting work in the reverse order of removal.

ADJUSTING THE HAND BRAKE

The same adjusting method can be used for adjusting the hand brake irrespective of the position of the control lever.

1. Release the hand brake control lever.

2. Turn all way loose the nuts A and B illustrated in Fig. 37.



Hand brake adjustment

Fig. 37

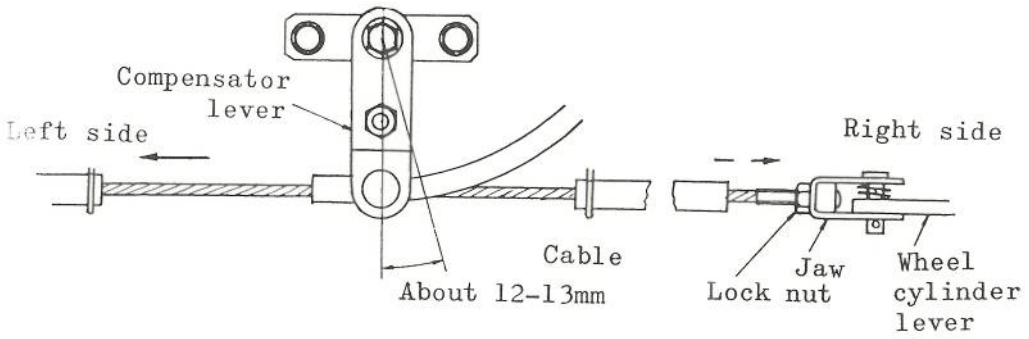
3. Adjust the right and left rear brake shoes to specified value.

4. Pull the right and left cables in direction indicated by arrow until they are in tension. Then match the hole in the wheel cylinder lever with the hole in the jaw and put pin through these holes and tighten the lock nut on the jaw.

Caution: The compensator lever (Fig. 38) should be tilted rightward from the vertical. The amount of tilt should be 12 - 13 mm from the center

of the compensator mount. It should be rechecked to make sure that the compensator comes into rest in vertical plane after the travel of the hand brake lever is properly adjusted (4 - 5 notches).

5. Securely tighten the lock nuts (A) and (B) on the relay lever.



Adjusting the hand brake

Fig. 38

Bonding the brake lining

1. Adhesive compound used

Products of Akebono Brake Company (AKEBOND)

2. Removing the used brake lining

a. Before removing used brake lining, apply marks to the shoe indicating the locations of the toe and heel end of the lining.

b. Put the shoe into bonder and heat it to about 300°C. Adhesive compound melts away permitting easy removal of the lining from the shoe.

3. Bonding method

a. Clean the bonding faces of shoe and lining in the following manner. With use of

emery cloth, remove rust, paint and other foreign matters from the bonding faces of the shoe and wipe of all traces of oil or other contaminants with benzine or volatile cleaning solution.

b. Bonding faces of the shoe and lining should be carefully cleaned for contaminants on the bonding faces reduce the bonding strength considerably and destroys the bonding.

4. Bonding the lining

a. With a glass rod, apply adhesive compound evenly over the bonding faces of the shoe and lining.

b. Allow adhesive compound on the bonding faces to dry in room temperature until surfaces are no longer tacky. (30 minutes in summer and 60 minutes in winter). Then fasten these parts together.

c. With use of shoe clamp, clamp a pair of shoes and lining and put them into bonding oven for curing.

i. Bonding oven ... Raise the temperature to 160 - 180°C and cure the parts for 60-90 minutes. Leave the parts in oven until the internal temperature drops as low as to 100°C.

5. Grinding the lining

With use of emery cloth remove all burrs around the lining. Check brake lining to drum contact and rectify if necessary with emery cloth.

Trouble-shooting and corrections

CAUSE OF TROUBLE

1. Brake failure or insufficient brake.

Cause of trouble	Corrections
1. Insufficient brake fluid	Top up
2. Leaky master cylinder	Replace defective parts (cup, master cylinder and the like)
3. Leaky wheel cylinder	Replace defective parts (cup, master cylinder and the like)
4. Leaky brake pipe or hose	Retighten or replace
5. Worn brake lining	Replace brake lining
6. Contaminated brake lining	Clean or replace brake lining
7. Air in the pressure system	Bleed the air

2. Dragging brakes

Cause of trouble	Corrections
1. Incorrect brake adjustment	Adjust
2. Use of lining made of different material or use of lining different in size	Replace
3. Contaminated brake lining or brake drum	Rectify leakage, clean or replace
4. Unevenly inflated tires	Adjust tire pressure
5. Deflected brake drum	Turn down in a lathe or replace the drum
6. Restricted wheel cylinder operation	Replace defective parts (cup, wheel cylinder and the like)

3. Pedal goes to floor board

Cause of trouble	Corrections
1. Incorrect brake adjustment	Readjust
2. Air in the pressure system	Bleed the pressure system
3. Leakage in the pressure system	Retighten or replace defective parts

4. Brake noise

Cause of trouble	Corrections
1. Worn lining	Replace lining
2. Loosened drum mounting, deflected or worn brake drum	Retighten, rectify or replace
3. Loosened hub bearing	Retighten
4. Hardened brake lining face	Replace lining

BRAKE (for model KR)

General description of brake

As brake devices, there are 2 systems: namely, foot operated hydraulic service brake (both front and rear wheels adopt 10" Bendix type duo-servo brakes) and manually operated mechanical type parking brake (acting on 2 rear wheels).

Adoption of duo-servo brakes contributes to increased braking efficiency both on forward travel and reversing. Furthermore, Bendix type automatic adjusting mechanism compensates for lining wear and eliminates the need of manual gap adjustments.

MAIN DATA

KIND			Internal expanding hydraulic type
Type		Front wheel	Duo-servo
		Rear wheel	"
Foot brake	Master cylinder inside diameter in mm (in)		19.0 (0.75)
	Wheel cylinder inside diameter in mm (in)		
		Front wheels	22.22 (0.88)
		Rear wheels	19.05 (0.75)
	Oil	Capacity cc (cu.in)	125 (7.6)
	Maximum oil pressure in kg/cm^2 (lbs/sq.in)		125 (1780) (Fully depressed 100 kg (220 lb))
	Type		Primary ... Resin mould MP Secondary ... Resin mould MP

Width	in mm (in)	
	Front wheels	50 (2.0)
	Rear wheels	50 (2.0)
Length	in mm (in)	
	Front wheels	Primary ... 244 (9.6) 110° Secondary ... 279 (11.0) 126°
	Rear wheels	Primary ... Secondary ... Same as above
Thickness	in mm (in)	
	Front wheels	5 (0.2)
	Rear wheels	5 (0.2)
Brake drum diameter in mm (in)		
	Front wheels	254 (10.0)
	Rear wheels	254 (10.0)
Number of adjuster notch x thread diameter x pitch		24 x 11 x 1.5
Adjusting	Method gap in mm (in)	Automatic adjusting type 0.38 (0.015)

MECHANISM

1. SERVICE BRAKE

Front brake

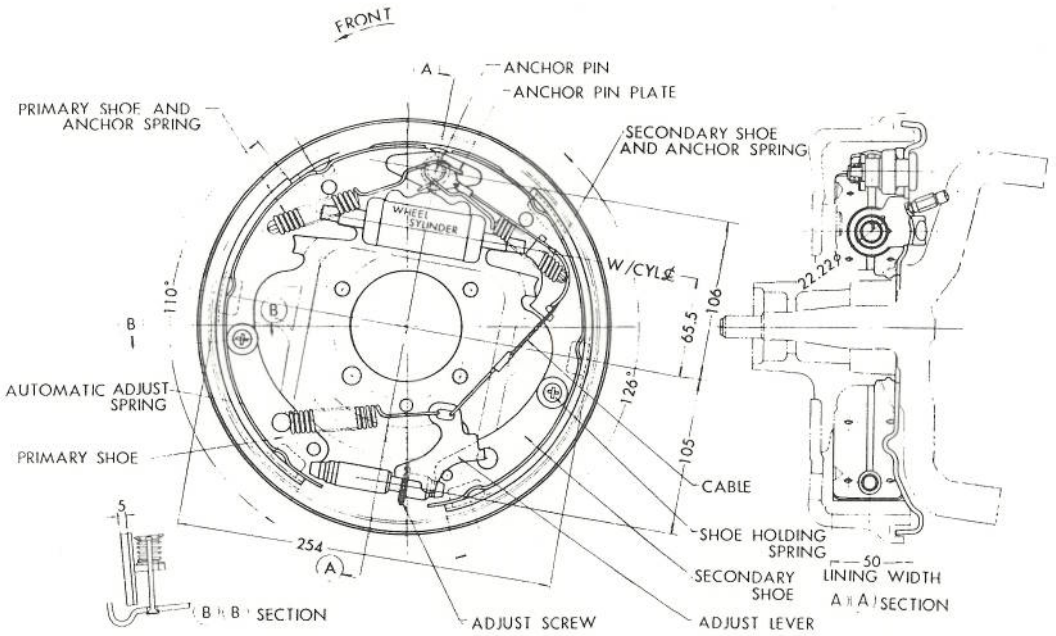


Fig. 39

This automatic adjusting device compensates for lining wear and maintains proper gap between drum and lining. Brake pedal stroke is held constant during the life of lining.

Yet, it is necessary to check lining wears at suitable mileage intervals. If the lining is used beyond the service life, serious damage to the drum will result.

Rear brake

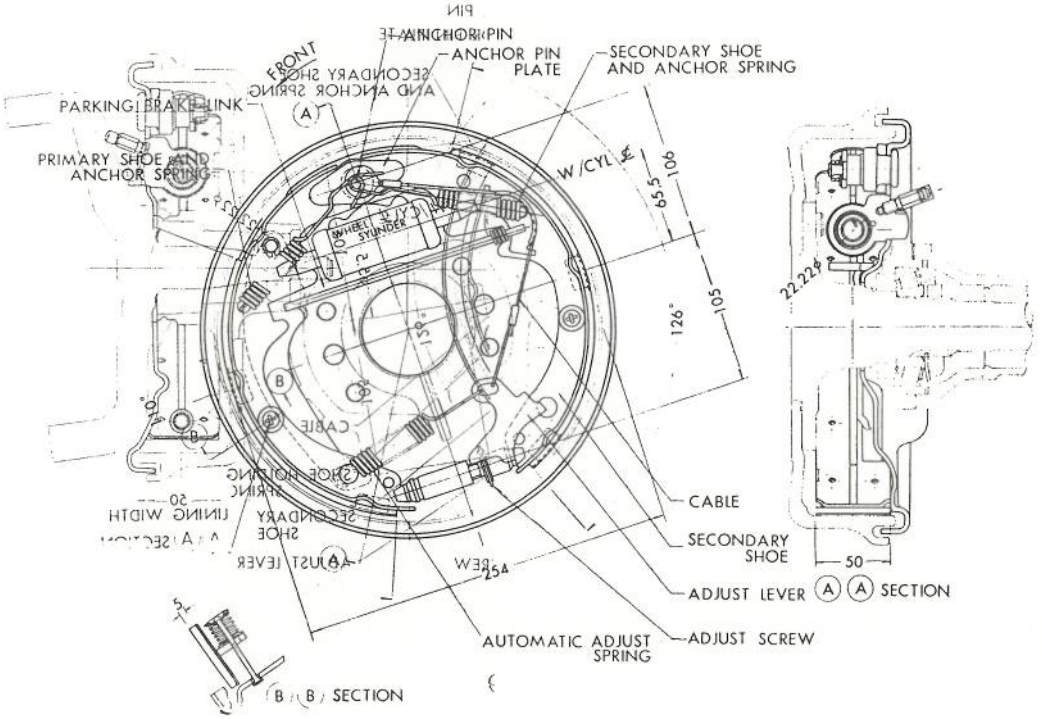


Fig. 40

2. PARKING BRAKE

Parking brake is a mechanical type, hand operated and parking brake link is fixed inside the rear brake. Pulling the parking brake lever operates the cable to expand the shoes outward thereby mechanically actuating the parking brakes.

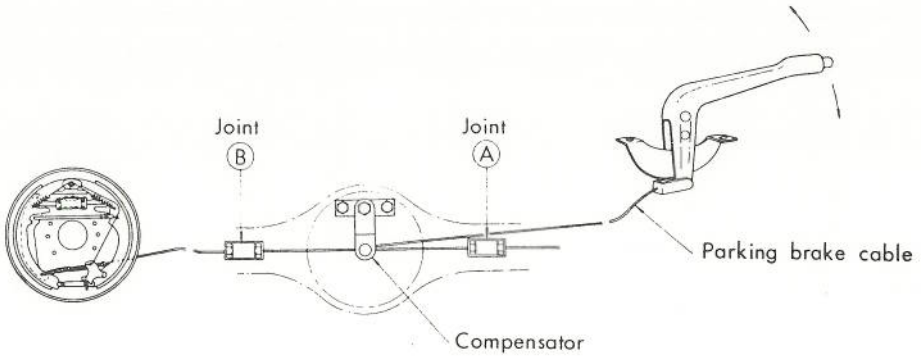


Fig. 41

COMPONENT PARTS ILLUSTRATION

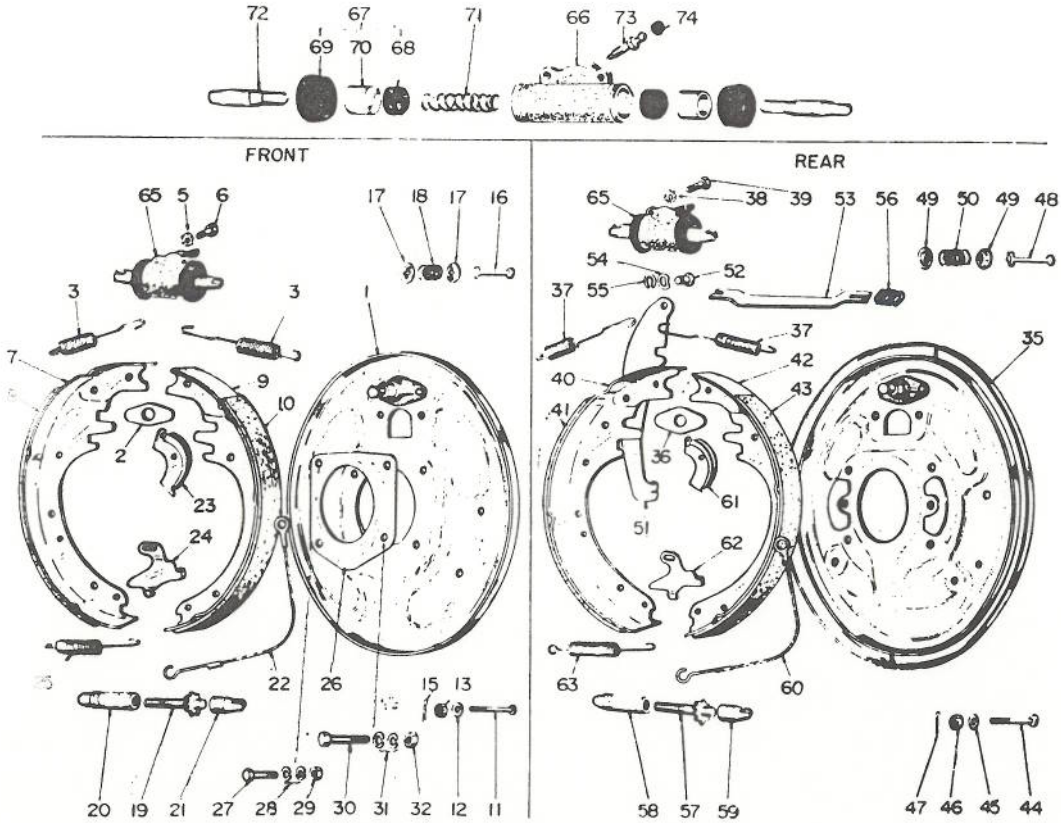


Fig. 42

1. Cover assy.; RH.
2. Plate; shoe guide
3. Spring; return
5. Lock washer; ... wheel cyl. setting
6. Bolt ... "
7. Brake shoe assy.; primary
8. Lining
9. Brake shoe assy.; secondary
10. Lining
11. Pin; brake shoe retaining
12. Washer; plane
13. Nut
15. Split pin
16. Pin; .. brake shoe holding
17. Seat; .. "
18. Spring; .. "
19. Adjuster; RH. LH. thread
20. Nut; RH. LH. thread
21. Socket; adjusting
22. Cable assy.
23. Cable guide
24. Lever; RH.
25. Spring; automatic adjuster
26. Cover; oil shield; RH.
27. Bolt; knuckle, oil catcher
28. Spring washer
29. Nut
30. Bolt; knuckle arm
31. Spring washer
32. Nut
35. Cover assy.; RH.
36. Plate; shoe guide
37. Spring; return
38. Lock washer; .. wheel cyl. setting
39. Bolt ... "
40. Brake shoe assy.; primary
41. Lining
41. Brake assy.; secondary
43. Lining
44. Pin; brake shoe retaining
45. Washer; plane
46. Nut
47. Split pin
48. Pin; .. brake shoe holding
49. Seat; .. "
50. Spring; .. "
51. Lever assy.; RH. parking
52. Pin; lever to shoe setting
53. Strut
54. Retainer
55. Spring washer
56. Spring; strut to shoe
57. Adjuster; RH. LH. thread
58. Nut
59. Socket
60. Cable assy.; automatic adjuster
61. Cable guide
63. Lever; RH. automatic adjuster
63. Spring; lever setting
65. Wheel cyl. assy.; RH. F. & R.
66. Body; RH.
67. Wheel cyl. repair kit
68. Piston cup
69. Boot
70. Piston
71. Spring
72. Push rod
73. Bleeder
74. Cap

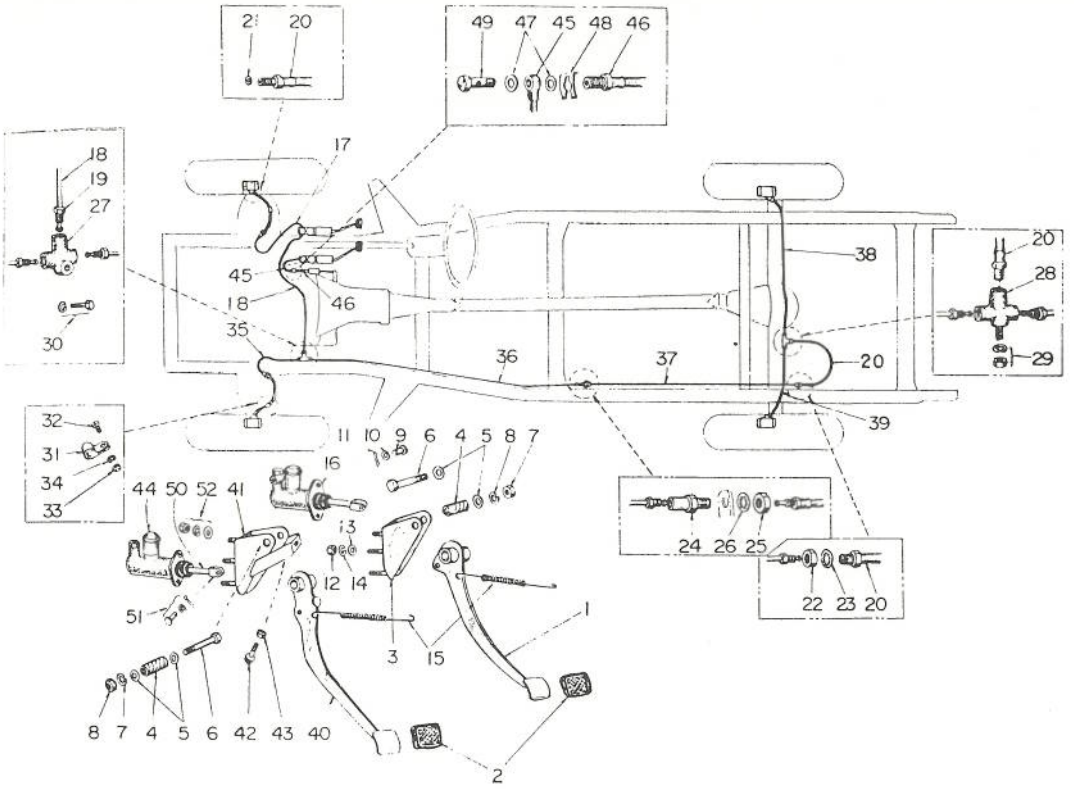

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Fig. 43

1. Brake pedal assy.
2. Rubber pad; brake & clutch
3. Fulcrum bkt. assy.
4. Bush; brake and clutch
5. Washer; nylon
6. Fulcrum pin; clutch pedal
7. Nut
8. Spring washer
9. Pin; joint, master cyl. to pedal
10. Washer; plane
11. Split pin
12. Nut; master cyl. to fulcrum bkt.
13. Washer; plane
14. Spring washer
15. Return spring; clutch & brake pedal
16. Master cyl. assy.; brake
17. Brake pipe assy.; master cyl. to front flex. hose RH.
18. Brake pipe assy.; cyl. to 3 way
19. Union nut
20. Flex. hose; brake rear
21. Gasket; to front wheel cyl.
22. Nut
23. Lock washer
24. 2 way connector
25. Nut
26. Lock washer
27. 3 way connector
28. " brake pipe line
29. Nut
30. Bolt connector fixing
31. Clip
32. Screw
33. Nut
34. Spring washer
35. Brake pipe assy.; 3 way LH. to front brake LH.
36. " 3 way LH. to 2 way LH.
37. " 3 way LH. to flex hose
38. " 3 way to R brake LH.
39. " 3 way to R brake LH.
40. Clutch pedal assy.
41. Fulcrum bkt. assy.
42. Checking bolt
43. Nut
44. Master cyl. assy.; clutch
45. Pipe line; clutch
46. Flex. hose
47. Gasket
48. Clip; flex. hose fix.
49. Joint bolt
50. Push rod; master cyl.
51. Pin
52. Nut

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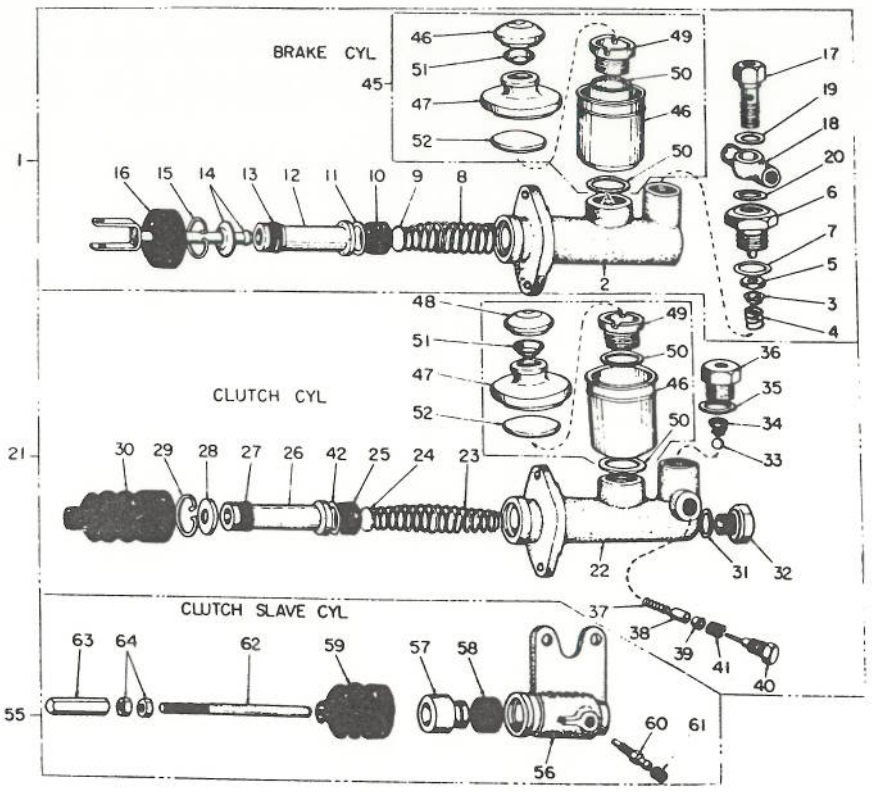


Fig. 44

1. Master cyl. assy.; brake
2. Body
3. Valve assy.
4. Return spring
5. Spring seat
6. End plug
7. Packing; end plug
8. Return spring; master cyl.
9. Retainer; return spring
10. Primary cup
11. Spacer; piston cup
12. Piston
13. Secondary cup
14. Push rod assy.
15. Circlip;
16. Boot
17. Banjo connection
18. Banjo bolt
19. Gasket
20. Gasket
21. Master cyl. assy.; clutch
22. Body
23. Return spring
24. Retainer
25. Primary cup
26. Piston
27. Secondary cup
28. Stopper; piston
29. Snap ring
30. Boot
31. Packing; end plug
32. End plug

33. Ball; clutch valve
34. Spring; ball
35. Packing; pipe connector
36. Pipe connector
37. Spring; lock valve
38. Lock valve
39. Bush; lock valve
40. Adjusting bolt assy.
41. Setting screw
42. Spacer; master cyl. clutch
45. Oil tank assy.; brake & clutch
46. Oil tank
47. Cap; oil tank
48. Cap; oil tank
49. Adapter
50. Washer; brake & clutch
51. Baffle plate
52. Float
55. Slave cyl. assy.
56. Body; slave cyl.
57. Piston
58. Piston cup
59. Boot
60. Bleeder screw
61. Cap; bleeder screw
62. Push rod
63. Rod end; push rod
64. Nut; push rod

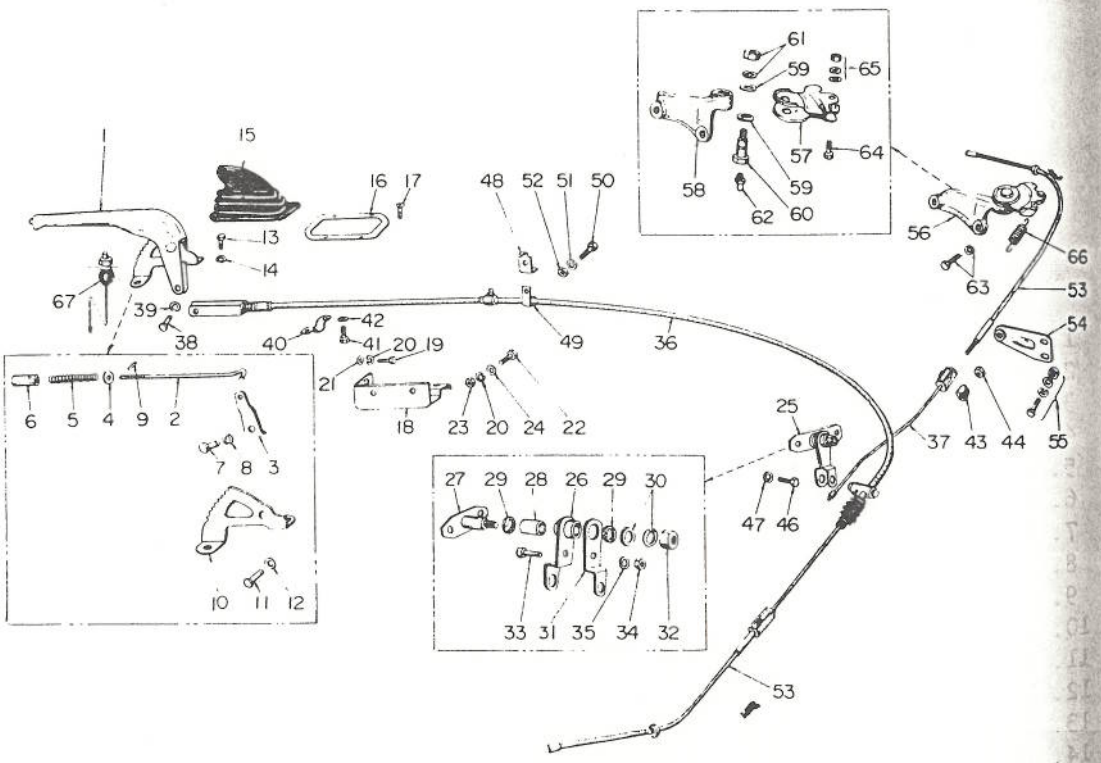
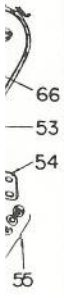


Fig. 45

1. Hand brake lever assy.
2. Brake lever assy.
3. Rod; hand brake lever
4. Claw
5. Washer; spring
6. Spring
7. Button
8. Pin; joint, claw to lever
9. Snap ring
10. Pin; straight; bottom to rod
11. Ratchet
12. Pin; ratchet fix.
13. Washer; plane
14. Bolt; hand brake to floor
15. Lock washer
16. Dust cover
17. Retainer; dust cover to floor
18. Screw
19. Shield; hand brake lever
20. Bolt; shield to bkt.
21. Spring washer
22. Washer; plane
23. Bolt; ... shield to sill
24. Nut; ... shield to sill
25. Washer; plane .."
25. Compensator assy.
26. Lever assy.
27. Plate assy.
28. Bush
29. Washer; felt
30. " plane
31. Lever
32. Nut
33. Bolt
34. Nut
35. Spring washer
36. Hand brake cable assy. front
37. " rear
38. Pin; ... lever to cable
39. Snap ring; .. "
40. Abutment clip; ... F. thimble to bkt.
41. Bolt; ... "
42. Lock washer; ... "
43. Jaw nut
44. Nut
46. Bolt; plate to axle case
47. Spring washer:
48. Bkt.; hand brake cable to frame
49. Clip
50. Bolt
51. Spring washer
52. Nut
53. Hand brake cable assy.; rear
54. Bkt.; hand brake cable support
55. Bolt
56. Relay lever & bkt. assy.; RH.
57. Relay lever; RH.
58. Bkt.; relay lever RH.
59. Washer; nylon
60. Bolt; special
61. Nut
62. Grease nipple; straight
63. Bolt; ... bkt. to axle case
64. Bolt; relay lever
65. Nut
66. Spring; hand brake cable return
67. Switch; hand brake



FUNCTIONS OF BRAKE

1. SERVICE BRAKE

Automatic adjusting device, as shown in Fig.46, comprises cable adjusting lever and automatic adjusting spring, which serve to adjust lining gap when brakes are applied while the automobile is reversing.

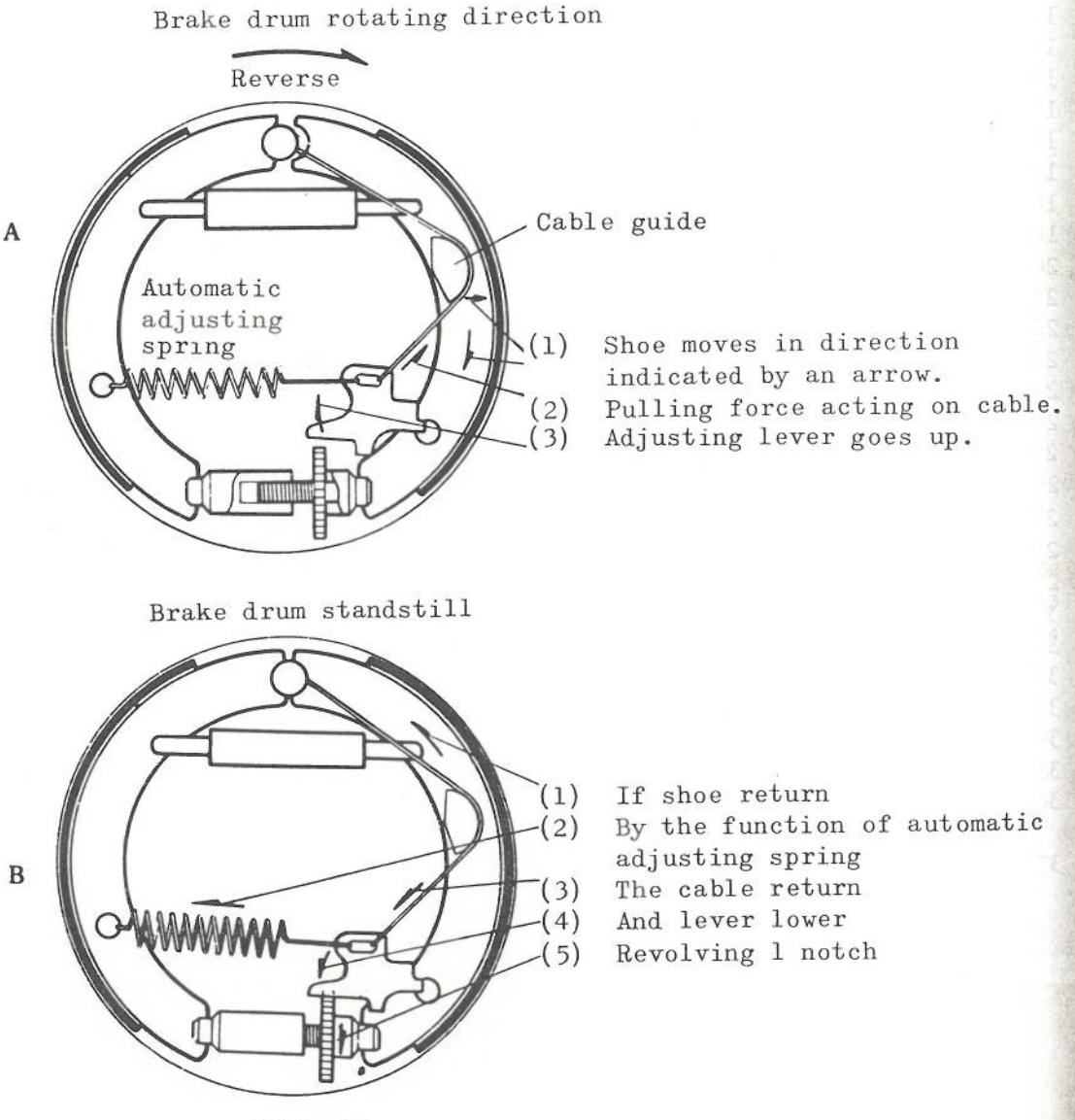


Fig. 46

As the wheel cylinder is operated. the brake shoe is moved outward against the brake drum and tends to move along with with the brake drum. If there is an excessive gap between the adjuster and shoe, the primary shoe is allowed to move in direction in which the drum is rotated thereby eliminating excess gap.

One end of cable is fixed to the anchor and the other end to the adjusting lever.

Now, when brake is applied while reversing, together with the movement of brake shoe, cable guide moves outward in the direction of brake drum rotation and with the direct action of the cable's pulling force, it actuates the adjusting lever.

When rotation of brake drum stops (Fig.46B), the brake shoe is pulled toward the direction of anchor pin by the tensile strength of anchor spring, releasing the pulling force of cable. Thus the adjusting lever returns to its original position by the tensile strength of automatic adjusting spring. At this instant, one notch of adjuster is

The adjusting lever not only moves up and down to turn the adjuster notch, but also move to left and right. The automatic adjusting spring fitted in position as against the adjusting lever, when the adjustment lever moves upward, force is activated trying to return same and the force trying to straight-

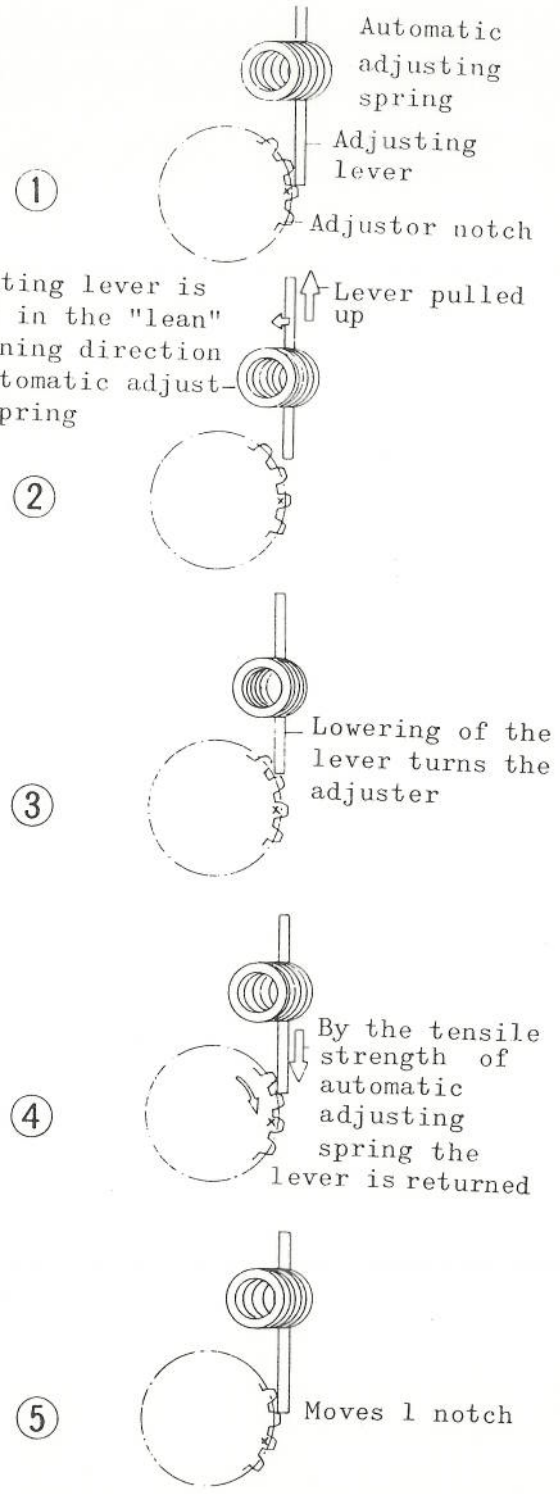


Fig. 47

en the "lean" of spring itself. This force trying to straighten the "lean" becomes the pulling force to adjusting lever inwardly. The functions during its operation are as shown in Fig. 47 (1)~(5).

2. PARKING BRAKE

Wasp adopts an independent rear wheel brake system which differs in operating principles from those for Elf and Elfin. (Fig. 48)

Parking brake system comprises parking brake lever and links. One end of parking brake lever is fixed to the primary shoe with a pin. However with pin as fulcrum, it moves freely in the rotating direction.

Parking brake link is extended between brake lever and secondary shoe just like a bracing rod and transmits the brake lever functions to secondary shoe.

When hand brake lever inside the cab is pulled, the brake cable functions and parking brake lever rotates in the direction as shown in Fig. 48 (2). Since brake cable is fixed at right angle to lever at bottom end (end portion opposite side of pin) of parking brake lever, if cable is pulled, the parking brake lever turn about the pin B.

Parking brake link, being pushed by lever, moves to right side as shown in Fig. 48 (2) and

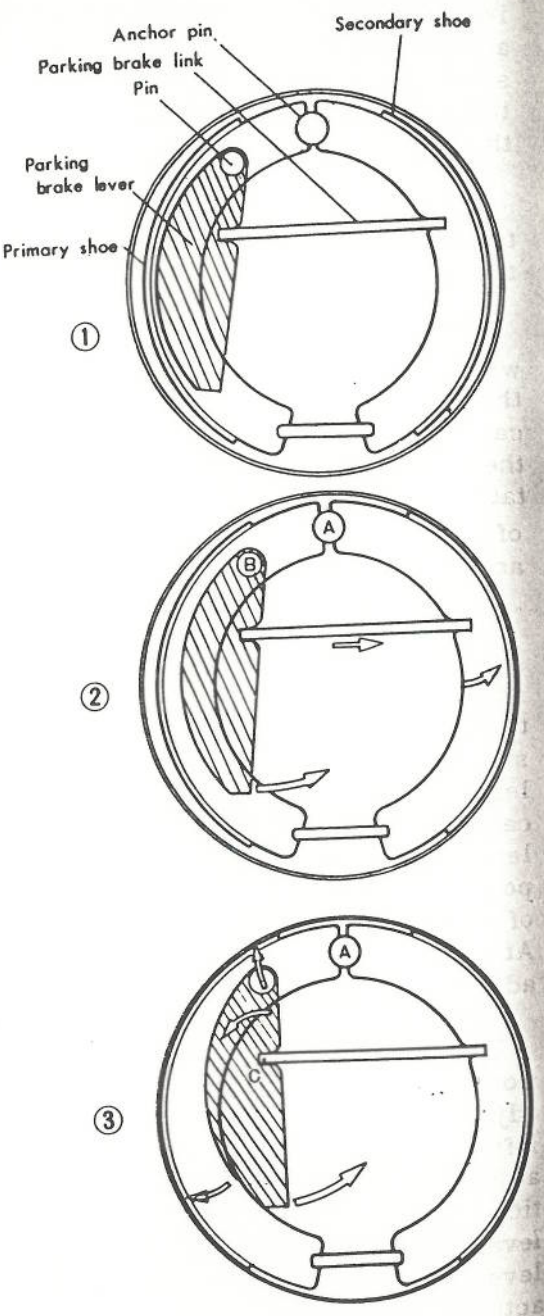


Fig. 48

pushes secondary shoe against brake drum.

When the secondary shoe is completely pressed against the brake drum, the brake remains in position, therefore the parking brake lever starts rotating with one end of brake link (C point of Fig. 48 (3)) as center. Because of this, the pin portion that connects primary shoe and brake lever is pushed out outward and primary shoe is pressed against brake drum.

As a means to transmit brake force to left and right rear wheels, a compensator is used. Its construction is as shown in Fig. 49.

The cable between hand brake lever and compensator is made up of inner cable and outer cable and the inner cable extends directly to parking brake lever of left rear wheel from the hand brake lever. For outer cable, the upper end is fixed to the floor right behind the hand brake lever while the lower end is fixed to the compensator.

When hand brake lever is operated, the inner cable is drawn and the parking lever of left rear wheel, functions.

The cable between hand brake lever and compensator is curve fitted, therefore when hand brake lever is pulled, the tensile strength acts the inner cable and works in the direction to straighten out this curvature. However, since upper end of outer cable is fixed to the floor, the force of outer cable trying to stretch, acts on the compensator and becomes power to rotate the compensator.

To the tip end of compensator lever, the cable that connects to the parking brake, is fitted, therefore when hand brake lever is pulled, the parking brake of left and right rear wheels come into function at the same time.

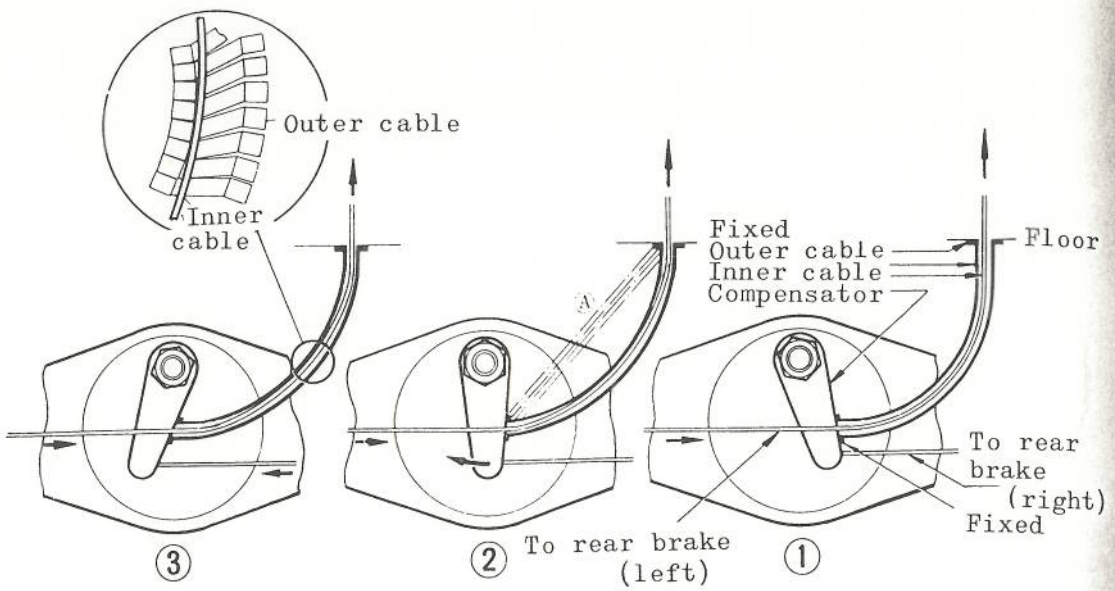


Fig. 49

TO DISASSEMBLE, CHECK, ASSEMBLE AND ADJUSTMENT

1. BRAKE DRUM AND BRAKE SHOE

a. To disassemble (Refer Fig. 50)

i. Jack-up the vehicle and remove the road wheels.

ii. Remove the setting screws on the drum and remove the brake drum.

Remove the drum by knocking it lightly with a copper hammer.

iii. Remove the return springs (Fig. 50 (1)) on the primary and secondary shoes.

iv. Remove the shoe holding spring (2) of primary shoe.

Turn spring seat while pressing down strongly, match the protrusion of pin end section to the square hole of seat and remove seat and spring.

v. Remove adjusting lever (7) and cable (6).

vi. Remove adjuster (3) and automatic adjusting spring (4).

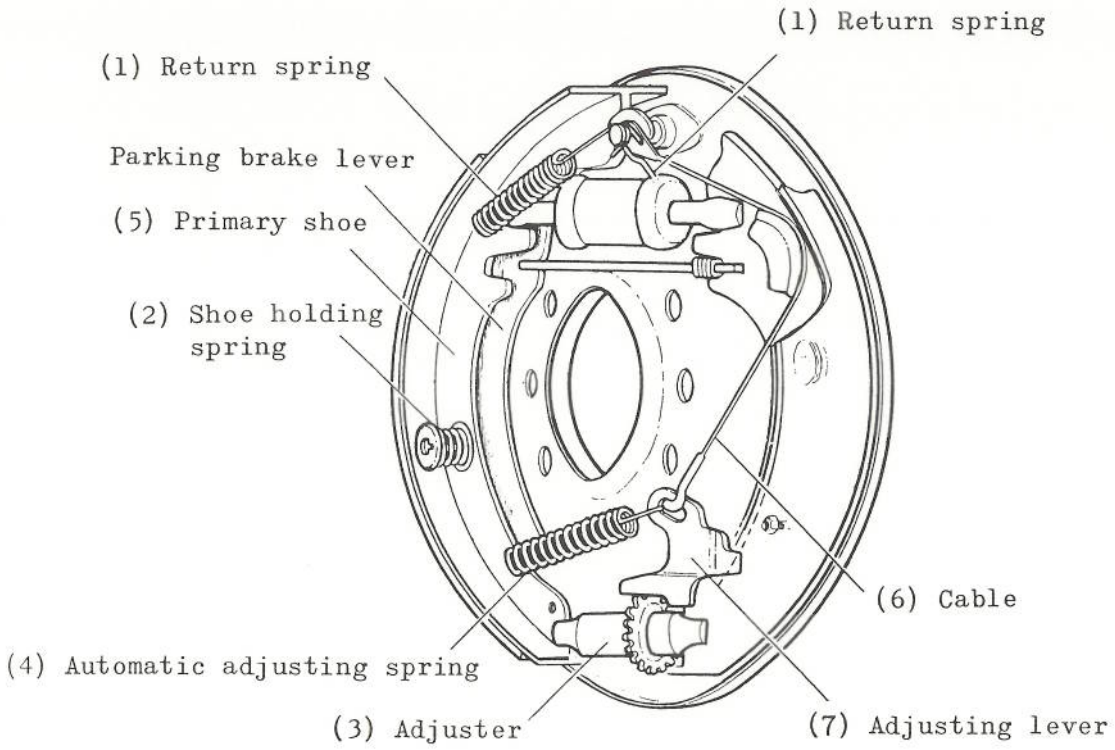


Fig. 50

vii. Remove parking brake lever together with primary shoe (5).

Remove inner cable of parking brake.

viii. Remove shoe holding spring and retaining pin of secondary shoe.

ix. Remove secondary shoe.

b. To check and to rectify

* Brake lining

The brake lining with the following defects should be replaced:

Irregular contact, wear and contamination, deterioration by overheat or disintegrated lining.

Note: Cause of trouble should be established before replacing lining found to be in irregular contact or contaminated with grease.

* Brake drum

i. Check the sliding surfaces of brake drum for damages, particulary for groove shaped wear, ridged wear and or cracks. Among these, in case groove shaped and ridged wears are excessive, rectify by grinding. Rectify appreciable wear with emery cloth. Measure beforehand the inside diameter and confirm whether it will stay within the rectifying limit after grinding.

Item		Figurative value
Standard inside diameter	mm (in)	254 (10.0")
Rectifying limit	mm (in)	256 (10.1")
Roundness degree	mm (in)	0.00 (0.003")
Finishing precision		10 S

Before turning down the drum in a lathe, replace drum if it fails to give specified thickness after grinding.

ii. Check for unusual wear. In this case, install driving shaft to brake drum and fit this into a lathe. Next, fit dial gauge to edged tool stand and while turning the brake drum gently with hand, take the dial gage reading.

In case, if dial gauge reading is found to be more than 0.15 mm (0.006"), rectification is necessary.

Note: 1. When grinding the inner surface of drum, it should be checked that the drum is correctly centered.

2. Confirm whether the mating face of drum after grounded and mating face of brake lining matches or not.

* Brake shoe and anchor pin

i. Check the shoe for distorsion and unusual wear of anchor pin hole.

Replace the shoe if it is found to be excessively distorted.

ii. Check anchor pin and replace if it is found to be excessively worn.

The gap between anchor pin and bush

Standard gap	in mm (in)	(0.14 0.087 (0.006 0.0034")
Usable limit	in mm (in)	0.20 (0.008")

* Return spring (Brake shoe)

When left and right return springs are uneven or spring strength are weakened, this leads to brake dragging and further restricts the returning action of the shoe which in turn, causes the brake to get over-heated.

i. Spring strength of left and right front wheels and rear wheels, should be even.

ii. Spring with considerable rust or weakened force should be replaced.

Item		Figurative value
Free length	in mm (in)	(Both front, rear wheel) 102 (4.0)
Spring constant	in kg/mm	(Both front, rear wheel) 1.4
Fitting load/fitting length	in kg/mm	(Both front, rear wheel) 35.5/125

c. Reassembly is performed in reverse procedure of disassembly, but be sure to confirm adjuster's left and right identifications and then install properly. For its identification, L (left), R (right) are stamped on the slide side end surface of adjuster notch.

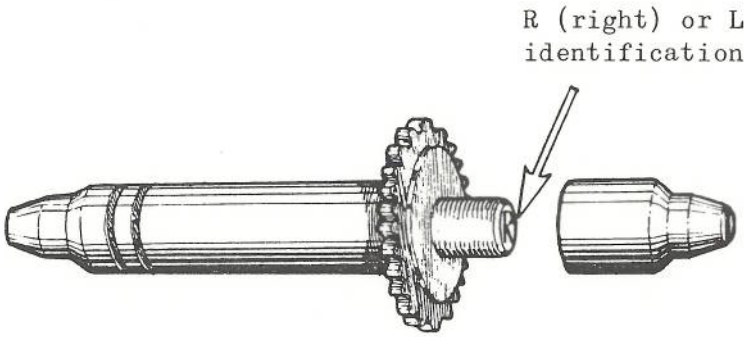


Fig. 51

d. Brake adjustments

Since wheel brakes of both front and rear wheels are fitted with Bendix type automatic adjusting device, brake adjustments are unnecessary. This automatic adjusting device however, since if functions to maintain most suitable gap always according to the conditions at the time though the brake linings have excessively worn, it is necessary therefore, to check for lining wears after a proper period. If lining wear is overlooked, the shoe rim also wears, causing damages even to brake drum.

When brake linings are replaced or when readjusting is required because of faulty adjustments, adjust according to following procedures.

i. Block securely the rear wheels when adjusting front wheels and rear wheels.

ii. Loosen the wheel nuts on the wheel and jack up the wheel.

iii. Remove the road wheel.

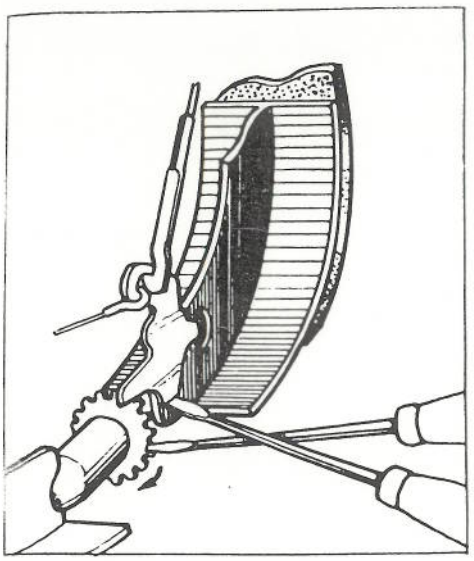


Fig. 52

iv. From the adjusting hole of brake drum, insert screw driver and perform adjustment (Fig. 14). With the aid of 2 screw drivers, adjust the gap in the following manner. Raise the lever with a screw driver and turn the adjuster with the other. When adjuster is rotated towards you (arrowed direction as in Fig. 52), the gap decreases, turning the adjuster of opposite direction increases the gap.

In case the linings are replaced, rotate towards you until the adjuster stops rotating and then return 28 30 notches. Then proper gap is obtained.

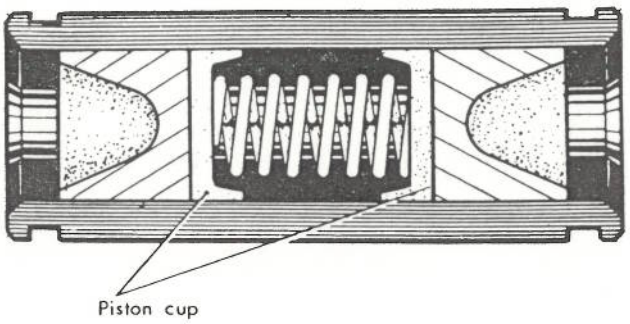


Fig. 53

When wheel cylinder is disassembled, be sure to replace piston cup with a new one.

When assemblying, be careful on the facing of the piston cup. Be sure to install with the opened side faced to the inner side. (Fig. 53)

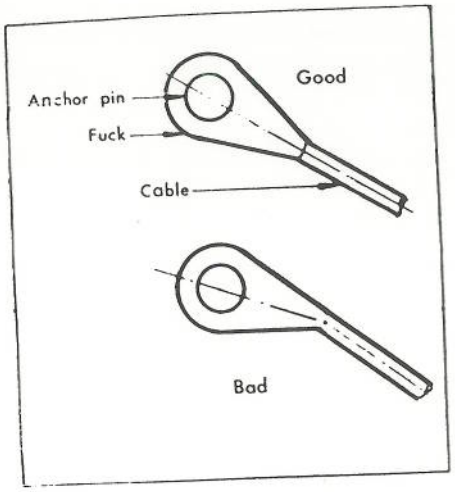


Fig. 54

Readjust the brakes in the similar manner. After the working parts are bedded-down, the automatic adjusting device comes into normal function to compensate for lining wear. When adjuster notch of automatic adjusting device wears and or the cable fitting is faulty, the adjusting lever slides over the notch and the automatic adjusting device fails to function. Consequently, brake failure will result. Also, when the fitting hook of cable to anchor is fitted bent (Fig. 54), the adjusting lever shall become always in a drawn condition and proper automatic adjustment.

If brake fails to give normal function despite readjustment, the brake should be disassembled and checked for defect, but pay particular attention to adjuster wears and hooking of cable. While cable is in continual use stretch may occur. Measure the cable for extension and if it is found to be elongated 247 mm (9.7"), replace with new one (Fig. 55).

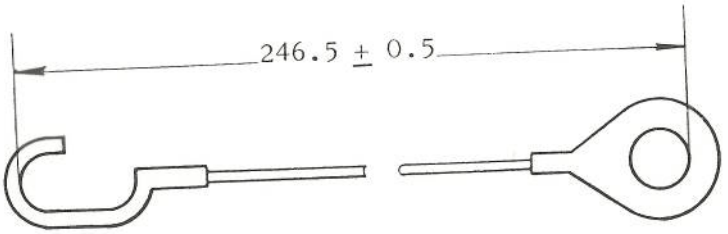


Fig. 55

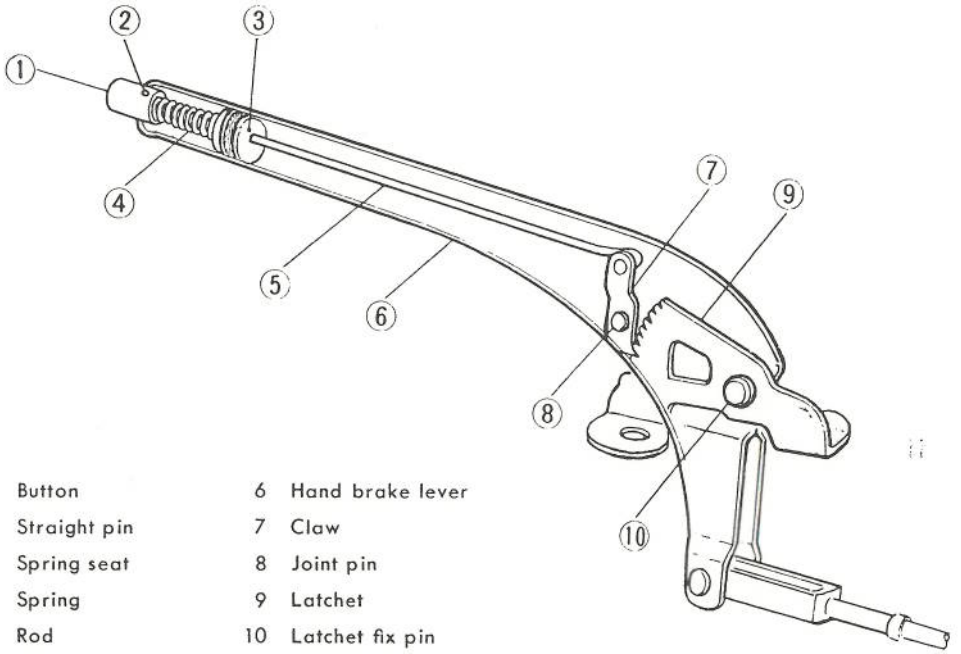
2. PARKING BRAKE (HAND BRAKE LEVER)

Since parking brake is hand operated mechanical type unitary with rear brake, if rear brake is adjusted, parking brake is automatically adjusted. However, unless the control linkages are properly adjusted, parking brake refuses to function properly.

a. To disassemble

Disconnect hand brake lever and cable. When snap ring is removed and pin pulled out, cable can be disconnected easily.

Remove the hand brake lever assembly from the floor.



1	Button	6	Hand brake lever
2	Straight pin	7	Claw
3	Spring seat	8	Joint pin
4	Spring	9	Latchet
5	Rod	10	Latchet fix pin

Fig. 56

Pins on the hand brake lever are caulked. The lever can not be disassembled. When there are defects on the hand brake lever assembly, replace the hand brake lever as a complete assembly. However slight damage to the lever may be repaired. When disassemblying, pay close attention to following points.

Rod, joint pin and latchet fix pin are caulked, therefore once disassembled, it could not be reused. Everytime disassembled, use new parts.

Spring seat is welded to lever main body and disconnecting is impossible. To disassemble, perform in following procedures.

i. Grind or file-off the caulked section of latchet fix pin with grinder or file and pull out the pin, then remove the latchet.

ii. Similary, remove the caulk of joint pin and pull out the joint pin.

iii. Pull out the button, pull out the straight pin and disconnect button and rod. Then take out spring and washer.

iv. From the large end side of lever, pull out the claw with rod.

v. When caulk on rod is removed, the claw can be easily disconnected.

b. To check and rectify

Check the wear of latchet teeth, and use a file to recondition the teeth. Replace latchet with worn pin hole. Check wear of claw finger. Rectify with file as necessary. Check rod for bending, wear of each pin hole of lever.

c. To assemble

Perform in reverse procedures of disassembly. Using each pin and rod with new ones, perform caulking securely after installing.

d. Adjustment of control cable

When hand brake lever is fully pulled, if the pulling allowance becomes more than 5 ~ 7 notches, perform stroke adjustment.

With the hand brake lever fully loosened, adjust the cable to give proper tension and adjust the brake lever travel with the jaw joint at the axle case or with the adjuster at the lever.

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PART 11

TIRES AND WHEELS

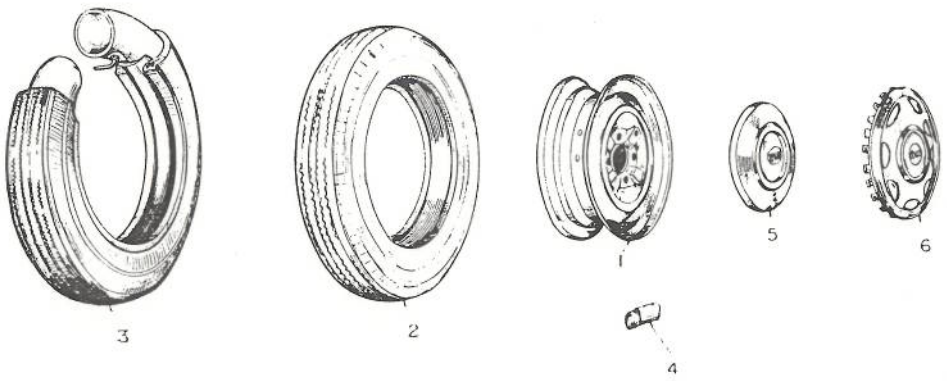
CONTENTS

PART 11 TIRES AND WHEELS

Data

Data \ Model		PR20	PRD20	KR	KR10-V
Tire	Front	5.60-13,4P.R.	5.60-14,4P.R.	6.00-14,6P.R.	5.50-14,6P.R.
	Rear	5.60-13,4P.R.	5.60-14,4P.R.	6.00-14,8P.R.	5.50-14,6P.R.
Tire Pressure (kg/cm^2)					
	Front	1.4	1.4	1.7	1.7
	Rear	1.4	1.7	4.3	3.2
Disk wheel		4-1/2-J x 13	4-J x 14	4-1/2-J x 14	4-J x 14

Tire and wheel in disassembled view



Component parts of tire and wheel

Fig. 1

1. Disk wheel
2. Tire (tubeless)
3. Tire (with inner tube)
4. Balance weight
5. Hub cap (standard)
6. Hub cap (deluxe)

Construction of the tire

One of the major function of the tire is to interpose a cushion between the road and the car wheel to absorb shocks resulting from irregularities in the road thereby preventing high frequency vibrations from being transmitted to the car. Reduced area of the tire face that comes into frictional contact with the road also help deaden high frequency vibrations.

The tire should be durable, less liable to wear, flexible and responsive to varying road condition while it withholds internal air pressure and provides good frictional contact between the wheel and the road to permit transmission of power through the tires to the road to secure good traction as well as to allow quick stops when the brakes are applied.

Tire casing in sectional view

Fig. 2

Tire casing is made up of layers of cord (cotton or tough nylon) over which the rubber inside wall is applied for improved service life. The beads, portions of the tire which are held against the rim, are fortified with bead wires over which the thick rubber layers are applied.

When the tire is subjected to operation, a part of flexing motion turns into heat and remains inside the tire. This heat can not be easily dissipated because of the poor heat-conductivity of the rubber and layers of cord used in the tire. Excessive build-up of heat deteriorates the fabric of the tire and gives a rise to tire wear.

Tire removal and mounting

REMOVAL

The tubeless tire can be removed from the rim in the same manner used for removing the tire with inner tube.

1. Take out the valve cap and valve inside to release internal air.

2. Push in the tire bead toward the center of the rim and starting with the opposite position, pry the bead up over the rim flange in the same manner used for removing the ordinary tire (tire with inner tube).

3. Cautions to be observed when removing the tire.

a. Exercise extreme care to avoid damaging the tire bead. Keep the valve on the rim.

b. On tubeless tire, proper bead to rim contact is essential to retain air inside so that a flat stock or a tire lever should not be used to force the beads away from the rim flange.

c. It is advisable to use a special tool for removing the beads from the rim.

d. Flat stocks, tire levers or other tools used for prying beads away from the rim should be smoothened out to prevent damage to the beads.

Removing the tire

Fig. 3

e. Water should be applied to the flat stocks or tire levers before use.

f. The valve should not be removed from the rim unless replacement is necessary.

MOUNTING

The tubeless tires are designed for use on the drop-center rim (or safety-rim) so that air can not be retained inside if they are fitted to two-piece rim or rim with detachable flange. However, the tubeless tire may be mounted to the two-piece rim with good result if rim gasket is used to prevent air leakage.

1. Reconditioning the rim

a. The rim flange plays an important role to hold the beads tightly against the rim allowing no air leakage. Examine the rim carefully for dents and for roughness or rusting and straighten out any dents with a hammer.

Reconditioning the rim flange

Fig. 4

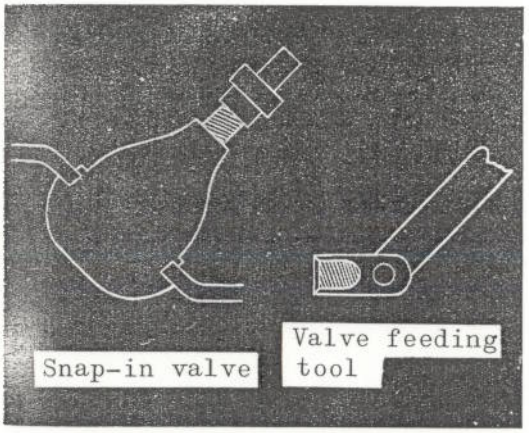
b. With use of emery cloth, clean off the rim flange carefully to prevent damage to paint finish

c. After cleaning the rim flange, carefully examine the butt welds for roughness and if necessary smooth out with a file. All these areas must be smooth so that the tire bead will seal tightly against the rim and allows no air leakage.

2. Refitting the valve

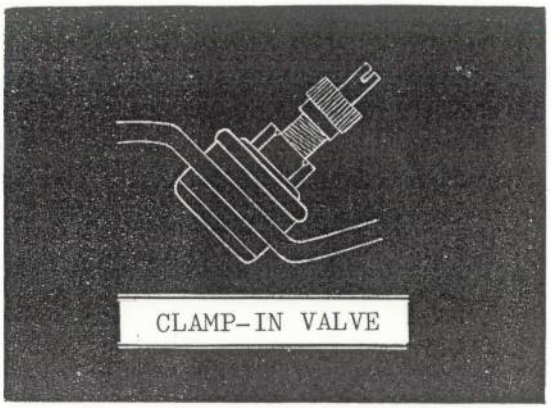
a. Clean out the inner face of the rim around the valve fitting hole with a sand paper or with emery cloth before fitting the tubeless valve.

b. The valves for use with the tubeless tire are available in the following two kinds: Snap-in valve (push-in rubber seal valve) and clamp-in valve (clamped metallic valve). The snap-in valves used in the tubeless tires of the Bellett should not be reused. The valve should be replaced whenever the tire is replaced.



Snap-in valve

Fig. 5



Clamp-in valve

Fig. 6

3. Wipe off clean the tire beads with a cloth soaked with clean water.

4. Wet tire beads, face of the rim and flat stocks or tire levers. This facilitates the beads to snap into position in the rim when the tire is inflated.

5. Mount the tire to the rim with use of narrow flat stocks.

6. Pry the beads over the rim flange, a little at a time in progression, carefully to prevent damage to the beads.

7. Beads should be carefully snapped into the rim flange to avoid damaging the rubber edge of the beads.

8. For mounting the tire to the rim flange, start at the portion farthest from the valve to prevent the valve base from falling out.

   Note: The spot indicating the wheel balance should be properly aligned with the valve position.

9. Rapidly inflate the tire with the valve inside removed. Hold the tire in vertical plane. Then bounce the tire on a floor while rotating it to facilitate the beads to snap properly into the rim flange and seal tightly to prevent air leakage.

10. Fit the valve inside, inflate the tire to about 3.5 kg/cm^2 and submerge the wheel in water in a vessel and check to see if air bubbles are arising from the beads, rim, rivets or from the valve.

Measuring tire pressure

Fig. 7

Tire check-up

INSPECTION

Carefully inspect the tires against the following:

1. Air pressure.
2. Thread wear and wheel-balancing.
3. Wheel alignment.
4. Cuts or bruise and depth of the cuts.
5. Pebbles, nails or other foreign material on the tread.

6. Damage due to impact.

7. Damage to the side wall and to the shoulder.

8. Any trace of contact with the part of the body. (Arch of the front wheel or upper link end).

9. Oil, grease or other contaminants on the surface.

Tire repair

METHOD FOR REPAIRING TUBELESS TIRE

The repairing work of the tubeless tires can be classified into two groups: "minor repair" and "Major repair". The "minor repair" means simple repairing of diminutive holes with the use of locally markettable rubber-plug or repair-gun. While the "Major repair" represents the repair of relatively large holes involving the use of vulcanizing process.

Pressure gun

Fig. 8

MINOR REPAIR

The minor repair can be divided into two types according to the material used: Pressure gun method and rubber plug method. The use of pressure gun is confined to the repair of diminutive holes sizing 2 mm in diameter or smaller, while the rubber plugs are used for repairing holes larger than 2 mm in diameter. However, the holes are usually found in various forms so that correct judgement will be necessary to access the damage to the tires.

PRESSURE GUN REPAIR

Items required:

Dough and pressure gun.

1. Remove the wheel from the car or jack up the wheel clear of the ground to permit free rolling.

2. With the use of a pliers, pull out the nail or other puncturing object.

Removing the puncturing object

Fig. 9

3. Reduce the tire pressure to about 2-5 kg/cm^2 and fill the pressure gun with dough.

4. Turn the handle on the pressure gun until the sealing dough appears and wipe off the nozzle to make sure only fresh dough will be used.

5. Center the nozzle over the puncture and press it firmly against the tire. Turn the handle one or two full turns to fill the hole with the sealing dough.

Tire repair

Fig. 10

6. Allow the tire to stand 20 minutes and then inflate the tire to specified value.

RUBBER-PLUG METHOD

Items required:

Rubber cement, large and small rubber plugs, a probe and a needle with eye

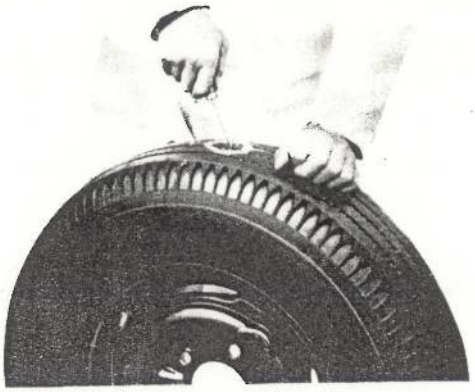
Repair-kit

Fig. 11

1. Reduce the tire pressure to about 1/3 of the specified value with the wheel in position.

2. Remove nail or other puncturing object from the tire and clean the damaged area with rubber cement.

3. Smear the probe with the rubber cement and put this through the puncture hole. Then work the probe around the inside of the hole to facilitate insertion of rubber plug.



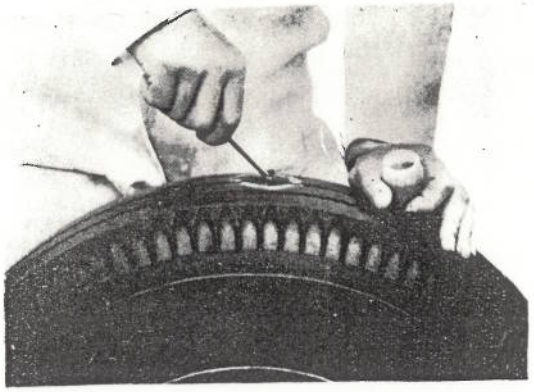
Tire repair

Fig. 12

4. Select a rubber plug of a size suitable for the hole (it must be larger than the diameter of the hole) and roll the small end of the plug into the eye of the needle. Dip the rubber plug and needle into rubber cement and put them through the puncture hole. Sudden reduction in resistance indicates that the needle with the plug cleared through the hole.

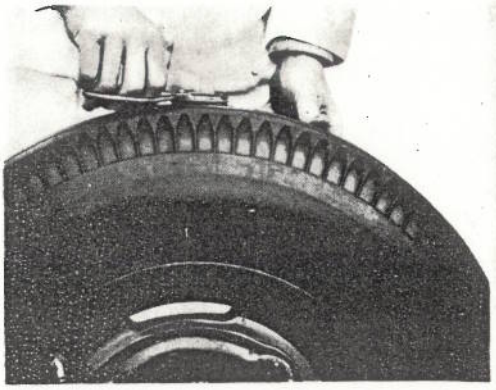
5. Pull out the needle and trim the rubber plug about 4 mm above tread surface.

6. Reinflate the tire to specified value.



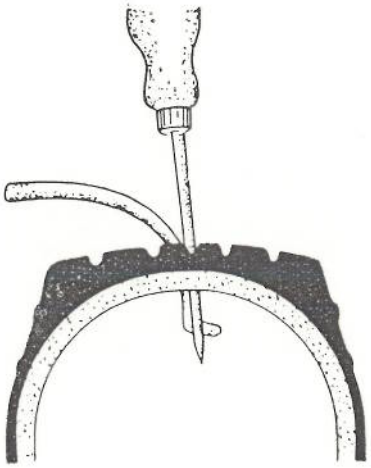
Tire repair

Fig. 13



Tire repair

Fig. 15



Tire repair

Fig. 14

MAJOR REPAIR

If the damage to the tire is beyond the range of pressure gun repair or rubber-plug repair, it is advisable that the repair be relied upon service stations where vulcanizer and other special equipment are available.

FACTORS AFFECTING THE TIRE SERVICE LIFE

1. Tire pressure

The function of the tires in supporting the car weight or load relies only upon the internal pressure so that it is extremely important to keep them properly inflated.

Over-inflation

Normal

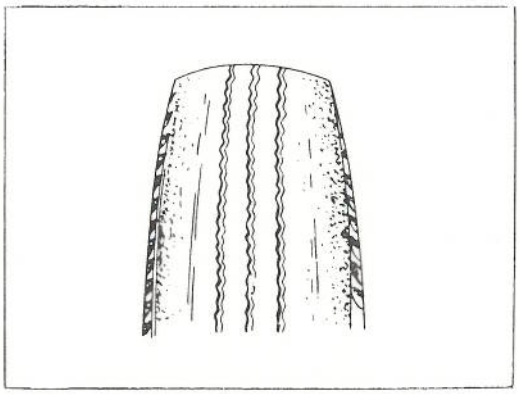
Under-inflation

Relations between tire pressure and wear

Fig. 16

a. Under-inflation

This imposes additional strain over the tire and together with increased flexing due to reduction in outside diameter, this leads to tire temperature raise, which in turn accelerates the tire wear and shortens the tire service life. (Fig. 17)

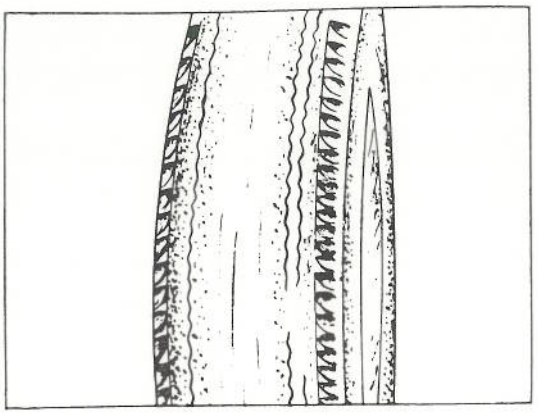


Under-inflation wear

Fig. 17

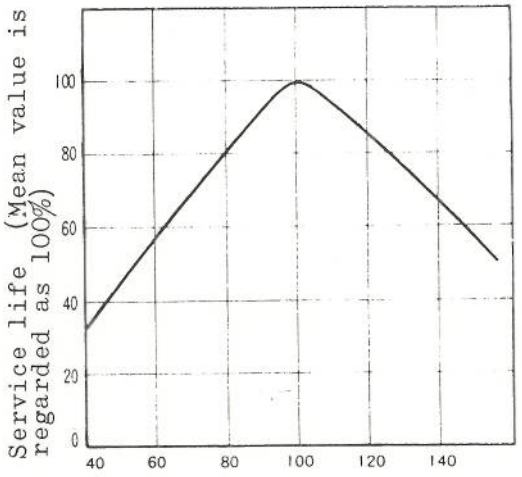
b. Over-inflation

This keeps the tire casing in extreme tension and gives a rise to tread wear. Excessive pressure in the tires give a hard ride and bruise to the tread may result.



Over-inflatior

Fig. 18



Relationship between tire pressure and service life

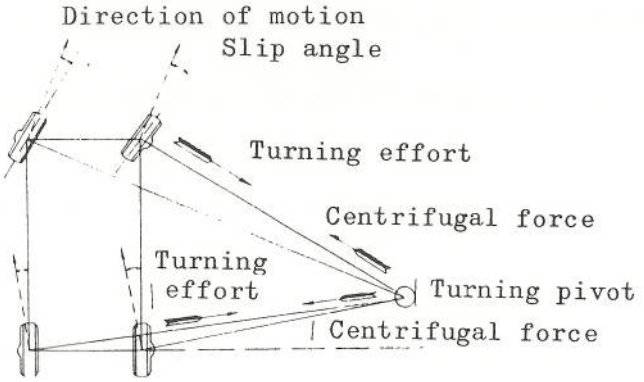
Fig. 19

c. Road condition

The influence of the road condition upon the service life of the tires has not beer drawing much of servicemen's or drivers' attention. Many of the surfaces of roads of today are so arranged to eliminate tendency of automobile to skid. Such improvements in the road surfaces contribute to better mobility of automobile.

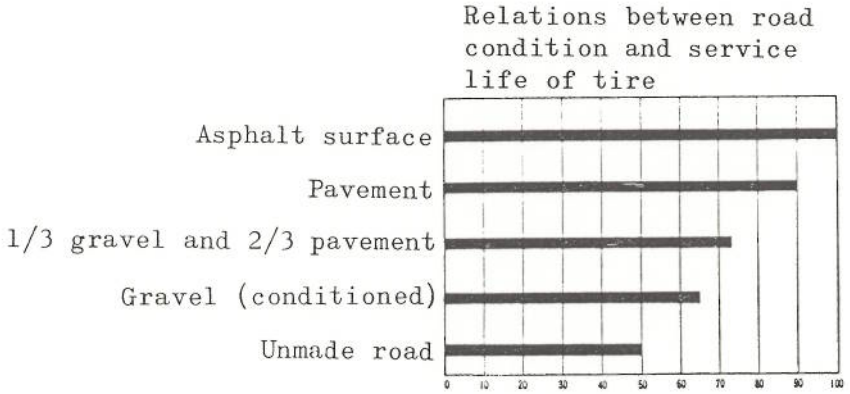
Meanwhile, increased frictional resistance on the roads accelerates tire wear despite the improvement in tread designs or patterns. When the automobile is following a curve or turning a corner, the direction in which the car proceeds deviates from the direction in which the car tends to move. This tendency gives direct influence upon the front wheels as well as on the rear wheels. The tire slippage and distortion due to steering increases in response to the car speed, load, condition of the crown of the road and to other various factors.

This tendency becomes more evident when the car is climbing up or descending a slope as such modes of operation necessitate increase in driving torque or in braking torque.



Tire slippage that accelerates tire wear when a car is turning

Fig. 20

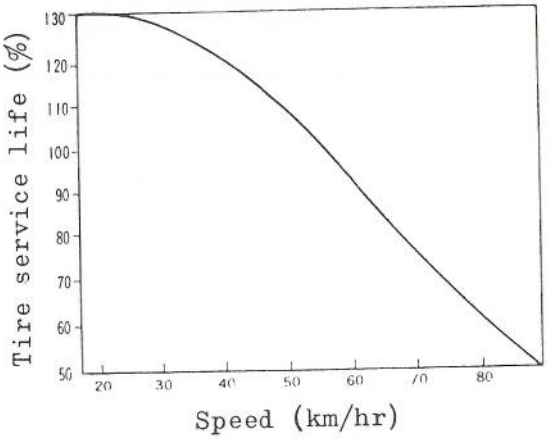


Relations between road condition and service life of tire

Fig. 21

c. Speed

Car speed also gives direct influence upon the tire service life.



Relations between car speed and tire service life

Fig. 22

Abnormal tire wear control

Improperly serviced automobile gives a rise to tire wear and further leads to tire damage due to uneven distribution of loads. When daily check-up reveals uneven wear on the tires, the cause of trouble should be established and corrections made. The automobile should be checked against the following.

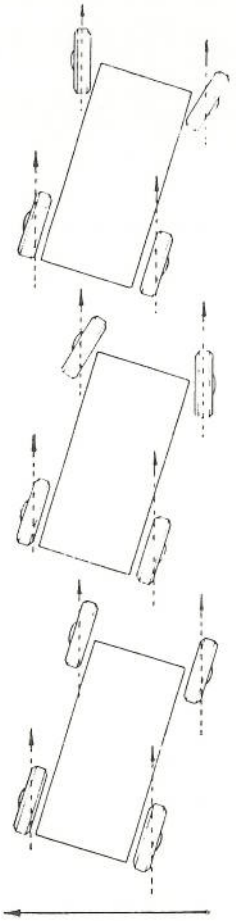
WHEEL ALIGNMENT

1. Toe-in Wear

Toe-in wear produces a feather-like edge at the inside edges of the tread ribs.

2. Toe-out Wear

Toe-out wear produces the same condition as toe-in wear,



Toe-out wear
This can be noted by excessive wear on the right front tire

Toe-in
This can be noted by excessive wear on the left front tire

Parallel
This evens out wear on both tires

Relations between maladjusted wheel alignment and tire wear

Fig. 23

except that the feather-like edge is formed on the outside edges of the tread ribs.

3. Camber-wear

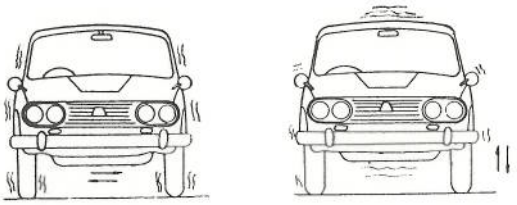
Maladjusted camber will cause noticeable wear on one side of the tires. If such wear is produced by driving mostly on highly crowned roads, regular tire interchanging can only aliminate such trouble.

4. Caster

Maladjusted caster produces spotty-wear on the tire and leads the automobile to one side or the other.

5. Wheel balance

If the wheels are out of static and dynamic balance, vertical and horizontal vibrations occur as the car is on travel and lead to irregular tire wear.



Out of dynamic balance

Out of static balance

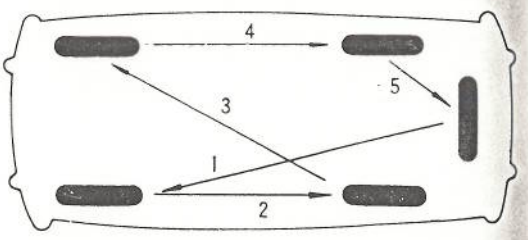
Out-of-balance wheels

Fig. 24

6. Tire rotation

Abnormal wear on the tires can not be avoided even if close attention is paid to the tire pressures and wheel alignment. This is because the abnormal wear depends largely upon the road condition, the manner in which the car is driven, steering or traction transmitted to the drive wheels.

For example, Keep-to-the-left driving produces wear in the left tire which is larger than that on the right tire, giving larger wear in the front tire than that on the rear tire. For these reasons, it is necessary to practice tire rotation in order to even out tire wear.



Tire Rotation

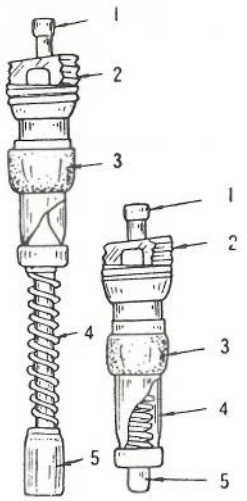
Fig. 25

Construction or inner tube

CONSTRUCTION

The inner tube comprises the tube and tire valve. The valve includes a valve inside to prevent air leakage. As the chuck of the air hose is pressed against the valve, the shaft is depressed by the air pressure allowing air to enter into the tube. On release of the air chuck from the valve, the shaft returns to original position allowing the metal ring to come into contact with the rubber seat thereby providing sealing effect.

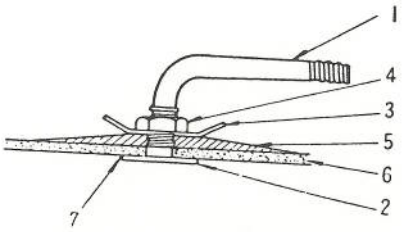
The valve is fitted to the inner tube and clamped in position with the valve base, special washer and hexagonal nut. It is advisable to use a new tube in a new tire, for if old tube is used in a new tire, the deteriorated rubber tends to over expand to produce wrinkles and causes damage to inner tube and tire.



Construction of valve inside

Fig. 26

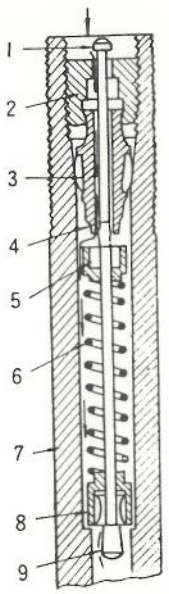
1. Shaft
2. Fixing screw
3. Seal ring
4. Spring
5. Spring seat



1. Valve stem
2. Valve base
3. Special washer
4. Nut
5. Valve pad
6. Tube
7. Base plate

Construction of tube and valve

Fig. 27



1. Shaft
2. Thread
3. Hard rubber
4. Metal ring
5. Soft rubber
6. Spring
7. Valve stem
8. Spring retainer
9. Air lead wire

Parts 2. through 8. are referred to as valve inside.

Construction of valve

Fig. 28

PART 12

STEERING

CONTENTS

PART 12 STEERING (for model PR)

Data and specificatications of the steering

Type	Rack and pinion
Shaft angle	3°12'
Rack travel equivalent to one full rotation of pinion (mm)	47.9
Number of rotation of the pinion from lock to lock	3 turns
Steering angle (Inside)	36°
(Outside)	33°
Rack shaft travel (mm)	139 ± 1.0
Number of pinion gear teeth	8
Number of pitch on the rack	29
Backlash (mm)	0 (Between pinion gear and rack)
Wheel play (mm)	5 (At the periphery of wheel)
Minimum turning circle	5000
Toe-in (mm)	3
Steering wheel diameter (mm)	400

Steering unit in exploded view

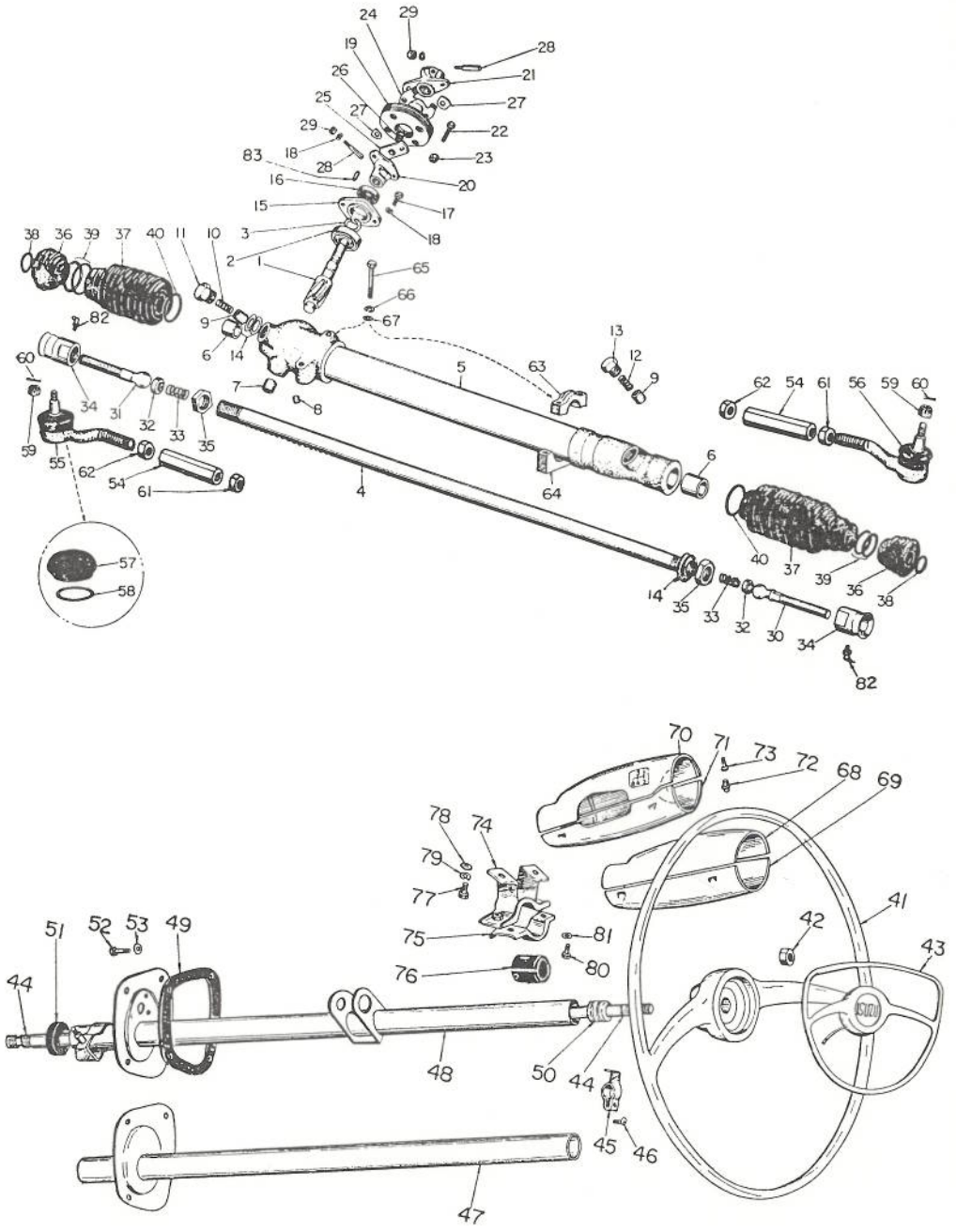


Fig. 1 Component parts of the steering unit

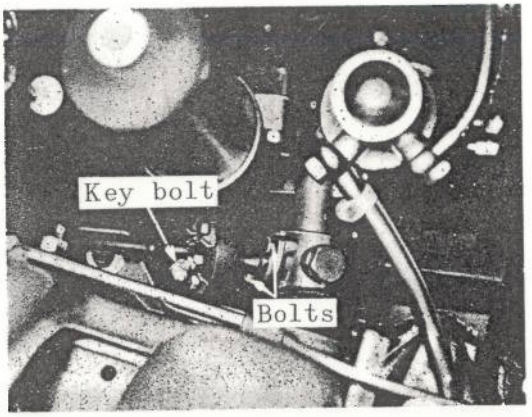
1. Pinion gear
2. Bearing
3. Snap ring
4. Rack shaft
5. Housing
6. Bush
7. Bush
8. Plug
9. Plunger
10. Spring
11. Cap
12. Spring
13. Cap
14. Stopper rubber
15. Rear cover
16. Seal
17. Bolt
18. Spring washer
19. Coupling
20. Flange
21. Flange
22. Bolt
23. Nut
24. Thrust piece
25. Thrust piece
26. Spring
27. Thrust washer
28. Keybolt
29. Nut
30. Joint ball
31. Joint ball
32. Ball seat
33. Spring
34. Ball housing
35. Lock nut
36. Boot
37. Boot
38. Spring
39. Spring
40. Spring
41. Steering wheel
42. Nut
43. Horn ring
44. Steering shaft
45. Striker ring
46. Screw
47. Steering column
48. Steering column
49. Rubber gasket
50. Bush
51. Seal
52. Bolt
53. Washer
54. Adjust tube
55. Rod end
56. Rod end
57. Boot
58. Spring
59. Nut
60. Split pin
61. Nut
62. Nut
63. Cap
64. Bracket
65. Bolt
66. Spring washer
67. Washer
68. Cowling
69. Cowling
70. Cowling
71. Cowling
72. Grommet
73. Screw
74. Support bracket
75. Cap
76. Rubber gasket
77. Bolt
78. Washer
79. Spring washer
80. Bolt
81. Spring washer
82. Grease nipple
83. Pin; flange

Steering unit removal

The rack and pinion type steering unit is mounted to the cross member. The construction of the link rod and associated parts of the steering unit has been simplified for easy operation and maintenance as well. The steering unit requires no adjustment. In order to hold the torque required to turn the steering wheel in constant, a plunger is arranged to give the rack shaft a thrust. The steering shaft is provided with a rubber coupling mounted on the intermediate part of the shaft to deaden vibration and road shocks.

STEERING UNIT REMOVAL

1. Take out the key bolts on the steering shaft coupling in the engine compartment. (Fig. 2)



Removing the steering unit

Fig. 2

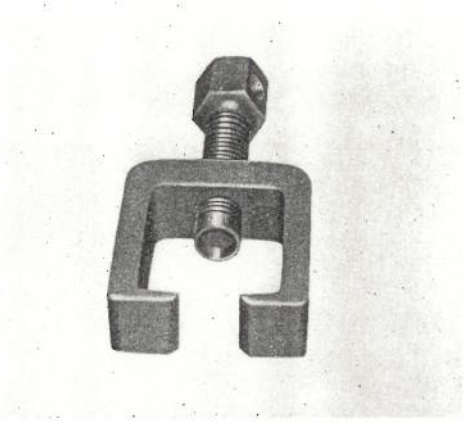
2. Pull out the steering shaft from the steering column together with the steering wheel and horn ring in their position.

Removing the steering shaft

Fig. 3

3. Jack up the front cross member and remove the front wheels.

4. With the aid of the puller (8521-0078), remove the rod ends from the right and left track rods.



Puller; trackrod

Fig. 4

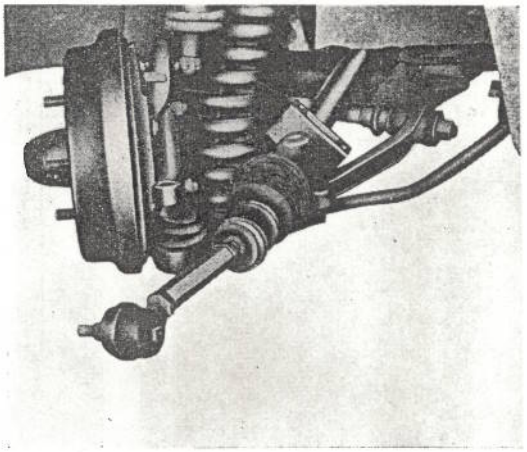
Note: As the oil lock type shock absorbers are fitted, removing the rod end by knocking the rebound stopper with a hammer causes the rack side ball joint to come in contact with the housing and further cause damage to the rod end boot. To prevent damage to these parts, the use of a special tool is essential.

5. Remove the steering housing from the cross member.

6. Take out the pinion gear rear cover setting bolts and pull out the coupling together with the pinion.

7. Withdraw the steering unit toward the right-hand side of the car through the clearance between the side frame and cross member.

Caution: Care should be taken not to damage the grease nipple.

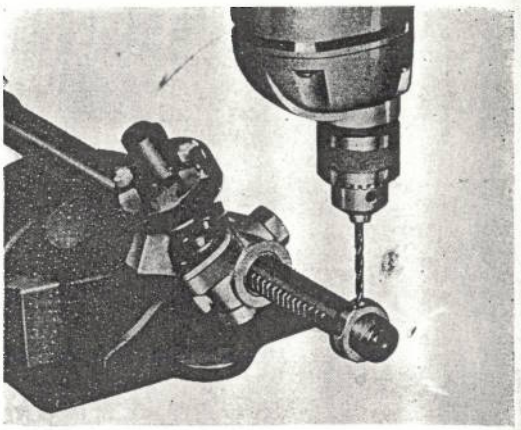


Removing the rod end

Fig. 5

Disassembling the steering unit

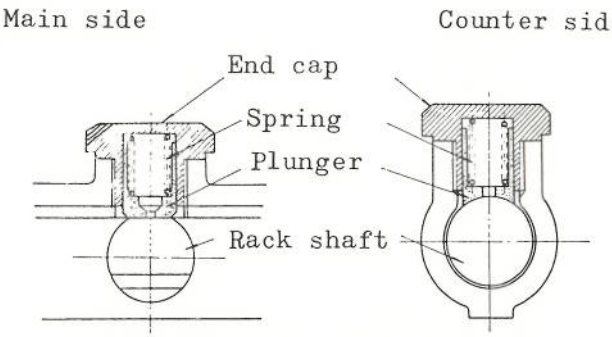
1. Take out the boot from the steering housing and turn down the knock pin and caulking on the lock nut with use of an electric drilling machine. Then pull out the remaining knock pin and remove the ball housing.



Removing the knock pin

Fig. 6

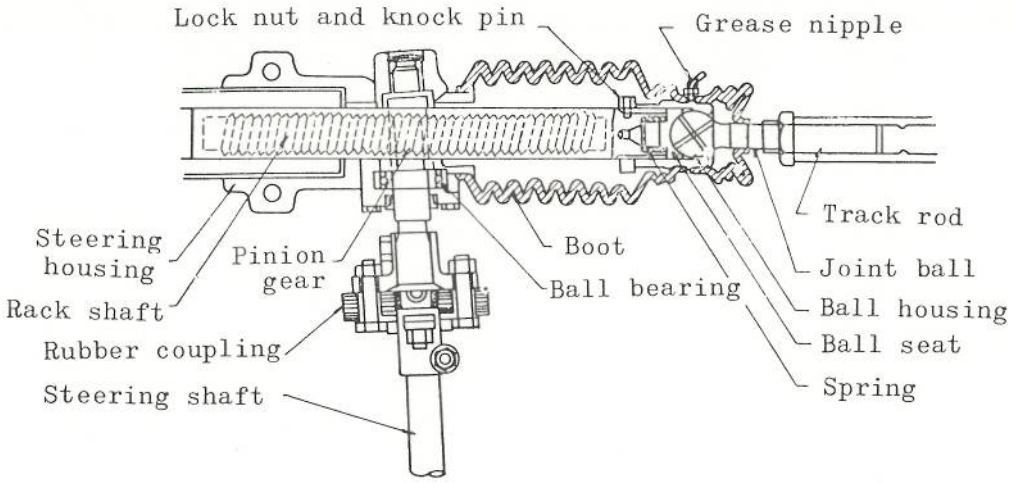
2. Remove the two plunger caps thrusting the rack shaft.



Removing the plunger caps

Fig. 7

3. Remove the rack shaft.



Sectional cut-away view of the major component parts

Fig. 8

Note: Wash all disassembled parts with detergent oil and check them for evidence of crack, damage or wear and make necessary replacement.

Adjusting the steering

1. Adjusting the rack shaft to joint ball contact. The rack shaft is connected with the joint ball through the adjustable joint to provide the joint ball with optimum contacting pressure. Correct adjustment can be obtained by tightening the ball housing in full and turn lose the adjuster 1/6 of a turn.

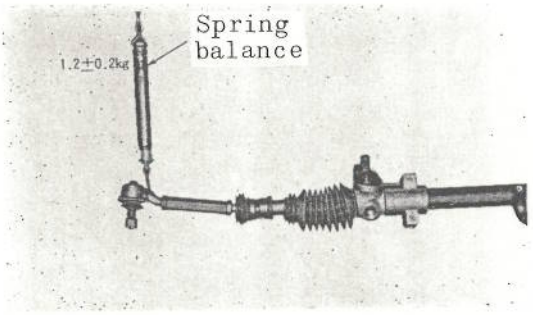
This adjustment provides 0.25 mm of clearance between the ball seat and rack shaft.

Upon completion of the adjustment, securely lock the ball housing with the lock nut.

Note: 1. Do not fit the knock pin into the lock nut at this state of adjustment.

2. When the above adjustment is made, check to see if the parts are provided with optimum preload. The standard preload is 1.2 kg ± 0.2 kg.

The preload can be checked in the following manner.



Measuring the preload

Fig. 9

3. Apply suitable chassis grease (Belpa) to the parts before refitting the rack shaft and pinion gear into the steering housing. Apply sufficient amount of grease (Molybdenum disulfide grease) to the parts before refitting the joint ball into the ball housing.

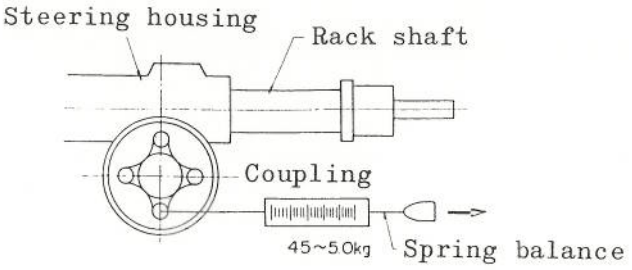
2. Torque required to turn the steering wheel

When the end caps on the right and left plunger are securely tightened, the coupling usually require 13 - 18 kg-cm torque for its operation. The above check ups should be made in the manner illustrated in Fig. 10 with the track rod end disconnected from the knuckle arm. (The torque required to rotate the steering, when measured at the flange setting bolt is 4.5 - 5.0 kg)

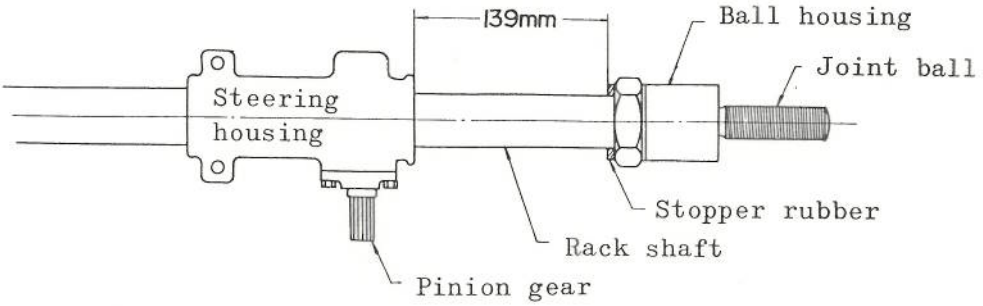
3. Adjusting the rack shaft travel

Correctly position the steering wheel before connecting the track rod end with the knuckle arm. The steering wheels turns three times from the lock to lock giving 139 mm of rack shaft travel. If the travel of the rack shaft is in excess of 139 mm, the distance of travel in excess should be compensated for by fitting the adjusting shim (44359-025) having thickness equivalent to the excess travel into the clearance between the ball housing and lock nut.

Parts name	Parts number	Thickness (mm)
Shim	44359-025	1.0



Measuring the torque required to rotate the steering wheel

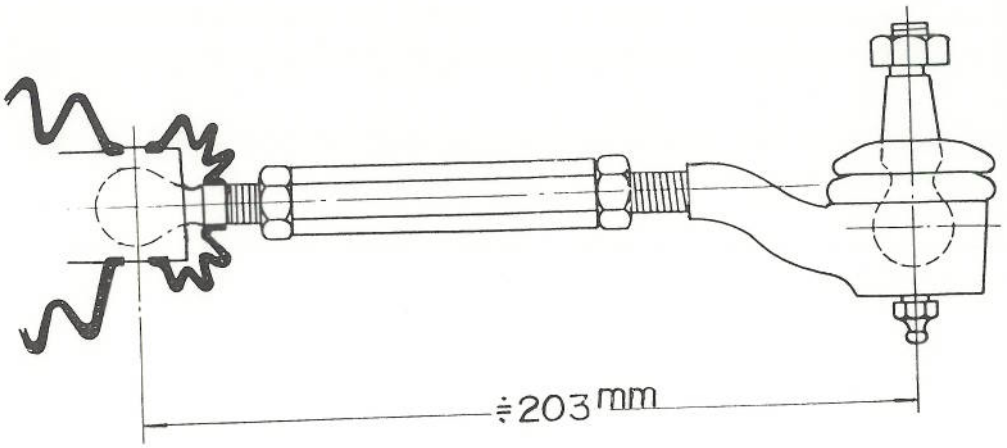


Adjusting the rack shaft travel

Fig. 11

4. Adjusting the track rod

Fit the boot, lock nut and track rod into the joint ball and adjust the fitting length of the right and left track rods to 203 mm. (Refer Fig. 12)



Adjusting the track rod

Fig. 12

5. Refit the steering unit and adjust the toe-in alignment.

Refitting the steering unit

1. Refit the steering unit to the cross member and tighten this to specified torque. The tightening torque is 2 ± 0.25 kg-m.

2. Clean the tapered portion of the track rod end before refitting. Tightening torque is 7 ± 0.5 kg-m.

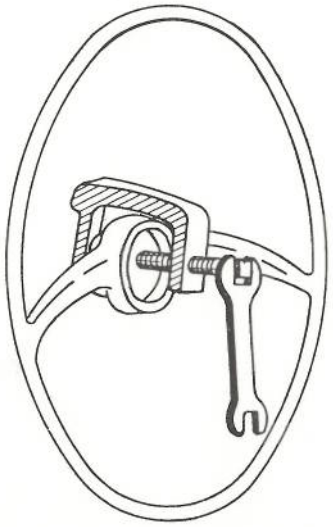
3. The pinion gear should be carefully fitted to the rack shaft to prevent entry of mud, dirt or other matters into the parts.

4. If the coupling is disassembled, horn grounding spring and cushion rubber should be properly fitted into their original position.

Removing the steering wheel and accessories

1. Remove the horn ring.

2. Remove the steering wheel with the aid of a puller (8521-0088).



Removing the steering wheel

Fig. 13

3. Pull out the flange key bolt from the coupling.

4. Pull out the steering shaft.

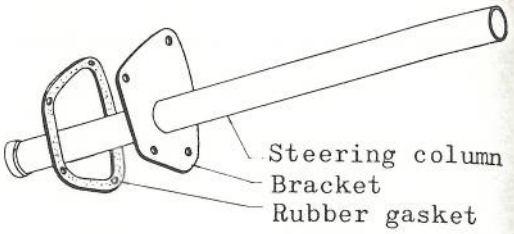
5. Remove the cowling, flasher switch and support bracket.

6. Remove the bracket on the dash panel side of the steering column.

Note: For model equipped with remote control transmission, disconnect the transmission control rod and check the steering column and upper bush for wear, and make necessary replacement.

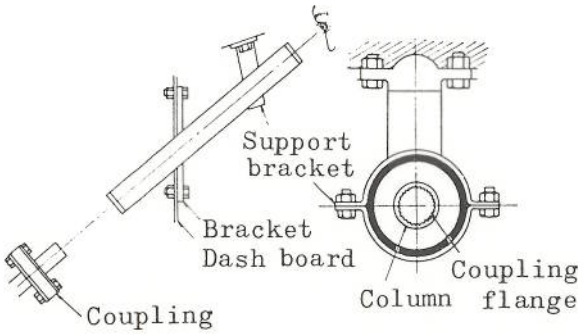
Refitting the steering wheel and accessories

1. Fit the steering column bracket to the dash panel and leave the bolts semi-tight. Fit the upper support bracket and align the coupling flange serration with the circumference of the steering column while looking them through the hole in the upper bush.



Fitting the rubber gasket

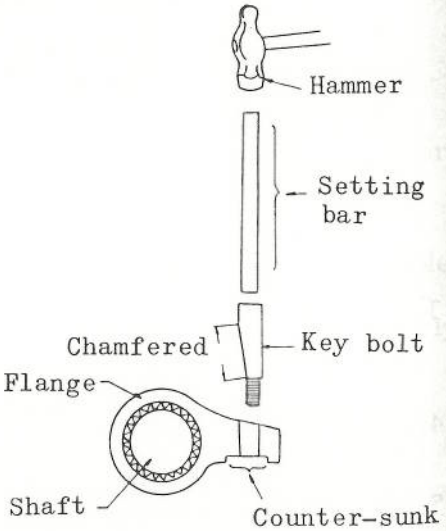
Fig. 15



Refitting the steering column bracket

Fig. 14

2. Refit the shaft and connect it with the corresponding parts at the coupling. Hold the flange with its counter-sunk part at bottom and fit the key bolt into the hole in the flange with the groove in the key bolt turned toward the shaft.



Refitting the key bolt

Fig. 16

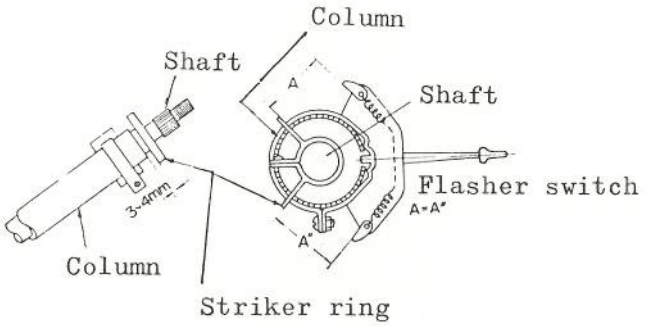
Note: 1. Apply adhesive compound (Cemedine 575) to the bracket gasket.

2. Apply ample amount of water-proof adhesive compound to the gasket.

3. Refit the steering wheel in straight-driving position and tighten it with the specified torque.

   The specified tightening torque is 11 ± 0.5 kg-m.

4. Correctly position the flasher switch to prevent the lever from coming into contact with the cowling and to give the lever free travel.



Refitting the flasher switch

Fig. 17

STEERING (for model KR)

Main data of steering

Gear type		Recirculating ball
Gear ratio		19.8
Steering angle	Inner	29° 05'
	Outer	25° 50'
Handle diameter		410 mm
Minimum turning radius		5200 mm
Oil capacity		0.2 ltr.

Illustration of the component part of steering system

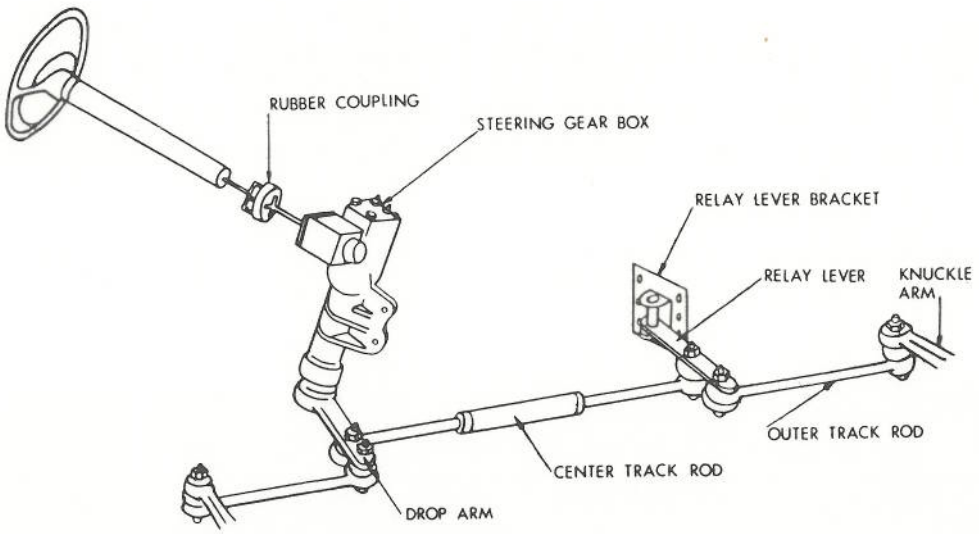


Fig. 18

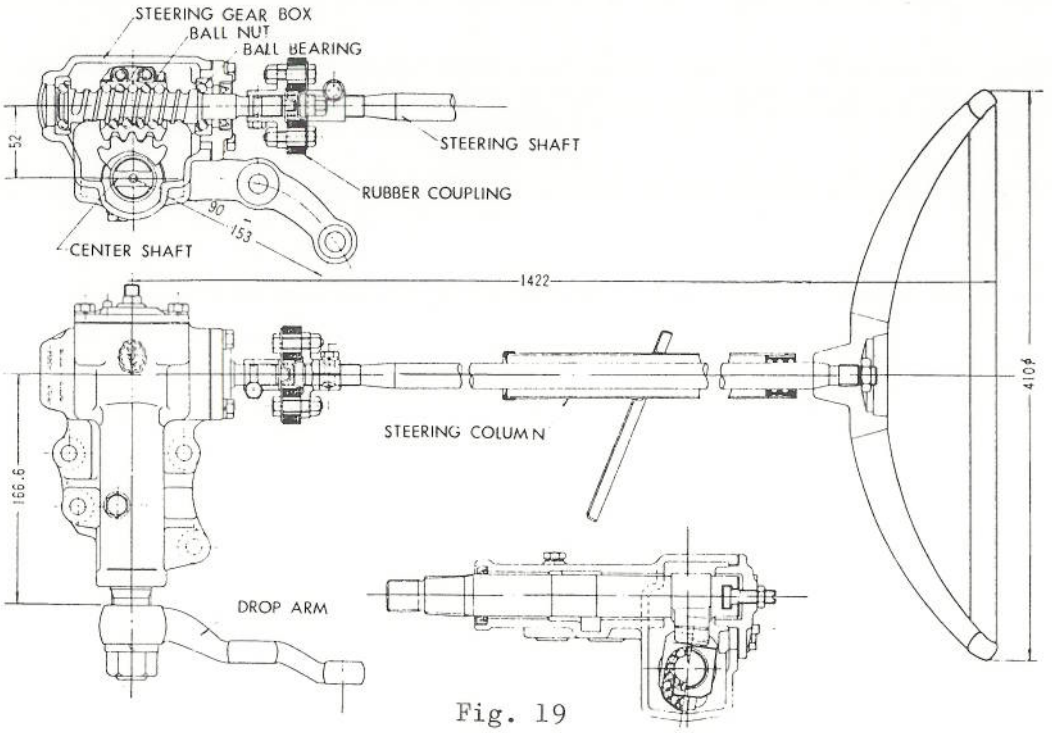


Fig. 19

Component parts of steering

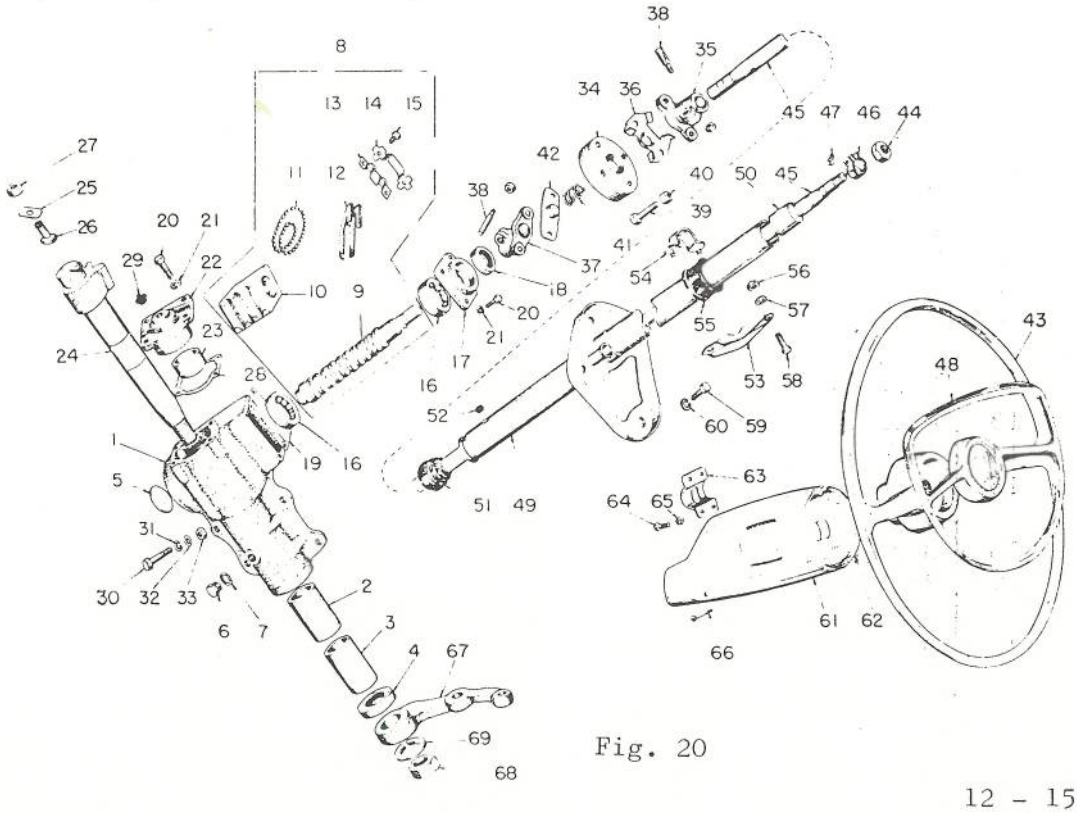


Fig. 20

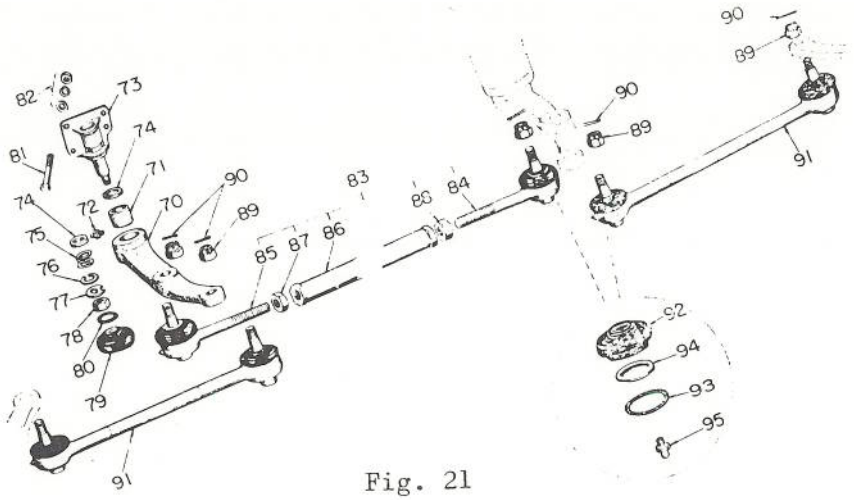


Fig. 21

Key	Part Name	Per Veh.	Key	Part Name	Per Veh.
	Steering unit	1	19	Shim; rear cover t=0.05mm	
1	Steering gear box assy.	1		" t=0.07mm	
2	Bush; sector shaft	1		" t=0.08mm	
3	"	1		" t=0.10mm	
4	Oil seal	1		" t=0.20mm	
5	Plug; plate	1	20	Bolt; cover to gear box	8
6	Plug	1	21	Spring washer	8
7	Packing;	1	22	Top cover assy.	1
8	Worm & ball nut assy.	1	23	Bush; sector shaft	1
9	Steering worm	1	24	Sector shaft	1
10	Ball nut	1	25	Shim; sector shaft	
11	Steel ball (1/4)	58		$t=1.5^{+0.02}_{+0.03}$mm	
12	Ball tube; ball nut	4		" $t=1.5^{+0.05}_{+0.06}$mm	
13	Ball tube clamp	1		" $t=1.5^{+0.08}_{+0.09}$mm	
14	Lock plate; ball tube	1		" $t=1.5^{+0.11}_{+0.12}$mm	
15	Screw; ball tube to ball nut	2		" $t=1.5^{+0.14}_{+0.15}$mm	
16	Brg.; steering worm	2			
17	Rear cover; steering gear box	1			
18	Oil seal; steering worm	1			

Key	Part Name	Per Veh.
26	Adj. screw; sector shaft	1
27	Lock unit	1
28	Packing; top cover	1
29	Plug; oil filler, top cover	1
30	Bolt; ... steering unit fix.	1
	" "	3
31	Spring washer	10
32	Washer	3
33	Nut	2
34	Coupling; steering shaft	1
35	Flange; coupling steering shaft	1
36	Thrust piece	1
37	Flange; steering worm coupling	1
38	Pin	2
	Nut	2
39	Bolt	4
40	Oddie nut	4
41	Spring; horn earth	1
42	Thrust piece	1
43	Steering wheel	1
44	Nut; wheel fix.	1
45	Steering shaft	1
	Bush; steering shaft	1
46	Striker ring	1
47	Screw; ring to shaft	1
48	Horn ring assy.	1
49	Steering column assy.	1
50	Bush; steering shaft, upper	1
51	Grommet steering column end	1
52	Grommet	1
53	Bkt.; steering column, low	1
54	Clip; steering column	1
55	Rubber packing	1
56	Nut	2
57	Spring washer	2
58	Bolt	2
	Spring washer	2
	Washer plane	2
59	Screw; column to dash	4
60	Spring washer	4
	Washer; plane	4
61	Cowl; inner, steering column	1
62	" outer, "	1
63	Clip; steering cowl fix.	1
64	Screw	4
65	Spring washer	4
66	Screw	2
	"	1
67	Drop arm	1
68	Nut; Drop arm fix.	1
69	Spring washer	1
70	Relay lever assy. w./bush	1
71	Bush; relay lever	2
72	Grease nipple	1
73	Relay lever bkt.assy.	1
74	Washer; plane	2
75	Spring	1
76	Washer; lever to shaft	1
77	Lock washer; "	1
78	Nut; "	1
79	Dust cover; relay lever	1
80	Clip; dust cover to relay lever	1
81	Bolt; relay bkt. to frame	3
	" "	1
82	Washer; plane, "	1
	Nut "	1
	Spring washer "	4
83	Track rod assy. center	1
84	Rod end assy.; right	1
85	" left	1

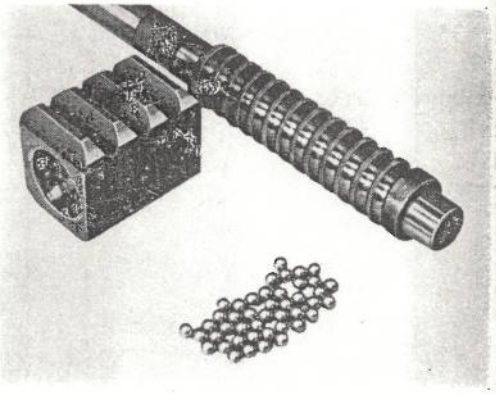
Key	Part Name	Per Veh.	Key	Part Name	Per Veh.
	Grease nipple	2	92	Boot	4
86	Adj. tube	1	93	Garter spring	4
87	Nut	1	94	Washer	4
88	Nut; left-thread	1	95	Grease nipple; straight	4
89	Nut	6			
90	Split pin	6			
91	Track rod assy.; outer	2			

Major component parts of steering system

1. ... The worm and ball nut that form the main body are both threaded with arc shaped cross section male and female thread grooves precisely polished and with 58 pieces of ball as medium, it is fitted together. Structurally it is like a ball bearing filled with balls between the rough male and female thread tops. Because of it, sliding friction is replaced to rolling friction, which enables light moving and the steering very smooth. (Fig. 22)

2. ... The balls take up that load and with the elasticity of slender worm, the shocks are softened.

3. ... On both ends of worm, ball bearings are used and the outer race bearings are installed in the gear box. (Fig. 23)



Shaft, ball nut & balls

Fig. 22

4. ... Ball tube is a "U" shaped bent pipe, split into two perpendicular and built in to a unit. At both ends, space shaped portion is gained to scoop up the balls.

Also to prevent the balls rolling out from the final end of ball nut, a means is provided at the portion close to the end, passing it through ball tube and returns to original state. (Fig. 24)

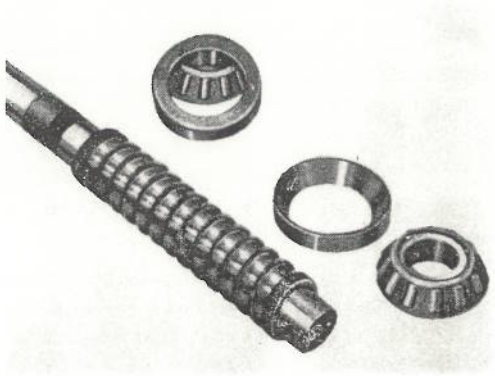


Fig. 23 Shaft and bearing

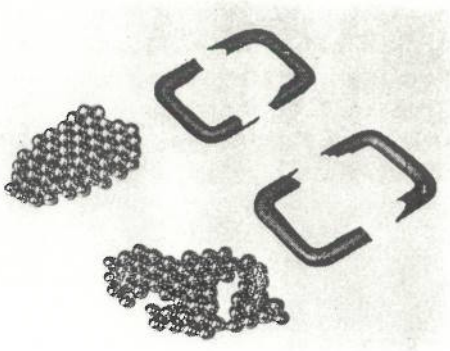
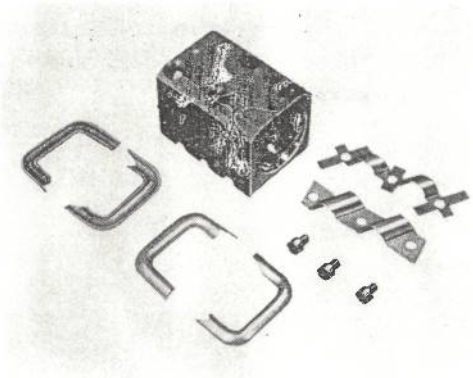


Fig. 24 Balls and ball tube



Ball nut and ball tube

Fig. 25

5. ... The ball rotation circuit is divided into 2 rows by the 2 sets of ball tube, but this is safety purposes, should one side circuit fails, the other circuit maintains normal function. (Fig. 25)

6. ... Sector gear is cut out in same body with secter shaft and its tooth surface is inclined 7°30' against the shaft center

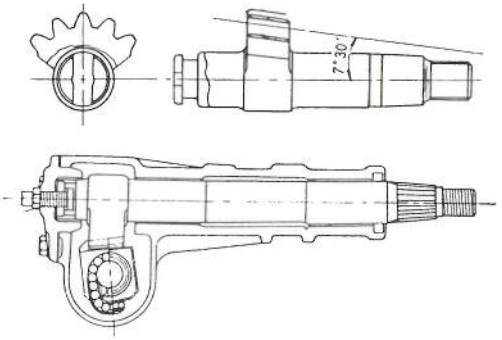
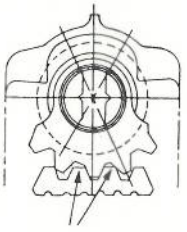


Fig. 26 Sector shaft



Central 2

Fig. 27

of sector shaft. With this inclined angle, it meshes with the ball nut rack and in case the mesh between sector gear and rack is to be adjusted, change the meshing position at this angle to adjust.

7. ... Among the 4 rack teeth of ball nut, the central 2 expecting more wear because of greater frequent usages, it is thicker by 0.12 mm than the teeth of both ends.

To remove steering unit

1. ... Remove the knock bolt on steering shaft side of the steering rubber coupling.

2. ... Remove horn ring and then pull out the steering wheel approximately 50 mm.

3. ... Using Puller Ass'y; drop arm (Part No. 8521-0085), remove drop arm from the steering sector shaft.

4. ... Loosen the 4 bolts that fix to the frame and take out the steering unit downward or upward of frame.

To fit steering unit

1. ... Fitting operations are performed by reversing the procedures of "To remove".

Tightening torque is as follows.

Steering unit fixing bolts:	10ϕ 4~5 m-kg.
"	12ϕ 7~9 m-kg.
Sector shaft and drop arm fixing nut:	21~22 m-kg.
Rubber coupling knock bolt:	2~2.5 m-kg.
Steering wheel fixing nut:	11~12 m-kg.

To disassemble, check and assemble steering unit

Ball recirculating type steering is durable and wears and damages are slight. As to the worm shaft assembly (proper name-worm and ball nut assembly), it is warranted by the manufacturer. As an indication for this, the lock plate of ball tube is sealed by being soldered. Therefore unless for special reason, this seal should not be removed.

Removing the seal destroys makers warranty.

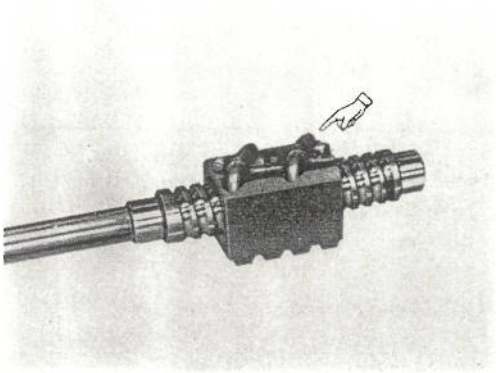


Fig. 28 Clamp sealed

TO DISASSEMBLE

Prior to disassembly, drain the oil from inside the gear box.

1. Loosen the lock nut of adjust screw.

2. Turn adjust screw slightly counter clockwise to lift the mesh of sector shaft gear and ball nut. Next, remove the fixing bolts of top cover.

3. Hold top cover so that it shall not revolve and revolve the adjust screw clockwise to remove top cover from the adjust screw.

4. Remove the adjust screw and adjust screw shim from the groove of sector shaft.

5. Revolve the sector shaft until to the straight forward position and pull out from the top cover side of gear box.

   Note: In this case, be careful not to damage the sector shaft serration and oil seal of the threaded portion.

6. Remove the flange of rubber coupling at the worm shaft side.

7. Remove rear cover bolts and take out the rear cover with bearing and oil seat fitted together.

8. Remove worm and ball nut assembly from the gear box rear cover side.

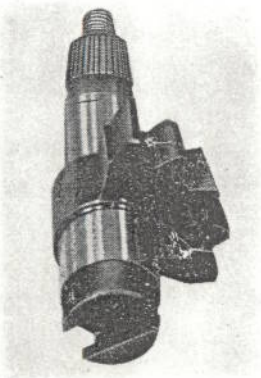
Note: If worm and ball nut assembly is stood on ends, it shall roll off by ball nut's own weight and will crash against the end portion of the worm thread grooves, damaging the ball tube. Therefore keep it always paralle.

9. Remove the bearing outer race fitted to the steering gear box.

TO CHECK

Wash disassembled parts with clean light oil, gasoline and or with cleaning solvent. Check visually in details the worm bearing, worm, ball nut, sector shaft and replace those with excessive wear, corrosion or crack.

The worm and ball nut assemblies of worm, ball nut, balls are selective combinations, hence in case any one part among them is damaged, it should be replaced with worm and or ball nut assemblies. Using with replacement only of such damaged part should be absolutely refrained.



Checking sector shaft

Fig. 29

Worm bearing, sector shaft, oil seal, gear box and cover are permissable to be replaced individually.

TO ASSEMBLE AND TO ADJUST

1. Press-in the ball bearing of worm shaft both ends to the body and rear cover.

2. Insert worm shaft assembly to the gear box.

3. Fit rear cover to the gear box.

   Insert shim between rear cover and box and adjust so that suitable pre-load is forced to the worm bearing.

   First of all, insert the shim used prior to disassembly and fix rear cover to the box.

4. To measure pre-load of worm shaft.

   Fit the steering wheel to the worn shaft, hook spring balancer to the wheel spokes outer edge portion and pull properly in tangential direction. At this instant, confirm that the steering shaft is in straight driving position.

If reading at moment the steering wheel begins turning is 160 ~ 270 gr, then it is proper. However if this drive force surpasses 270 gr, increase shim and adjust so that it shall become 160 ~170 gr. In case the drive force does not come up to 160 gr, replace with a thinner shim or lessen a shim and adjust to its proper drive force.

When installing shim, wipe clean both surfaces of shim so that dusts or metal filings are uninserted.

For adjusting shim, following kinds are available.

Rear cover adjust shim

Parts No.	Thickness (mm)
44235-038	0.05
44235-039	0.07
44235-040	0.08
44235-041	0.10
44235-042	0.20

5. When adjustments by shim are finished, fix securely the rear cover.

6. Perform assembly adjustments of sector shaft.

Insert fit the adjust screw to the "T" shaped groove of sector shaft and check to see that gap is not present between adjust screw crown and sector shaft, moreover whether adjust screw slides lighty or not. Next adjust with shim so that this gap becomes 0.05 mm.

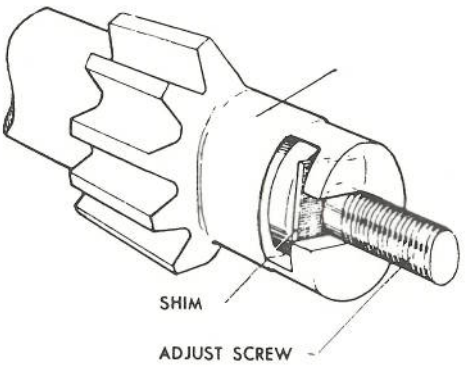


Fig. 30

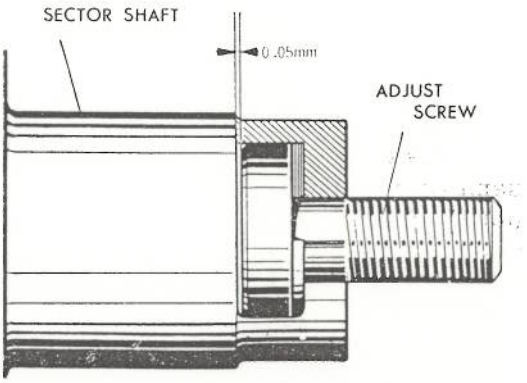


Fig. 31

7. Screw-in top cover to adjust screw and fit sector shaft to top cover bush.

8. Place ball nut at center and put in sector shaft to the gear box.

At this instant, the sector's central tooth should mesh with the central groove of rack.

9. While confirming that ball nut and sector shaft are meshing in proper condition, fix the side cover.

Kinds of adjusting shim

Shim thickness (mm)	Parts No.
1.5 $^{+0.030}_{+0.020}$	44279-008
1.5 $^{+0.060}_{+0.050}$	44279-009
1.5 $^{+0.090}_{+0.080}$	44279-010
1.5 $^{+0.120}_{+0.110}$	44279-011
1.5 $^{+0.150}_{+0.140}$	44279-012

10. Adjust the mesh of rack and sector shaft gear of ball nut with the adjust screw to absorb excessive play. (By turning the adjust screw clockwise, backlash becomes lessened).

11. Fill designated oil to regulated amount. (Be careful especially not to mix dusts or metal filings). Following oils are recommended.

Belpa H, hypoid gear oil SAE 90.

12. To reconfirm, measure the pre-load of steering unit.

This method is similar to in the case of measuring the pre-load of worm bearing. Pre-load standard value is 180 ~ 750 gr.

This measuring should be performed in straight forward condition.

Disassembly and reassembly of worn shaft assembly

Disassembly of worm shaft assembly should not be performed not saying the least by user but also by service shop. In case one of the parts among the worm shaft assembly is defective, replace wholly the worm shaft assembly. When the seal of ball tube is cut either by user or dealer, manufacturer is not liable to any responsibility on the component parts, regardless of any circumstances.

Since the section is precisely processed, even though disassembled under circumstances urgently inevitable, careful attention should be paid on its handling.

TO DISASSEMBLE WORM SHAFT ASSEMBLY

Break the seal and remove the tube clamp.

Remove ball tube of one side. (Do not remove both sides at once). To prevent scattering of balls, place receiving plate and work above it.

Remove 1/2 turn the ball nut and face downward the tube inserting hole and while revolving the worm gently, draw out the balls.

Confirm whether all the balls have come out from one circuit by counting its numbers. The circuit has 29 balls.

To prevent erroneous interchanging of balls from other circuit, store them in separate box.

Remove the ball tube of the remaining side and draw out the balls similarly. Arriving just prior to completion of drawing out all, hold firmly by hand ball nut and worm to prevent contact of ball nut and worm.

Remove worm while being careful not to strike ball nut to worm.

Check visually disassembled parts for wear and presence or not of damages. Since worm, ball nut and balls are selected combination, in case even a single part is found damaged, it should be replaced with a complete unit of worm shaft assembly.

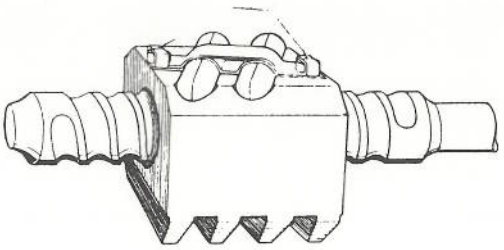


Fig. 32

For instance, even when one steel ball is damaged, replace with worm shaft assembly. Needless to say, replacing only of the said steel ball, but although all numbers of steel ball are replaced, is should not be operated. It will lead to greater troubles.

TO ASSEMBLE WORM SHAFT ASSEMBLY

Insert worm inside ball nut, maintain worm parallel and coincide worm groove and ball nut in shaft direction.

While revolving the worm little by little, put-in balls one by one closely from the ball tube hole of ball nut.

At this instant, if the balls should enter to other circuit or be caught in the gap of worm nut other than the circuit, the worm shall stop revolving, therefore insert a piece of stick to the ball inserting other circuit, to prevent deranging the worm's thread groove and nut's thread groove.

When the ball initially inserted comes out to the opposite side ball tube hole of the same ball circuit, then stop the revolution of worm.

Arrange the remaining balls inside the ball tube and stop with grease both ends of tube to prevent balls falling out.

At this instant, do not allow worm to revolve. If worm is made to revolve, balls will enter in the 2 circuits, causing damages to ball tube.

Apply the same procedure for inserting balls into circuit.

Fit clamp and lock plate and lock the fixing bolts.

After assembly, when worm is stood up perpendicular, the ball nut should drop smoothly while revolving on its own weight.

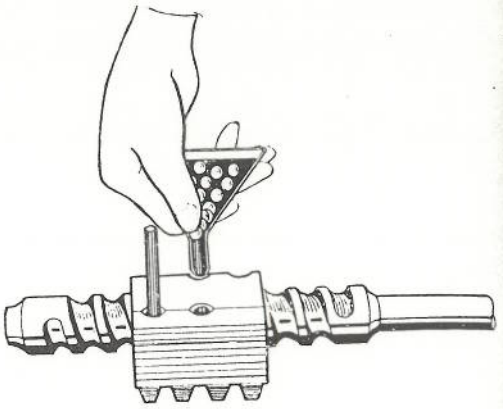


Fig. 33

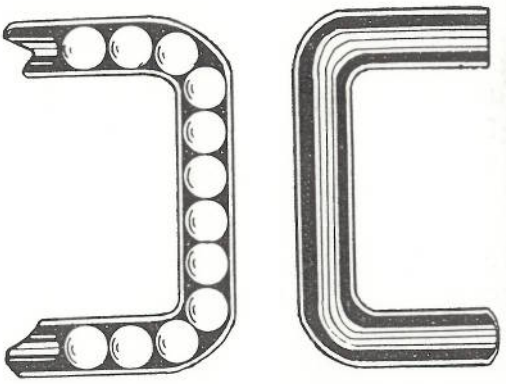


Fig. 34

Troubles and countermeasure of steering system

The functions of steering influence greatly to correlative devices, therefore to discover the troubles, the following devices also should be checked at same time.

Front wheel alignment
Front hub bearing
Tires and its air pressure
Service brake
Frame alignment
Front suspension

King pin
Front axle
Connecting devices

STEERING IS HEAVY

Jack-up the front axle and turn the steering wheel left and right. When it is still heavy, disconnect the drop arm and once again turn the wheel. If it is still heavy as before, it may be considered that something parts in the steering unit is defective. Most probable causes of trouble and countermeasures are:

Cause	Countermeasure
Insufficient lubrication oil	Replenish oil
Faulty sliding of adjust screw and sector shaft	Adjust with side cover shim
Too small backlash of sector gear	Adjust backlash
Too great pre-load of worm bearing	Rear cover shim adjustment
Damaged worm shaft component parts	Replace worm and ball nut assembly
Damaged worm bearing	Replace concerned parts
Too tight or steering bush seizure	Replace bush

As causes aside from steering unit.

Too tight joint portion each
Too tight king pin
Deranged front axle
Insufficient tire air pressure

Pay close attentions to the above.

PART 13

BODY AND ACCESSORIES

CONTENTS

PART 13 BODY AND ACCESSORIES

Introduction

This chapter deals mainly with the body of the Bellett, however, the service information on engine hood, windshield and doors of the Bellett are readily applicable to those on the Wasp because these parts are mechanically identical.

The correct procedures for removing and refitting the front body and pick-up body of the Wasp are given at the end of this chapter.

FEATURE OF THE BELLET BODY

The body of the Bellett has unitary-construction.

Advantages given by the passenger car with unitarily-constructed body are:

1. Light-weight

It is generally known that the unitarily-constructed body can be made lightest.

2. Strength

The body with unitary-construction is generally known to be more advantageous than the others with frames for its greater bending strength and torsional strength. The production of body with frame still involves a problem in the method of combining the body with the frame.

3. Seat arrangement

In designing the passenger cars, efforts have been made to improve stability by lowering the floors. Here again, the body with unitary-construction proves to be better than the body with frame. Lowered floor gives larger head clearance, leg room and contributes to improved seat arrangement.

Engine hood

REMOVING THE RELEASE LEVER

1. Remove the return spring.

2. Loosen the control cable clip, inner wire stopper bolt and remove these parts. (Fig. 1)

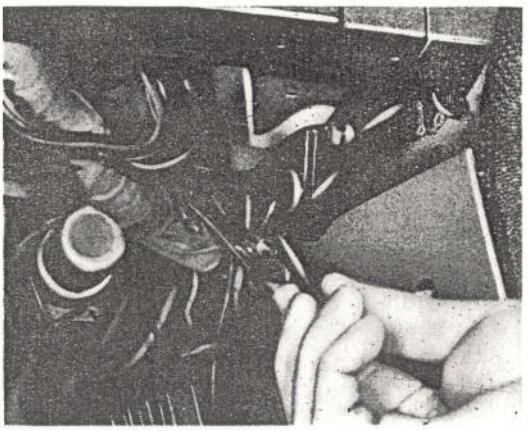


Fig. 1

3. Take out the release lever fixing bolts.

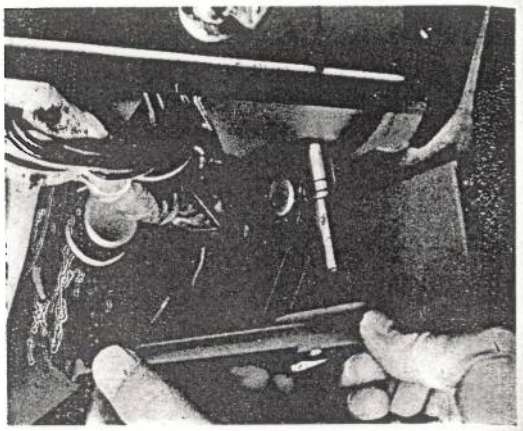


Fig. 2

REFITTING

Carry out the work in the reverse order of removal.

REMOVING THE ENGINE HOOD CONTROL CABLE

1. Remove the clip on the release lever side and loosen the stopper bolt.

2. Expand the dash upper clip and unfasten the cable downward.

3. Remove the clip on the engine hood lock.

4. Withdraw the cable toward the engine compartment.

5. Deflect the cable and position it on the left hand side of the dash panel and align its end with the groove in the lock lever.

6. Lift the pin on the cable end and remove the cable. (Fig. 3)

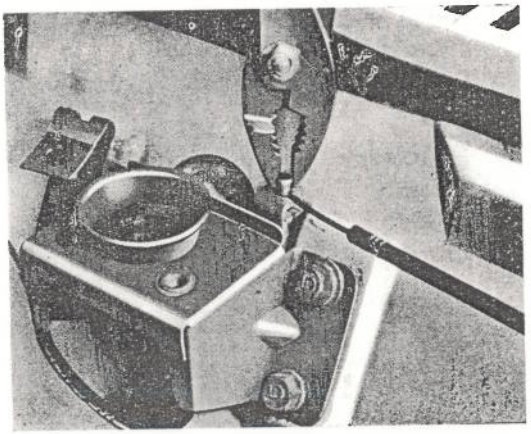


Fig. 3

REFITTING

Carry out the work in the reverse order of moval.

Note: 1. When setting the cable at the release lever side, the inner cable should be extended 20-30 mm from the stopper bolts. (Fig. 4)

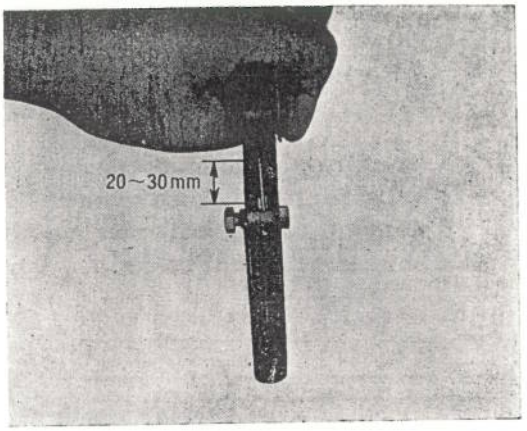


Fig. 4

2. When setting the clip on the release lever side, alignment should be made to bring the inner cable in the center of the outer cable to prevent the inner cable binding in the outer cable. (Fig. 5)

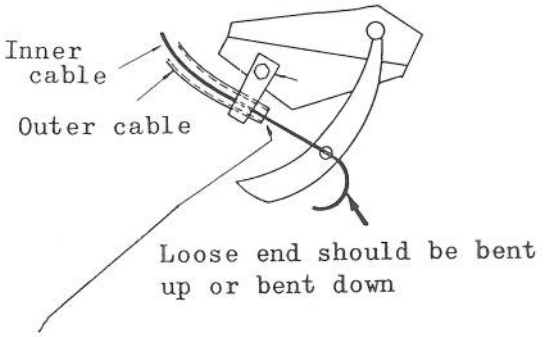


Fig. 5

3. The tip end of the cable should be bent up or bent down to keep it from coming into contact with hand.

4. Clips should be carefully clamped to prevent damage to the outer cable.

ENGINE HOOD LOCK

REMOVAL

1. Remove the engine hood control cable clip.

2. Take out the lock fixing bolts.

3. Turn the lock a half turn to align the groove in the lever with the inner cable.

4. Lift up the pin on the cable end and remove the lock from the cable.

REFITTING

Carry out the work in the reverse order of removal.

ENGINE HOOD

REMOVAL

1. Turn loose all four bolts on the right and left hinges and take out three bolts from each hinge. (Before removing the hinges, apply setting marks with a scriber to facilitate refitting the hinges to their original positions). (Fig. 6)

2. With the engine hood in suspension, remove the engine hood stay fixing nuts and remove the stay from the engine hood.

3. Support the engine hood with hands and shoulder, remove the bolts remaining on the hinges and then remove the engine hood. (The bolts on the right and left hinges should be removed at the same time by two men working on the hinges.)

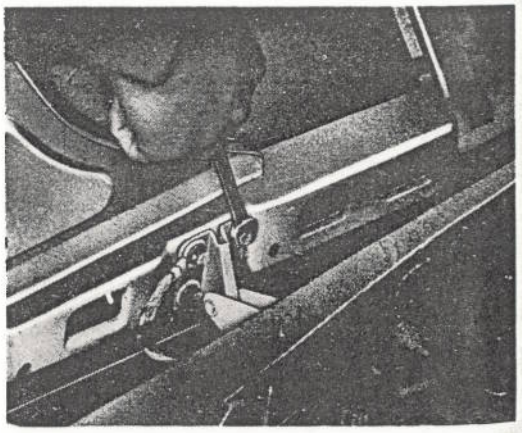


Fig. 6

REFITTING

1. Carry out the work in the reverse order of removal. The bonding cable should be fastened together with the hinge.

ENGINE HOOD ADJUSTMENT

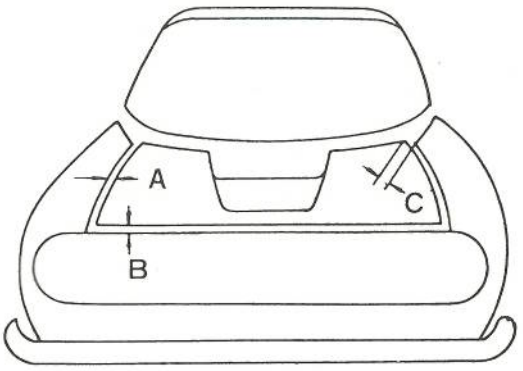
1. A ... Side clearances between the engine hood and fenders. (horizontal adjustment)

   B ... Alignment with the front part of the fenders. (vertical adjustment)

   C ... Alignment with the rear part of the fenders. (vertical adjustment)

   These adjustment can be made by adjusting the setting position of the hinges. (Fig. 7)

   Note: After the adjustment the bolts should be securely tightened.



Engine hood adjustment

Fig. 7

2. Engine hood lock adjustment

   a. For vertical adjustment, loosen the lock nut on the striker and turn the spigot with a screwdriver as required. (Fig. 8)

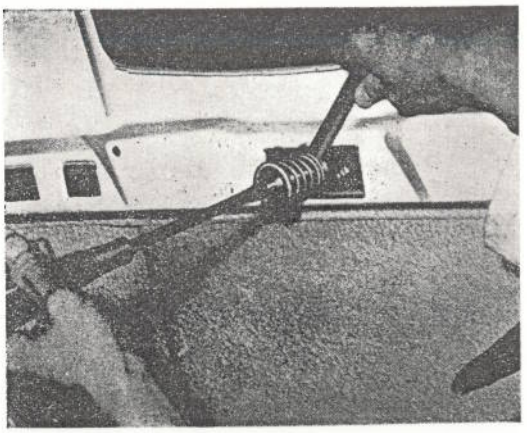


Fig. 8

b. For longitudinal adjustment (front and rearward), loosen the striker setting bolts and move the striker as required.

c. For transverse adjustment (sideway), loosen the lock assembly fixing bolts and move the lock assembly as required.

Note: The bolts and nuts should be securely tightened after the correct adjustment is made.

Fenders

REMOVAL

1. Remove the doors. (See subparagraph "Doors").

2. Remove the rear view mirrors on the fenders and radio antenna on cars so equipped. (On deluxe models the antenna is on the right side fender).

3. Remove the headlamp rim.

4. Remove the headlamp assembly.

5. Take out the fender fixing bolts and nuts.

   a. Balance panel setting bolts: 5.

   b. Headlamp setting bolts: 4

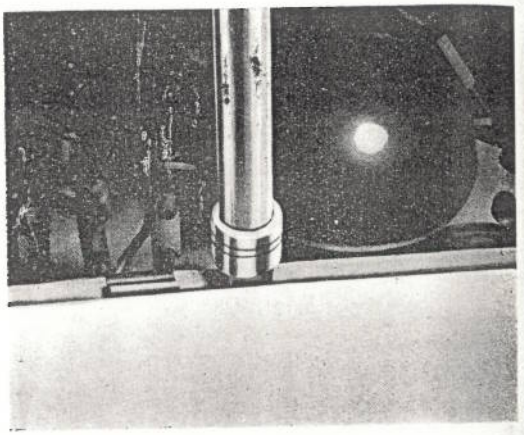


Fig. 9

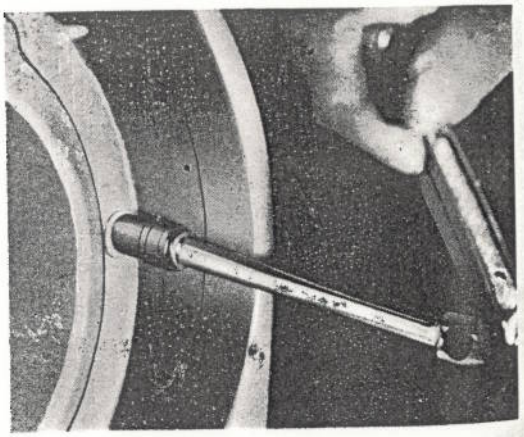


Fig. 10

c. Setting bolts behind the front bumper: 2

d. Setting bolts on the lower part of the A post: 5

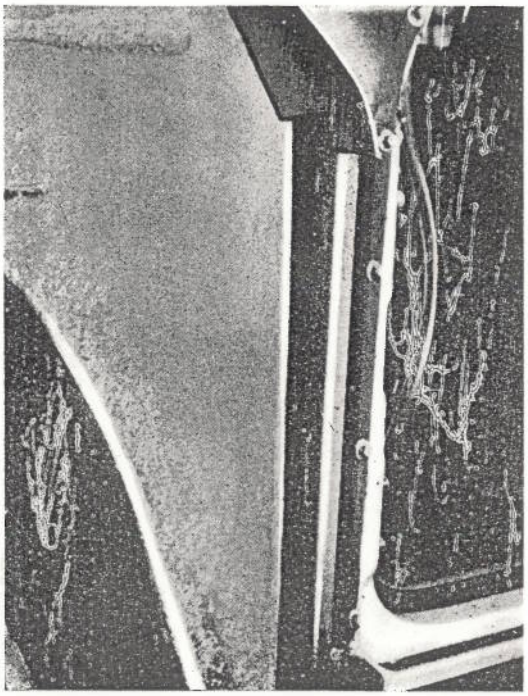


Fig. 11

e. Setting bolts and nuts on the lower rear part of the fender: 1

6. Take out the bulb from the side flasher lamp.

REFITTING

1. Remove the rust primer (rust inhibitor) and adhesive compounds (Cemedine 333) from the fenders.

2. Apply rust primer (rust inhibitor) and adhesive compounds (Cemedine 333) to the fenders.

3. Carry out the work in the reverse order of removal.

4. After refitting, check the alignment and make adjustment as necessary.

Windshield glass and rear window glass

WINDSHIELD GLASS

REMOVAL

1. Remove the windshield wiper arms and blades.

2. Hold one of the legs against the inner face of the windshield glass while the other man hold his hand on the spot from the outside. (Clean cloth pad should be attached to the leg to prevent damage to the glass). (Fig. 12)

Fig. 12

3. Carefully apply foot pressure to the corner of the windshield glass to work it away from the body together with the weather strip. (Glass may be moved away slightly from the body).

   Note: If application of reasonable foot pressure to the glass fails to force the windshield outward, don't impose undue stress upon the glass and try the other corner of the glass.

4. Gradually slide the leg over the glass.

5. Force the whole part of the glass away from the body.

6. A man working on the outside holds the lower part of the glass and release it from the body. (Fig. 13)

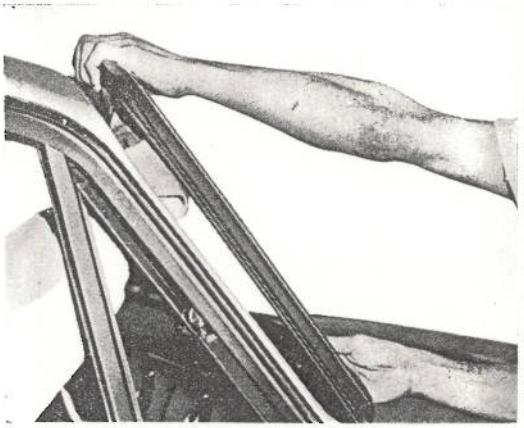


Fig. 13

7. Remove the weather strip from the glass.

Caution: 1. Do not apply unreasonable foot pressure to the windshield glass.

2. A man working on the outside should pay close attention to the glass to prevent accidental damage to the glass.

3. This work necessitates well-controlled two-men's team work.

REFITTING

1. Fill the weather strip with sealer (sealant 770GA) through the entire length. (Fig. 14)

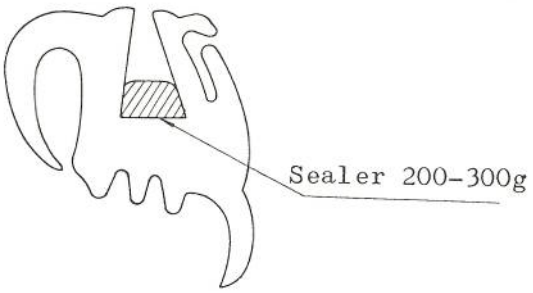


Fig. 14

2. Mount the glass on a work bench with the inside faced up.

Note: There are provided optimum clamping interferences between the weather strip and glass so that this interference should be distributed evenly over the entire edge of the glass.

3. Refit the weather strip to the glass. (Fig. 15)

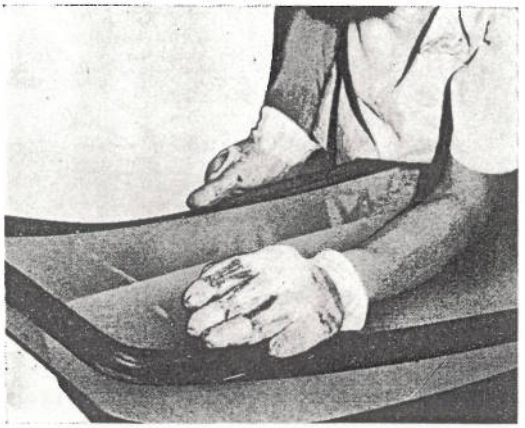


Fig. 15

4. Turn the glass up side down and apply soap water to the bead setting groove.

5. Fit a string (3ϕ nylon string is preferred) into the groove through the entire length.

6. With a needle with a hook on its end, rise the lip on the groove and fit the beading into the groove. (Figs. 16 and 17)

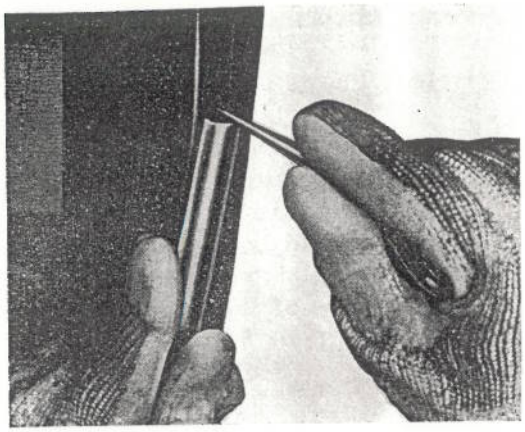


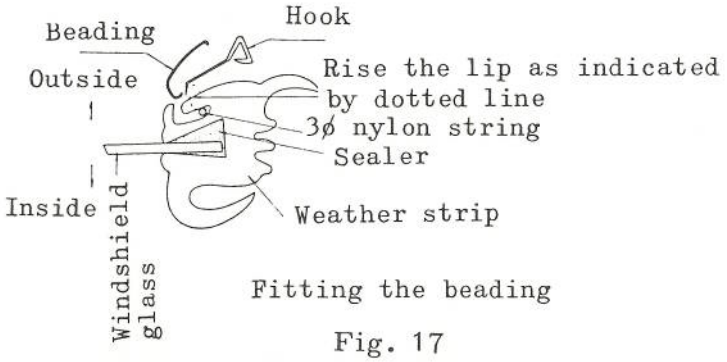
Fig. 16

7. Pull the string downward and work out through the entire length while force fitting the beading. (Fig. 18)

8. Fit the upper and lower part of the cover plate.

9. Turn the windshield glass upside down.

10. Fit the glass setting string (5ϕ) to the weather strip. (Fig. 19)



Fitting the beading

Fig. 17

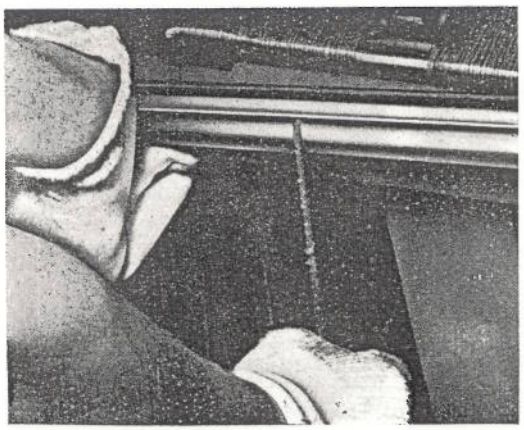


Fig. 18

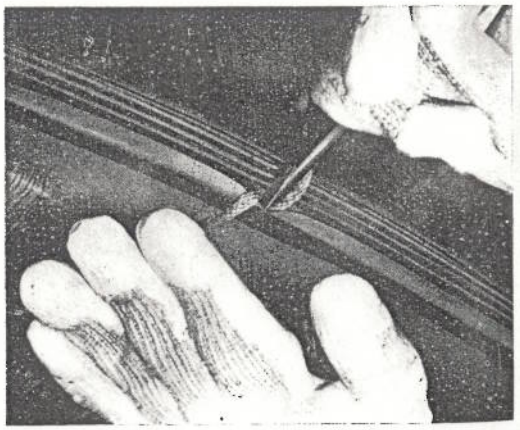


Fig. 19

11. The ends of the string should be overlapped each other at the lower part of the glass. (Figs. 20 and 21)

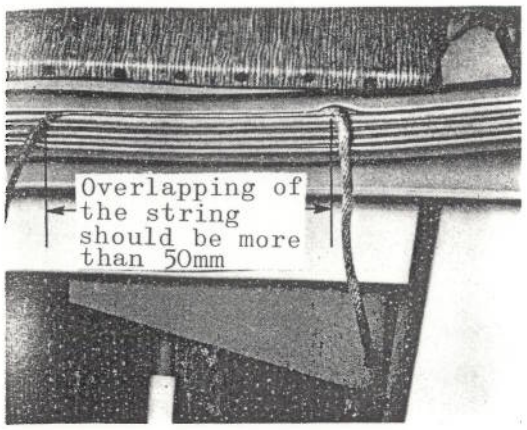


Fig. 20

Fig. 21

12. Apply sealer (sealant 770GA) to the bonding face of the body. (Fig. 22)

13. Upon completion of the above work, position the glass on the body and leave the loose end of the string inside the body. (Fig. 23)

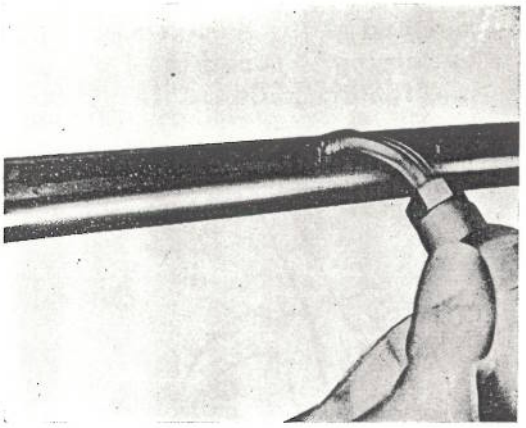


Fig. 22

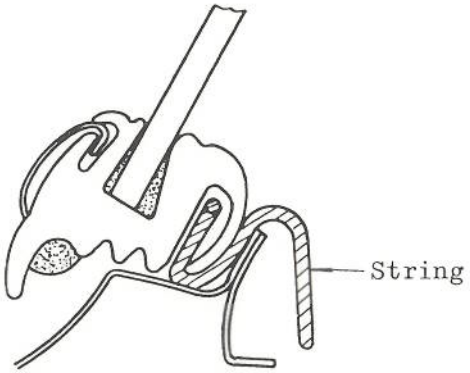


Fig. 23

Note: The glass should be properly aligned with the body.

14. From the outside, lightly knock the entire face of the glass with a rubber hammer to bring the glass as close as possible to the body.

15. Knock the lower center part of the glass with a rubber hammer and at the same time, pull the string to force the lip turns into the body side. (Fig. 24)

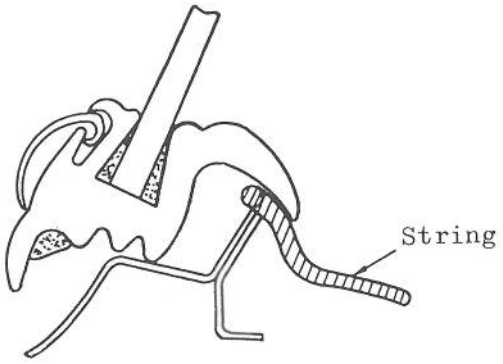


Fig. 24

16. Repeat this operation until one side is fitted.

17. Pull the string on the other side and fit the remaining side.

18. Snap in the upper part of the glass into position.

19. Check the fitting through the entire part of the glass and use a rubber hammer to secure the fitting where necessary.

20. If the lip is not properly fitted, rise the part of the lip with a hook on the needle and fit this properly into position. (Fig. 25)

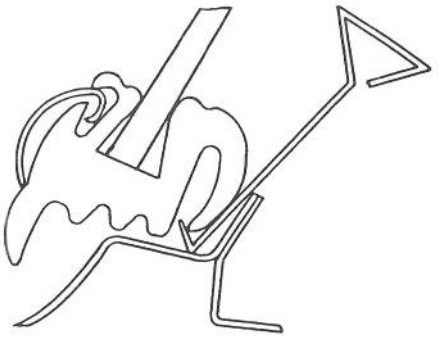
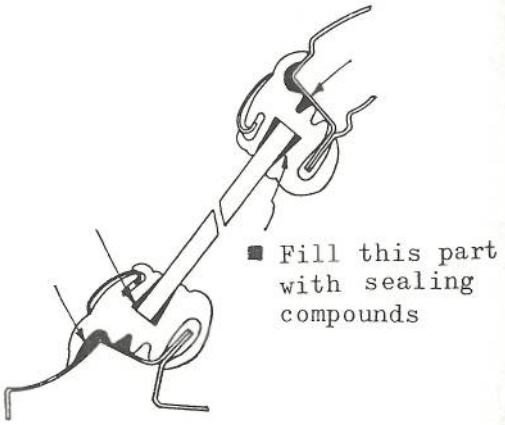


Fig. 25

21. With gasoline containing no ethyl-lead or with mineral spirits, wipe the excess adhesive compounds before drying. (Fig. 26)



Glass as mounted in position

Fig. 26

REAR WINDOW GLASS

REMOVAL

1. Carry out the work in the same procedure used for removing the windshield glass.

REFITTING

1. Apply the same procedure used for refitting the windshield glass. The rear window glass does not use beading.

Doors

TRIM PAD

REMOVAL

1. Remove the garnish moulding.

2. Remove the inside door handles, and window regulator handles.

Procedure of removal

Press the escutcheon toward the base side and pull out the cross pin with a needle. Then remove the handle.

3. Remove the arm rest or door pull from the right front door.

4. Remove the trim pad.

Procedure of removal

Insert a screw driver between trim pad and door inner panel and pry the panel away unsnapping the fasteners.

Caution: A screwdriver should be brought close to the fasteners to prevent the fastener from being released from the pad.

REFITTING

1. Carry out the work in the reverse order of removal.

Note: 1. Both handles on the right and left doors should be oriented to the same direction.

2. Upon completion of the refitting work check the clearance between pad and adjust the contact between pad and finisher.

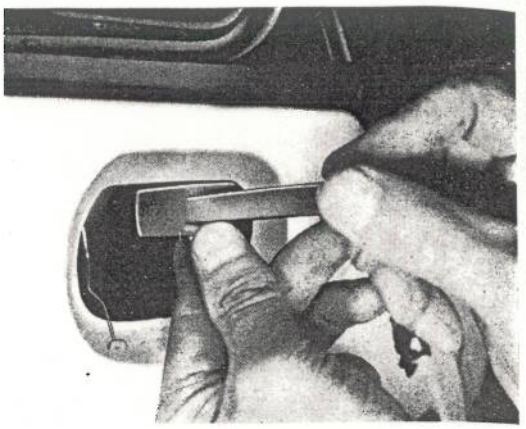


Fig. 27

GLASS RUN CHANNEL

REMOVAL

1. Remove the trim pad. (See subparagraph "Trim pad").

2. Remove the vinyl film.

3. Remove the sash tightening bolts.

   Note: Close attention is necessary as there may be provided adjusting shim between sash and inner panel.

4. Loosen the nut on the lower part of the draughtless ventilator and remove this together with plain washer and spring washer. (Fig. 27)

5. Pull out the sash outward.

   Note: 1. The sash may be removed easily with the window glass raised about 1/3 from the lowest position.

   2. Sash should be carefully handled to prevent damage to the painted surface.

6. The photographs above all indicate the work on the front doors but the rear doors should be worked in the same manner.

REFITTING

1. Carry out the work in the reverse order of removal.

2. The following points should be checked and necessary adjustment made after the sash is refitted.

   a. Alignment of the top level of the sash.

b. Contact of the weather strip.

3. The vinyl film should be fitted to the position after the adhesive compounds (DB-No. 1630) applied is allowed to dry.

Note: The vinyl film should be fitted to position without wrinkles on the surface as the wrinkles on the vinyl film leads to water leakage.

4. Apply adhesive compounds to all part of the doors indicated by the bias lines in Figs. 28(a) and (b).

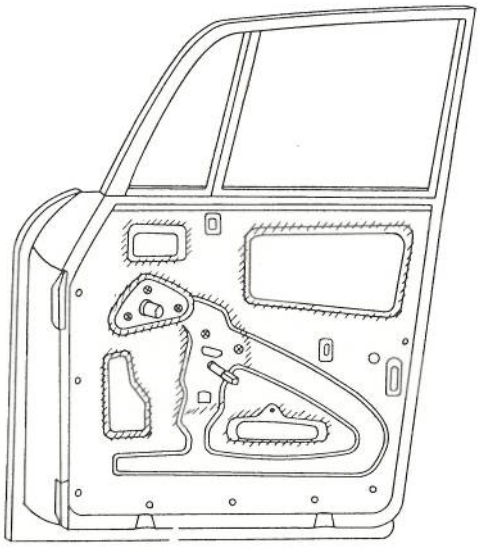


Fig 28(a)

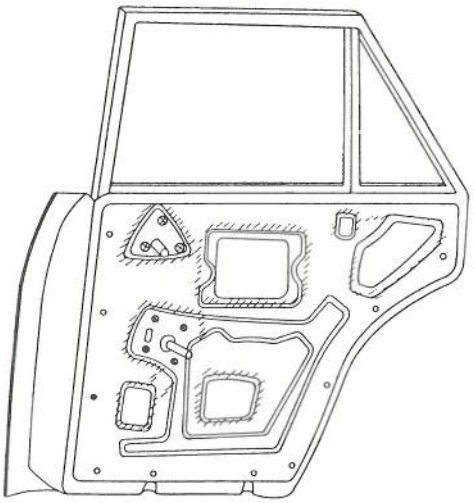


Fig. 28(b)

DRAUGHTLESS VENTILATOR

REMOVAL

1. Remove the sash. (Refer the subparagraph "Glass run channels".

2. File down the pivot pin. The pivot pin head should be carefully filed down to prevent damage to the sash. (Fig. 29)

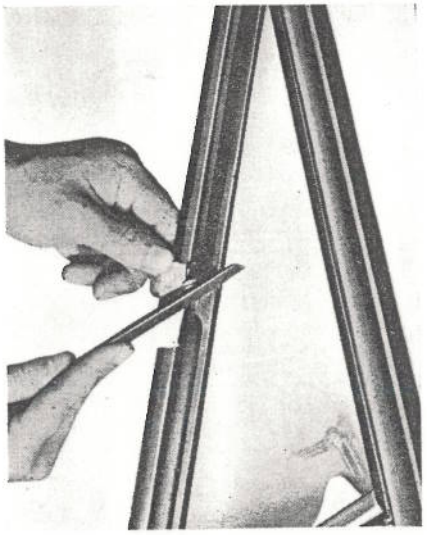


Fig. 29

3. Loosen the nut on the lower part of the draughtless ventilator and remove this together with plain washer and spring.

4. Pull out the glass.

REFITTING

1. Carry out the work in the reverse order of removal.

   Note: 1. The pivot pin should be fitted from the upward and secured in position by peening.

   2. Fit the shaft noting the oval hole in the washer.

   3. The nut should be turned in until its outer face is 23 mm apart from the tip end of the shaft. (Fig. 30)

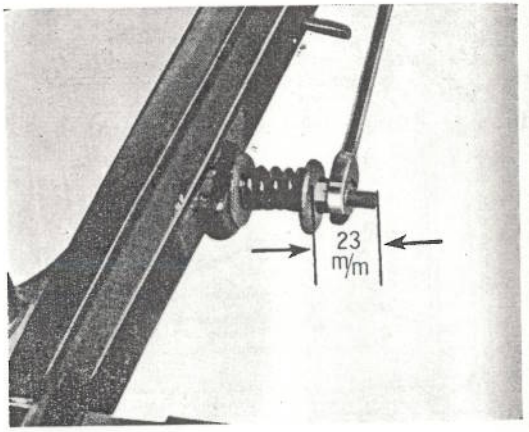


Fig. 30

2. After refitting, check the following and make adjustment as necessary.

   a. See if the weather strip is held in contact with the glass.

b. See if the sash is in contact with the glass. Adjustment can be made by varying the top pivot angle with a pliers or with a wrench. (Fig. 31)

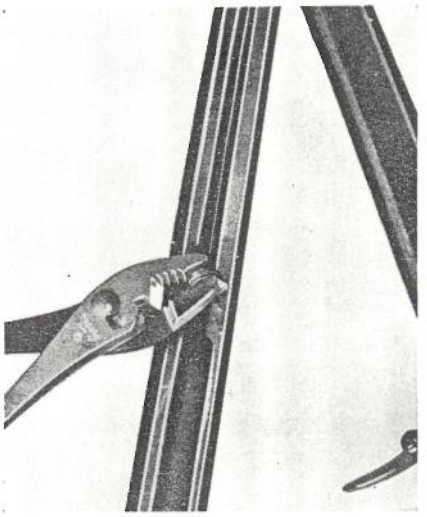


Fig. 31

3. Lubricate the following part to give smooth operation.

a. Rivet on the top pivot.

b. Root of the catch handle.

c. Washer on the lower bracket.

WEATHER STRIP ON THE DRAUGHTLESS VENTILATOR

FITTING

1. Apply soap water to the periphery of the weather strip with a brush. (Soap water serves as lubricant).

2. With fingers, lift the rubber in the weather strip hole and fit this to the root of the top pivot.

Caution: Exercise extreme care to prevent damage to the rubber. (Figs. 32 and 33)

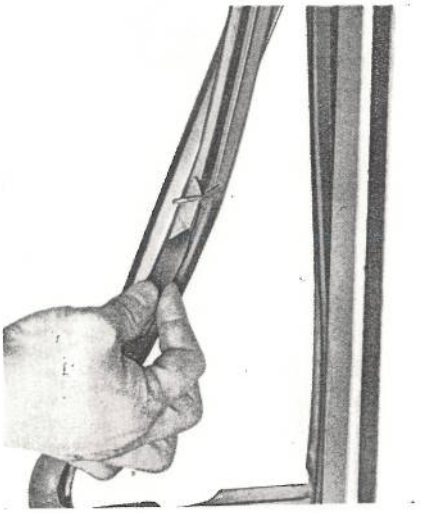


Fig. 32

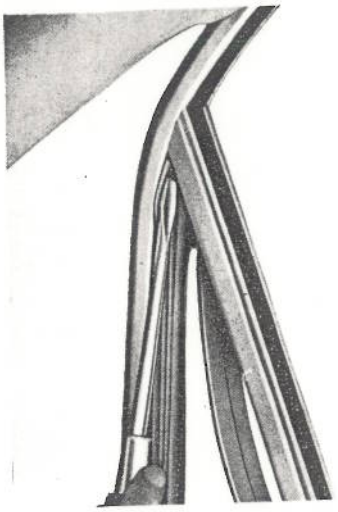


Fig. 33

3. Press the top of the weather strip with a screwdriver and fit this into the sash.

   Note: The weather strip should be held firmly against the sash to prevent water seepage.

4. Fit one of the grooves in the weather strip into the sash and hold this in place with fingers and force the other groove into the sash with a screwdriver.

5. After fitting, check the condition of the lip through the entire length and adjust as necessary.

QUARTER WINDOW GLASS ON THE REAR DOOR

REMOVAL

1. Remove the sash. (Refer the subparagraph "Sash")

2. Remove the glass run channel.

3. Take out four screws on the sash.

4. Remove the sash.

5. Work out the glass beginning with the corner.

REFITTING

1. Apply soap water to the periphery of the weather strip.

2. Force the glass into the sash.

   Note: The glass should be closely fitted to the sash by knocking it with a rubber hammer. (Fig. 34)

3. Refit the sash.

4. After refitting, check the condition of the weather strip and make adjustment as necessary.

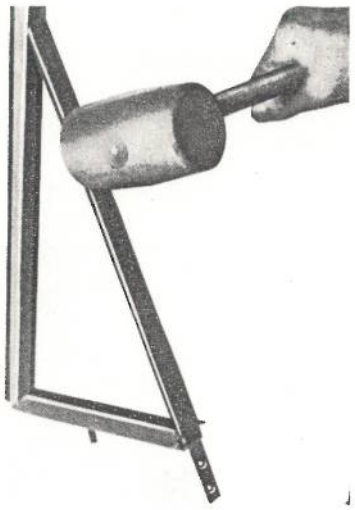


Fig. 34

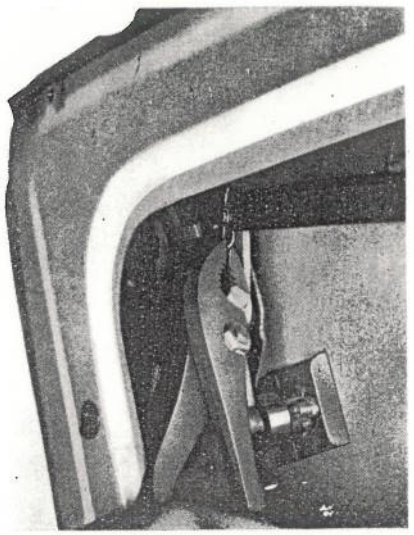


Fig. 35

DOOR LOCK AND REMOTE CONTROL

REMOVAL

1. Remove the sash. (Refer the subparagraph "Sash")

   Note: The front door necessitates the removal of sash for removing the door lock assembly but the door lock on the rear door can be removed without removing the sash.

2. Remove the rod pin from the joint connecting the door lock with the remote control and then remove the remote control. (Fig. 35)

3. Remove the fixing screws on the remote control.

4. Take out the remote control from the access hole.

5. Remove the remote control rod pin and then take out the screws for removing the door lock assembly.

REFITTING

1. Carry out the refitting work in the reverse order of removal.

2. After refitting, apply adhesive compounds (DH No. 215) to the screw head and washer to prevent water seepage.

WINDOW REGULATOR

REMOVAL

1. Remove the sash. (Refer the subparagraph "sash")

2. Remove the roller on the regulator from the glass holder. (Fig. 36)

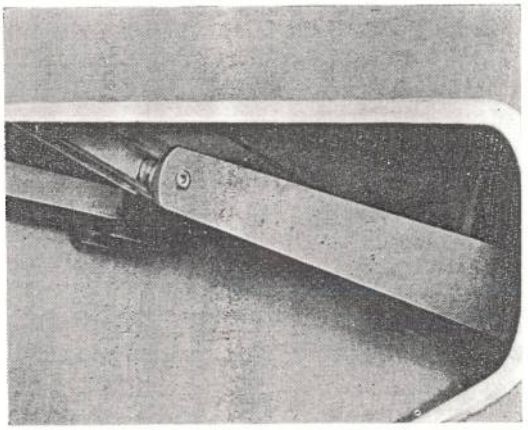


Fig. 36

3. Take out the regulator setting screws.

4. Take out the regulator through the access holes. (Fig. 37)

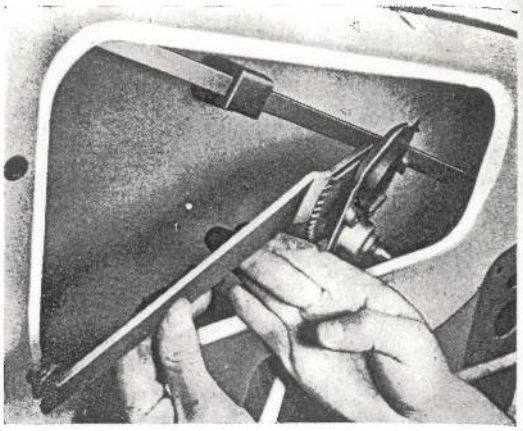


Fig. 37

REFITTING

1. Carry out the work in the reverse order of removal.

2. After refitting, apply adhesive compounds (DB No. 215) to the screw head and washer to prevent water seepage.

DOOR

REMOVAL

1. Hold the door in suspension and loosen the screws on the door hinges. The use of a tool as indicated in the photograph facilitates the work and prevents damage to the screw head. (Fig. 38)

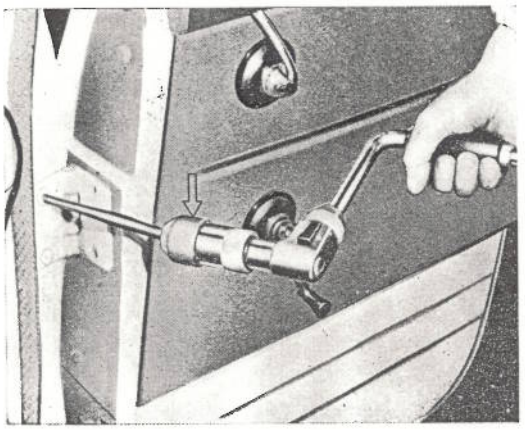


Fig. 38

REFITTING

1. Refit the doors noting the following.

   a. Alignment with fender, tonneau cover and adjacent door.

   b. Contact of weather strip.

   c. Clearance between sash and body

DOOR STRIKER

ADJUSTMENT

1. Repeat closing and opening of the door with the push button on the outside handle depressed. If bumping noise arises, this may be attributed to incorrect adjustment of either upper or lower dovetail. Check and adjust as necessary.

2. Loosen the screws on the striker.

   Note: The use of a tool as indicated in Fig. 38 facilicates the work and prevents damage to the screw head.

3. With the use of a wood block and a hammer, adjust the striker in the manner as illustrated in Fig. 39.

4. Securely tighten the screws.

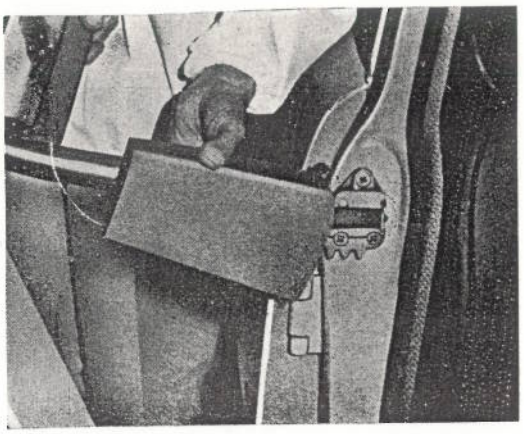


Fig. 39

Tread plate

FRONT TREAD PLATE

REMOVAL

1. Take out five fixing screws.

2. Raise the front part of rack pad in direction as indicated by arrow. (The plate should be flexed carefully to secure it against breakage). (Fig. 40)

3. Bend the rounded tip end of the plate in direction as indicated by an arrow and lift it up. (Fig. 41)

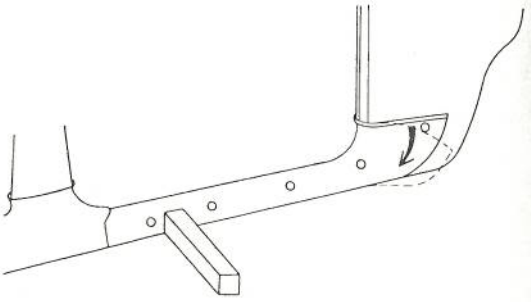


Fig. 40

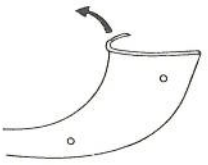


Fig. 41

REFITTING

1. Carry out the work in the reverse order of removal.

Note: 1. With the rubber hammer, work the rounded part of the pad to bring it into proper contact with the body

2. With the rubber hammer, work the plate through the entire part to ensure good contact with the body. The hammer should not be used against the edges of the plate.

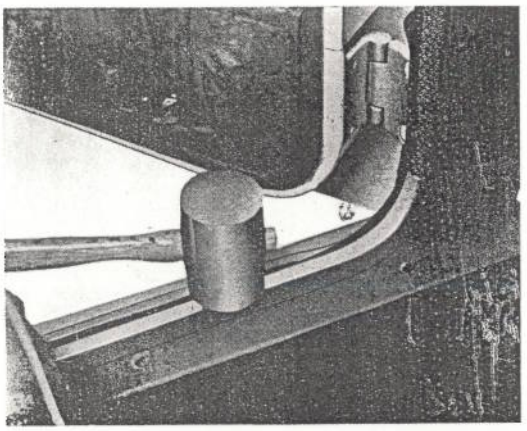


Fig. 42

3. As the wire harness is fitted between the plate and body, this should be check to see if it is properly fitted into the groove in the body before the plate is refitted.

4. Correctly overlap the rear part of the plate with the front part of the rear plate.

5. Both the removing and refitting work should be carry out carefully to prevent damage to the finisher.

REAR TREAD PLATE

REMOVAL

1. Remove the rear tread plate together with the front plate. (See Subparagraph "Front plate").

2. Take out six fixing screws on the plate.

3. Rise the rounded part for B, C and D post in direction indicated by arrows. (Fig. 43)

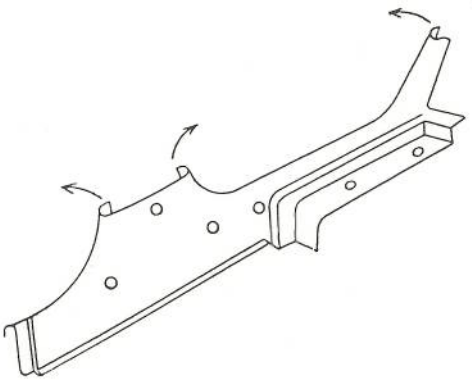


Fig. 43

4. Lift up the plate vertically about 300 mm above the original position before removing.

REFITTING

1. Carry out the work in the reverse order of removal using the subparagraph "Front plate" as a reference.

Seats

FRONT BENCH SEAT

REMOVAL

1. Slide the seat all the way forward.

2. Remove the slide fixing bolts (1 each on both side) on the rear part of the seat from the seat bracket. (Removing the floor carpet facilitates the work). (Fig. 44)

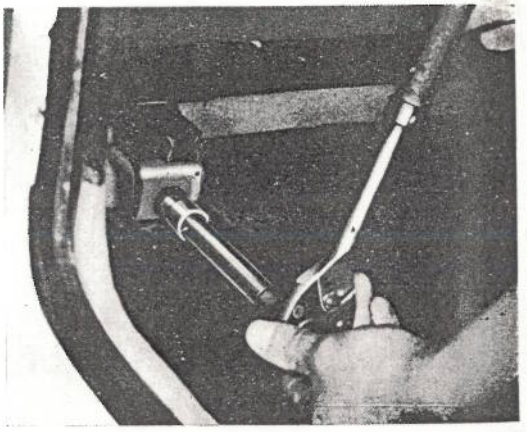


Fig. 44

3. Slide the seat all the way rearward.

4. Take out the slide fixing nuts (1 each on both side) from the lower part of the bracket.

5. Remove the seat by applying upward pressure from underneath the seat with one hand while lifting the upper part of the seat with the other hand.

REFITTING

1. Carry out the work in the reverse order of removal.

FRONT BUCKET SEAT

REMOVAL

1. For removing the front bucket seats, use the same manner applied for removing the bench seat. (For removing the rigidly fixed seat on standard model, remove the fixing bolts and nuts with the seat in position).

REAR SEAT

REMOVAL

1. Depress the rear part of the cushion downward while lifting the front part with the other hand.

2. Raise the lower part of the squab about 50 mm from the setting position.

3. Withdraw one end of the squab forward and take it out by slanting it as required.

Note: As the upper side of the ends of the squab is provided with wires, care should be exercised to prevent damage to the D post butt.

REFITTING

Carry out the work in the reverse order of removal.

BENCH SEAT SLIDE

REMOVAL

1. Straighten out the slide control wire end at the slide side. (Fig. 45)

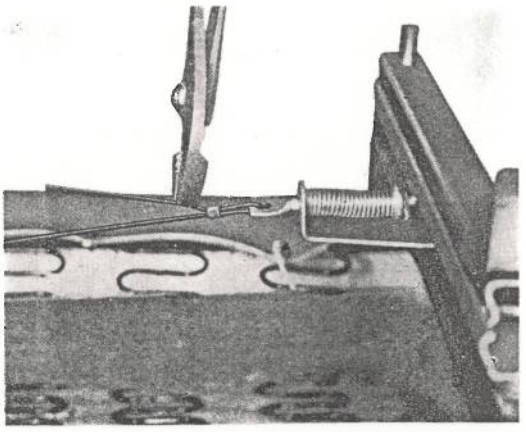


Fig. 45

2. Pull out the stopper pin.

3. Remove the wire.

4. Remove two slide fixing nuts. (Fig. 46)

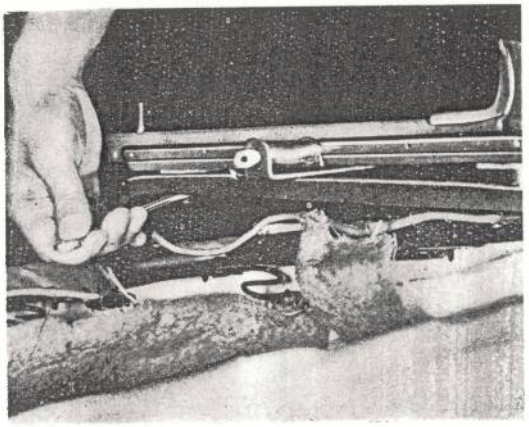


Fig. 46

REFITTING

1. Carry out the work in the reverse order of removal.

BUCKET SEAT SLIDE

REMOVAL

1. Remove two fixing nuts from the slide.

BUCKET SEAT CHANNEL

REMOVAL

1. This can be removed in the same manner used for removing the bench seat slide.

Meters

METER ASSEMBLY

REMOVAL

1. Disconnect the speedometer cable from the meter.

2. Remove the flexible shaft for the trip gage from the bracket. (Fig. 47)

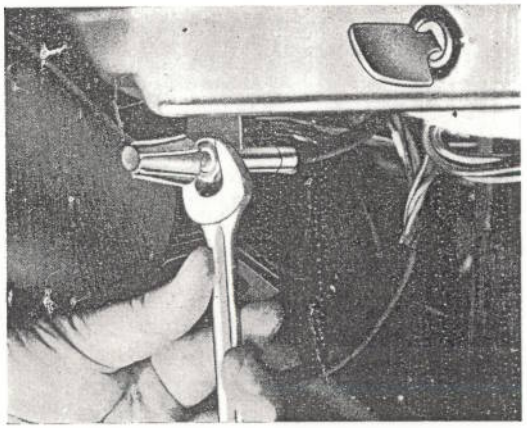


Fig. 47

3. Take out four screws on the speedometer hood.

4. Hold the speedometer in suspension with left hand and disconnect the connectors on the cable extended from the chassis harness. Then the speedometer assembly can be taken out. (Keep the rubber washer fitted between the speedometer hood and the panel from being mislocated).

REFITTING

1. Carry out the work in the reverse order of removal.

Switch finisher

SWITCH FINISHER

REMOVAL

1. With a needle, depress the knock in the switch knob and take out the knob.

   For the model equipped with gasoline engine . . .

   choke control knob, wiper and lighting switch knob.

   For the model equipped with diesel engine . . .

   engine stop switch knob, idle control knob, wiper and lighting switch knob.

2. Insert a screwdriver edge into the groove in the switch fixing nut and knock the screwdriver lightly with a hammer. The use of a special jig as illustrated facilitates the work and prevents damage to the nut. (Fig. 48)

3. Remove the cigarette lighter on the model so equipped.

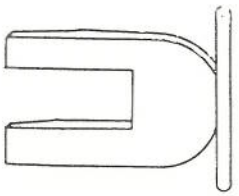
4. Remove the fixing screws and remove the cover strips.

5. Loosen the meter assembly fixing screws and pry away the lower part of the meter. The screws may be loosened enough to give allowance for moving the lower part of the meter.

6. Loosen the three screws on the switch finisher and take out the switch finisher.

REFITTING

1. Carry out the work in the reverse order of removal. The switch finisher fixing screws should be left semi-tight and fully tightened after the switches are refitted.



The use of a special jig facilitates the work and prevents damage to the nut

Fig. 48

Heater

VENTILATOR

REMOVING

1. Remove the rubber elbow fixing band.

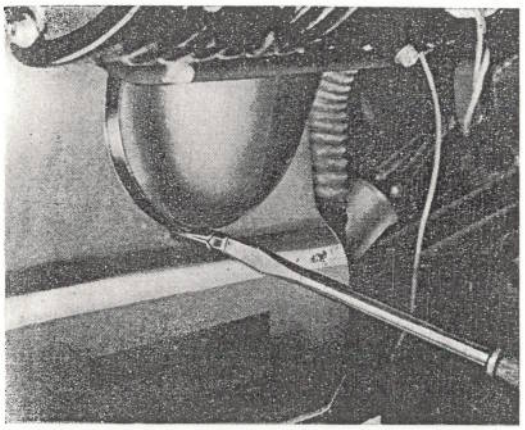


Fig. 49

2. Take out the ventilator fixing screws.

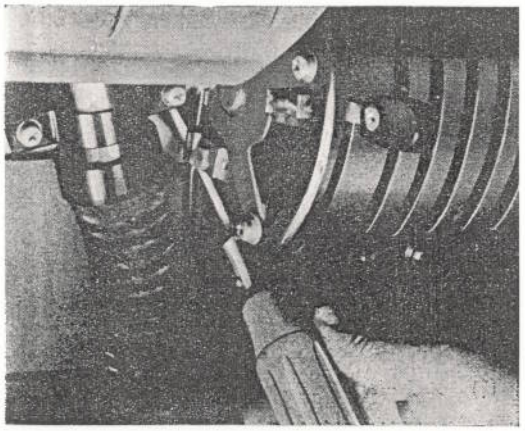


Fig. 50

3. Remove the ventilator together with the rubber elbow.

REFITTING

1. Carry out the work in the reverse order of removal.

HEATER UNIT

REMOVING

1. Disconnect the rubber elbow.

2. Pull the demister hose with twisting motion and take this out from the nozzle side.

3. Disconnect the two terminals in the heater circuit.

4. Loosen the heater control wire fixing screws.

5. Remove the floor mat and remove the deflector panel. (Fixed with 2 screws). (Fig. 51)

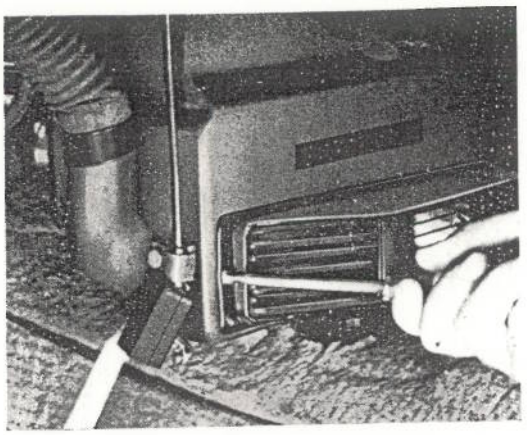


Fig. 51

6. Take out heater unit fixing bolts.

7. Loosen the water hose clips in the engine compartment at the dash panel side.

8. Insert a screwdriver edge between water hose and hose connector and pry these parts apart.

   Note: Exercise extreme care to prevent damage to the hose.

9. Remove the unit with the hose in position.

REFITTING

Carry out the work in the reverse order of removal. Fill hermetic sealing compounds between the water hose and connector.

DEFROSTER NOZZLE

REMOVING

1. Disconnect the demister hose. (See subparagraph "Heater unit" (2) for detailed information).

2. Remove the clamp fixing screws from the bracket. (Fig. 52)

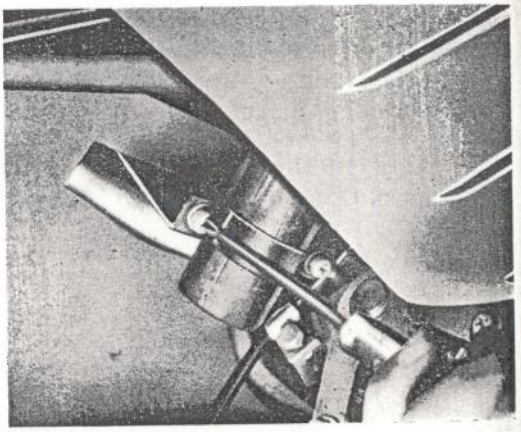


Fig. 52

3. Withdraw the nozzle downward.

REFITTING

Carry out the work in the reverse order of removal.

Note: 1. Overlapping of the hose and nozzle should be adjusted to about 20 mm. (Fig. 53)

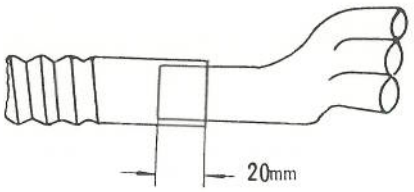


Fig. 53

2. Ends of the clip should be turned toward the engine compartment for better appearance.

Parcel tray

GLOVE COMPARTMENT WITH CYLINDER LOCK

REMOVING

1. Take out a fixing screw.

2. Pull out the cylinder while depressing the notch. (Fig. 54)

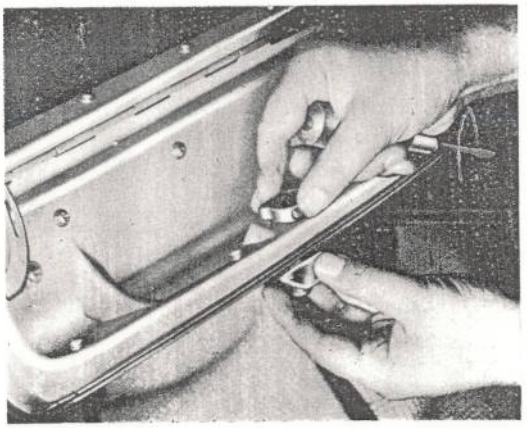


Fig. 54

REFITTING

1. Refit the cylinder lock in the reverse order of removal.

GLOVE COMPARTMENT LID

REMOVING

1. Take out the two stay fixing screws.

2. Take out the fixing screws (4) on the hinges.

REFITTING

1. Refit the lid in the reverse order of removal.

GLOVE COMPARTMENT RIM

REMOVING

1. With the lid in opened position, remove six screws.

2. Remove the rim with a hand on the reverse side.

REFITTING

1. Position the rim in place. Align the holes in the rim with those on the body and fit a screw into the adjacent hole. Fit all six screws into holes and leave them semi-tight.

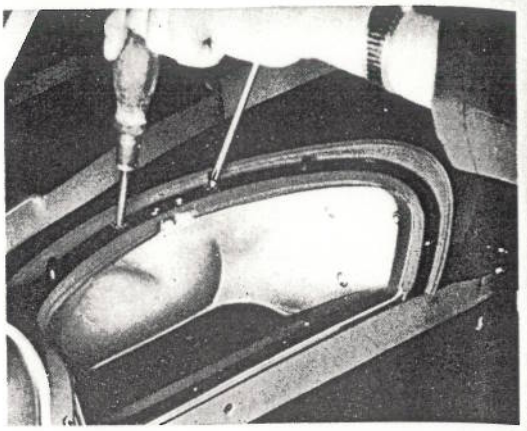


Fig. 55

2. Tighten two screws on the lower right and left side.

3. Tighten the remaining screws while pulling the clash pad toward the operator.

GLOVE COMPARTMENT

REMOVING

1. Remove the defroster nozzle.

2. Take out the six setting screws.

3. Move the glove compartment toward the dash panel.

REFITTING

1. Carry out the work in the reverse order of removal.

PARCEL BOX
(on the standard model)

REMOVING

1. Remove the setting screw.

2. Withdraw the parcel box rearward.

REFITTING

1. Refit the parcel box in the reverse order of removal. Screw should be tightened while holding the box firmly against the crash pad to eliminate the clearance between the box and the pad.

REAR PARCEL TRAY

REMOVING

1. Remove the rear seat squab (Refer the subparagraph "Seat" for detailed information).

2. Remove the front beading fixing screws (7) and remove the beading.

3. Take out tray fixing screws (8) and lift the tray.

REFITTING

Refit the tray in the reverse order of removal.

Head lining

REMOVING

1. Remove the windshield glass. (Refer the subparagraph "Windshield glass" for correct procedure).

2. Remove the rear window glass. (Refer the subparagraph "Rear window glass" for correct procedure).

3. Remove the sunvisor

4. Remove the rear view mirror.

5 Remove the dome lamp.

6. Remove the safety hanger.

7. Take out the finisher and remove the clip.

8. Remove the D post pad.

   Note: D post pad is provided with a clip similar to that in the trim pad so that care should be taken to prevent damage to the pad.

9. Separate the bonding face of the head lining and take out the listing rail through the hole in the body side panel.

10. For head lining at the B-C posts, raise the bracket with a screwdriver and take out the liner plate. (Fig. 56)

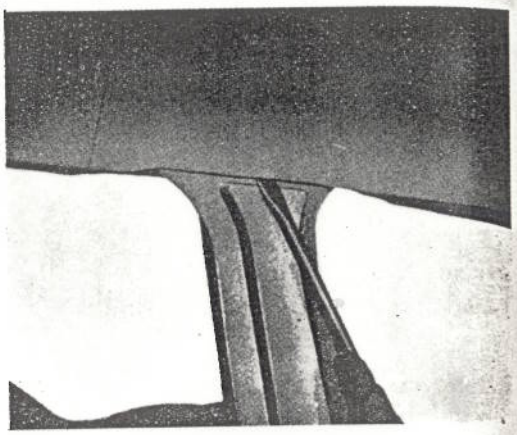


Fig. 56

REFITTING

1. Apply adhesive compounds (CB No. 1630) evenly over the reverse side of the head lining at portions indicated by bias lines in Fig. 57.

   Note: Work bench should be cleaned to prevent the head lining from being contaminated.

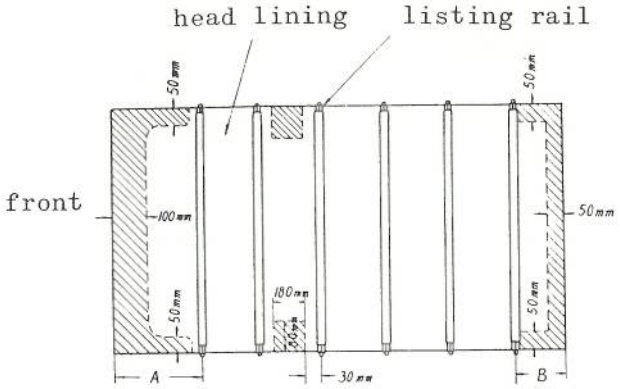


Fig. 57

Note: Check the measurement A and B and turn the head lining so that A comes to the front part.

2. Apply adhesive compounds (DB No. 1630) to the portion around the right and left of D post pad fixing clip (indicated by circle in photograph), windshield glass fixing flange and rear window glass fixing flange. (Figs. 58, 59 and 60)

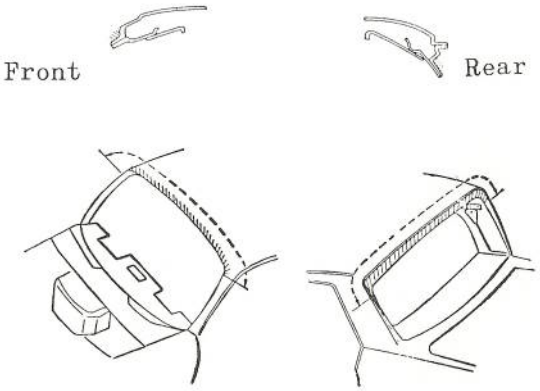


Fig. 59

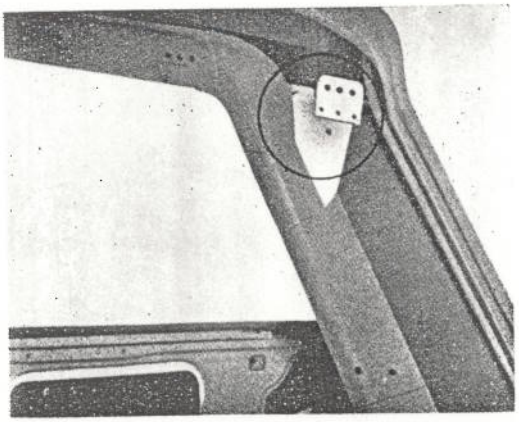


Fig. 58

Fig. 60

3. Refit the listing rail by inserting it through the hole in the body side panel.

Method for refitting

a. Insert the lug on the listing rail into the hole in the body side panel. (Fig. 61)

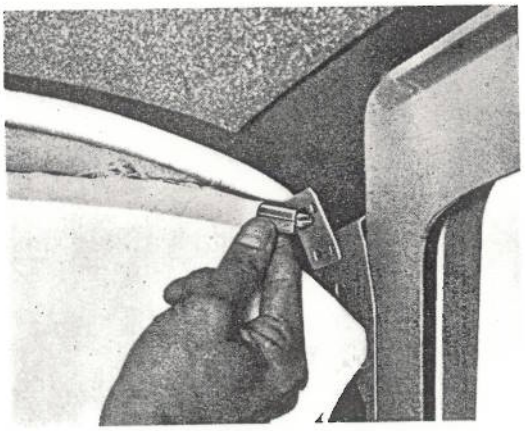


Fig. 61

b. Hold the center part of the rail with hands and squeeze the cover outward to remove the wrinkles. (Fig. 62)

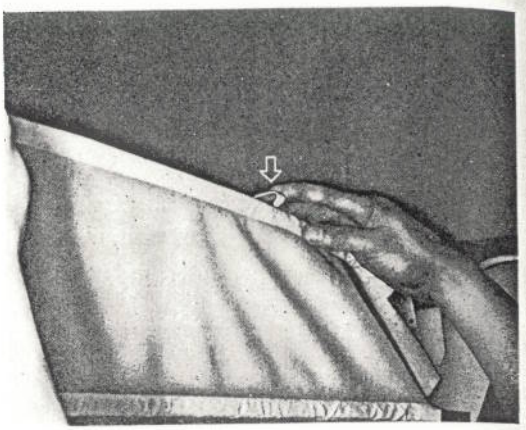


Fig. 62

c. Hold the rails in tension with both hands. (Fig. 63)

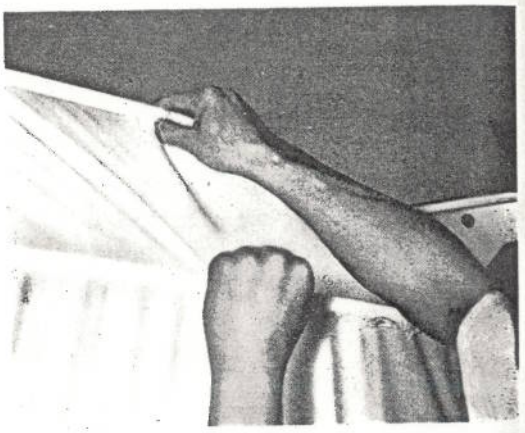


Fig. 63

Note: Care should be exercised to hold the lining in proper tension.

Order of Refitting

1. Refit the lining starting at the rear end.

2. When holding the first rail in tension, hook the clip onto the rail. (Fig. 64)

3. Carry on the work in the same manner until all the rails are refitted.

Fig. 64

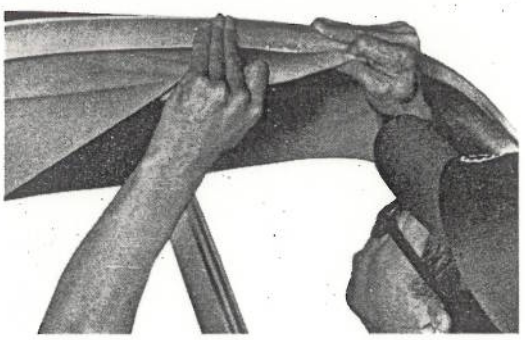


Fig. 65

4. When holding the last rail in tension, hook the clip to the rail.

Note: There are provided three lug inserting holes on both sides, so that any one of the holes may be used to adjust the tension of the head lining.

4. Refit the head lining to the windshield glass and bond this to the flange.

Bonding procedure

a. With both hands, keep the mid part of the head lining in tension and fix its ends to the flange by bonding.

Note: Weak in tension causes longitudinal wrinkles on the head lining. (Fig. 65)

b. When bonding a part of the head lining to the A post corner, cut the edge into a few segments with a scissors and bond these parts to the corner while keeping the head lining in tension. (Fig. 66 and 67).

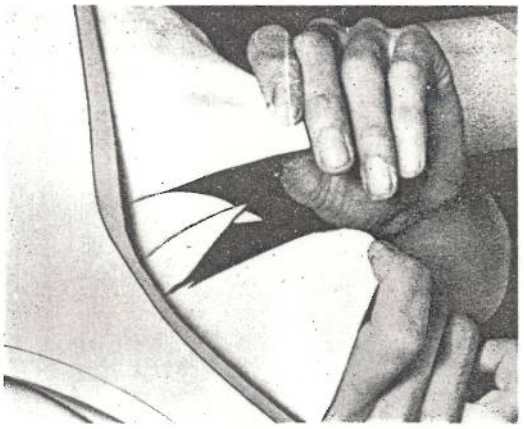


Fig. 66

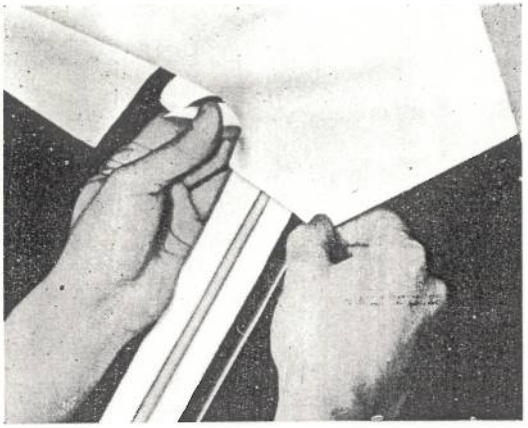


Fig. 67

c. Bend down the edge of the head lining in the shape of the tip end of the A post depression and bond the bent end to the position. (Fig. 68)

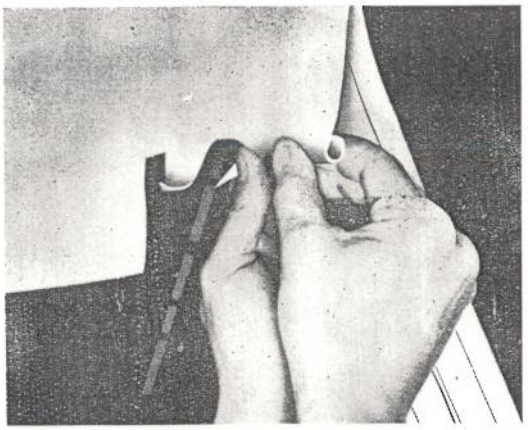


Fig. 68

d. Trim the head lining along the root of the flange. (Fig. 69)

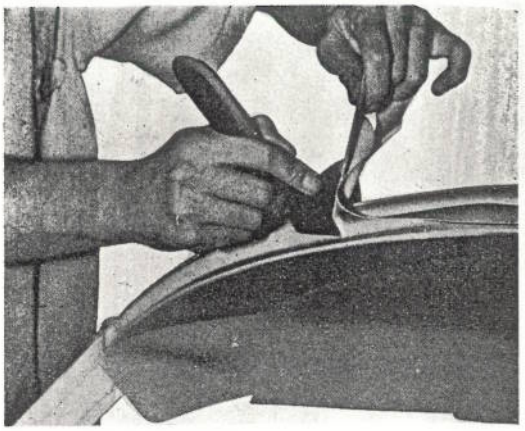


Fig. 69

5. Bond the end of the head lining to the rear window glass fixing flange.

Bonding procedure

a. Apply the same procedure used for bonding the front edge to the windshield glass fixing flange.

b. When bonding a part of the head lining to the D post corner, cut the edge into a few segments with a scissors and bond these parts to the corner while keeping the head lining in tension. (Fig. 70)

Fig. 70

c. Trim the edge of the head lining along the root of the flange.

6. Trim the end of the head lining along the door finisher fixing flange leaving about 10 mm of bonding allowance. (Fig. 71)

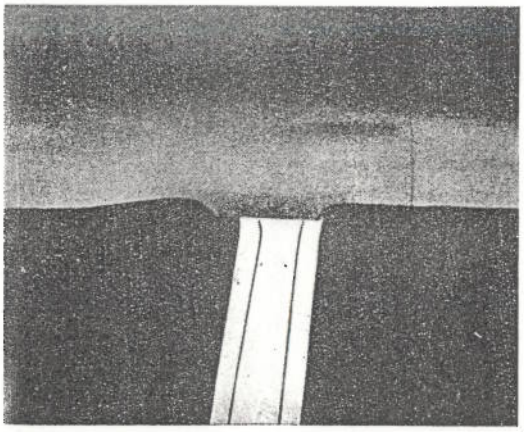


Fig. 71

7. Bond the end of the head lining to the B-C posts.

Bonding procedure

a. Bond a liner plate to the head lining about 13 - 15 mm apart from the edge of the head lining. (Fig. 72)

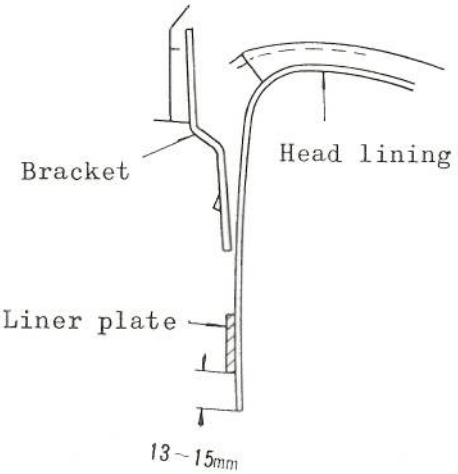


Fig. 72

b. Bend down the edge of the head lining and fit this into the bracket.

Note: If the bracket is dent and there is no clearance for inserting a plate, raise the bracket with a screwdriver. (Fig. 73 and 74)

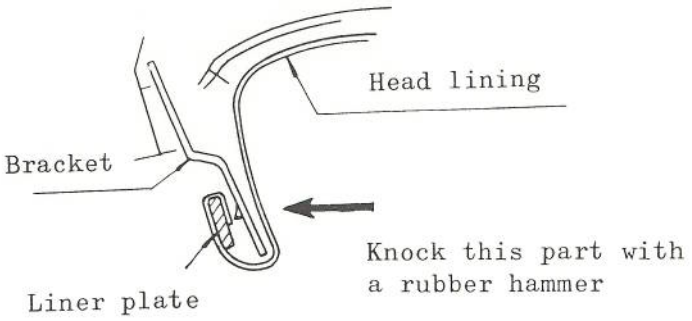


Fig. 73

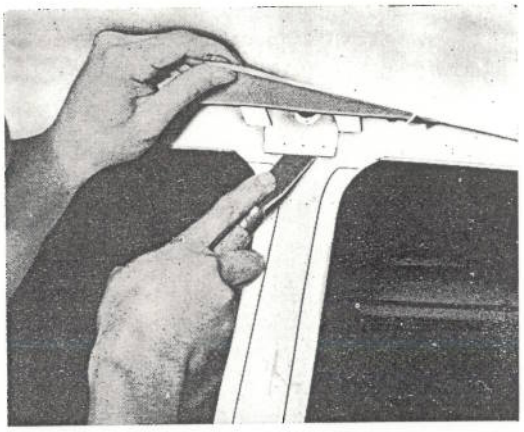


Fig. 74

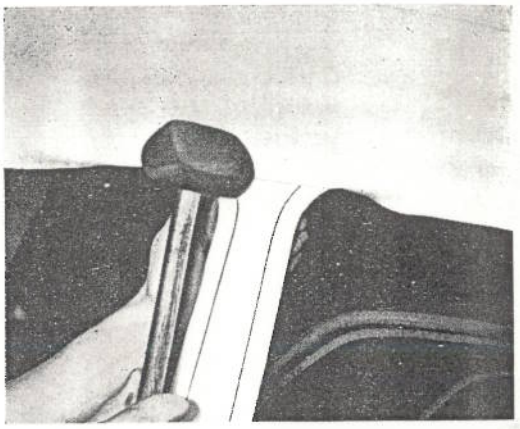


Fig. 75

c. With a rubber hammer, knock the bracket over the head lining to clamp the head lining in position. (Fig. 75)

8. Bond the D post pad.

Bonding procedure

a. Apply adhesive compounds (DB No. 1630) to bonding face of the D post pad. (indicated by bias lines) (Fig. 76)

b. Feel the clip setting hole in the pad with finger and pierce a hole in the head lining.

c. Fit the clip on the pad into this hole.

d. Set the hard board of the pad to the position about 8-10 mm apart from the tip end of the flange and bond the loose end of the leather while keeping it in tension. (Fig.77)

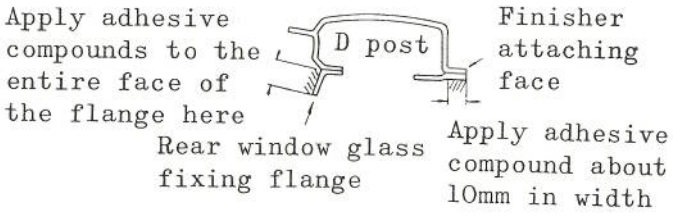


Fig. 76

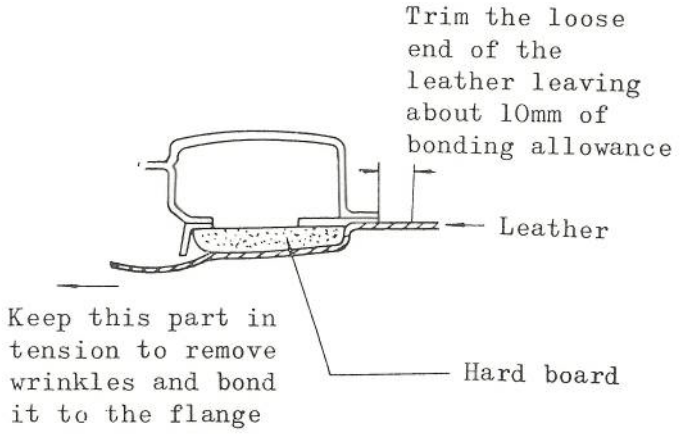


Fig. 77

e. Pull the leather by hand to remove wrinkles on the pad and bond this to the rear window glass fixing flange.

Note: Cut the corner into a few segments.

f. Trim the edge along the finisher leaving about 10 mm of bonding allowance.

g. Trim the leather edge along the window glass fixing flange.

h. Rub the fingers over the end of the leather to ensure proper bonding.

i. Upper corner should be fortified with a piece of cellophane tape to prevent peeling while refitting the rear window glass.

9. Fitting clips to the finisher

Note: 1. Fit the clips with its nail faced outward.

2. Clip setting clearance.

Linear part
about 30 mm apart

Curved part
about 15 mm apart

(Fig. 78)

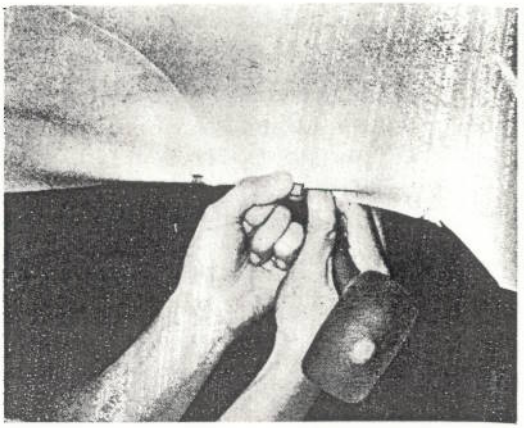


Fig. 78

10. Carry out the remaining work in the reverse order of removal.

Luggage compartment

REMOVAL

1. Disconnect the terminal from the rear license plate lamp.

2. Withdraw the wire harness toward the inside of the luggage compartment.

3. Loosen the screws on the right and left hinges on the luggage compartment lid and take out only one each of bolt from the hinges.

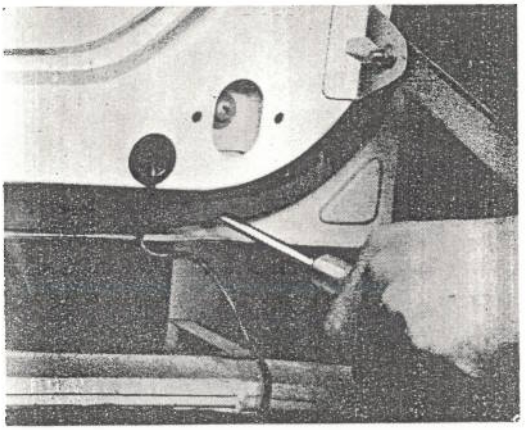


Fig. 79

4. Hold the upper part of the luggage compartment lid and remove the stay fixing nuts.

5. Hold the compartment lid in raised position with shoulder and take out the screws remaining on the hinges and then remove the lid.

REFITTING

1. Carry out the work in the reverse order of removal. The wire harness should be put through the internal part of the compartment lid in the following manner.

   a. Connect a piece of wire in the length of about 60 cm to the terminal.

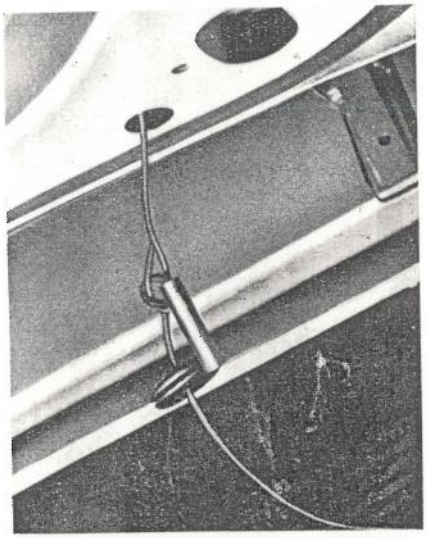


Fig. 80

b. Put loose end of the wire through the access hole in the compartment lid and bring the terminal close to the lamp.

LUGGAGE COMPARTMENT LID LOCK ASSEMBLY

REMOVAL

1. Take out the four fixing bolts.

REFITTING

Carry out the refitting work in the reverse order of removal noting the following.

a. 2 ground lead wires for the license plate lamp should be fastened with the fixing bolts.

b. The fixing bolts should be left semi-tight and securely tightened after the luggage compartment lid is correctly aligned with the body.

LUGGAGE COMPARTMENT LID

1. For adjusting the luggage compartment lid in front and rear ward and sideway, loosen the setting screws and adjust the clearance between the lid and rear deck and between the lid and tonneau panel.

2. For vertical adjustment of the lid, loosen the lock fixing nuts and adjust the lock in vertical plane. Loosen the striker fixing bolts and adjust the striker as required. Excessively lowered lid gives tension and excessively raised lid produces excess play or maladjusts the alignment between lid and tonneau panel.

Fig. 81

LUGGAGE COMPARTMENT CYLINDER LOCK

REMOVING

1. Pry the clip away from the cylinder lock. (Fig. 82)

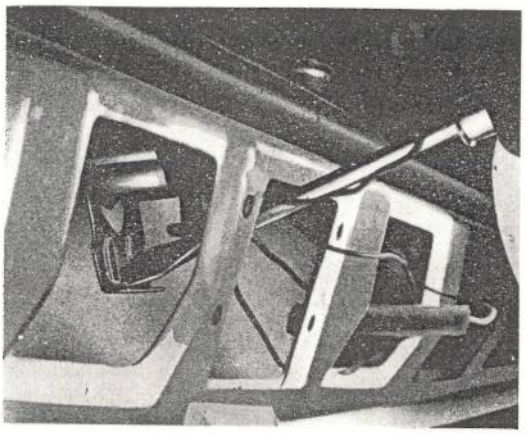


Fig. 82

REFITTING

1. Refit the cylinder lock in the reverse order of removal.

REAR LICENSE PLATE PLINTH

REMOVING

1. Take out three screws and remove the plinth.

REFITTING

1. Refit the plinth in the reverse order of removal.

Fuel Tank

REMOVING

1. Drain the fuel tank completely.

2. Disconnect the fuel pipe.

   After disconnection, plug the the pipe to prevent fuel from leaking out through the pipe.

   Note: The model with gasoline engine is provided with a single fuel pipe while the model with diesel engine is equipped with double fuel pipe. (Fig. 83)

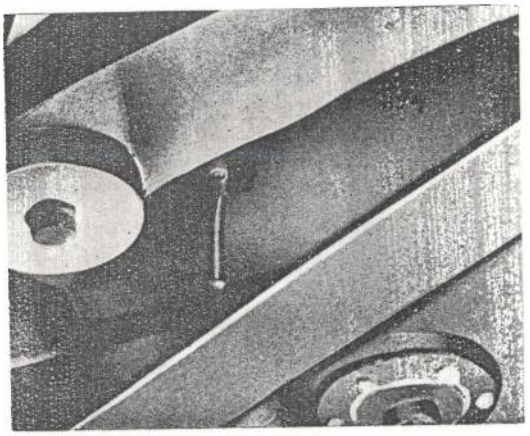


Fig. 83

3. Remove the mat in the luggage compartment.

4. Disconnect the breather pipe.

5. Disconnect the hose on the filler neck.

6. Disconnect the wiring to the tank unit.

7. Take out the fuel tank clamping bolts.

REFITTING

1. Apply adhesive compounds (DB No. 211) to the floor gasket.

2. Align the holes in the gasket with those in the body and fit the gasket.

   Note: The use of rods having the diameter equivalent to the hole facilitate the work.

3. Apply adhesive compounds (DB No. 211) to the gasket which is already fitted to the body.

4. Carry out the remaining work in the reverse order of removal.

   Note: Warm the vinyl pipe to gain additional flex and fit this into position.

Moulding

SIDE MOULDING

REMOVING

1. Fit the screwdriver into the lower part of the clip at the end of the moulding and pry the clip off. (The screwdriver edge should be covered with vinyl tape to prevent damage to paint finish).

2. In the same manner, pry off all the clips. (Fig. 84)

Note: 1. Exercise extreme care to prevent damage to the paint finish.

2. Screwdriver should be inserted close to the clip to prevent moulding from being deformed. (Fig. 85)

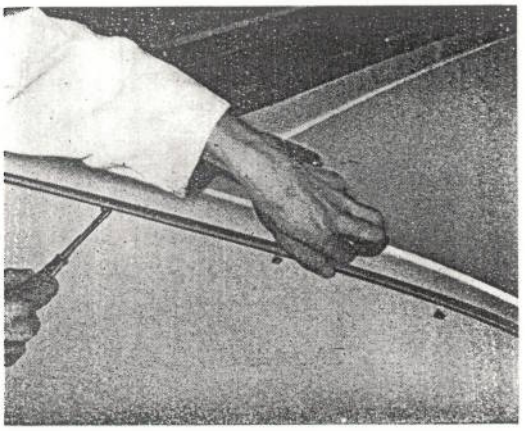


Fig. 84

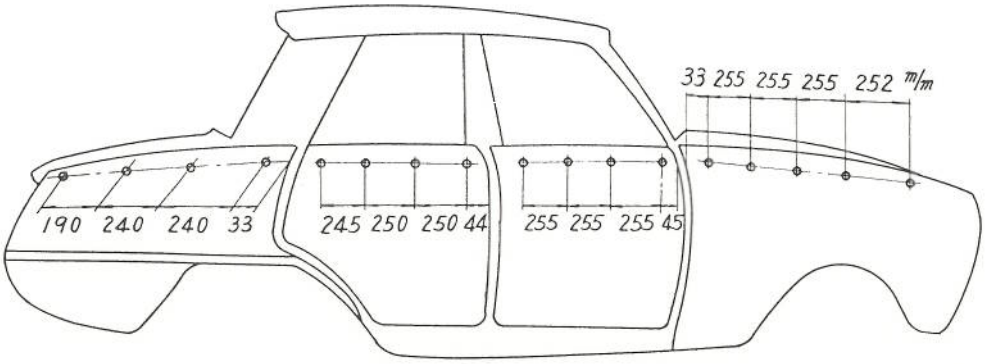


Fig. 85

REFITTING

1. Orient the clips in proper direction.

2. Set the position of the moulding noting the clearance between the moulding and body.

3. Snap in the upper part of the moulding into the clip and while depressing the moulding downward with hand apply hand pressure toward the body. (Fig. 86)

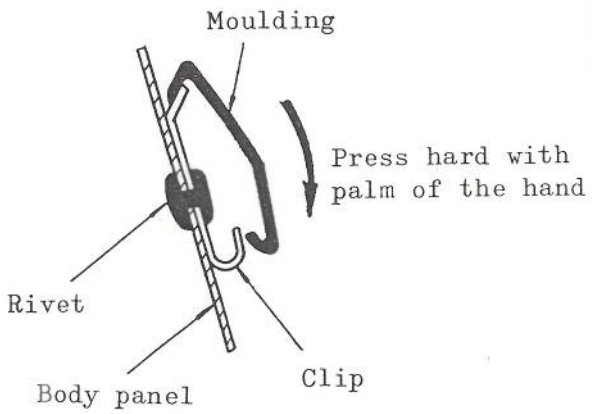


Fig. 86

DRIP MOULDING

REMOVING

1. Cover the lower end of the D post with a rag and pry the moulding away with a pliers. (Fig. 87)

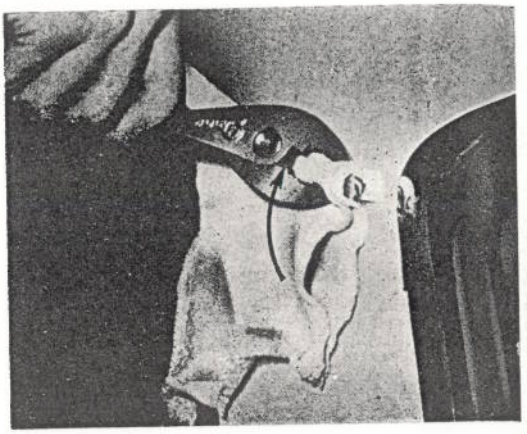


Fig. 87

2. Apply the same procedure for removing the rest of the moulding.

REFITTING

1. Refit the moulding in the reverse order of removal starting with the part at the end of the A post.

2. Snap the moulding into the drip channel and hold the moulding in position with hand. Knock the moulding lightly with the rubber hammer. (Figs. 88 and 89)

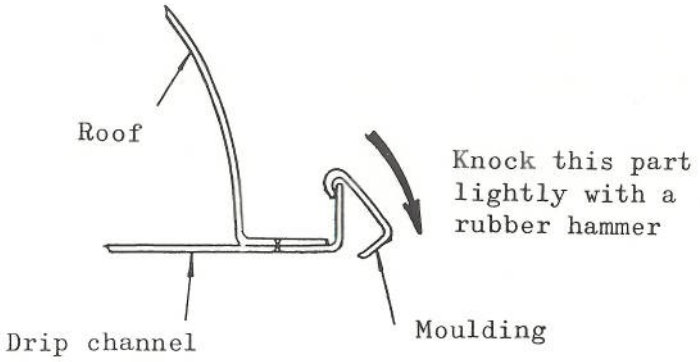


Fig. 88

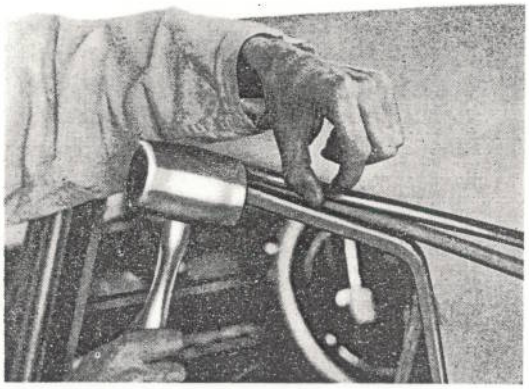


Fig. 89

REAR WINDOW MOULDING

REMOVING

1. Cover the lower part of the moulding side with a cloth and use the screwdriver to pry the clip off. Apply the same procedure for releasing the remaining clips and remove the side moulding. (The screwdriver edge should be covered with a vinyl tape to prevent damage to paint finish).

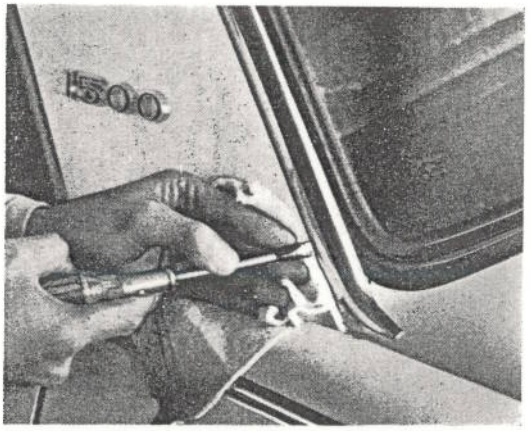


Fig. 90

2. Apply the same procedure for removing the top moulding. (Fig. 91)

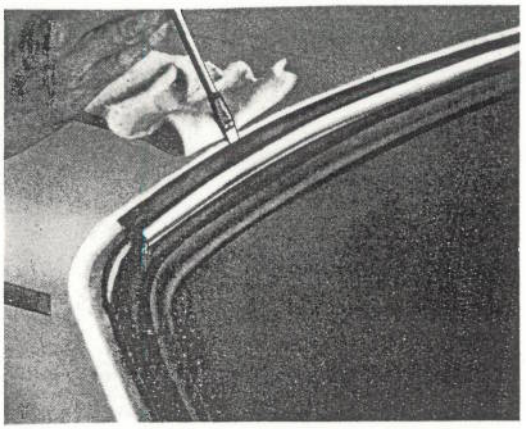


Fig. 91

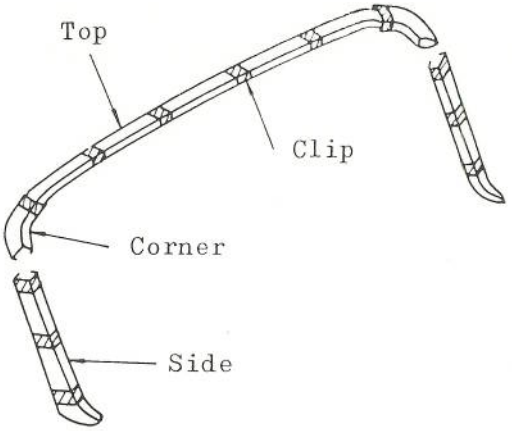
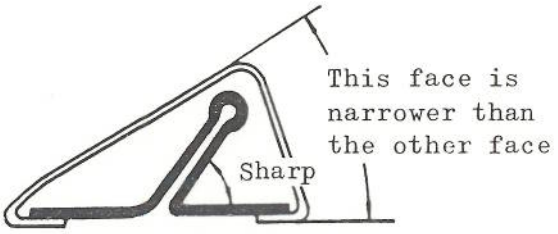


Fig. 93

REFITTING

1. Fit three each of clips to the right and left moulding top.



Fitting the clip into moulding

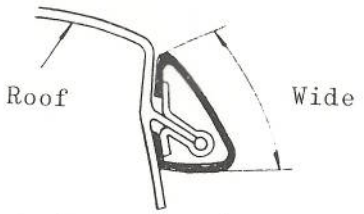
Fig. 92

2. Fit three clips into the side moulding. (Fig. 93)

Fit clips to the moulding top at the edges and between edges with the same distance apart. These clips should be fixed in position with adhesive compounds.

3. Fit the moulding corner to the top and fix them together with vinyl tape. Overlapping is about 20 mm.

4. Upon completion of the above work, position the moulding top in place and fit the corner mouldings to the body and fit clips. Hold the clip and moulding over the flange and depress the moulding with the palm of the hand. (Starting with the center part and carry on the work outward). (Fig. 94)



Arrangement of moulding on the body

Fig. 94

5. Fit the side moulding into the corner moulding and align the lower corner of the side moulding with the body. Then hold the clip and moulding over the flange and depress the moulding over the flange with the palm of the hand.

B-C POST MOULDING

REMOVING

1. Take out two fixing screws for removing the moulding.

REFITTING

1. Refit the moulding in the reverse order of removal noting the clearance between the moulding and sashes.

A list of adhesive compounds and filling compounds

Parts requiring adhesive compounds	Sort of adhesive compounds and filling compounds used
Name letter	Cemedine No. 333
Engine hood seal	Cemedine No. 521
Crash pad	DB No. 1630
Pad insulation	DB No. 1642
Finisher; seat pan	Cemedine No. 521
Trim pads	DB No. 1630
Glass run channel	"
Seal sash bottom	"
Weather strip; door waist	"
Vinyl film	"
Luggage compartment lid seal	"
Gasket; fuel tank	DB NO. 211
Tail/stop lamp	"
Flasher/reverse lamp	"
Fuse unit	"
Cover plate	Sealant No. 770-GA
Dash screw hole filling	DB No. 211
Dash grommet	"
Master cylinder	Sealant No. 770-GA
Gasket; plinth	DB No. 1630
Gasket; steering column	Cemedine No. 575
Steering column filling	Sealant No. 880
Water hose	Hermetic
Windshield glass and rear window glass	Sealant No. 770-GA

Body panels in exploded view

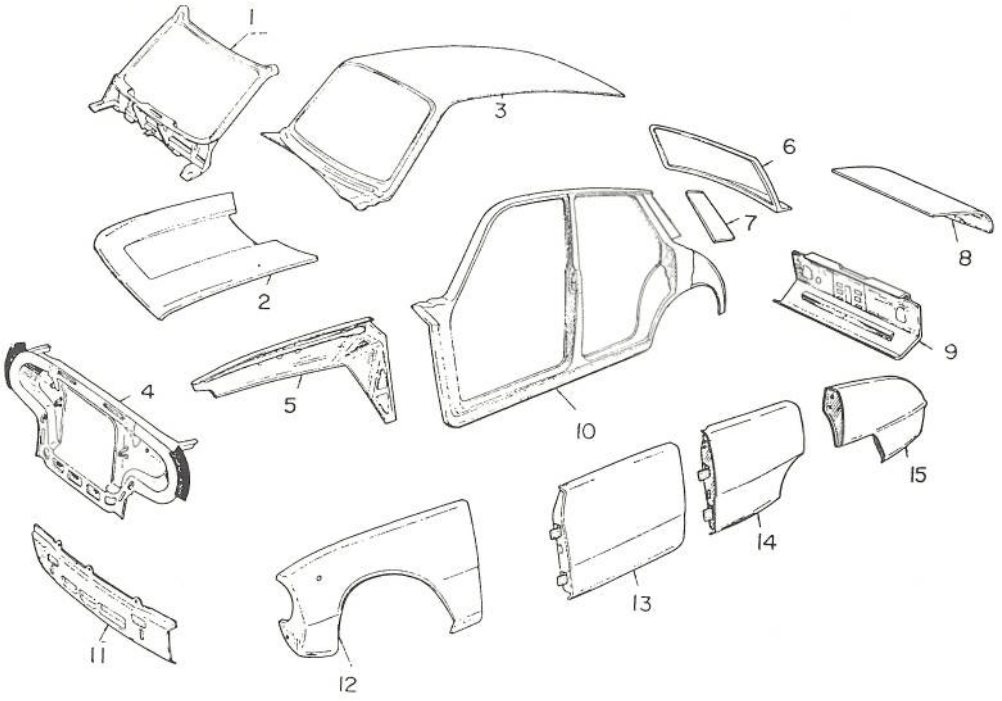


Fig. 95

1. Windshield finisher
2. Engine hood panel
3. Roof assembly
4. Deflector panel
5. Balance panel
6. Rear window surround assembly
7. Roof extension
8. Luggage compartment lid panel
9. Body rear lower panel assembly
10. Body side panel assembly
11. Filing panel assembly
12. Fender panel
13. Front door panel assembly
14. Rear door panel assembly
15. Tonneau panel

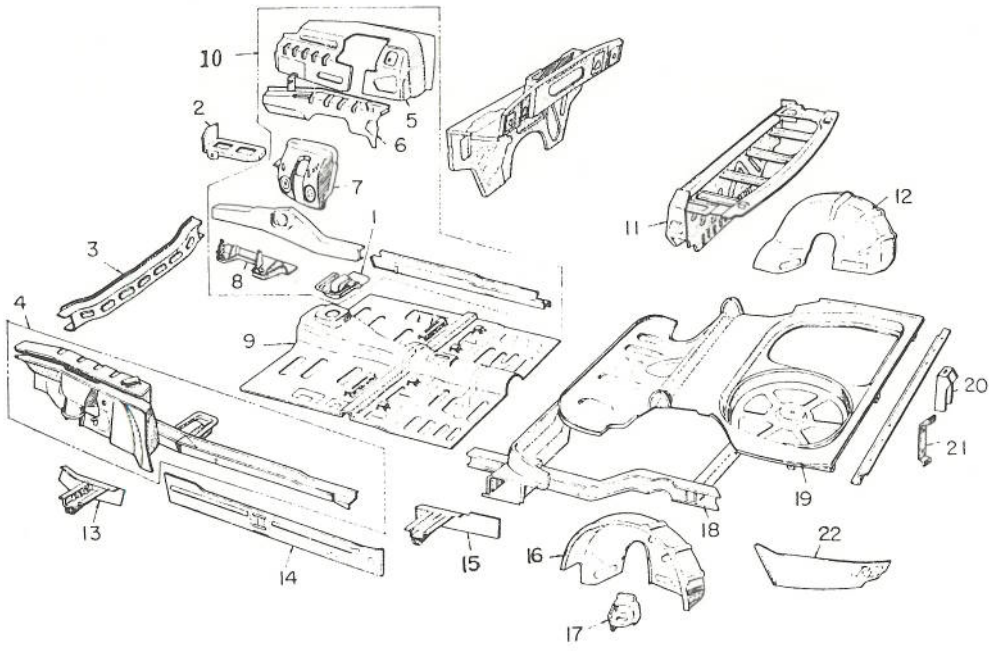


Fig. 96

1. Engine mounting bracket
2. Support bracket
3. Front cross member
4. Front frame assembly
5. Front wheel arch
6. Reinforcement
7. Support bracket assembly
8. Stiffener
9. Main floor assembly
10. Front frame assembly
11. Squab panel assembly
12. Rear wheel arch
13. Crossing plate
14. Rear wheel arch (housing)
15. Crossing plate
16. Rear wheel arch
17. Spring bracket
18. Rear frame assembly
19. Luggage floor
20. Striker bracket
21. Bracket tool ring
22. Closing; tonneau

Removing and installing of front body (Wasp only)

TO REMOVE FRONT BODY

1. When removing front body, disconnect the connections of engine, steering etc. according to following procedures.

   a. Remove bonnet panel and remove battery and radiator assembly.

   b. Disconnect the fuel pipe connections to fuel filter, fuel pump at its joints. (Remove front body with fuel pipe in fitted condition to body).

   c. Disconnect the connection between steering shaft and steering worm at coupling portion.

   d. Disconnect the transmission gear control rod connection at the joint portion of select lever and shift lever.

   e. Remove air cleaner.

   f. Disconnect the connections of engine control cable relations.

   g. Remove each wiring cord to starter, dynamo thermometer unit, oil pressure unit and glow plug (only on diesel engine).

2. Similarly at around the lower part of body, disconnect the following each connection.

   a. Disconnect the connection of fuel tank and fuel pipe at the joint fitted underneath to the rearmost portion of front body.

   b. Disconnect the connection between body harness and chassis harness at the connector near the transmission side, inner side of frame.

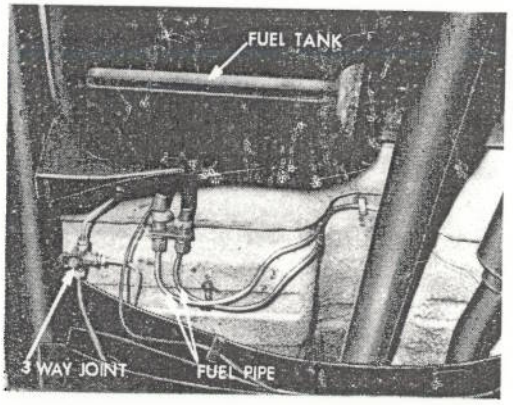


Fig. 97

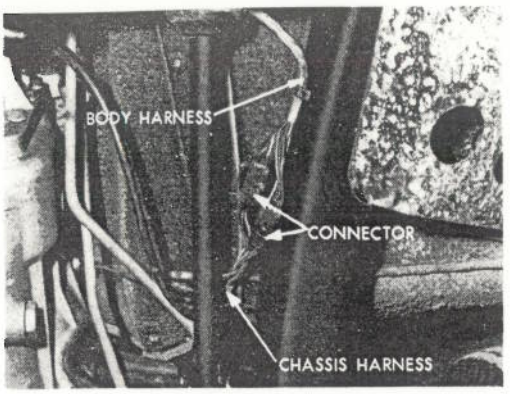


Fig. 98

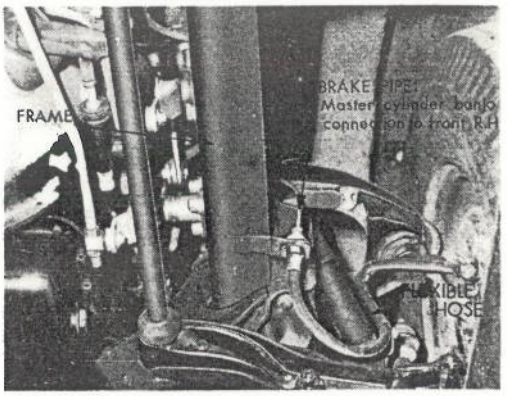


Fig. 99

c. Remove speedometer cable from rear of transmission.

d. Remove clutch slave cylinder from transmission case and remove return spring.

e. Disconnect brake pipe; master cylinder banjo connection to front RH. at frame bracket portion from flexible hose.

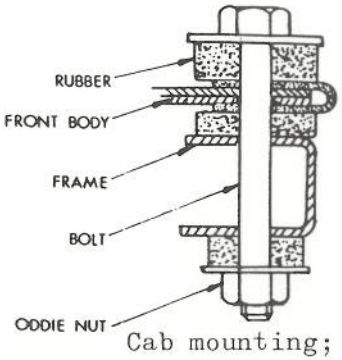
f. Remove the brake pipe; master cylinder banjo connection to 3 way joint from the 3 way joint fitted to frame at lower side of front body rearmost portion. (Fig. 99)

g. Separate the joint of hand brake lever and cable after removing the shield; hand brake lever.

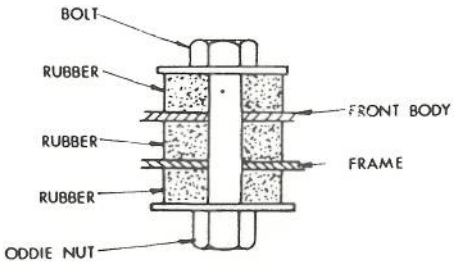
3. After the foregoing process, remove the fixing bolts that fix front body to frame.

a. Front body is fixed to the frame at three locations left and right totalling 6 with cushion rubbers in between.

Remove such each bolt and remove front body from frame according to procedures as shown in Fig. 100.



Cab mounting; Front



Cab mounting; Center & Rear

Fig. 100

4. Open the door and place a wide thick plate to the ceiling of front body and hook wire on both ends, then with a chain block etc., gradually lift it up. Exercise extreme care to prevent contacting damages of each section. Place the body removed from the frame on a supporting stand.

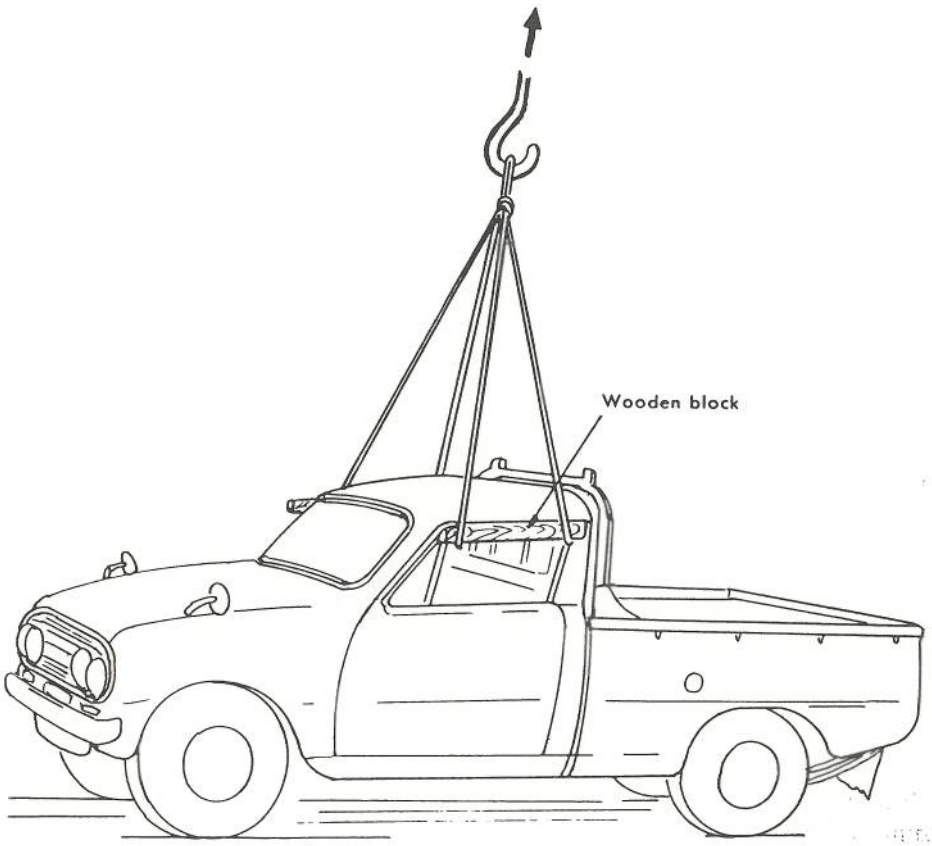


Fig. 101

TO INSTALL FRONT BODY

Prior to installing front body on the frame, check the fixing bolts and each rubber.

If bolts are found deformed or rubber fatigued, it should be replaced with new ones.

Remaining work should be performed by reversing the procedure of removal.

REMOVING AND INSTALLING FENDER PANEL

In case damaged fender panel requires replacement the panel per se can be removed from the body.

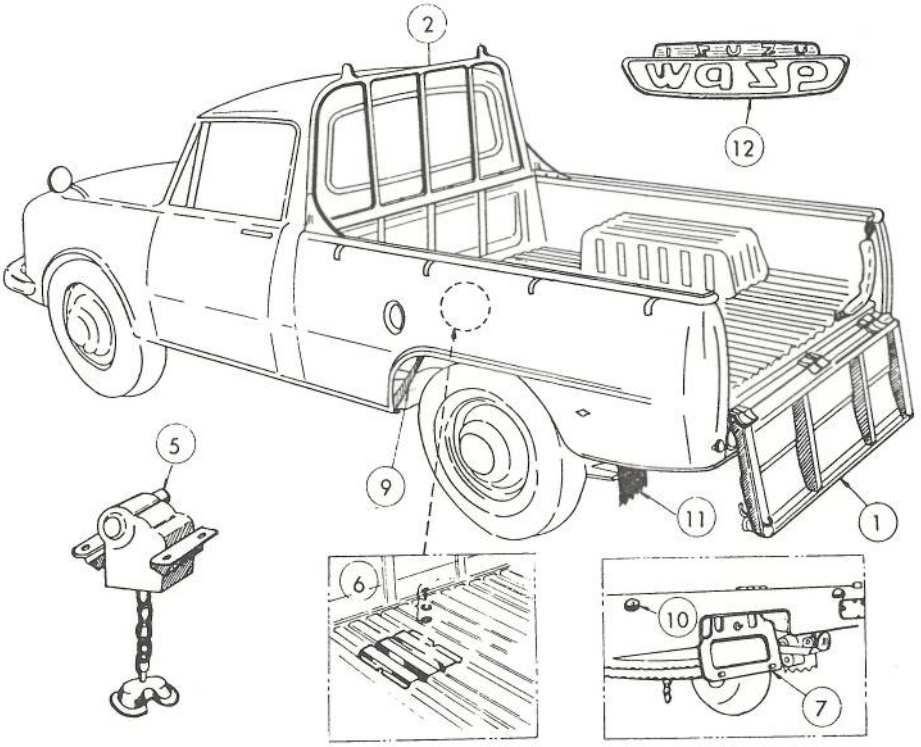
TO REMOVE AND TO FIT FENDER PANEL

1. After head lamp rim is removed, remove the fixing bolts to valance panel, deflector panel and remove fender panel from body.

2. To install, it is to be performed in reverse procedures, but when installing a new panel, it is better to process after painting is finished and accessories are replaced. When fitting, pay close attention to the dimensional balance left and right.

Rear body

ILLUSTRATION OF COMPONENT PARTS OF THE REAR BODY



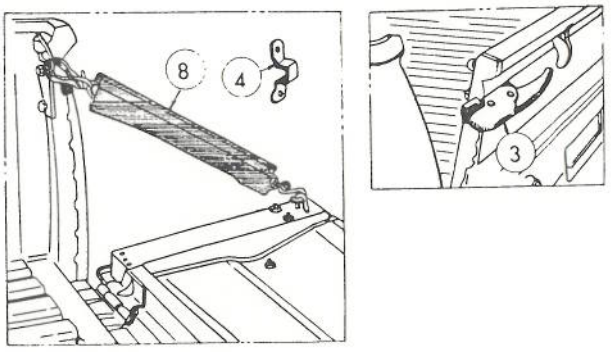


Fig. 102

1. Back door assembly
2. Guard frame assembly
3. Lock assembly; back door
4. Striker; back door
5. Spare tyre hanger assembly
6. Inspection door
7. B.K.T.; Number plate
8. Chain; Back door
9. Stay; Side panel front
10. Stopper rubber; back door
11. Mud cover
12. Name letter back door

TO REMOVE AND TO FIT REAR BODY

1. Disconnect the connection between wiring cord and body harness of tail, stop and flasher lamp, rear license, plate lamp at the connector.

2. Remove filler neck hose and breather pipe by tightening each clip from fuel tank.

3. Remove spare tire.

4. Remove the 8 bolts of rear body mounting. Rear mounting bracket positions are as shown in Fig. 33.

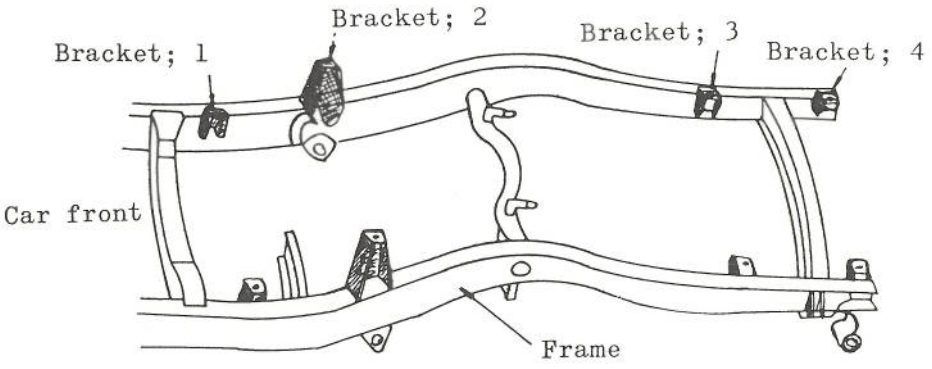


Fig. 103

5. Hook wire to the 4 rope hooks of rear body and lift with chain block.

6. To install, perform in reverse procedures of "To remove".

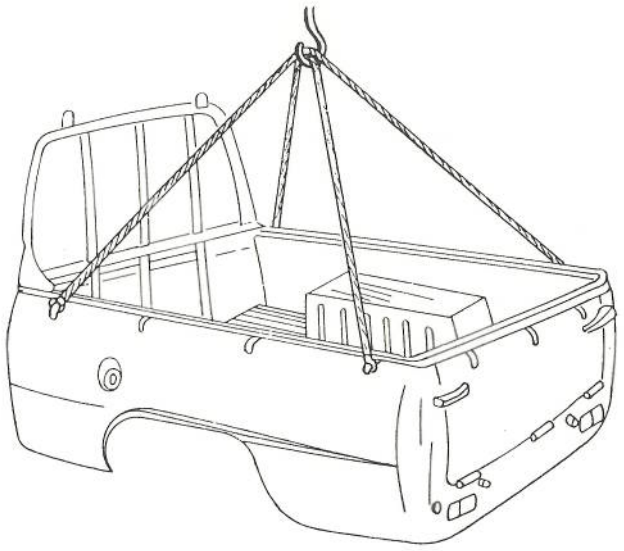


Fig. 104

PART 14

ELECTRICAL SYSTEM

CONTENTS

PART 14 ELECTRICAL SYSTEM

Lighting system

FUSE BOX

The fuse box is situated in the engine compartment at the right hand side of the dash panel.

In the fuse box, there are four cartridge fuses mounted in their positions with two spare fuses inserted in holes for easy access. (Fig. 1)

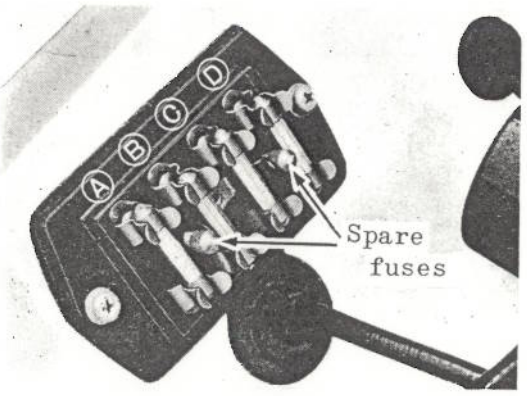


Fig. 1

If the fuse is found to be burnt out, make sure to establish the cause and make necessary correction before replacing the fuse with specified capacity.

A ... 15A (For reverse lamp, heater circuit, meter warning lamp and wiper circuit)

B ... 15A (For stop lamp, horn relay and flasher unit)

C ... 15A (For cigarette lighter and outlet receptacle)

D ... 30A (For dome lamp and lighting circuit)

HEADLAMPS

Take out four screws (two screws for standard model) and remove the rim. Take out two screws on the lens frame and remove holder springs for removing the headlamp. (Fig. 2)

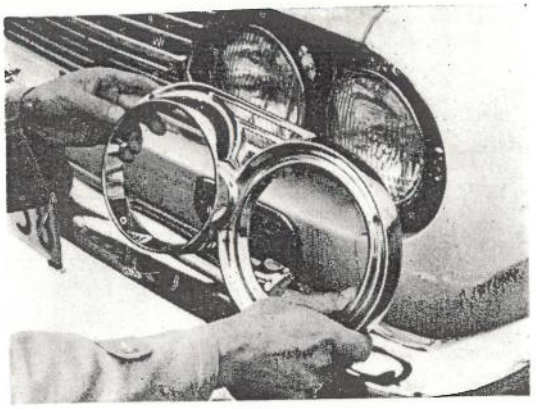


Fig. 2

Headlamps are of sealed-beam type which necessitate the bulb replacement integrally with lens and reflector. (Fig. 3)

The deluxe model is equipped with dual headlamps, the outer two of which have the capacity of 50W/37.5W while the inner two have the capacity of 37.5W.

Standard model is equipped with headlamps having the capacity of 50W/40W.

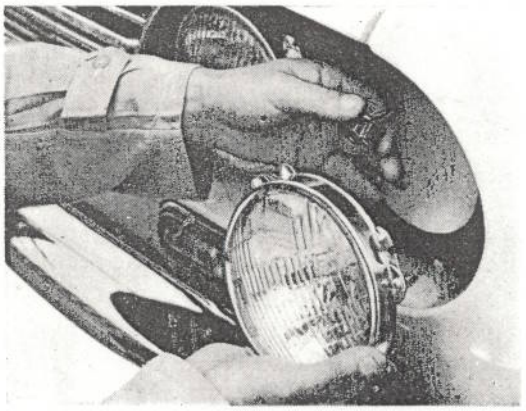


Fig. 3

After the headlamps are fitted, the aiming adjustment should be made: The screw on the upper part of the lens frame is for vertical adjustment while the screws on the right and left hand side of the lens frame are for horizontal adjustment. (Fig. 4)

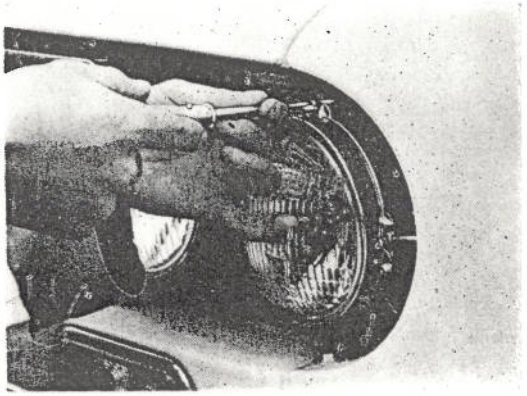


Fig. 4

AIMING THE HEADLAMPS

Aiming the headlamps usually involves the use of precise instrument but simple adjustment may be made in the following manner.

Park the car on a level in the right angle to a wall with 3 meters apart. The center of the main beam should not be higher than the level. For aiming the dual headlamps, the inner two lamps should be covered or their circuits disconnected when adjusting the outer headlamps. In the same manner, the outer two lamps should either

be covered or their circuits disconnected when adjusting the inner headlamps.

(On model equipped with dual headlamps, all the four lamps light with the dimmer switch in main beam position and the outer two turn on with the dimmer switch shifted into low beam position.)

The correct pattern of the headlamp beam is as illustrated in Fig. 5.

MAIN BEAM ADJUSTMENTS ON VARIOUS MODELS

Reference value

Models	Measurement represented by A	Measurement represented by B	Measurement represented by C
PR20, PR20D	630mm	621mm	604mm
PR10	630mm	621mm	604mm
PR D10	645mm	636mm	604mm
PR90	640mm	631mm	604mm
KR10, 20	725mm	716mm	604mm
KRD10	725mm	716mm	604mm

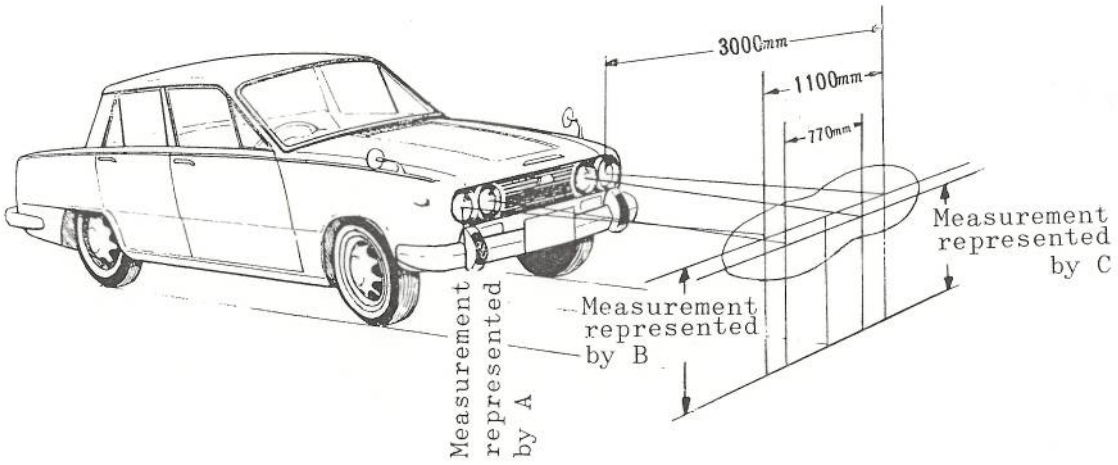


Fig. 5

PARKING LAMPS

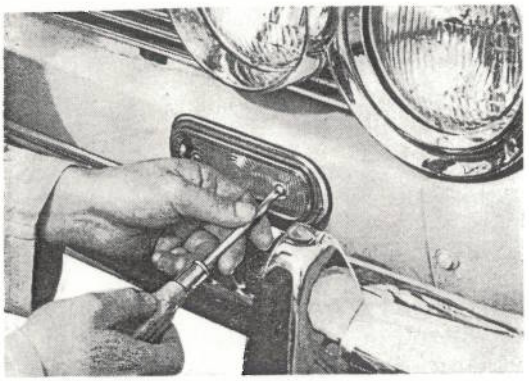


Fig. 6

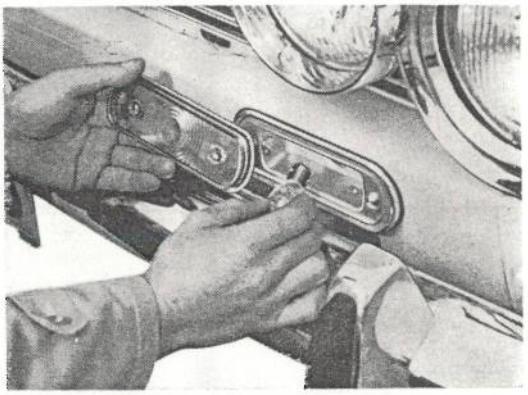


Fig. 7

Take out the two screws on the lens for removing the lens. For removing the bulb, push it in slightly and turn in counter-clockwise. The bulb incorporates two filaments in a single unit, the capacity of which are 21W/6W. (Figs. 6 and 7)

SIDE FLASHER LAMP

For bulb replacement, take out the dust cover together with the socket toward the inside of the fender to gain access to the bulb. The capacity of the bulb is 3W. (Fig. 8)

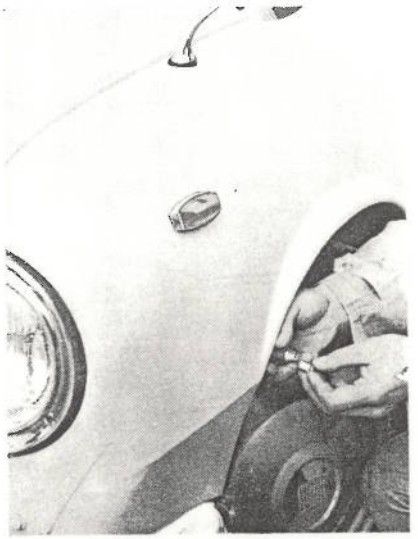


Fig. 8

STOP/TAIL LAMP

With the luggage compartment lid in raised position, the bulb is accessible when the rubber seal is removed. The capacity is 21W/6W. (Fig. 9)

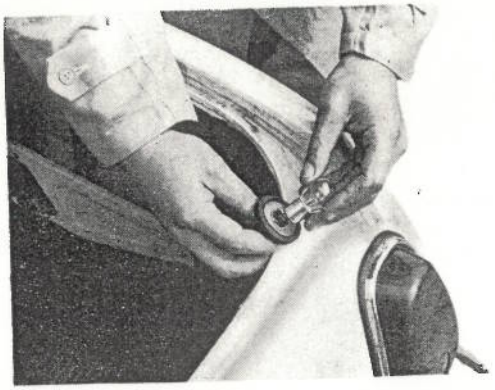


Fig. 9

FLASHER AND REVERSE LAMP

Take out three screws on the lens for removing the lens. For removing the bulb, push it in slightly and turn it counter-clockwise. The bulb has yellowish color, the capacity of which is 21W. (Figs. 10 and 11)

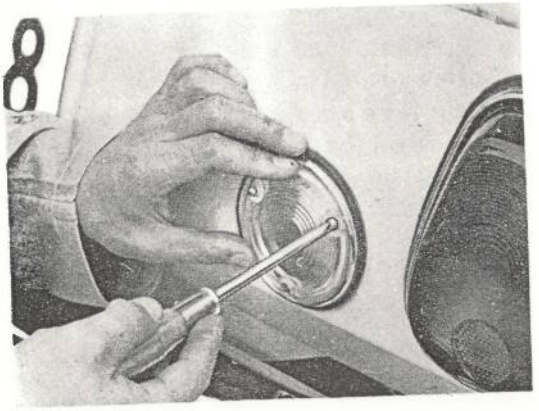


Fig. 10

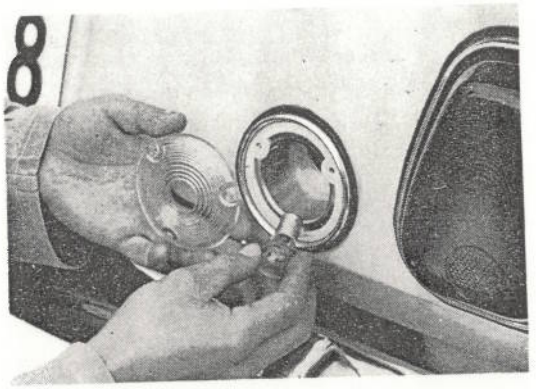


Fig. 11

LICENSE PLATE LAMP

With the luggage compartment lid in raised position, remove the rubber seal on the reverse side of the lens for bulb replacement. The bulb has the capacity of 6W. (Fig. 12)

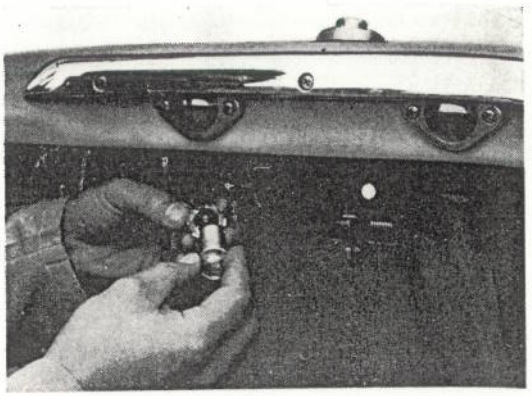


Fig. 12

DOME LAMP

Remove the cover for the bulb replacement.

The capacity of the bulb is 6W. (Fig. 13)

Fig. 13

Instruments - gages and switches

GENERAL DATA ON THE COMBINATION METER AND SPEEDOMETER

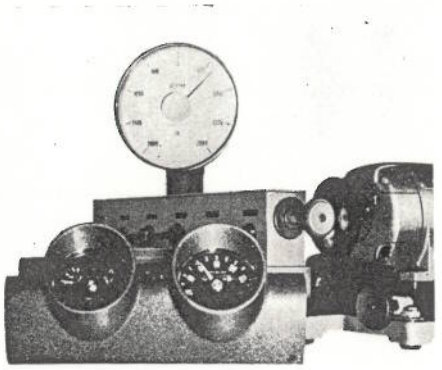
Speedometer	Rotating magnet type 637 r.p.m. ... 60 Km/h ($^{+3.5}_{-1.0}$ Km/h)
Thermometer	Operates on thermister C = 50°C (±7.5°C) 80°C (±6.5°C) H = 110°C (±6.5°C)
Fuel gage	Operates on resistance winding F (±1.8/16) 1/2 (±1.6/16) E (±1.3/16)
Ammeter	PR D10 ... Moving iron segment type PR 20 ... Warning type

TESTING THE METERS

1. Speedometer

With the use of the speedometer tester, test the speedometer in the manner as illustrated in Fig. 14. The function of the speedometer may be regarded as normal if the meter pointer indicates 60 km/h when the drive shaft is rotated at 637 r.p.m. Allowable error in the speedometer indication is as listed in the following table.

Speedometer indication km/h	20	40	60	100
Allowable error km/h	+3.0 -3.0	+3.0 -1.5	+3.5 -1.0	+5.0 -0



Speedometer tester

Fig. 14

2. Fuel gage

a. General test

Connect the UNIT terminal with the fuel tank unit as illustrated in Fig. 15. Then bring the float of the fuel tank unit into points E, 1/2 and F and see if the gage pointer comes within the ranges depicted in Fig. 16.

Function of the gage and unit may be regarded as normal if the meter pointer gives correct indication corresponding with the movement of the float.

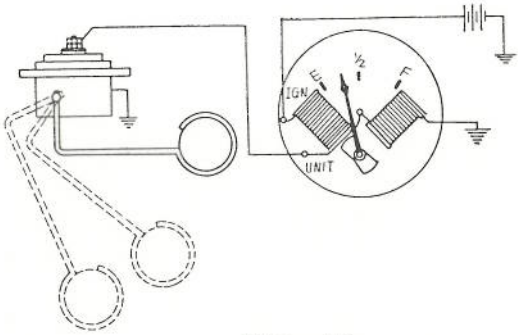


Fig. 15

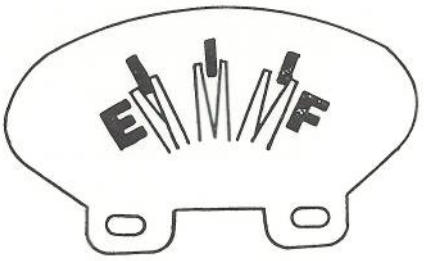


Fig. 16

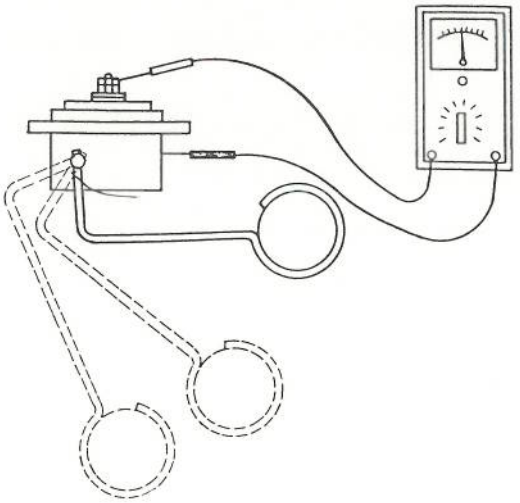


Fig. 17

b. Single unit test

i. Fuel tank unit

Connect the circuit tester leads to the tank unit as illustrated in Fig. 17. Then move the float into positions F, 1/2 and E and read the tester.

The tank unit may be regarded as normal if the tester readings fall within the values given in the following table.

Standard indication	F	1/2	E
Unit without associated component (Model 1965 and earlier)	83 ± 5Ω	43 ± 3Ω	3 ± 1.5Ω
Unit without associated component (Model 1966 and later)	0 + 2Ω	50 ± 5Ω	150 ± 15Ω

ii. Rated voltage regulator

The fuel gage of the models 1966 and later are equipped with rated voltage regulator. The terminal voltage on the meter side of the rated voltage regulator should appear as high as 8.5V ± 0.5V when the terminal voltage on the rated voltage regulator at the battery side falls within 11 - 16V.

3. Thermometer

a. General test

Connect the UNIT terminal of the gage with the thermometer unit as illustrated in Fig. 18. Then, apply the the battery voltage (12V) to the IGN terminal on the gage and submerge the thermometer unit into water in a suitable vessel. Then heat the water and note the reading. The function of the gage and unit may be regarded as normal if the gage pointer falls within the range C in Fig. 19 when the water is heated to 50°C and registers within the center ranges on the meter when water temperature is raised as high as to 80°C.

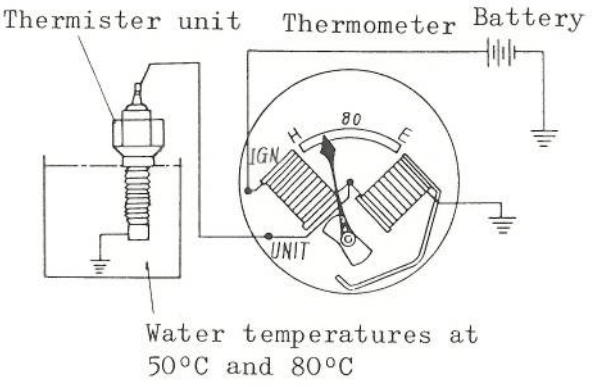


Fig. 18

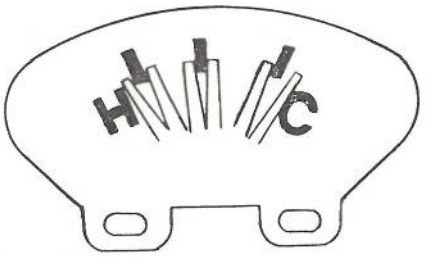


Fig. 19

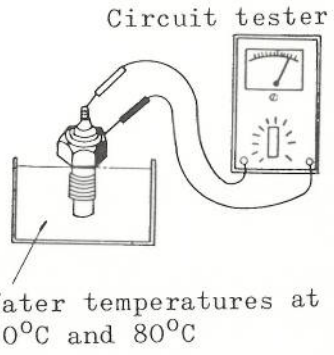


Fig. 20

b. Single unit test

i. Thermo unit

Submerge the thermo unit in hot water and measure the resistance value with the use of circuit tester. The function of the thermo unit may be regarded as normal if the resistance values measured with the unit in water at two different temperature fall within the range given in the following table.

Standard indication	50°C	80°C
Thermo unit (for models 1965 and earlier)	157 ± 17Ω	52 ± 4.2Ω
Thermo unit (for models 1966 and later)	130 Ω	48.5 ± 4.2Ω

ii. Rated voltage regulator

The thermometer for the models 1966 and later are equipped with rated voltage regulator. The terminal voltage on the meter side of the rated voltage regulator should appear as high as 8.5V ± 0.5V when the terminal voltage on the rated voltage regulator at the battery side falls within 11 - 16V.

4. AC generator charge warning circuit

Owing to the rectifying diodes used in combination with the AC generator, the operation of the charge warning lamp should be relied upon the method which differs in principle from that employed in DC generator circuit. Whereas, in the AC generator circuit, a charge warning relay built in the voltage regulator serves to operate the charge warning lamp as illustrated in Fig. 21.

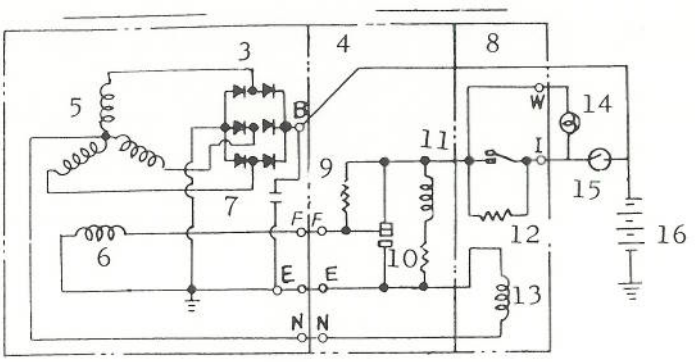


Fig. 21

1 - Generator
2 - Voltage regulator
3 - Silicon rectifying diodes
4 - Voltage regulator
5 - Stator coil
6 - Rotor coil
7 - Condenser
8 - Field relay
9 - Rotor coil inserting resistance
10 - Compensating resistance
11 - Voltage coil
12 - Field resistance
13 - Voltage coil
14 - Charge lamp
15 - Ignition switch
16 - Battery

This method utilizes the center voltage in Y-connection in the generator stator coil for operating the relay thereby indicating the function of the AC generator.

Malfunction of the warning lamp may be attributed to trouble in the wiring depicted in Fig. 21 or stuck warning relay points. If the warning lamp fails to go out, the trouble is attributable to malfunctioning relay or defective relay points.

FLASHER SWITCH AND FLASHER CIRCUIT

1. Wiring and function of the flasher

The flasher unit, flasher switch and lamps are connected as illustrated in Fig. 22. When the flasher switch is thrown into "right-turning position", the current flows through the circuit identified with thick line from the flasher unit and put the right turning flasher lamp into operation. Left turning flasher circuit is illustrated in Fig. 24.

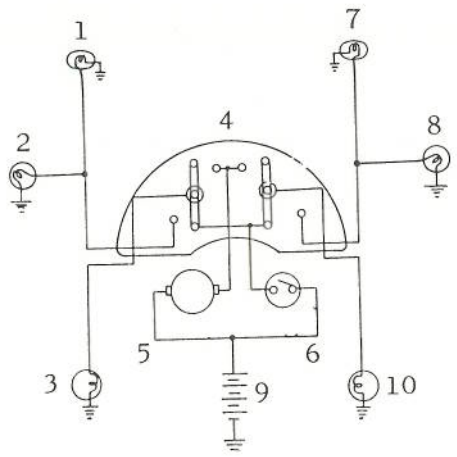


Fig. 22

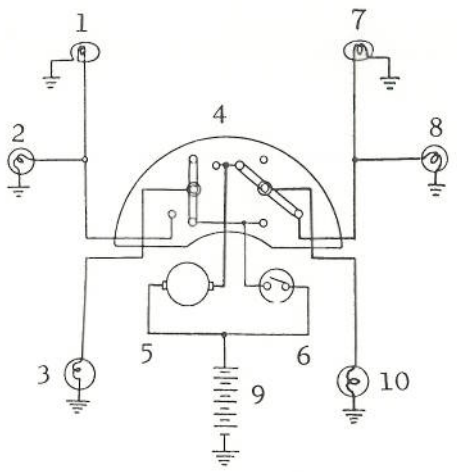


Fig. 23

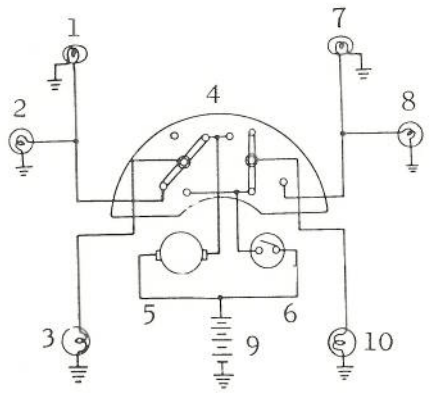


Fig. 24

1 - Flasher lamp (left)
2 - Warning lamp
3 - Flasher/reverse lamp
4 - Flasher switch
5 - Flasher lamp (right)
6 - Warning lamp
7 - Flasher unit
8 - Reverse lamp switch
9 - Battery (12V)
10 - Flasher/reverse lamp (right)

2. Testing the flasher

If the operation of the flasher switch fails to put the flasher lamps (both right and left) into normal function, remove the flasher unit and test it in the following manner. Connect the flasher unit and a bulb (12V/55W) to the battery as illustrated in Fig. 26 and see if flashing operation takes place. The flasher unit may be regarded as normal if flashing counts as fast as 50-120 times per minute. If the flasher unit is known to be in good condition, check the flasher circuit and flasher switch for failure. (Fig. 25)

a. If the flashing is slow, check the capacity of the bulb in use, grounding and voltage drop in the circuit from the battery to the B terminal on the flasher unit.

b. If the flashing operation of the right and left flasher lamps are far off the balance or only the right or left flasher lamps operate, the trouble is attributed to disproportion in the current flowing through the flasher circuit. Establish the cause of trouble by checking the capacity of the bulbs in use, grounding or wiring.

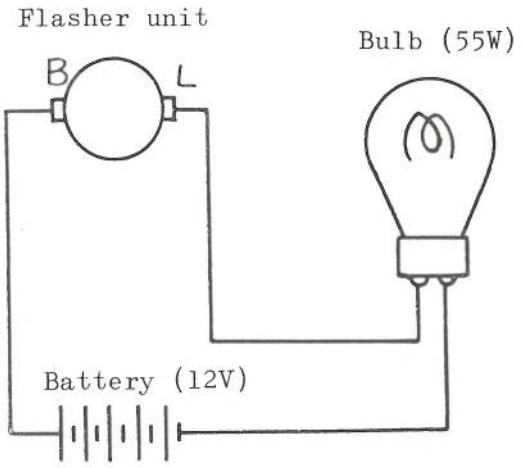


Fig. 25

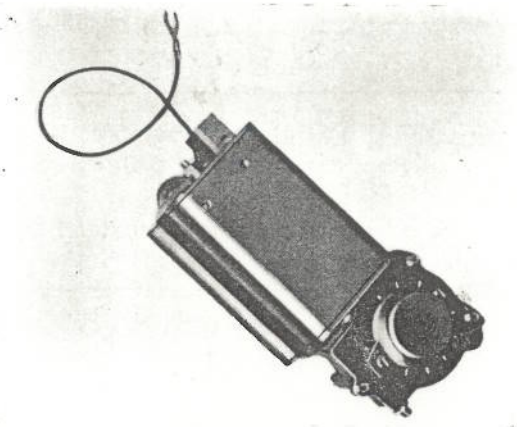
Windshield wipe

GENERAL DATA AND SPECIFICATION

Model	Type
Standard	Single-speed with automatic stopper
Deluxe	2-speed with automatic stopper and rise-up mechanism

Item		Data		Remarks
Rated voltage		12V		
Range of service voltage		10-14V		
Starting voltage		Below 8.5V		Low speed operation with linkage and wiper blade (bench test)
Insulation resistance		Above 1M		At normal temperature with normal relative humidity Result obtained with 500V-Megger
No-load operation		Low-speed	High-speed	
	Operating noise	Below 57 phon	"	At normal temperature when motor is cold Voltage applied for operation is 13V
	Rotating speed	45±7r.p.m.	60±7r.p.m.	Operating noise was measured at spot 10 cm apart from the motor
	Current	Below 4A	Below 3.5A	

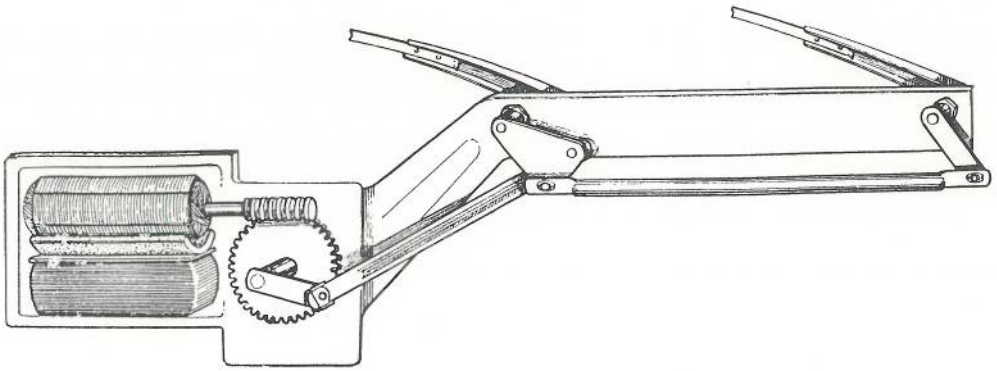
Operation with load	Torque	Above 80 kg-cm	Above 60 kg-cm	Operation at normal temperature without load. The voltage applied for operation is 13V
	Current	Below 14A	"	After 90 minutes of continuous operation
Over-run by inertia		Below 30°		
Temperature raise	Temperature raise	Below 65°C		Low speed operation at normal temperature under 20 kg-cm of load. The voltage applied for operation is 13V
	Rotating speed	43 ± 5 r.p.m.		
Weight		3.65 kg		



For standard model

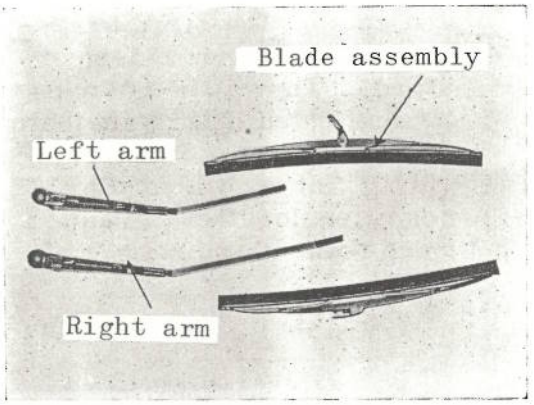
Fig. 26

Item	Data
Length of the blade	280 mm
Wiping angle	115° ± 5
Pressure on arm	250 g
Length of arm	RH 296 mm LH 236 mm



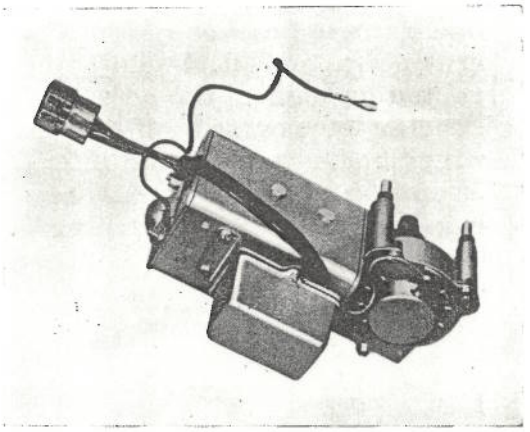
Construction

Fig. 27



Blade and arm

Fig. 28



For deluxe model

Fig. 29

WIPER MOTOR

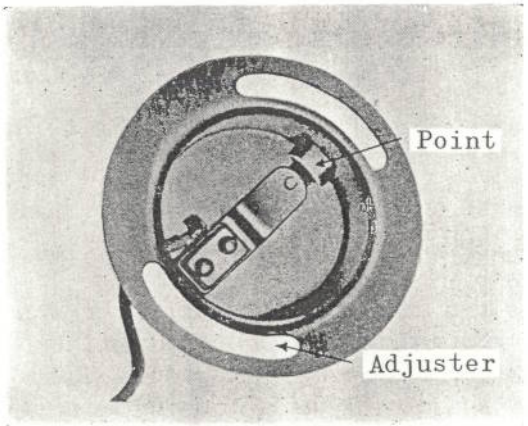
1. Construction

The armature rotates in a field coil mounted yoke. A holder base comprising a carbon brush holder and a circuit breaker is provided on the commutator side, and an end cover supporting the rotor shaft is provided on the outer side of the motor. The end cover has a housing to carry a thrust bearing of the rotor shaft. A worm wheel and a gear shaft are mounted in the gear case which serve to reduce the rotating speed.

2. Automatic stopper

This device is adapted to bring the wiper blade into its lowest position of the stroke irrespective of its position at which the power is turned-off. When the switch is turned off, the motor continues to rotate until the contact points of the automatic stopper are released thereby permitting the wiper blades to come down to rest in their bottom position.

The automatic stopper is made adjustable so that if the wiper blade moves in excess of its operating range, it should be corrected by turning the adjuster counter-clockwise. If the wiper blade stops in the intermediate position of its stroke, it may be adjusted by turning the adjuster in clockwise direction. (Fig. 30)



Automatic stopper cover

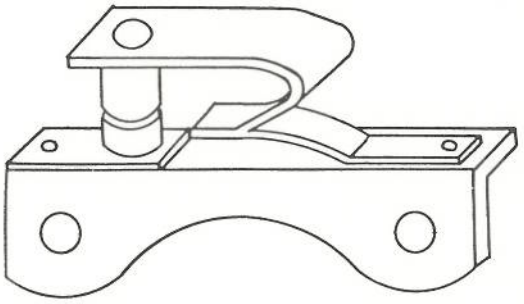
Fig. 30

3. Circuit breaker

The circuit breaker is adapted to protect the wiper motor from being damaged by over-heating.

a. The circuit breaker does not come into function unless the load exceeds 5A or the internal temperature of the motor exceeds 100°C.

b. Whenever a load exceeding 5A is applied to the motor, the circuit breaker comes into function within 10 minutes and cuts off the circuit irrelative to its internal temperature. The wiper motor may be uneffected if it is subjected to current up to 15A providing that such irregular condition does not continue more than 10 minutes.

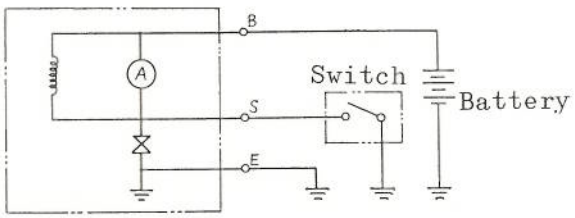


Circuit breaker

Fig. 31

c. The circuit breaker points repeats to contact and release with a few seconds of interval until the abnormal load is removed or the power is turned off thereby holding the internal temperature of the motor constant and protect it from being damaged.

4. Motor wiring diagram



Single-speed motor

Fig. 32

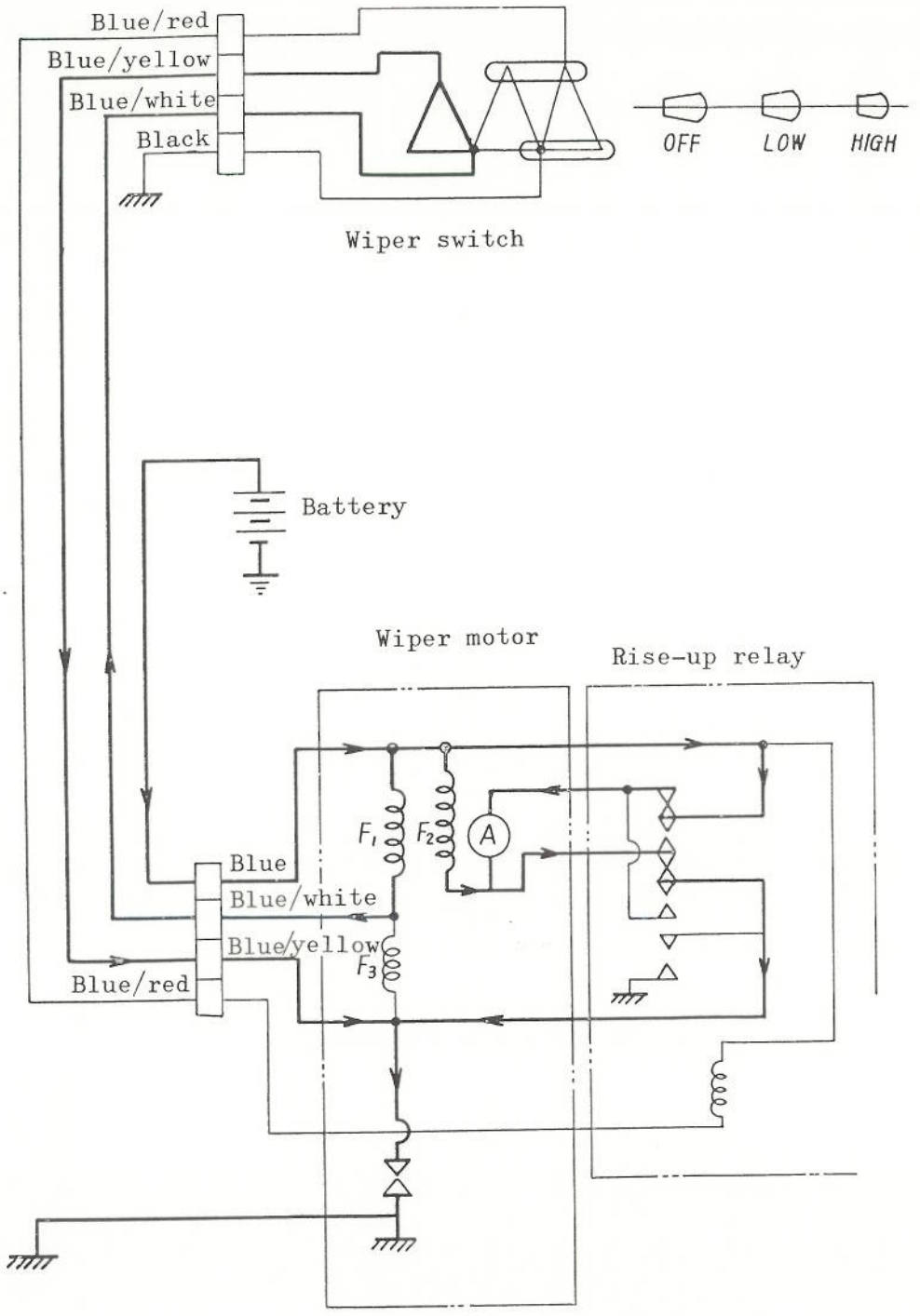
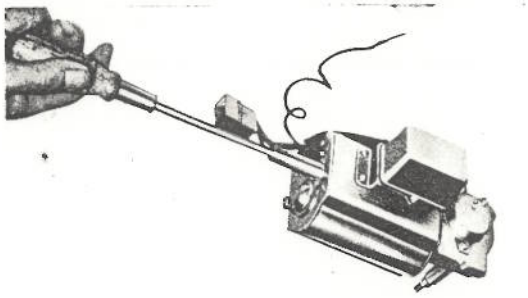


Fig. 33 2-speed motor wiring diagram

5. Disassembly

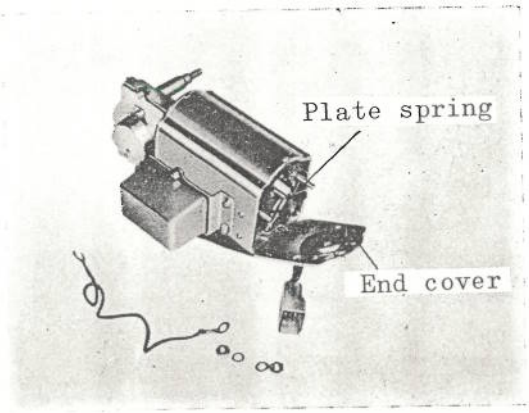
a. Take out the 5 mm nut and then remove the end cover. (Fig. 34)



Removing the nut

Fig. 34

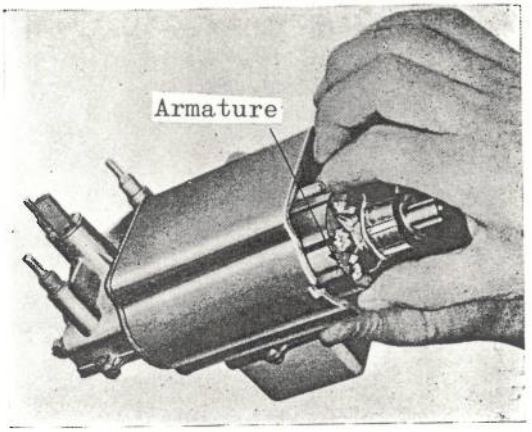
b. Take out the plate spring and remove the brush holder. (Fig. 35)



Removing the brush holder

Fig. 35

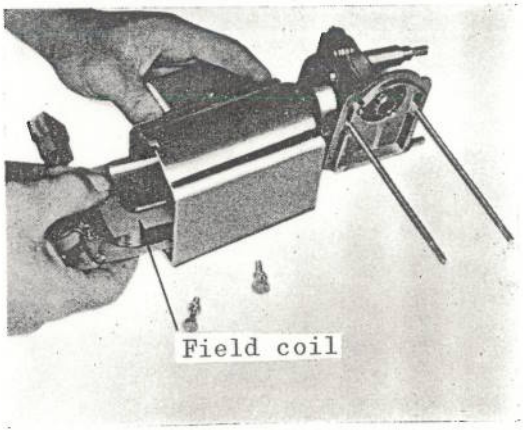
c. Take out the armature with hand and then withdraw the gear case. (Fig. 36)



Removing the armature

Fig. 36

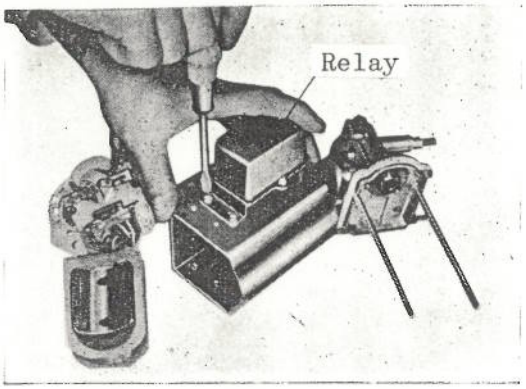
d. Take out the 5 mm bolt from the yoke and remove the field coil. (Fig. 37)



Removing the field coil

Fig. 37

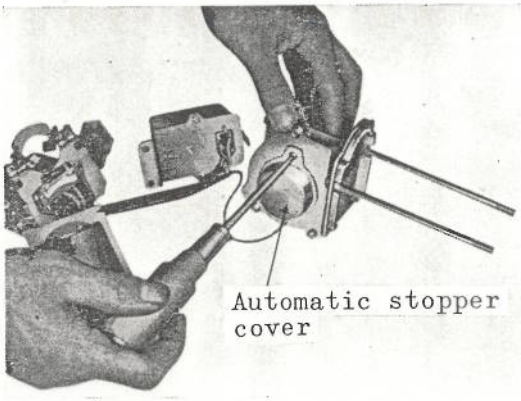
e. Remove the 4 mm screw from the relay. (Fig. 38)



Removing the screw from the relay

Fig. 38

f. Remove the automatic stopper cover. (Fig. 39)



Removing the automatic stopper cover

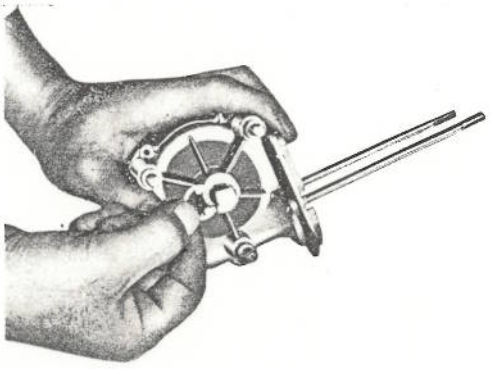
Fig. 39

g. Remove the gear box cover. (3 mm tapping screw). (Fig. 40)

Removing the gear box cover

Fig. 40

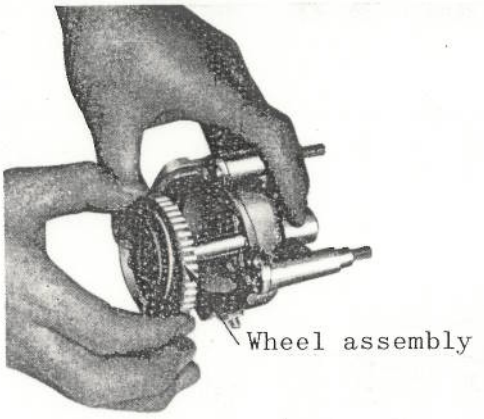
h. Take out the stopper ring from the gear shaft. (Fig. 41)



Removing the stopper ring

Fig. 41

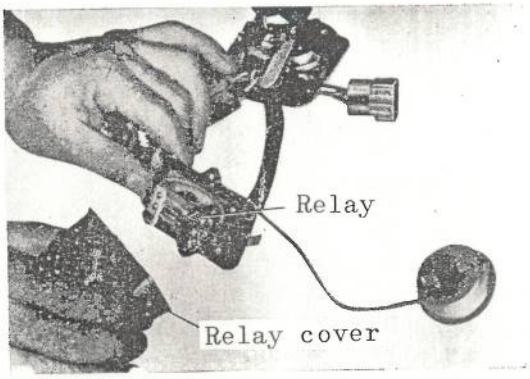
i. Pull out the worm wheel assembly. (Fig. 42)



Removing the worm wheel

Fig. 42

j. Remove the relay cover. (Fig. 43)

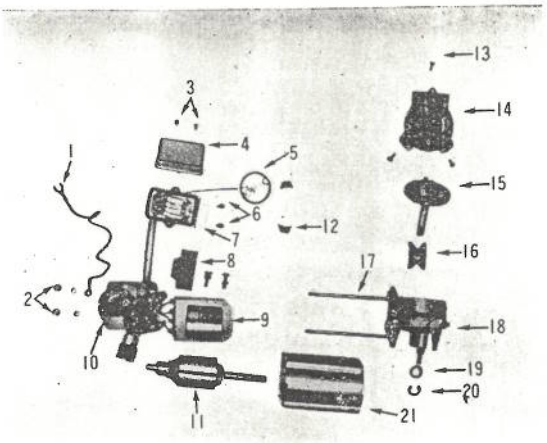


Removing the relay cover

Fig. 43

The above procedures suffice to disassemble the wiper motor into pieces. (Fig. 44)

For reassembly, reverse the order of disassembly.



Component parts of the wiper motor

Fig. 44

1. Harness
2. Nut
3. Bolt
4. Relay cover
5. Automatic stopper
6. Bolt
7. Relay
8. Fiber
9. Field coil assembly
10. End cover
11. Armature
12. Adjusting screw
13. Tapping screw
14. Gear box cover
15. Worm wheel assembly
16. Wheel arm
17. Stud bolt
18. Gear box
19. Thrust washer
20. Stopper ring
21. Yoke

Note: The short connecting rod should be superimposed on the crank arm when refitting the motor to the frame.

6. Inspection

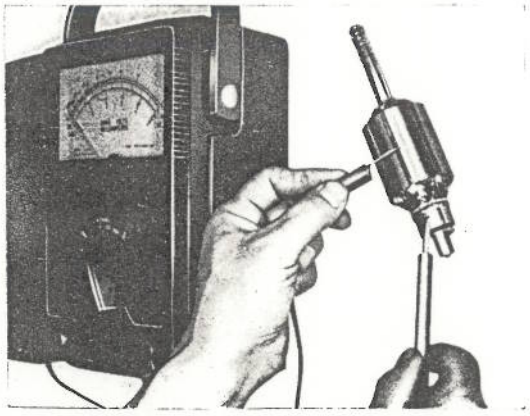
a. Worm wheel

i. Check the gear teeth for cracking. (Visual check-up)

b. Armature

ii. Conduction test

Check to see if conduction takes place between the core and commutator. Conduction between these parts indicates short-circuitting and therefore, the trouble should be rectified or the parts replaced. (Fig. 45)



Conduction test

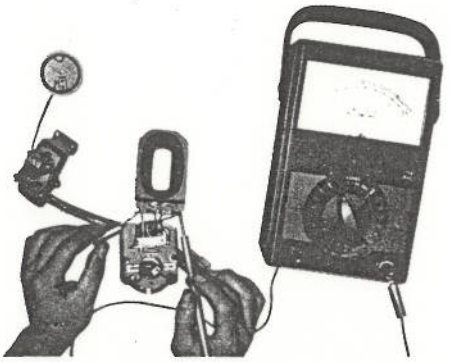
Fig. 45

c. Commutator

i. Examine the commutator for roughness and contamination. Clean the face of the commutator with use of fine abrasive paper.

d. Field coil

i. Make the conduction test at least three spots always including red cord. If conduction does not take place, rectify or replace the field coild.



Conduction test on the field coil

Fig. 46

ii. Check the conditions of solders and make necessary corrections.

e. Brush holder

i. Check the reduction in the length of the carbon brushes and damage. If their length get shorter than 1/3 of the original length or found damaged they should be replaced.

The original length of the carbon brush is 8 mm.

ii. Check the strength of the brush springs. This is standard at 150 gr when compressed in full.

iii. Check the circuit breaker points for fouling and compression pressure. The pressure acting on the points are standard at 200-250 gr. Clean the points with fine emery cloth if necessary.

iv. Check soldering for looseness and make necessary rectification.

f. End cover metal

i. Check the end cover oilless (self-lubricating) bearing for wear and contamination.

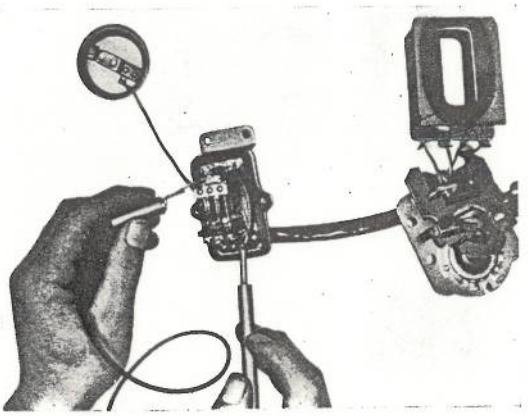
Replace the end cover assembly as a unit if the bearing wear is considerable. If the bearings are found to be contaminated, clean and apply small amount of spindle oil.

The oil allowance between bearing and shaft is 0.02mm.

g. Relay

i. Check the relay points for fouling or roughness. Remove all the contaminant on the points and use fine emery cloth if necessary.

ii. To check the relay for disconnection, use conduction tester. If the suitable tester is not available, connect the relay to the battery. If relay operates as the power is supplied, the relay may be regarded as in normal operating condition. (Fig. 47)



Conduction test with use of battery

Fig. 47

h. Automatic stopper cover

i. Check the points for fouling and clean as necessary.

1. Frame

i. Check the pitch on the serration for dent or wear and make replacement as necessary.

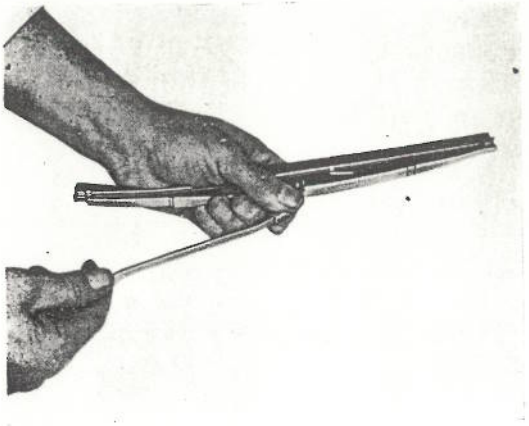
ii. Check the eccentrical spring for breakage and replace if necessary.

iii. Check crankarm for deformation or breakage. Also check the arm hinge for wear. Rectify or replace the parts as necessary.

j. Blade

i. The blade can be removed from the arm by holding the holder with fingers and slightly bending the arm toward the operator.

ii. Check the blade for evidence of wear or damage and make necessary replacement. (Fig. 48)



Removing the blade from the arm

Fig. 48

TROUBLE-SHOOTING AND CORRECTION

	Cause of trouble	Manners of service
Motor fails to rotate	Excessively worn bearing or bearing binding	Check the diameter of the bearing. Also check the diameter of the armature shaft
	Relay failure	Establish the cause of trouble. Also check the point gap
	Armature layer short	Rectify or replace
	Dislocated balance weight binding in motor	Replace
	Over-loading (Binding or sticking arms)	Check the spring pressure and blade
	Erroneous wiring	Correct the wiring according to the wiring diagram
	Poorly contacted carbon brush	Free the carbon brush in the holder to operate smoothly
	Disconnected or loosened soldering	Make visual check-ups and pull the lead slightly with fingers
	Damaged gears	Replace
Brush noise is considerable	Poor brush to commutator contact	Replace if brushes are worn beyond service limit
	Badly contaminated commutator face	Clean
	Uneven commutator face	Rectify
	Contaminated commutator face	Clean

Screaking noise	Foreign material on the brush face	Clean or replace if necessary
	Excess friction on the tip end of the thrust ball	Fit the armature into place and check to make sure that there is provided suitable thrust (Shaking of the yoke in frontward and rearward direction makes rattling noise) (Apply small amount of grease to the tip end of the thrust)
Motor fails to stop	Failure of the automatic stopper	Defective points or foreign material on the points
	Failure of the relay	Readjust the point gap
	Shorted relay	Disconnect the relay from the motor circuit and check for failure

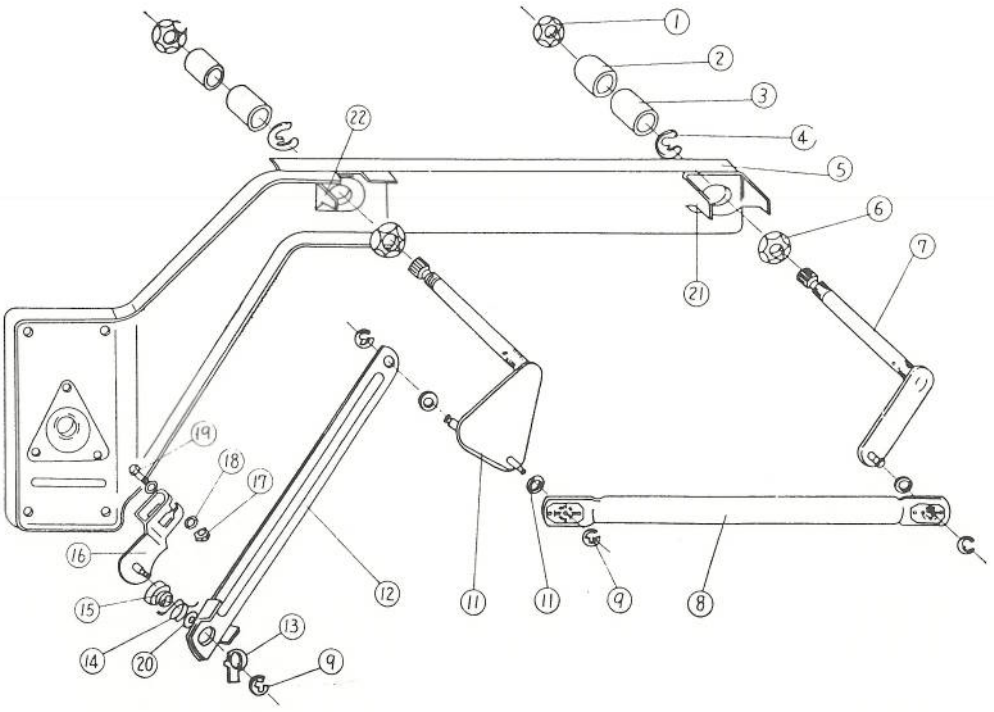
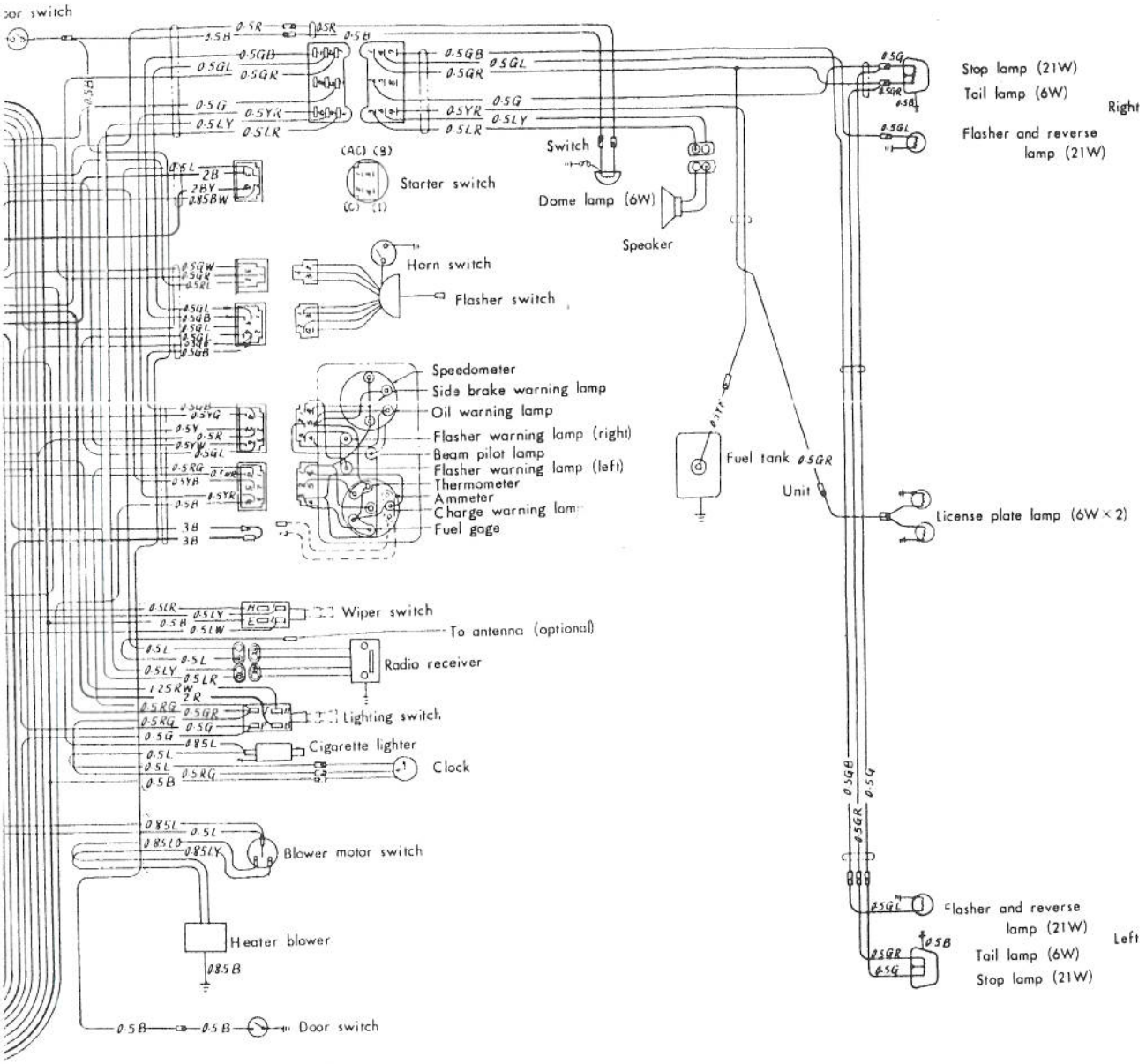


Fig. 49

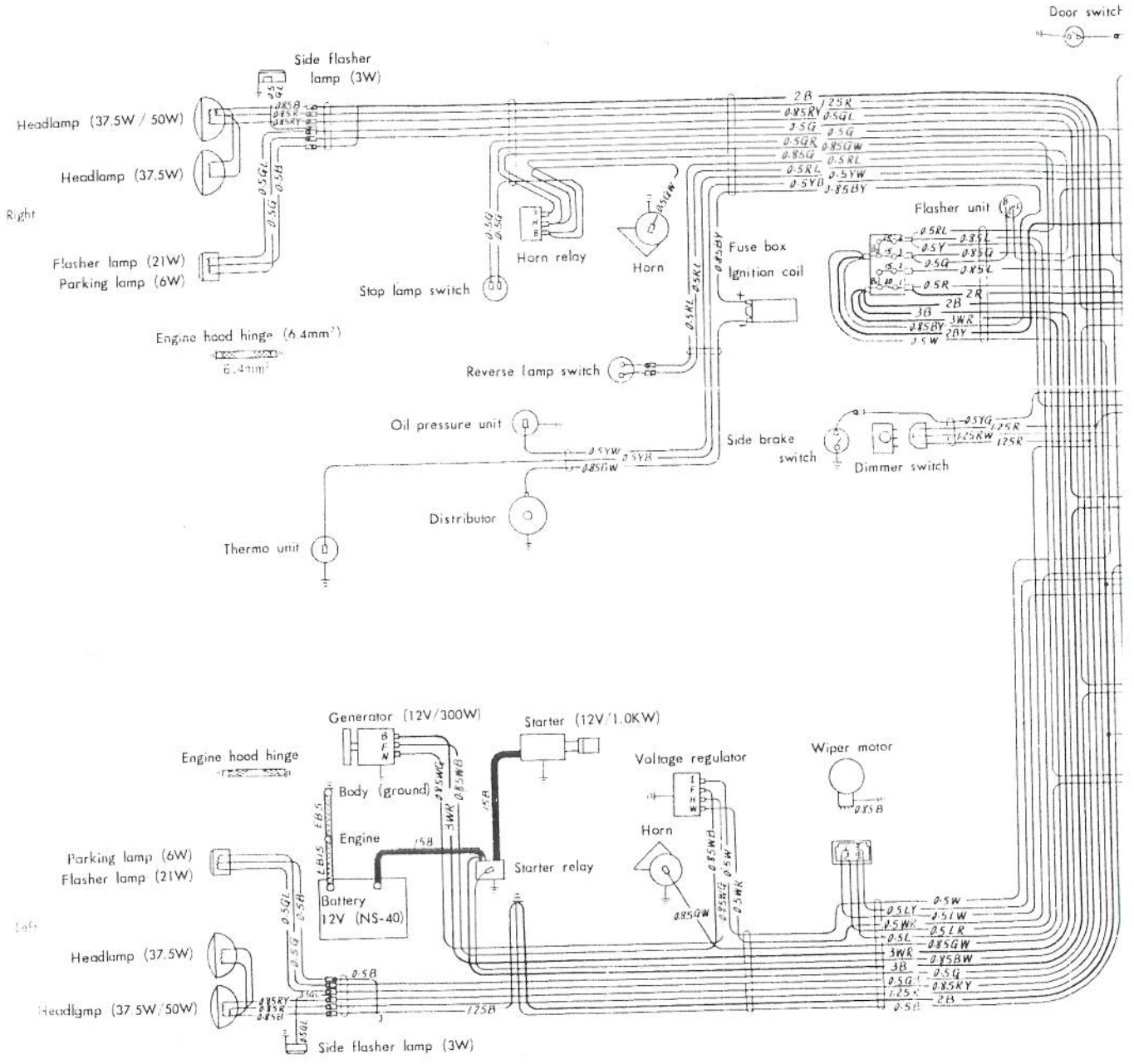
COMPONENT PARTS OF THE FRAME

Item	Q'ty	Parts name	Item	Q'ty	Parts name
1	2	5/8ϕ nut	12	1	Connecting rod (S) assembly
2	2	Distance collar	13	1	Eccentrical plate
3	2	Distance collar	14	1	Friction spring
4	2	Stopper	15	1	Eccentrical metal
5	1	Bracket assembly	16	1	Crank arm (D)
6	2	5/8ϕ nut	17	1	6ϕ nut
7	1	Right arm assembly	18	1	Washer
8	1	Connecting rod (L) assembly	19	1	Hexagonal bolt
9	4	Stop ring	20	1	Metal washer
10	4	Washer	21	1	Stopper (L)
11	1	Left arm assembly	22	1	Stopper (R)

:TT 1500 gasoline engine



(1) Wiring diagram for the BELLETT



PART 15

ESSENTIAL TOOLS

CONTENTS

PART 15 ESSENTIAL TOOLS

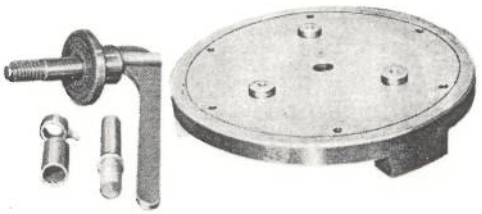
For clutch

Parts number 8524-1407
Parts name
Aligner; clutch pilot

Refer the paragraph "Clutch"

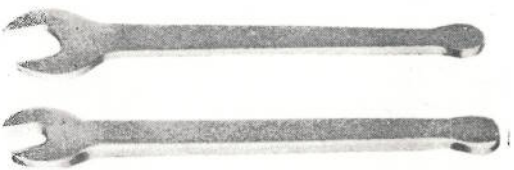
Parts number 8522-0023
Parts name
Jig assembly; clutch

Refer the paragraph "Clutch"



Parts number 8511-1109
8511-1110
Parts name
Wrench; clutch eye bolt

Refer the paragraph "Clutch"



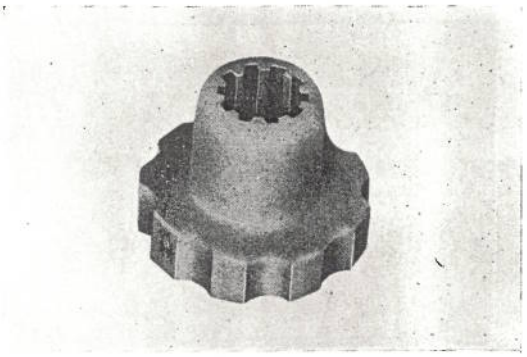
For transmission

Parts number 8529-1408

Parts name

Plug; mission rear cover

Refer the paragraph "Transmission"



Parts number 8511-4204

Parts name

Extension; clutch housing bolt

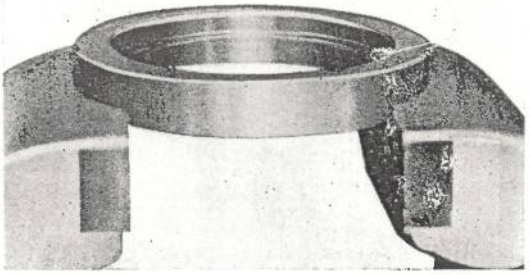
Refer the paragraph "Transmission"

Parts number 8521-1736

Parts name

Puller; front cover

Refer the paragraph "Transmission"

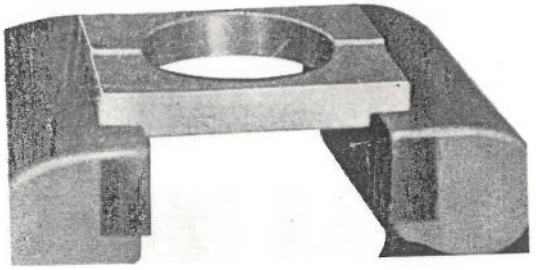


Parts number 8521-1737

Parts name

Puller; top gearshaft bearing

Refer the paragraph "Transmission"



Parts number 8511-1144

Parts name

Wrench; mainshaft nut

Refer the paragraph "Transmission"

Parts number 8522-1134

Parts name

Setting tool; mainshaft snap ring

Refer the paragraph "Transmission"

Parts number 8511-1115

Parts name

Wrench; pinion gear holder

Refer the paragraph "Transmission"

For steering system

Parts number 8521-0088
8521-1126
8521-1460

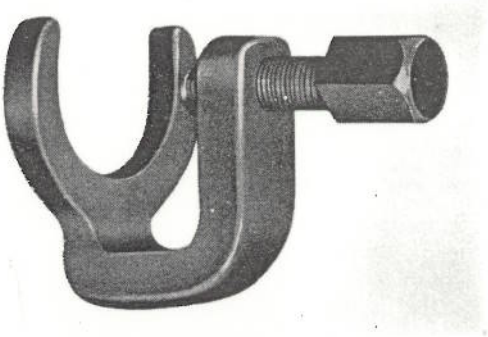
Parts name

Replacer; steering wheel

Replacer; guide

Replacer; bolt

Refer the paragraph "Steering system"

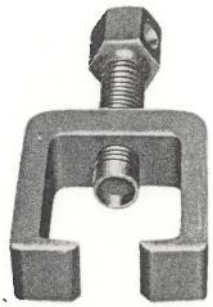


Parts number 8521-0078

Parts name

Puller assembly; knuckle, track rod and ball joint

Refer the paragraph "Steering system"



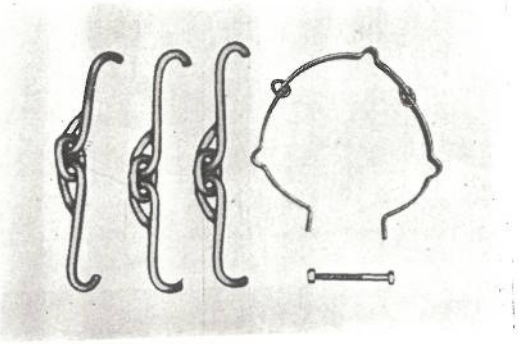
For front suspension

Parts number 8523-1544

Parts name

Clip; coil spring

Refer the paragraph "Front suspension"

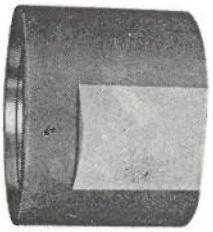


Parts number 8523-1380

Parts name

Guide pipe; replacer
For use in common with:
Upper fulcrum pin bush,
engine rear mounting bush,
diagonal link bush and
lower fulcrum pin bush

Refer the paragraph "Front suspension"

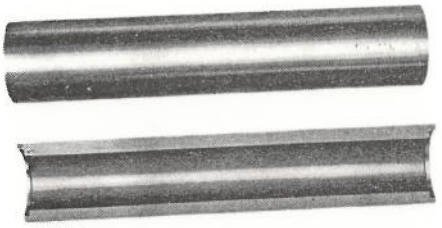


Parts number 8523-1382

Parts name

Distance tube; lower fulcrum pin

Refer the paragraph "Front suspension"



Parts number 8523-1383

Parts name

Plate; lower fulcrum pin bush

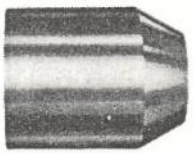
Refer the paragraph "Front suspension"

Parts number 8523-1384

Parts name

Attachment; upper fulcrum pin bush
For use in common with:
Lower fulcrum pin bush

Refer the paragraph "Front suspension"

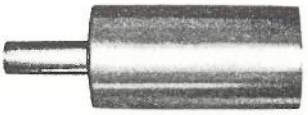


Parts number 8523-1385

Parts name

Attachment; replacer for upper fulcrum pin bush

Refer the paragraph "Front suspension"



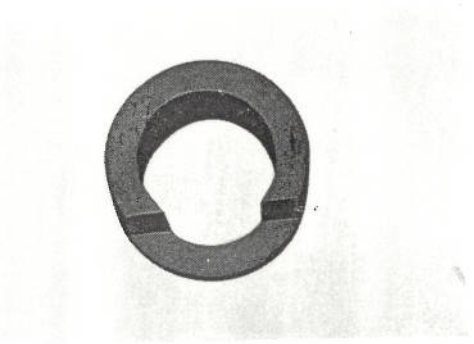
Parts number 8523-1386

Parts name

Adapter; replacer

For use in common with:
Upper fulcrum pin bush and
Lower fulcrum pin bush

Refer the paragraph
"Front suspension"

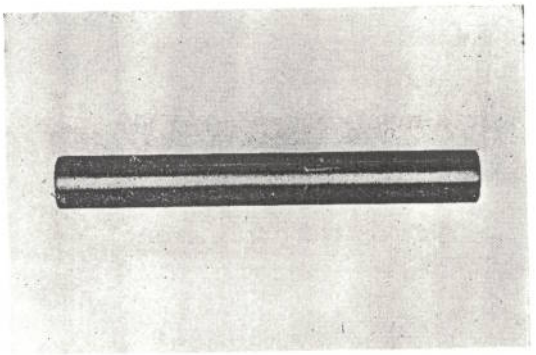


Parts number 8523-1394

Parts name

Push bar; upper fulcrum pin bush

Refer the paragraph
"Front suspension"



For rear axle and rear suspension

Parts number 8521-0083

Parts name

Remover assembly;
rear axle

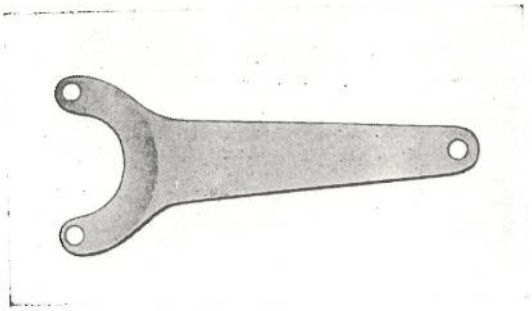
Refer the paragraph
"Rear axle"

Parts number 8511-1342

Parts name

Wrench; coupling driver

Refer the paragraph "Rear axle"

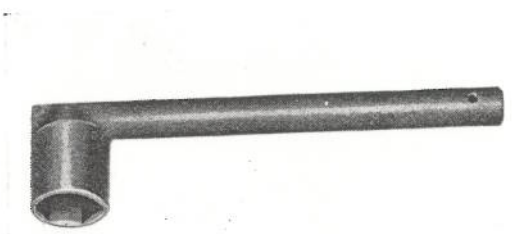


Parts number 8511-1345

Parts name

Wrench; coupling nut

Refer the paragraph "Rear axle"



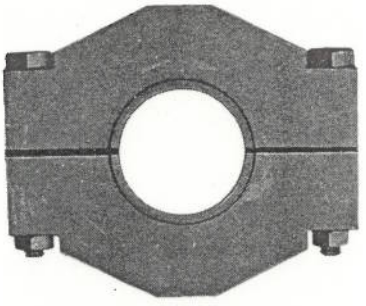
Parts number 8521-0082

Parts name

Bearing separator;

hypoid pinion bearing inner lace

Refer the paragraph "Rear axle"



Parts number 8521-5032

Parts name

Spindle; bearing separator

Refer the paragraph "Rear axle"

Parts number 8521-5031

Parts name

Lever stopper

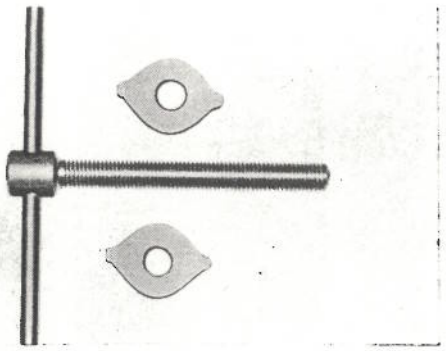
Refer the paragraph "Rear axle"

Parts number 8521-0086

Parts name

Puller assembly; hypoid pinion inner and outer bearing , outer lace

Refer the paragraph "Rear axle"

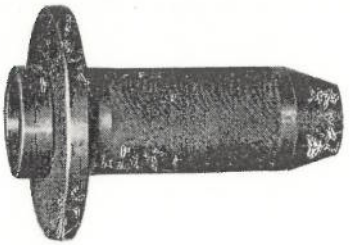


Parts number 8522-1142

Parts name

Setting tool;
differential oil seal

Refer the paragraph "Rear axle"

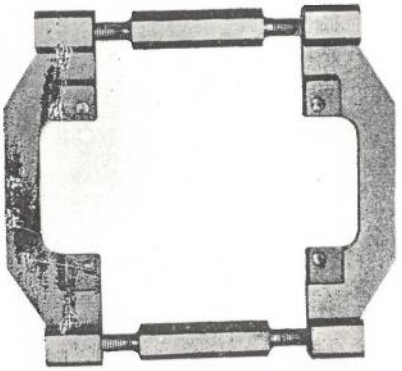


Parts number 8524-1613
8524-1614
8524-1615
8524-1616

Parts name

Spreader assembly;
differential housing
Plate; spreader differential housing
Shaft; spreader differential housing
Knock; spreader differential housing

Refer the paragraph "Rear axle"



Parts number 8522-1140

Parts name

Setting tool; hypoid pinion outer bearing inner lace

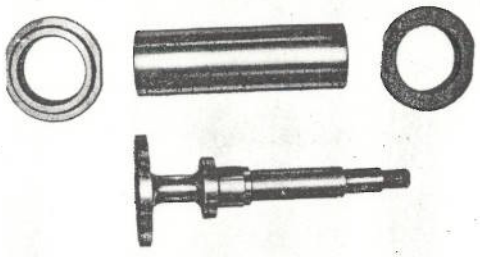
Refer the paragraph "Rear axle"

Parts number 8524-1617
8524-1618
8524-1619

Parts name

Dummy shaft,
dummy pinion shaft and
dummy bearing

Refer the paragraph
"Rear axle"

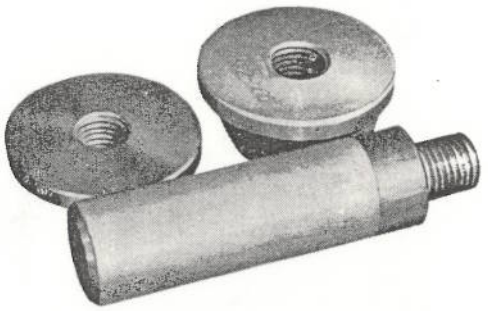


Parts number 8522-1141
8522-1148
8522-1166

Parts name

Setting tool; hypoid pinion
outer bearing outer lace
Grip; setting tool
Setting tool; hypoid pinion
inner bearing outer lace

Refer the paragraph
"Rear axle"

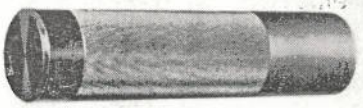


Parts number 8522-1165

Parts name

Setting tool; hypoid pinion
inner bearing inner lace

Refer the paragraph
"Rear axle"

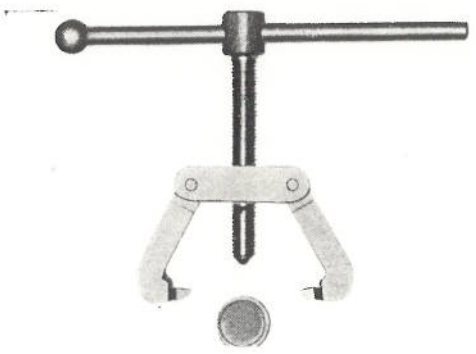


Parts number 8521-0084
8521-1743

Parts name

Puller assembly; differential side bearing
Seat; differential side bearing puller

Refer the paragraph "Rear axle"



Parts number 8514-1601

Parts name

Remover; differential lock pin

Refer the paragraph "Rear axle"

Parts number 8521-5033

Parts name

Remover; differential cross pin

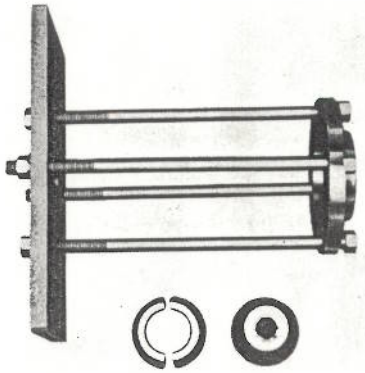
Refer the paragraph "Rear axle"

Parts number 8521-0089

Parts name

Puller assembly;
sleeve outer axle shaft

Refer the paragraph
"Rear suspension"



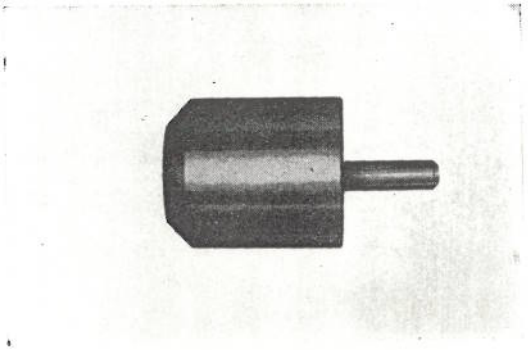
Parts number 8523-1381

Parts name

Attachment; replacer

For use in common with:
engine rear mounting bush
and diagonal link bush

Refer the paragraph
"Rear suspension"

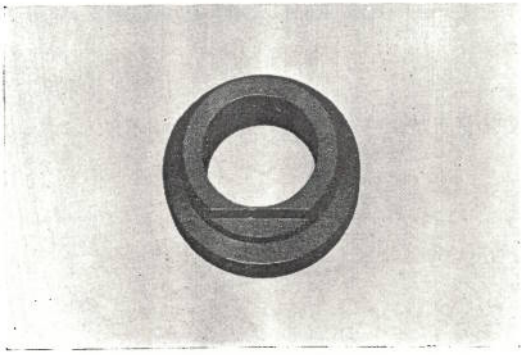


Parts number 8523-1390

Parts name

Adapter; replacer
diagonal link bush

Refer the paragraph
"Rear suspension"



Parts number 8543-1501
8543-1502
8543-1503

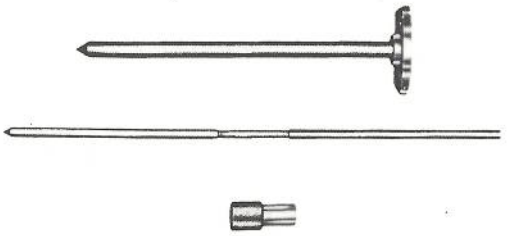
Parts name

Gage; diagonal link center

Master; inner axle shaft

Master; outer axle shaft

Refer the paragraph "Rear suspension"



Parts number 8523-1392

Parts name

Attachment; replacer diagonal link bush

Refer the paragraph "Rear suspension"

Parts number 8523-1393

Parts name

Push bar; diagonal link bush

Refer the paragraph "Rear suspension"

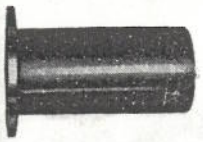
Parts number 8523-1391

Parts name

Replacer;

diagonal link bush

Refer the paragraph "Rear suspension"



CONVERSION TABLES

CONVERSION TABLES

MILLIMETERS TO INCHES				INCHES TO MILLIMETERS		FAHRENHEIT & CENTIGRADE			
mm.	Inches	mm	Inches	Inches	mm.	°F	°C	°C	°F
1	0.0394	51	2.0079	1/64	0.3969	-20	-28.9	-30	-22
2	0.0787	52	2.0472	1/32	0.7937	-15	-26.1	-28	-18.4
3	0.1181	53	2.0866	3/64	1.1906	-10	-23.3	-26	-14.8
4	0.1575	54	2.1260	1/16	1.5875	-5	-20.6	-24	-11.2
5	0.1968	55	2.1653	5/64	1.9844	0	-17.8	-22	-7.6
				3/32	2.3812	1	-17.2	-20	-4
6	0.2362	56	2.2047	7/64	2.7781	2	-16.7	-18	-0.4
7	0.2756	57	2.2441	1/8	3.1750	3	-16.1	-16	3.2
8	0.3150	58	2.2835	9/64	3.5719	4	-15.6	-14	6.8
9	0.3543	59	2.3228	5/32	3.9687	5	-15.0	-12	10.4
10	0.3937	60	2.3622	11/64	4.3656	10	-12.2	-10	14
				3/16	4.7625	15	-9.4	-8	17.6
11	0.4331	61	2.4016	13/64	5.1594	20	-6.7	-6	21.2
12	0.4724	62	2.4409	7/32	5.5562	25	-3.9	-4	24.8
13	0.5118	63	2.4803	15/64	5.9531	30	-1.1	-2	28.4
14	0.5512	64	2.5197	1/4	6.3500	35	1.7	0	32
15	0.5905	65	2.5590	17/64	6.7469	40	4.4	2	35.6
				9/32	7.1437	45	7.2	4	39.2
16	0.6299	66	2.6984	19/64	7.5406	50	10.0	6	42.8
17	0.6693	67	2.6378	5/16	7.9375	55	12.8	8	46.4
18	0.7087	68	2.6772	21/64	8.3344	60	15.6	10	50
19	0.7480	69	2.7165	11/32	8.7312	65	18.3	12	53.6
20	0.7874	70	2.7559	23/64	9.1281	70	21.1	14	57.2
				3/8	9.5250	75	23.9	16	60.8
21	0.8268	71	2.7953	25/64	9.9219	80	26.7	18	64.4
22	0.8661	72	2.8346	13/32	10.3187	85	29.4	20	68
23	0.9055	73	2.8740	27/64	10.7156	90	32.2	22	71.6
24	0.9449	74	2.9134	7/16	11.1125	95	35.0	24	75.2
25	0.9842	75	2.9527	29/64	11.5094	100	37.8	26	78.8
				15/32	11.9062	105	40.6	28	82.4
26	1.0236	76	2.9921	31/64	12.3031	110	43.3	30	86
27	1.0630	77	3.0315	1/2	12.7000	115	46.1	32	89.6
28	1.1024	78	3.0709	33/64	13.0969	120	48.9	34	93.2
29	1.1417	79	3.1102	17/32	13.4937	125	51.7	36	96.8
30	1.1811	80	3.1496	35/64	13.8906	130	54.4	38	100.4
				9/16	14.2875	135	57.2	40	104
31	1.2205	81	3.1890	37/64	14.6844	140	60.0	42	107.6
32	1.2598	82	3.2283	19/32	15.0812	145	62.8	44	112.2
33	1.2992	83	3.2677	39/64	15.4781	150	65.6	46	114.8
34	1.3386	84	3.3071	5/8	15.8750	155	68.3	48	118.4
35	1.3779	85	3.3464	41/64	16.2719	160	71.1	50	122
				21/32	16.6687	165	73.9	52	125.6
36	1.4173	86	3.3858	43/64	17.0656	170	76.7	54	129.2
37	1.4567	87	3.4252	11/16	17.4625	175	79.4	56	132.8
38	1.4961	88	3.4646	45/64	17.8594	180	82.2	58	136.4
39	1.5354	89	3.5039	23/32	18.2562	185	85.0	60	140
40	1.5748	90	3.5433	47/64	18.6531	190	87.8	62	143.6
				3/4	19.0500	195	90.6	64	147.2
41	1.6142	91	3.5827	49/64	19.4469	200	93.3	66	150.8
42	1.6535	92	3.6220	25/32	19.8437	205	96.1	68	154.4
43	1.6929	93	3.6614	51/64	20.2406	210	98.9	70	158
44	1.7323	94	3.7008	13/16	20.6375	212	100.0	75	167
45	1.7716	95	3.7401	53/64	21.0344	215	101.7	80	176
				27/32	21.4312	220	104.4	85	185
46	1.8110	96	3.7795	55/64	21.8281	225	107.2	90	194
47	1.8504	97	3.8189	7/8	22.2250	230	110.0	95	203
48	1.8898	98	3.8583	57/64	22.6219	235	112.8	100	212
49	1.9291	99	3.8976	29/32	23.0187	240	115.6	105	221
50	1.9685	100	3.9370	59/64	23.4156	245	118.3	110	230
				15/16	23.8125	250	121.1	115	239
				61/64	24.2094	255	123.9	120	248
				31/32	24.6062	260	126.6	125	257
				63/64	25.0031	265	129.4	130	266

CONVERSION TABLES

FEET TO METERS

ft	0	1	2	3	4	5	6	7	8	9	ft
	m	m	m	m	m	m	m	m	m	m	
—		0.305	0.610	0.914	1.219	1.524	1.829	2.134	2.438	2.743	—
10	3.048	3.353	3.658	3.962	4.267	4.572	4.877	5.182	5.486	5.791	10
20	6.096	6.401	6.706	7.010	7.315	7.620	7.925	8.230	8.534	8.839	20
30	9.144	9.449	9.754	10.058	10.363	10.668	10.973	11.278	11.582	11.887	30
40	12.192	12.497	12.802	13.106	13.411	13.716	14.021	14.326	14.630	14.935	40
50	15.240	15.545	15.850	16.154	16.459	16.764	17.069	17.374	17.678	17.983	50
60	18.288	18.593	18.898	19.202	19.507	19.812	20.117	20.422	20.726	21.031	60
70	21.336	21.641	21.946	22.250	22.555	22.860	23.165	23.470	23.774	24.079	70
80	24.384	24.689	24.994	25.298	25.603	25.908	26.213	26.518	26.822	27.127	80
90	27.432	27.737	28.042	28.346	28.651	28.956	29.261	29.566	29.870	30.175	90
100	30.480	30.785	31.090	31.394	31.699	32.004	32.309	32.614	32.918	33.223	100

MILES TO KILOMETERS

mile	0	1	2	3	4	5	6	7	8	9	mile
	km	km	km	km	km	km	km	km	km	km	
—		1.609	3.219	4.828	6.437	8.047	9.656	11.265	12.875	14.484	—
10	16.093	17.703	19.312	20.921	22.531	24.140	25.750	27.359	28.968	30.578	10
20	32.187	33.796	35.406	37.015	38.624	40.234	41.843	43.452	45.062	46.671	20
30	48.280	49.890	51.499	53.108	54.718	56.327	57.936	59.546	61.155	62.764	30
40	64.374	65.983	67.593	69.202	70.811	72.421	74.030	75.639	77.249	78.858	40
50	80.467	82.077	83.686	85.295	86.905	88.514	90.123	91.733	93.342	94.951	50
60	96.561	98.170	99.779	101.39	103.00	104.61	106.22	107.83	109.44	111.04	60
70	112.65	114.26	115.87	117.48	119.09	120.70	122.31	123.92	125.53	127.14	70
80	128.75	130.36	131.97	133.58	135.19	136.79	138.40	140.01	141.62	143.23	80
90	144.84	146.45	148.06	149.67	151.28	152.89	154.50	156.11	157.72	159.33	90
100	160.93	162.54	164.15	165.76	167.37	168.98	170.59	172.20	173.81	175.42	100

SQUARE INCHES TO SQUARE CENTIMETERS

in^2	0	1	2	3	4	5	6	7	8	9	in^2
	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	
—		6.452	12.903	19.355	25.806	32.258	38.710	45.161	51.613	58.064	—
10	64.516	70.968	77.419	83.871	90.322	96.774	103.226	109.677	116.129	122.580	10
20	129.032	135.484	141.935	148.387	154.838	161.290	167.742	174.193	180.645	187.096	20
30	193.548	200.000	206.451	212.903	219.354	225.806	232.258	238.709	245.161	251.612	30
40	258.064	264.516	270.967	277.419	283.870	290.322	296.774	303.225	309.677	316.128	40
50	322.580	329.032	335.483	341.935	348.386	354.838	361.290	367.741	374.193	380.644	50
60	387.096	393.548	399.999	406.451	412.902	419.354	425.806	432.257	438.709	445.160	60
70	451.612	458.064	464.515	470.967	477.418	483.870	490.322	496.773	503.225	509.676	70
80	516.128	522.580	529.031	535.483	541.934	548.386	554.838	561.289	567.741	574.192	80
90	580.644	587.096	593.547	599.999	606.450	612.902	619.354	625.805	632.257	638.708	90
100	645.160	651.612	658.063	664.515	670.966	677.418	683.870	690.321	696.773	703.224	100

CUBIC INCHES TO CUBIC CENTIMETERS

in^3	0	1	2	3	4	5	6	7	8	9	in^3
	cm^3	cm^3	cm^3	cm^3	cm^3	cm^3	cm^3	cm^3	cm^3	cm^3	
—		16.387	32.774	49.161	65.548	81.935	98.322	114.709	131.097	147.484	—
10	163.871	180.258	196.645	213.032	229.419	245.806	262.193	278.580	294.967	311.354	10
20	327.741	344.128	360.515	376.902	393.290	409.677	426.064	442.451	458.838	475.225	20
30	491.612	507.999	524.386	540.773	557.160	573.547	589.934	606.321	622.708	639.095	30
40	655.483	671.870	688.257	704.644	721.031	737.418	753.805	770.192	786.579	802.966	40
50	819.353	835.740	852.127	868.514	884.901	901.289	917.676	934.063	950.450	966.837	50
60	983.224	999.611	1015.998	1032.385	1048.772	1065.159	1081.546	1097.933	1114.320	1130.707	60
70	1147.094	1163.482	1179.869	1196.256	1212.643	1229.030	1245.417	1261.804	1278.191	1294.578	70
80	1310.965	1327.352	1343.739	1360.126	1376.513	1392.200	1409.288	1425.675	1442.062	1458.449	80
90	1474.836	1491.223	1507.610	1523.997	1540.384	1556.771	1573.158	1589.545	1605.932	1622.319	90
100	1638.706	1655.093	1671.481	1687.868	1704.255	1720.642	1737.029	1753.416	1769.803	1786.190	100

METERS TO FEET

m	0	1	2	3	4	5	6	7	8	9	m
	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft	
—		3.2808	6.5617	9.8425	13.1234	16.4042	19.6850	22.9659	26.2467	29.5276	—
10	32.8084	36.0892	39.3701	42.6509	45.9318	49.2126	52.4934	55.7743	59.0551	62.3360	10
20	65.6168	68.8976	72.1785	75.4593	78.7402	82.0210	85.3018	88.5827	91.8635	95.1444	20
30	98.4252	101.7060	104.9869	108.2677	111.5486	114.8294	118.1102	121.3911	124.6719	127.9528	30
40	131.2336	134.5144	137.7953	141.0761	144.3570	147.6378	150.9186	154.1995	157.4803	160.7612	40
50	164.0420	167.3228	170.6037	173.8845	177.1654	180.4462	183.7270	187.0079	190.2887	193.5696	50
60	196.8504	200.1312	203.4121	206.6929	209.9738	213.2546	216.5354	219.8163	223.0971	226.3780	60
70	229.6588	232.9396	236.2205	239.5013	242.7822	246.0630	249.3438	252.6247	255.9055	259.1864	70
80	262.4672	265.7480	269.0289	272.3097	275.5906	278.8714	282.1522	285.4331	288.7139	291.9948	80
90	295.2756	298.5564	301.8373	305.1181	308.3990	311.6798	314.9606	318.2415	321.5223	324.8032	90
100	328.0840	331.3648	334.6457	337.9265	341.2074	344.4882	347.7690	351.0499	354.3307	357.6116	100

KILOMETERS TO MILES

km	0	1	2	3	4	5	6	7	8	9	km
	mil	mil	mil	mil	mil	mil	mil	mil	mil	mil	
—		0.621	1.243	1.864	2.486	3.107	3.728	4.350	4.971	5.592	—
10	6.214	6.835	7.457	8.078	8.699	9.321	9.942	10.562	11.1 5	11.805	10
20	12.427	13.049	13.670	14.292	14.913	15.534	16.156	16.776	17.399	18.019	20
30	18.641	19.263	19.884	20.506	21.127	21.748	22.370	22.990	23.613	24.233	30
40	24.855	25.477	26.098	26.720	27.341	27.962	28.584	29.204	29.827	30.447	40
50	31.069	31.690	32.311	32.933	33.554	34.175	34.797	35.417	36.040	36.660	50
60	37.282	37.904	38.525	39.147	39.768	40.389	41.011	41.631	42.254	42.874	60
70	43.497	44.118	44.739	45.361	45.982	46.603	47.225	47.845	48.468	49.088	70
80	49.711	50.332	50.953	51.575	52.196	52.817	53.439	54.059	54.682	55.302	80
90	55.924	56.545	57.166	57.788	58.409	59.030	59.652	60.272	60.895	61.515	90
100	62.138	62.759	63.380	64.002	64.623	65.244	65.866	66.486	67.109	67.729	100

SQUARE CENTIMETERS TO SQUARE INCHES

cm^2	0	1	2	3	4	5	6	7	8	9	cm^2
	in^2	in^2	in^2	in^2	in^2	in^2	in^2	in^2	in^2	in^2	
—		0. 55	0.310	0.465	0.620	0.775	0.930	1.085	1.240	1.395	—
10	1.550	1.705	1.860	2.015	2.170	2.325	2.480	2.635	2.790	2.945	10
20	3.100	3.255	3.410	3.565	3.720	3.875	4.030	4.185	4.340	4.495	20
30	4.650	4.805	4.960	5.115	5.270	5.425	5.580	5.735	5.890	6.045	30
40	6.200	6.355	6.510	6.665	6.820	6.975	7.130	7.285	7.440	7.595	40
50	7.750	7.905	8.060	8.215	8.370	8.525	8.680	8.835	8.990	9.145	50
60	9.300	9.455	9.610	9.765	9.920	10.075	10.230	10.385	10.540	10.695	60
70	10.850	11.005	11.160	11.315	11.470	11.625	11.780	11.935	12.090	12.245	70
80	12.400	12.555	12.710	12.865	13.020	13.175	13.330	13.485	13.640	13.795	80
90	13.950	14.105	14.260	14.415	14.570	14.725	14.880	15.035	15.190	15.345	90
100	15.500	15.655	15.810	15.965	16.120	16.275	16.430	16.385	16.740	16.895	100

CUBIC CENTIMETERS TO CUBIC INCHES

cm^3	0	1	2	3	4	5	6	7	8	9	cm^3
	in^3	in^3	in^3	in^3	in^3	in^3	in^3	in^3	in^3	in^3	
—		0.0610	0.1220	0.1831	0.2441	0.3051	0.3661	0.4272	0.4882	0.5492	—
10	0.6102	0.6713	0.7323	0.7933	0.8543	0.9154	0.9764	1.0374	1.0984	1.1595	10
20	1.2205	1.2815	1.3425	1.4035	1.4646	1.5256	1.5866	1.6476	1.7087	1.7697	20
30	1.8307	1.8917	1.9528	2.0138	2.0748	2.1358	2.1969	2.2579	2.3189	2.3799	30
40	2.4409	2.5020	2.5630	2.6240	2.6850	2.7461	2.8071	2.8681	2.9291	2.9902	40
50	3.0512	3.1122	3.1732	3.2343	3.2953	3.3563	3.4173	3.4784	3.5394	3.6004	50
60	3.6614	3.7224	3.7835	3.8445	3.9055	3.9665	4.0276	4.0886	4.1495	4.2106	60
70	4.2717	4.3327	4.3937	4.4547	4.5158	4.5768	4.6378	4.6988	4.7599	4.8209	70
80	4.8819	4.9429	5.0039	5.0650	5.1260	5.1870	5.2480	5.3091	5.3701	5.4311	80
90	5.4921	5.5532	5.6142	5.6752	5.7362	5.7973	5.8583	5.9193	5.9803	6.0414	90
100	6.1024	6.1634	6.2244	6.2854	6.3465	6.4075	6.4685	6.5295	6.5906	6.6516	100

CUBIC FEET TO CUBIC METERS

ft^3	0	1	2	3	4	5	6	7	8	9	ft^3
	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	
—		0.0283	0.0566	0.0850	0.1133	0.1416	0.1699	0.1982	0.2265	0.2549	—
10	0.2832	0.3115	0.3398	0.3681	0.3964	0.4248	0.4531	0.4814	0.5097	0.5380	10
20	0.5663	0.5947	0.6230	0.6513	0.6796	0.7079	0.7362	0.7646	0.7929	0.8212	20
30	0.8495	0.8778	0.9061	0.9345	0.9628	0.9911	1.0194	1.0477	1.0760	1.1044	30
40	1.1327	1.1610	1.1893	1.2176	1.2459	1.2743	1.3026	1.3309	1.3592	1.3875	40
50	1.4159	1.4442	1.4725	1.5008	1.5291	1.5574	1.5858	1.6141	1.6424	1.6707	50
60	1.6990	1.7273	1.7557	1.7840	1.8123	1.8406	1.8689	1.8972	1.9256	1.9539	60
70	1.9822	2.0105	2.0388	2.0671	2.0955	2.1238	2.1521	2.1804	2.2087	2.2370	70
80	2.2654	2.2937	2.3220	2.3503	2.3786	2.4069	2.4353	2.4636	2.4919	2.5202	80
90	2.5485	2.5768	2.6052	2.6335	2.6618	2.6901	2.7184	2.7468	2.7751	2.8034	90
100	2.8317	2.6800	2.8884	2.9167	2.9450	2.9733	3.0016	3.0300	3.0583	3.0866	100

GALLONS (U. S.) TO LITERS

U.S. gal	0	1	2	3	4	5	6	7	8	9	U.S. gal
	ℓ	ℓ	ℓ	ℓ	ℓ	ℓ	ℓ	ℓ	ℓ	ℓ	
—		3.7854	7.5709	11.3563	15.1417	18.9271	22.7126	26.4980	30.2834	34.0638	—
10	37.8543	41.6397	45.4251	49.2105	52.9960	56.7814	60.5668	64.3523	68.1377	71.9231	10
20	75.7085	79.4940	83.2794	87.0648	90.8502	94.6357	98.4211	102.2065	105.9920	109.7774	20
30	113.5528	117.3482	121.1337	124.9191	128.7045	132.4899	136.2754	140.0608	143.8462	147.6316	30
40	151.4171	155.2025	158.9879	162.7734	166.5588	170.3442	174.1296	177.9151	181.7005	185.4859	40
50	189.2713	193.0568	196.8422	200.6276	204.4131	208.1985	211.9839	215.7693	219.5548	223.3402	50
60	227.1256	230.9110	234.6965	238.4819	242.2673	246.0527	249.8382	253.6236	257.4090	261.1945	60
70	264.9799	268.7653	272.5507	276.3362	280.1216	283.9070	287.6924	291.4779	295.2633	299.0487	70
80	302.8342	306.6196	310.4050	314.1904	317.9759	321.7613	325.5467	329.3321	333.1176	336.9030	80
90	340.6884	344.4738	348.2593	352.0447	355.8301	359.6156	363.4010	367.1864	370.9718	374.7573	90
100	378.5427	382.3281	386.1135	389.8990	393.6844	397.4698	401.2553	405.0407	408.8261	412.6115	100

GALLONS (IMP.) TO LITERS

IMP gal	0	1	2	3	4	5	6	7	8	9	IMP gal
	ℓ	ℓ	ℓ	ℓ	ℓ	ℓ	ℓ	ℓ	ℓ	ℓ	
—		4.5460	9.0919	13.6379	18.1838	22.7298	27.2758	31.8217	36.3677	40.9136	—
10	45.4596	50.0055	54.5515	59.0975	63.6434	68.1894	72.2354	77.2813	81.8275	86.3732	10
20	90.9192	95.4652	100.0111	104.5571	109.1030	113.6490	118.1950	122.7409	127.2869	131.8328	20
30	136.3788	140.9248	145.4707	150.0167	154.5626	159.1086	163.6546	168.0005	172.7465	177.2924	30
40	181.8384	186.3844	190.9303	195.4763	200.0222	204.5682	209.1142	213.6601	218.2061	222.7520	40
50	227.2980	231.8440	236.3899	240.9359	245.4818	250.0278	254.5738	259.1197	263.6657	268.2116	50
60	272.7576	277.3036	281.8495	286.3955	290.9414	295.4874	300.0334	304.5793	309.1253	313.6712	60
70	318.2172	322.7632	327.3091	331.8551	336.4010	340.9470	345.4930	350.0389	354.5849	359.1308	70
80	363.6768	368.2223	372.7687	377.3147	381.8606	386.4066	390.9526	395.4985	400.0445	404.5904	80
90	409.1364	413.6824	418.2283	422.7743	427.3202	431.8662	436.4122	440.9581	445.9041	450.0500	90
100	454.5960	459.1420	463.6879	468.2339	472.7798	477.3258	481.8718	486.4177	490.9637	495.5096	100

POUNDS TO KILOGRAMS

lb	0	1	2	3	4	5	6	7	8	9	lb
	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	
—		0.454	0.907	1.361	1.814	2.268	2.722	3.175	3.629	4.082	—
10	4.536	4.990	5.443	5.897	6.350	6.804	7.257	7.711	8.165	8.618	10
20	9.072	9.525	9.979	10.433	10.886	11.340	11.793	12.247	12.701	13.154	20
30	13.608	14.061	14.515	14.969	15.422	15.876	16.329	16.783	17.237	17.690	30
40	18.144	18.597	19.051	19.504	19.958	20.412	20.865	21.319	21.772	22.226	40
50	22.680	23.133	23.587	24.040	24.494	24.948	25.401	25.855	26.308	26.762	50
60	27.216	27.669	28.123	28.576	29.030	29.484	29.937	30.391	30.844	31.298	60
70	31.751	32.205	32.659	33.112	33.566	34.019	34.473	34.927	35.380	35.834	70
80	36.287	36.741	37.195	37.648	38.102	38.555	39.009	39.463	39.916	40.370	80
90	40.823	41.277	41.730	42.184	42.638	43.092	43.545	43.998	44.453	44.906	90
100	45.359	45.813	46.266	46.720	47.174	47.627	48.081	48.534	48.988	49.442	100

CUBIC METERS TO CUBIC FEET

m^3	0	1	2	3	4	5	6	7	8	9	m^3
	ft^3	ft^3	ft^3	ft^3	ft^3	ft^3	ft^3	ft^3	ft^3	ft^3	
—		35.3	70.6	105.9	141.3	176.6	211.9	247.2	282.5	317.8	—
10	353.1	388.5	423.8	459.1	494.4	529.7	565.0	600.3	635.7	671.0	10
20	706.3	741.6	776.9	812.2	847.5	882.9	918.2	953.5	988.8	1024.1	20
30	1059.4	1094.7	1130.1	1165.4	1200.7	1236.0	1271.3	1306.6	1341.9	1377.3	30
40	1412.6	1447.9	1483.2	1518.5	1553.8	1589.2	1624.5	1659.8	1695.1	1730.4	40
50	1765.7	1801.0	1836.4	1871.7	1907.0	1942.3	1977.6	2012.9	2048.2	2083.6	50
60	2118.9	2154.2	2189.5	2224.8	2260.1	2295.4	2330.8	2366.1	2401.4	2436.7	60
70	2472.0	2507.3	2542.6	2578.0	2613.3	2648.6	2683.9	2719.2	2754.5	2789.8	70
80	2825.2	2860.5	2895.8	2931.1	2966.4	3001.7	3037.0	3072.4	3107.7	3143.0	80
90	3178.3	3213.6	3248.9	3284.2	3319.6	3354.9	3390.2	3425.5	3460.8	3496.1	90
100	3531.4	3566.7	3602.0	3637.3	3672.7	3708.0	3743.3	3778.6	3813.9	3849.2	100

LITERS TO GALLONS (U. S.)

ℓ	0	1	2	3	4	5	6	7	8	9	ℓ
	gal	gal	gal	gal	gal	gal	gal	gal	gal	gal	
—		0.2642	0.5283	0.7925	1.0567	1.3209	1.5850	1.8492	2.1134	2.3775	—
10	2.6417	2.9059	3.1701	3.4342	3.6984	3.9626	4.2267	4.4909	4.7551	5.0192	10
20	5.2834	5.5476	5.8118	6.0759	6.3401	6.6043	6.8684	7.1326	7.3968	7.6610	20
30	7.9251	8.1893	8.4535	8.7176	8.9818	9.2460	9.5102	9.7743	10.0385	10.3027	30
40	10.5668	10.8310	11.0952	11.3594	11.6235	11.8877	12.1519	12.4160	12.6802	12.9444	40
50	13.2086	13.4727	13.7369	14.0011	14.2652	14.5294	14.7936	15.0577	15.3219	15.5861	50
60	15.8503	16.1144	16.3786	16.6428	16.9069	17.1711	17.4353	17.6995	17.9636	18.2278	60
70	18.4920	18.7561	19.0203	19.2845	19.5487	19.8128	20.0770	20.3412	20.6053	20.8695	70
80	21.1337	21.3979	21.6620	21.9262	22.1904	22.4545	22.7187	22.9829	23.2470	23.5112	80
90	25.7754	24.0396	24.3037	24.5679	24.8321	25.0962	25.3604	25.6246	25.8888	26.1529	90
100	26.4171	26.6813	26.9454	27.2096	27.4738	27.7380	28.0021	28.2663	28.5305	28.7946	100

LITERS TO GALLONS (IMP.)

ℓ	0	1	2	3	4	5	6	7	8	9	ℓ
	gal	gal	gal	gal	gal	gal	gal	gal	gal	gal	
—		0.2200	0.4400	0.6599	0.8799	1.0999	1.3199	1.5398	1.7598	1.9798	—
10	2.1998	2.4197	2.6397	2.8597	3.0797	3.2996	3.5196	3.7396	3.9596	4.1795	10
20	4.3995	4.6195	4.8395	5.0594	5.2794	5.4994	5.7194	5.9394	6.1593	6.3793	20
30	6.5993	6.8193	7.0392	7.2592	7.4792	7.6992	7.9191	8.1391	8.3591	8.5791	30
40	8.7990	9.0190	9.2390	9.4590	9.6789	9.8989	10.9189	10.3389	10.5588	10.7788	40
50	10.9988	11.2188	11.4388	11.6587	11.8787	12.0987	12.3187	12.5386	12.7586	12.9786	50
60	13.1986	13.4185	13.6385	13.8585	14.0785	14.2984	14.5184	14.7384	14.9584	15.1783	60
70	15.3983	15.6183	15.8383	16.0582	16.2782	16.4982	16.7182	16.9382	17.1581	17.3781	70
80	17.5981	17.8181	18.0380	18.2580	18.4780	18.6980	18.9179	19.1379	19.3579	19.5779	80
90	19.7978	20.0178	20.2378	20.4578	20.6777	20.8977	21.1177	21.3377	21.5576	21.7776	90
100	21.9976	22.2176	22.4376	22.6575	22.8775	23.0975	23.3175	23.5374	23.7574	23.9774	100

KILOGRAMS TO POUNDS

kg	0	1	2	3	4	5	6	7	8	9	kg
	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	
—		2.205	4.409	6.614	8.818	11.023	13.228	15.432	17.637	19.842	—
10	22.046	24.251	26.455	28.660	30.865	33.069	35.274	37.479	39.683	41.888	10
20	44.092	46.297	48.502	50.706	52.911	55.116	57.320	59.525	61.729	63.934	20
30	66.139	68.343	70.548	72.752	74.957	77.162	79.366	81.571	83.776	85.980	30
40	88.185	90.389	92.594	94.799	97.003	99.208	101.41	103.62	105.82	108.03	40
50	110.23	112.44	114.64	116.84	119.05	121.25	123.46	125.66	127.87	130.07	50
60	132.28	134.48	136.69	138.89	141.10	143.30	145.51	147.71	149.91	152.12	60
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.76	171.96	174.17	70
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.01	196.21	80
90	198.42	200.62	202.83	205.03	207.23	209.44	211.64	213.85	216.05	218.26	90
100	220.46	222.67	224.87	227.08	229.28	231.49	233.69	235.89	238.10	240.30	100

POUNDS PER SQUARE INCHES TO KILOGRAMS PER SQUARE CENTIMETERS

lb/in^2	0	1	2	3	4	5	6	7	8	9	lb/in^2
	kg/cm^2	kg/cm^2	kg/cm^2	kg/cm^2	kg/cm^2	kg/cm^2	kg/cm^2	kg/cm^2	kg/cm^2	kg/cm^2	
—		0.0703	0.1406	0.2100	0.2812	0.3515	0.4218	0.4921	0.5625	0.6328	—
10	0.7031	0.7734	0.8437	0.9140	0.9843	1.0546	1.1249	1.1952	1.2655	1.3358	10
20	1.4062	1.4765	1.5468	1.6171	1.6874	1.7577	1.8280	1.8983	1.9686	2.0389	20
30	2.1092	2.1795	2.2498	2.3202	2.3905	2.4608	2.5311	2.6014	2.6717	2.7420	30
40	2.8123	2.8826	2.9529	3.0232	3.0935	3.1639	3.2342	3.3045	3.3748	3.4451	40
50	3.5154	3.5857	3.6560	3.7263	3.7966	3.8669	3.9372	4.0072	4.0779	4.1482	50
60	4.2185	4.2888	4.3591	4.4294	4.4997	4.5700	4.6403	4.7106	4.7809	4.8512	60
70	4.9216	4.9919	5.0622	5.1325	5.2028	5.2731	5.3434	5.4137	5.4840	5.5543	70
80	5.6246	5.6949	5.7652	5.8356	5.9059	5.9762	6.0465	6.1168	6.1871	6.2574	80
90	6.3277	6.3980	6.4683	6.5386	6.6089	6.6793	6.7496	6.8199	6.8902	6.9605	90
100	7.0308	7.1011	7.1714	7.2417	7.3120	7.3823	7.4526	7.5229	7.5933	7.6636	100

KILOGRAMS PER SQUARE CENTIMETERS TO POUNDS PER SQUARE INCHES

kg/cm^2	0	1	2	3	4	5	6	7	8	9	kg/cm
	lb/in^2	lb/in^2	lb/in^2	lb/in^2	lb/in^2	lb/in^2	lb/in^2	lb/in^2	lb/in^2	lb/in^2	
—		14.22	28.45	42.67	56.89	71.12	85.34	99.56	113.78	128.01	—
10	142.23	156.45	170.68	184.90	199.12	213.35	227.57	241.79	256.02	270.24	10
20	284.46	298.69	312.91	327.13	341.36	355.58	369.80	384.03	398.25	412.47	20
30	426.70	440.92	455.14	469.36	483.59	497.81	512.03	526.26	540.48	554.70	30
40	568.93	583.15	597.37	611.60	625.82	640.04	654.27	668.49	682.71	696.94	40
50	711.16	725.38	739.61	753.83	768.05	782.28	796.50	810.72	824.94	839.17	50
60	853.39	867.61	881.84	896.06	910.28	924.51	938.73	952.95	967.18	981.40	60
70	995.62	1009.8	1024.1	1038.3	1052.5	1066.7	1081.0	1095.2	1109.4	1123.6	70
80	1137.8	1152.1	1166.3	1180.5	1194.7	1209.0	1223.2	1237.4	1251.6	1265.9	80
90	1280.1	1294.3	1308.5	1322.7	1337.0	1351.2	1365.4	1379.6	1393.9	1408.1	90
100	1422.3	1436.5	1450.8	1465.0	1479.2	1493.4	1507.7	1521.9	1536.1	1550.3	100

FOOT POUNDS TO KILOGRAMETERS

ft-lb	0	1	2	3	4	5	6	7	8	9	ft-lb
	kgm	kgm	kgm	kgm	kgm	kgm	kgm	kgm	kgm	kgm	
—		0.138	0.276	0.415	0.553	0.691	0.829	0.967	1.106	1.244	—
10	1.382	1.520	1.658	1.796	1.934	2.073	2.211	2.349	2.487	2.625	10
20	2.764	2.902	3.040	3.178	3.316	3.455	3.593	3.731	3.869	4.007	20
30	4.146	4.284	4.422	4.560	4.698	4.837	4.975	5.113	5.251	5.389	30
40	5.528	5.666	5.804	5.942	6.080	6.219	6.357	6.495	6.633	6.771	40
50	6.910	7.048	7.186	7.324	7.462	7.601	7.739	7.877	8.015	8.153	50
60	8.292	8.430	8.568	8.706	8.844	8.983	9.121	9.259	9.397	9.535	60
70	9.674	9.812	9.950	10.088	10.227	10.365	10.503	10.641	10.779	10.918	70
80	11.056	11.194	11.332	11.470	11.609	11.747	11.885	12.023	12.161	12.300	80
90	12.438	12.576	12.714	12.855	12.991	13.129	13.267	13.405	13.544	13.682	90
100	13.820	13.958	14.096	14.235	14.373	14.511	14.649	14.787	14.925	14.064	100

KILOGRAMETERS TO FOOT POUNDS

kgm	0	1	2	3	4	5	6	7	8	9	kgm
	ft-lb	ft-lb	ft-lb	ft-lb	ft-lb	ft-lb	ft-lb	ft-lb	ft-lb	ft-lb	
—		7.23	14.47	21.70	28.93	36.17	43.40	50.63	57.87	65.10	—
10	72.33	79.57	86.80	94.03	101.27	108.50	115.74	122.97	130.20	137.43	10
20	144.67	151.90	159.13	166.37	173.60	180.84	188.08	195.30	202.54	209.77	20
30	217.00	224.23	231.46	238.70	245.93	253.17	260.41	267.63	274.87	282.10	30
40	289.34	296.57	303.79	311.04	318.27	325.50	332.75	339.98	347.21	354.44	40
50	361.66	368.89	376.12	383.36	390.59	397.82	405.07	412.30	419.53	426.76	50
60	434.00	441.23	448.45	455.70	462.93	470.17	477.41	484.64	491.87	499.10	60
70	506.34	513.57	520.80	528.04	535.27	542.50	549.75	556.98	564.21	571.44	70
80	578.68	585.91	593.14	600.38	607.61	614.85	622.09	629.41	636.55	643.78	80
90	651.00	658.23	665.46	672.70	679.93	687.17	694.41	701.63	708.87	716.10	90
100	723.34	730.57	737.80	745.04	752.27	759.51	766.75	774.07	781.21	788.44	100

FD-2204

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