

SECTION 8

DIFFERENTIAL

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A. Description

The differential is driven directly by the final drive gear which is an integral part of the transmission countershaft. By this arrangement, the differential is enclosed in the crankcase together with the transmission and the crankshaft; all being lubricated by the engine oil. The principal gears used are a helical type, which affords quiet operation.

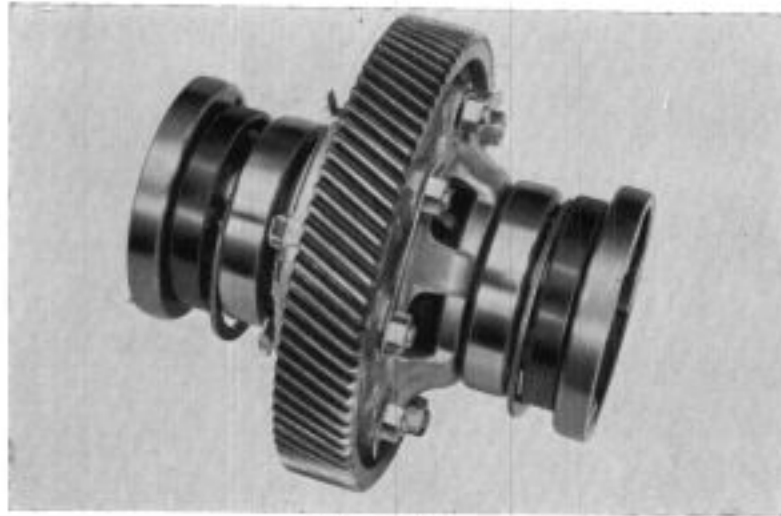


Fig. 8A-1

B. Technical Data

Reduction Gear Type	Helical Gear
Reduction Ratio	
N360	3.192
LN360	3.954
A360	3.542
N400/N600	3.037
A600	3.542
Differential Gear Type and Number	Straight Bevel, 2 ea.
Backlash	
Pinion to Side Gear	0.1 to 0.4 mm (0.0039 to 0.0158 in)
Clearance	
Pinion Shaft to Pinion Inside Diameter	0.03 to 0.09 mm (0.0012 to 0.0035 in)
Pinion Side to Differential Gear Case	0.1 to 0.2 mm (0.0039 to 0.0079 in)
Final Driven Gear Eccentricity	0 to 0.07 mm (0 to 0.0027 in)

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C. Maintenance

a. Disassembly

Disassemble the differential unit referring to the Fig. 8C-1 below.

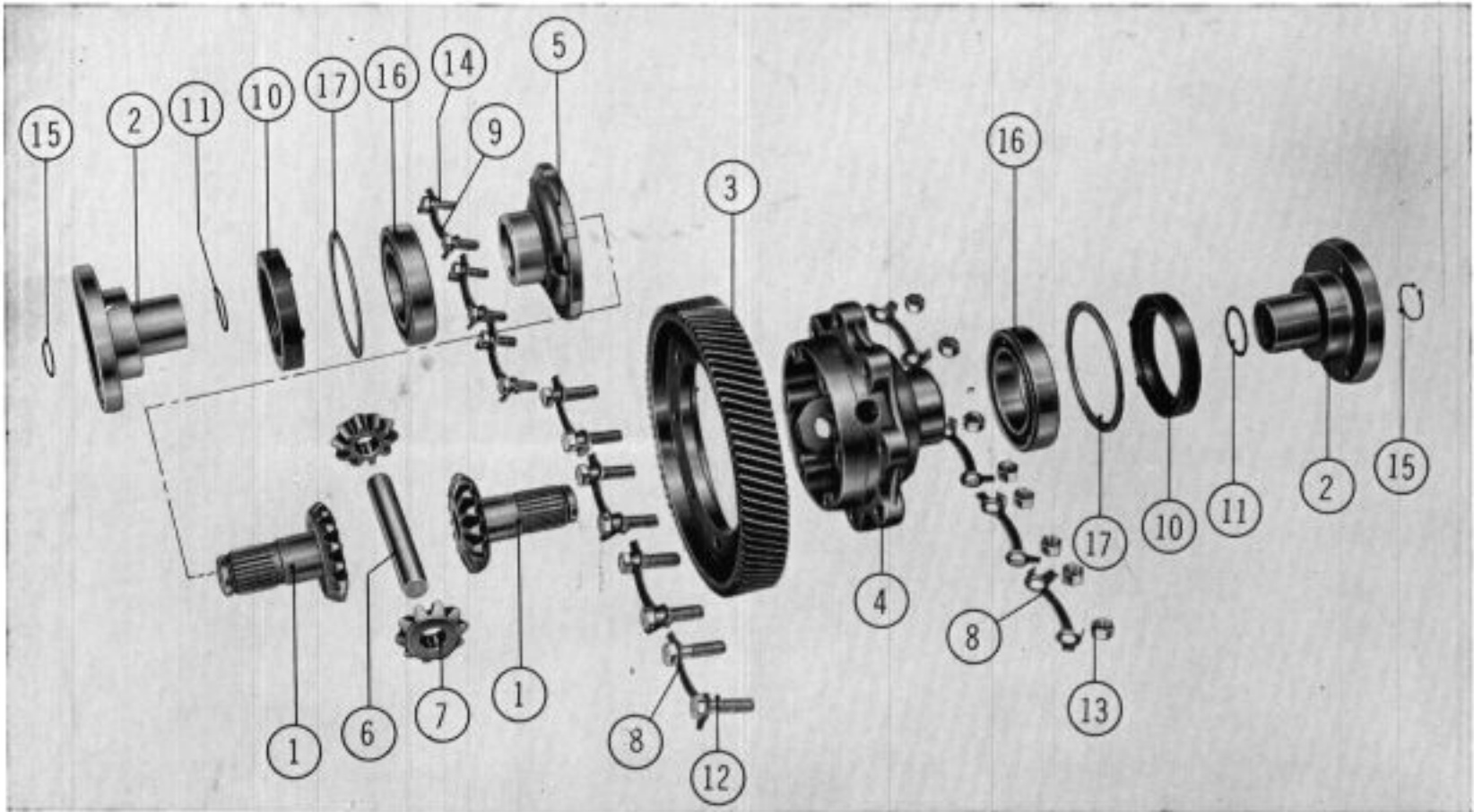


Fig. 8C-1

- | | |
|----------------------------------|-----------------------------|
| 1 Differential side gear | 10 Oil seal (54 x 75 x 12) |
| 2 Joint Flange | 11 O-ring |
| 3 Final driven gear | 12 Setting bolt |
| 4 Differential gear case | 13 Setting nut |
| 5 Differential gear case cap | 14 Setting bolt |
| 6 Differential pinion gear shaft | 15 Circlip |
| 7 Pinion gear | 16 Ball bearing |
| 8 Lock plate | 17 Thrust plate |
| 9 Lock plate | |



Fig. 8C-2

b. Inspection and Adjustment

1. Checking the backlash

Lock the ring gear and one side of the joint flange, and check the backlash by moving the opposite joint flange and take measurement using a dial gauge.

Standard tolerance:

0.1 to 0.4mm (0.0039 to 0.0158 in)

If the backlash is excessive, perform the following corrective action.

Check the wear of the spline on the differential side gear and if found to be excessive, replace with a new part.

Check the side clearance of the pinion gear with a thickness gauge. (Fig. 8C-3)

It should be 0.1 to 0.2mm (0.0039 to 0.0079 in), if found to be greater than 0.3mm (0.0118 in), install shims to obtain the proper clearance. (Fig. 8C-3)

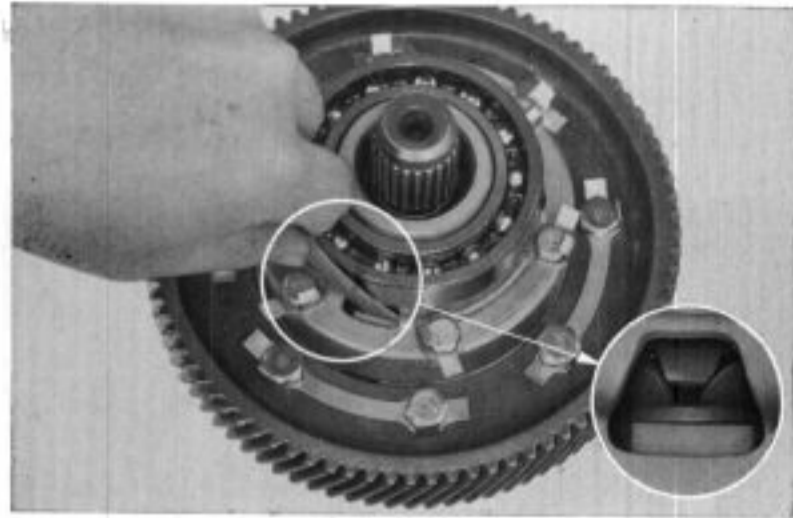


Fig. 8C-3

2. Checking the ring gear for eccentricity

Rotate the ring gear and check the entire circumference of the ring gear to determine if the gear is eccentrically mounted. If it is found to be improperly mounted, remove the ring gear from the differential case and remount.

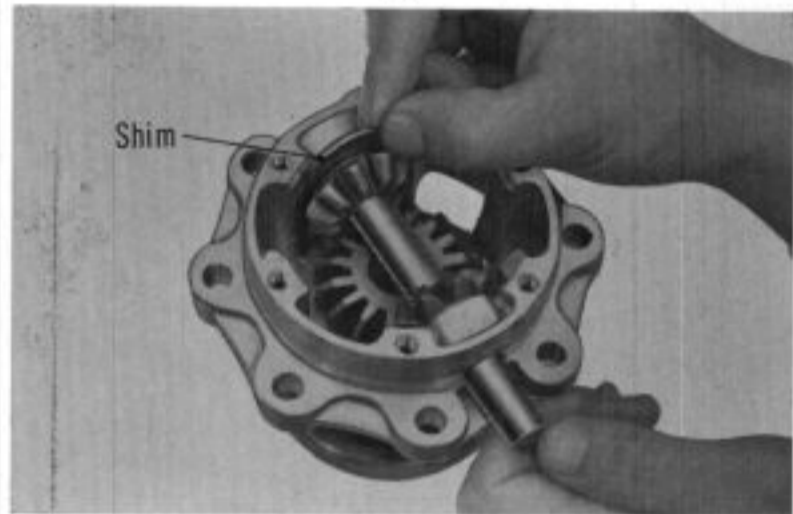


Fig. 8C-4

3. Checking the clearance between the differential pinion shaft and the differential pinion. Measure the shaft diameter and the pinion inside diameter with micrometer and then compute the radial clearance. (Fig. 8C-5)

Standard clearance:

0.03 to 0.09mm (0.0012 to 0.0035 in)

If the clearance is greater than 0.15mm (0.0059 in), replace the worn part.

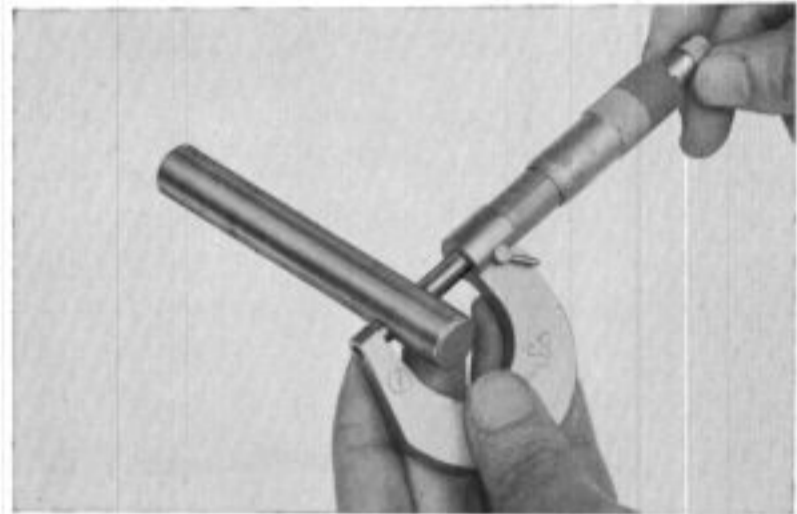


Fig. 8C-5

4. Measure the eccentricity of the differential final gear. Support the bearings on both sides with V-blocks, and measure the eccentricity of the gear in at least four different positions at interval of 90°. If eccentricity exceeds 0.1mm (0.0039 in) loosen the gear retaining bolt and adjust it with a plastic hammer. If eccentricity is excessive, replace the gear with a new one.

Standard tolerance:

0 to 0.07mm (0 to 0.0027 in)

Serviceable limit:

Repair if over 0.1mm (0.0039 in)



Fig. 8C-6

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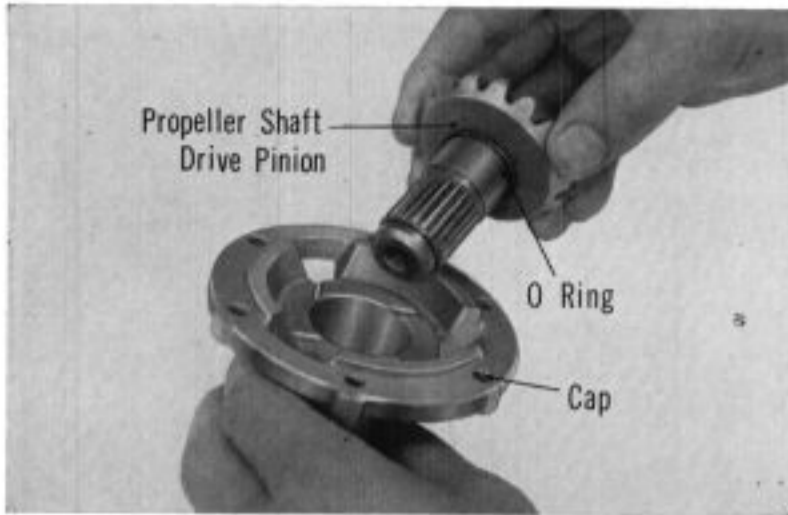


Fig. 8C-7

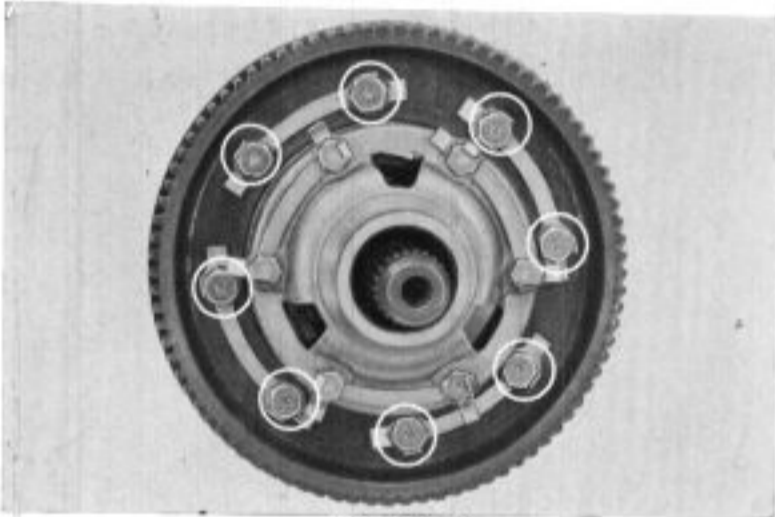


Fig. 8C-8

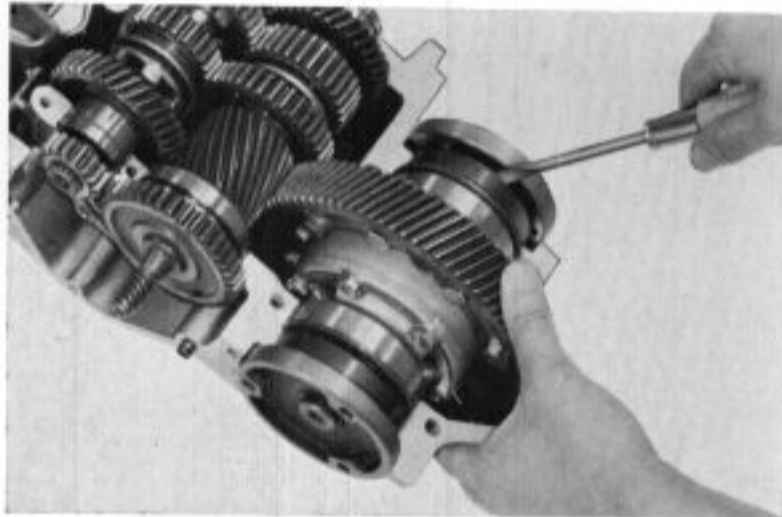


Fig. 8C-9

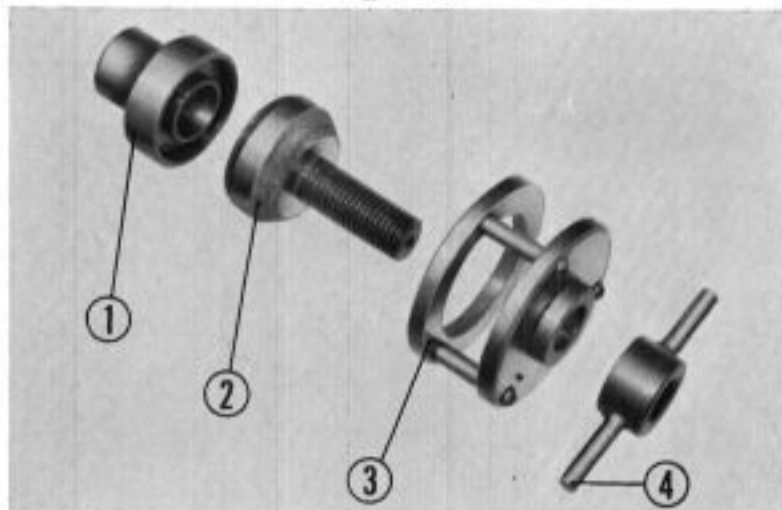


Fig. 8C-10

c. Assembly

Refer to the exploded view in Fig. 8C-1 to make assembly. Before installing the differential side gear check the 24.8 x 1.8 O-ring which is used as an oil seal to assure that it is not damaged.

Assemble the ring gear into the differential case, install and torque the 8mm mounting bolts to from 2.8 to 3.0kg-m (20.25 to 21.70 ft-lb). Use all new lock washers.

Before assembling the differential assembly into the lower crankcase make sure that the oil seals are mounted against the bearings. (Fig. 8C-9)
Oil seals can be replaced with the engine mounted on the chassis.

d. Replacement of differential oil seal (54 x 75 x 12)

Oil leakage from the differential gear is mainly due to a worn oil seal (54x75x12) or a defective O-ring. If the oil seal is found defective upon checking, replace it using the oil seal driver C (special tool). When this replacement is made with the engine unit disassembled, use of the tool is unnecessary. For an engine installed in a vehicle, however, observe the following procedure: (Fig. 8C-10)

1. Jack up the vehicle, and drain the engine oil (approximately 1.5 liters).
2. Clean the linkage between the drive shaft and the differential shaft and in the neighboring vicinity.
3. Disconnect the drive shaft from the differential joint flange. (Refer to SECTION 9. DRIVE SHAFT)
4. Remove the external circlip (22mm) with snap ring pliers and remove the joint flange by pulling it out with the bolt attached. (Fig. 8C-11)

Note:

The oil may spill out at this time, so position a container to catch it beforehand.

5. Draw out the defective oil seal with a puller. Check to see if any springs have been left in the differential gear case after removal. (Fig. 8C-12)
6. Relocate the O-ring on the side gear to the location adjacent to the spline using a thin wire for correct sealing.

7. Insert ① of oil seal driver C into the side gear, and fit the external circlip (22mm). (Fig. 8C-13)

Note:

The circlip must be securely inserted.

8. Thread ② of the tool into ①. (Fig. 8C-14)
9. The oil seal has grooves (refer to the Fig. 8C-15) for return of oil into the differential gear and to prevent leakage. Because of this, has to be installed correctly. The arrow mark and the R and L mark on the side of the oil seal, indicate the direction of rotation and position of installation, respectively: "R" for right side, "L" for left side. (Fig. 8C-15)

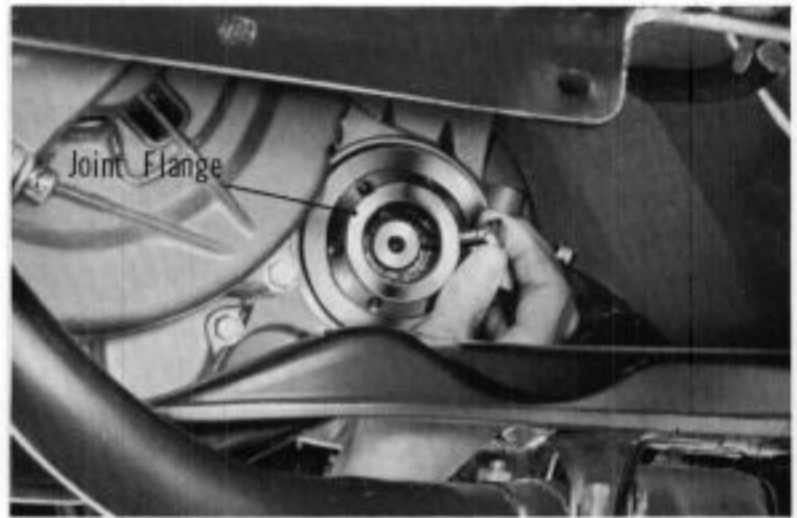


Fig. 8C-11

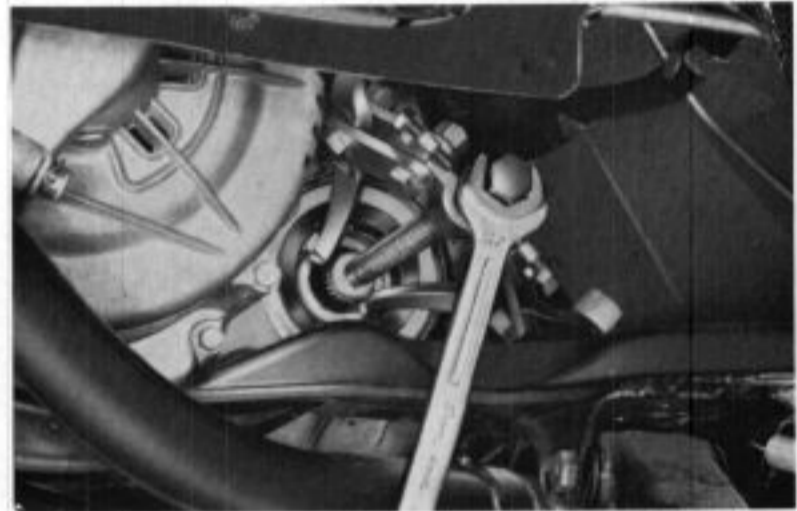


Fig. 8C-12

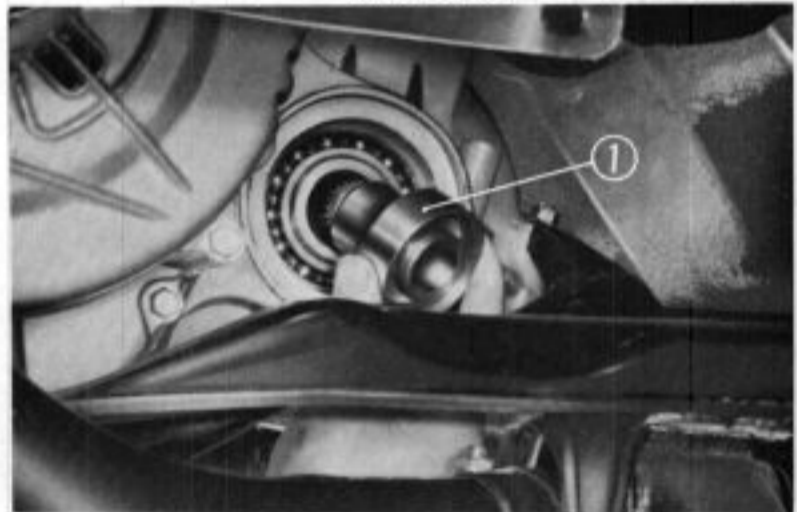


Fig. 8C-13

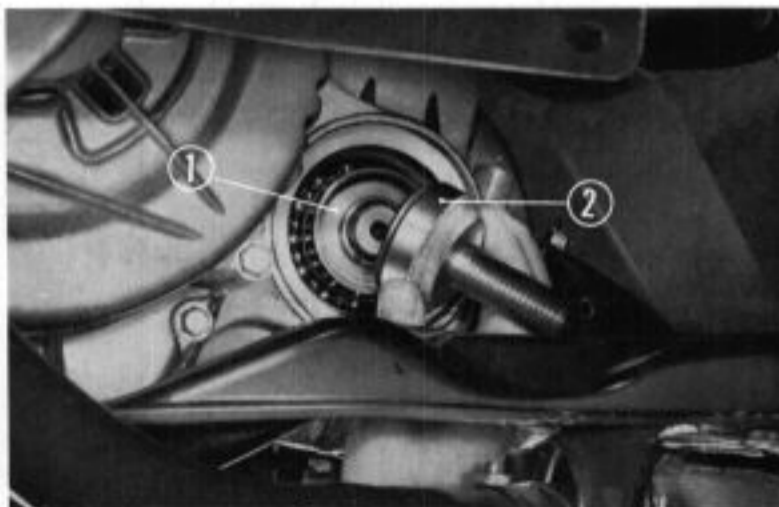


Fig. 8C-14

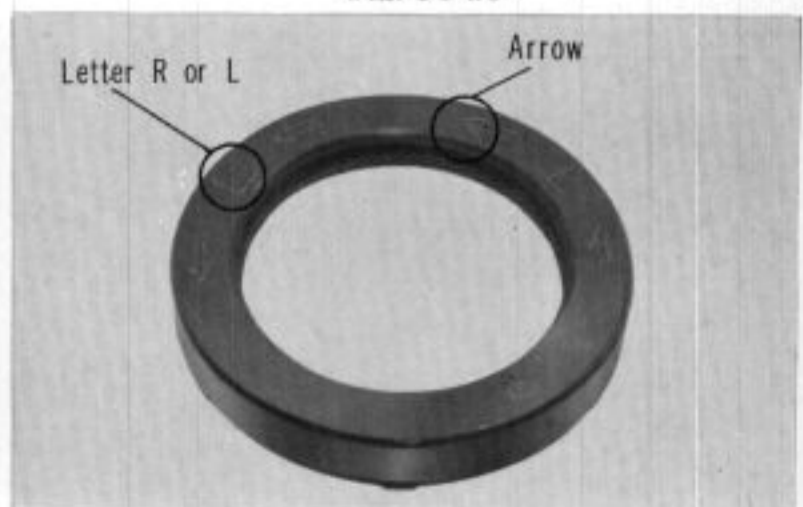


Fig. 8C-15

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Fig. 8C-16



Fig. 8C-17

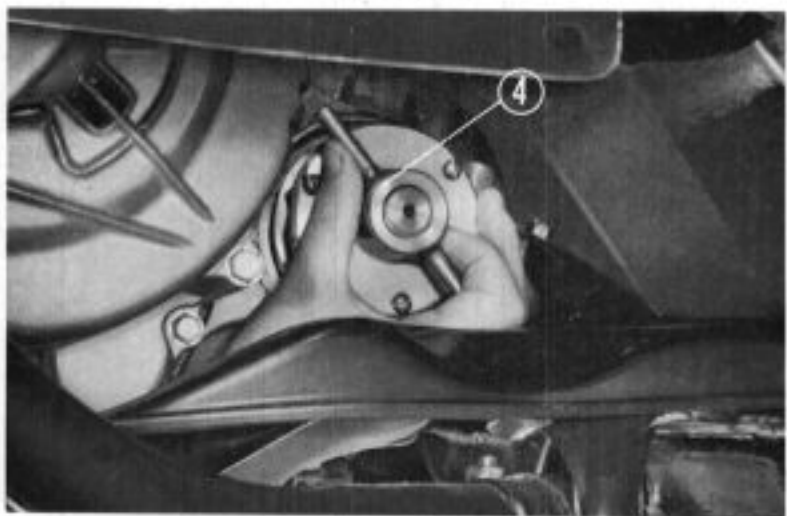


Fig. 8C-18

10. After confirming right and left positions fit the oil seal over the entire circumference, and apply a soapy water solution or grease to the outer periphery of the oil seal to facilitate fitting. (Fig. 8C-16)

11. Attach ③ of the tool to the oil seal. (Fig. 8C-17)

12. Force the oil seal into position by threading handle ④ of the oil seal driver C onto ③. (Fig. 8C-18)

13. After confirming the oil seal fitted completely, remove the tool and fit the external circlip 22mm.

D. Special Tool



07054-56801 Oil seal driver C

M E M O

