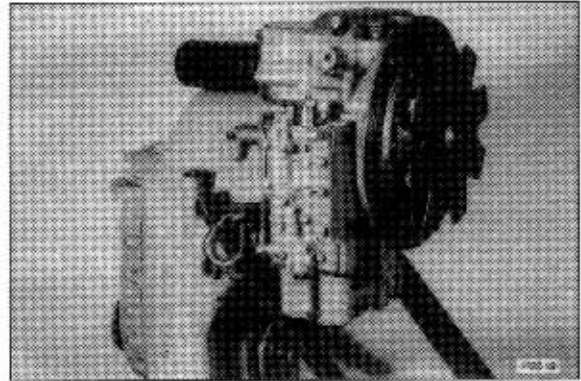


GROUP 4 DISASSEMBLY AND ASSEMBLY

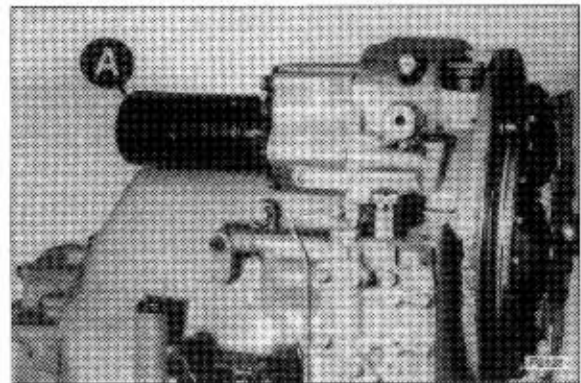
1. TRANSMISSION

1) 4 SPEED TRANSMISSION DISASSEMBLY

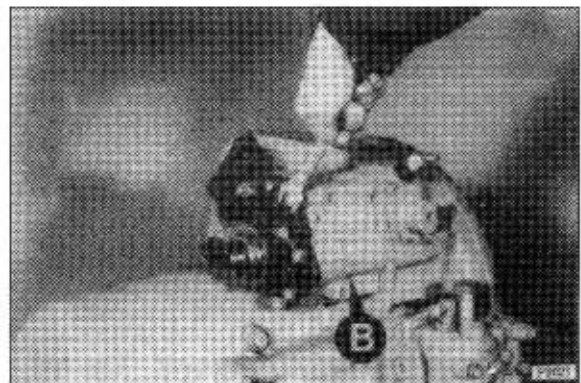
- (1) It is recommended that a locally made stand is used to support the transmission as shown during disassembly.



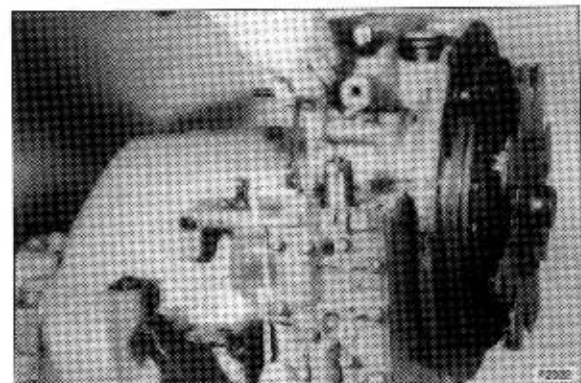
- (2) Remove the filter cartridge **A** and dipstick/filler tube (Not shown).



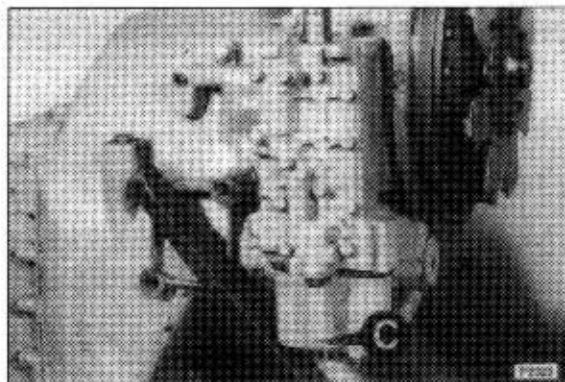
- (3) Remove the charge pump **B** and the main hydraulic pump (Not shown).



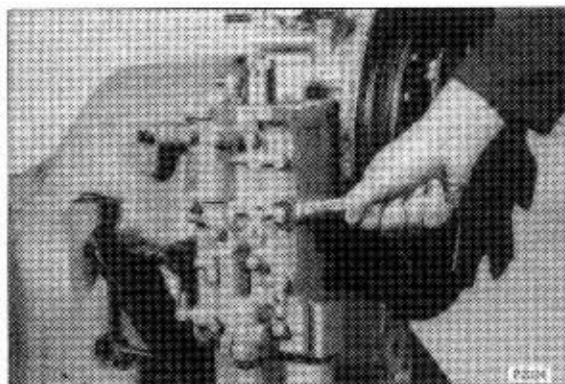
- (4) Remove the cross-over pipe.



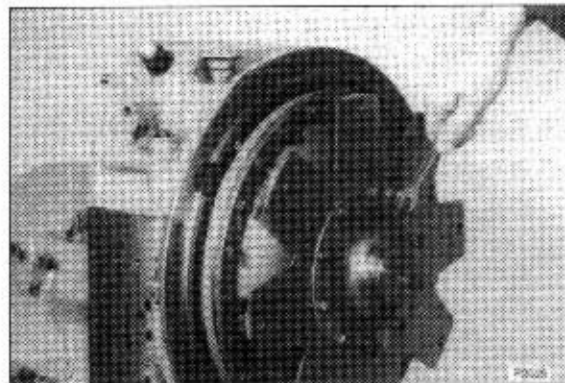
- (5) Disconnect the shuttle valve solenoid wires **C**.



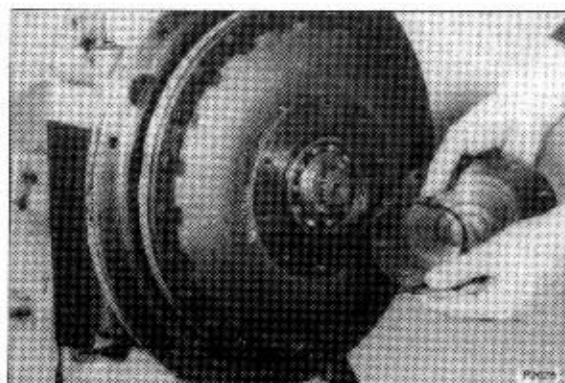
- (6) Unscrew bolts and remove the valve block assemblies.



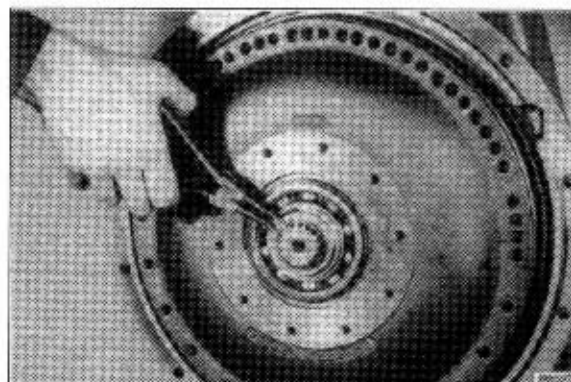
- (7) Remove the drive plate group and backing ring.
※ Some units may have stud nuts and washers fitted.



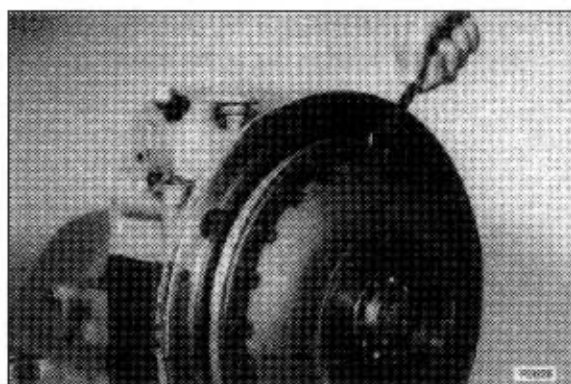
- (8) Remove the bearing cap cover. Discard the O-ring. Use a small pan to catch the oil.



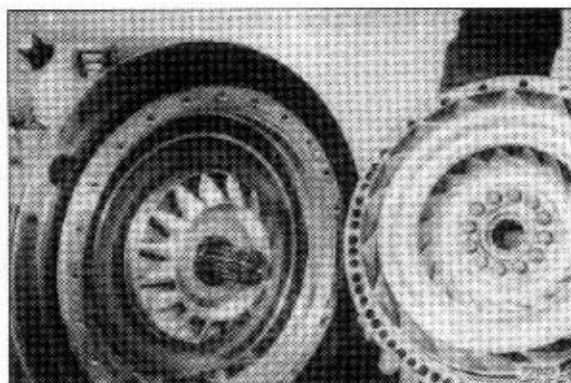
(9) Remove the turbine retaining circlip.



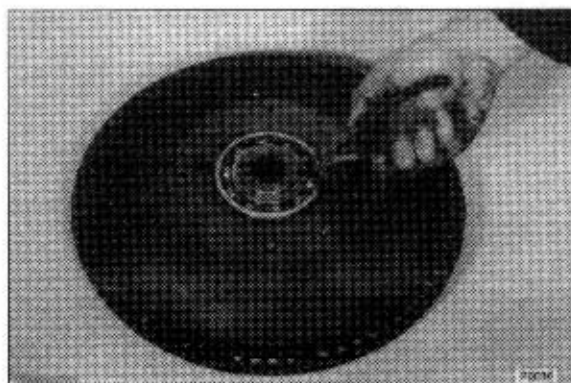
(10) Remove the cover bolts.



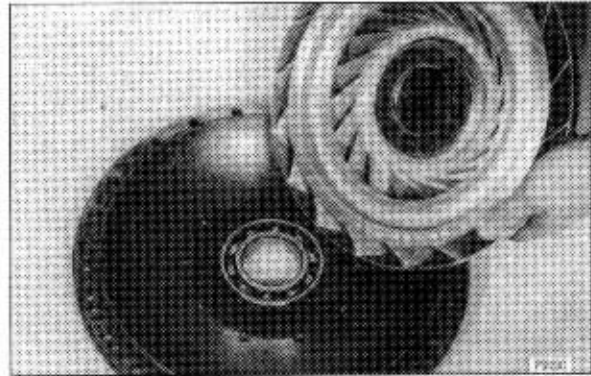
(11) Withdraw the impeller cover and turbine as an assembly.



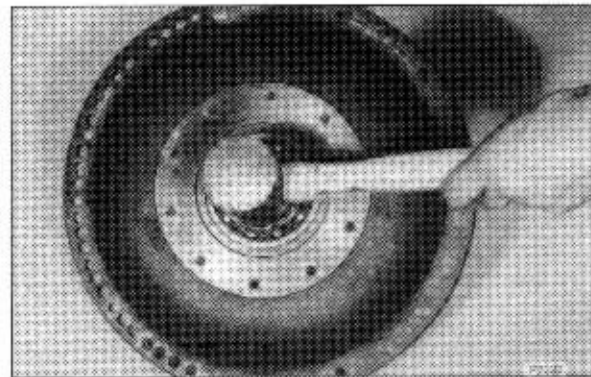
(12) Remove the turbine hub retaining circlip.



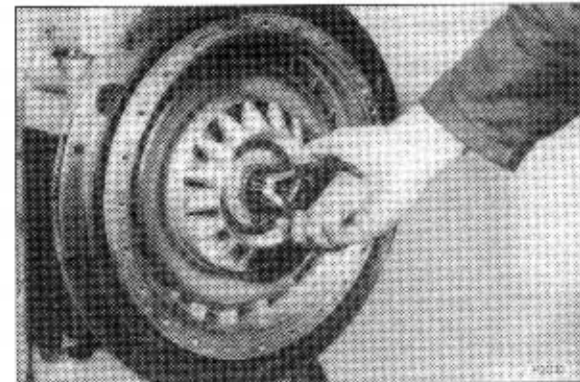
- (13) Tap the turbine and hub from the impeller cover.



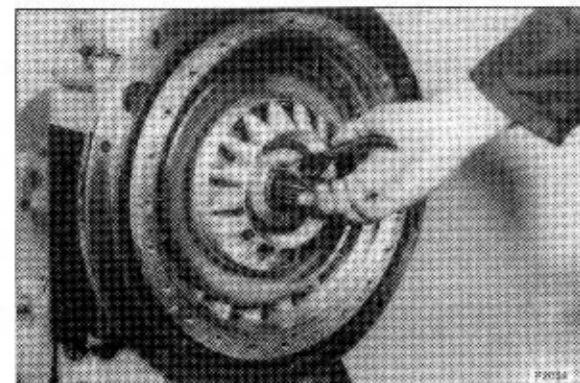
- (14) Remove the cover bearing retaining circlip and tap the bearing out of the cover.



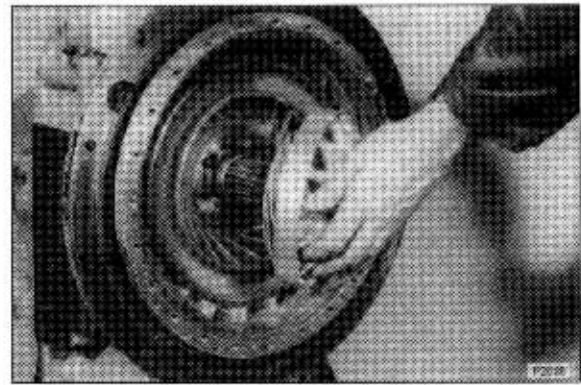
- (15) Remove the turbine bearing circlip.



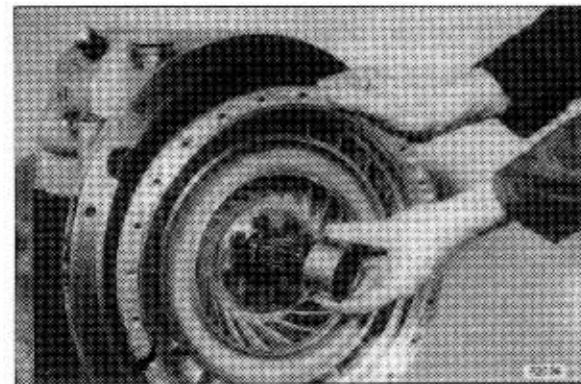
- (16) Remove the reaction member retaining circlip.



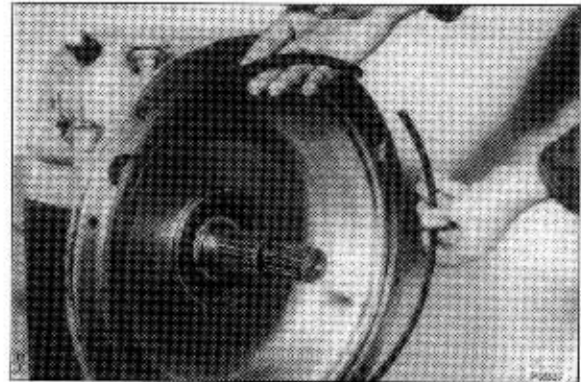
(17) Remove the reaction member.



(18) Withdraw the spacer and remove the impeller and hub assembly.

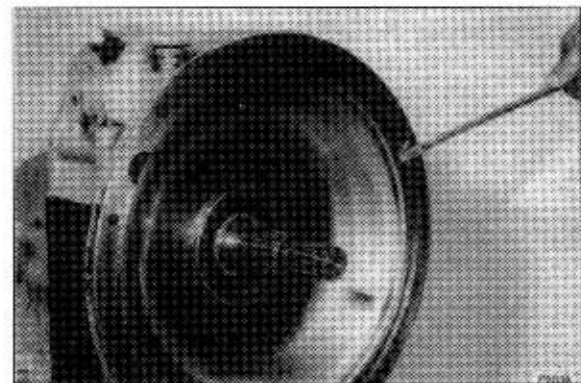


(19) Remove the oil baffle retaining ring.

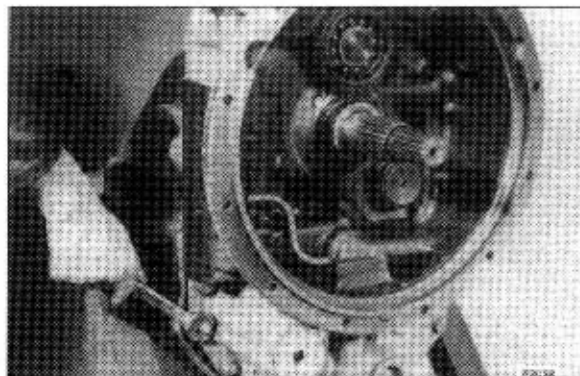


(20) Prise out the oil baffle and remove the seal.

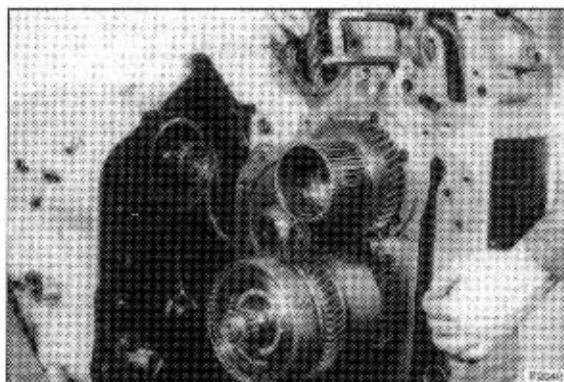
※ A resistance will be felt due to the heavy oil sealing ring.



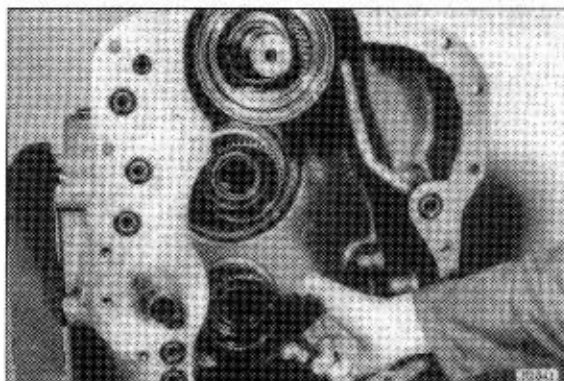
- (21) Support the converter housing with a hoist and unscrew the converter housing bolts.



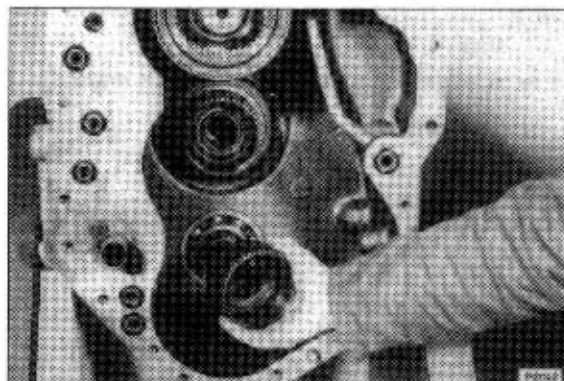
- (22) Lift the converter housing clear.
※ Reverse, 2nd, 3rd and 4th clutches will remain in the converter housing.



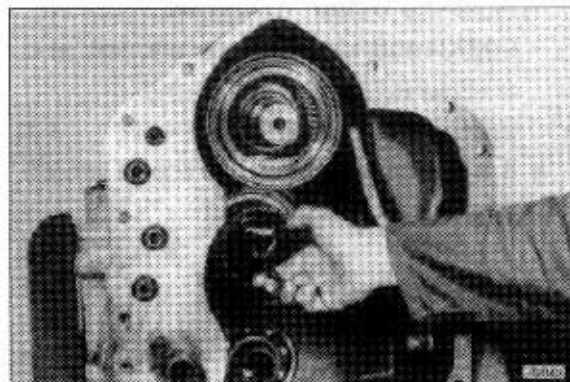
- (23) Remove the 3rd gear hub circlip.



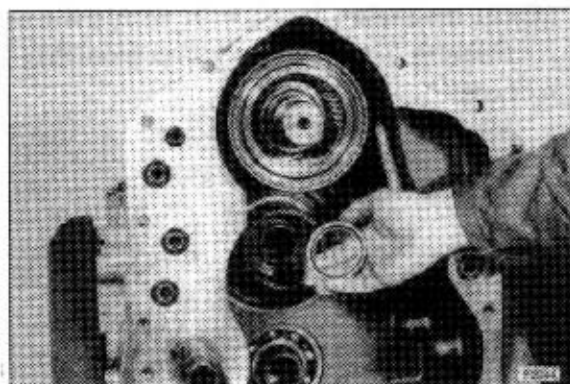
- (24) Remove the 3rd gear hub.



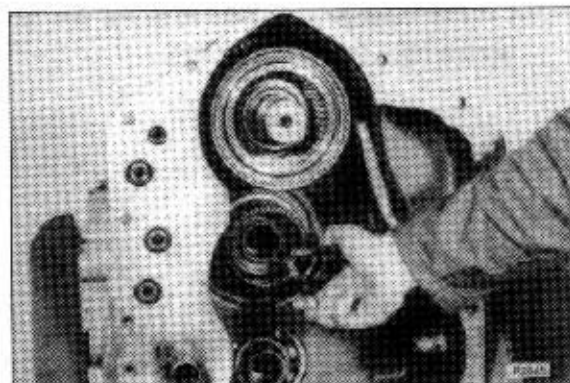
(25) Remove the 2nd gear retaining washer circlip.



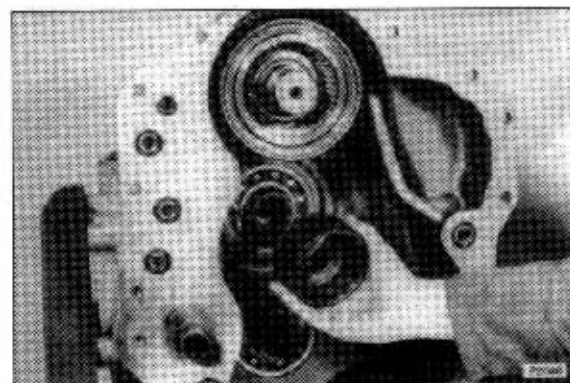
(26) Remove the 2nd gear hub circlip retaining washer.



(27) Remove the 2nd gear hub circlip.

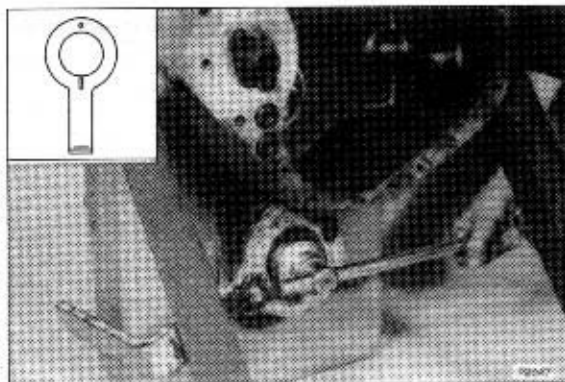


(28) Remove the 2nd gear hub.

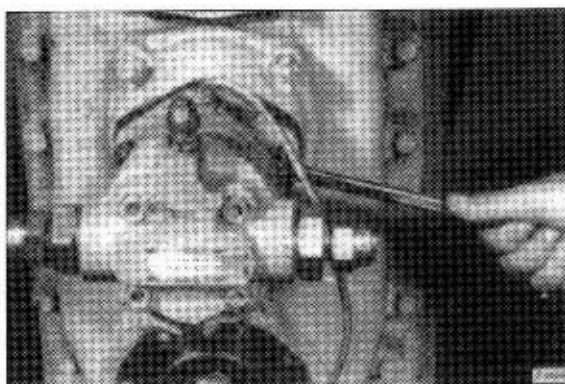


(29) Hold the output flange with tool No. 992/04800 (Modified as shown) and unscrew nut, washer and O-ring. Withdraw output flange.

※ It is also possible to use an impact wrench for this operation.



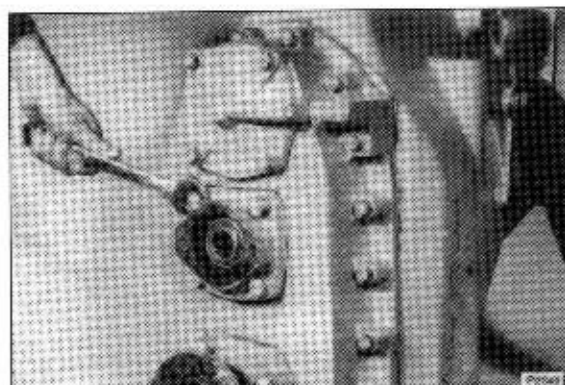
(30) On machines fitted with emergency steering, unscrew the pump mounting bolts.



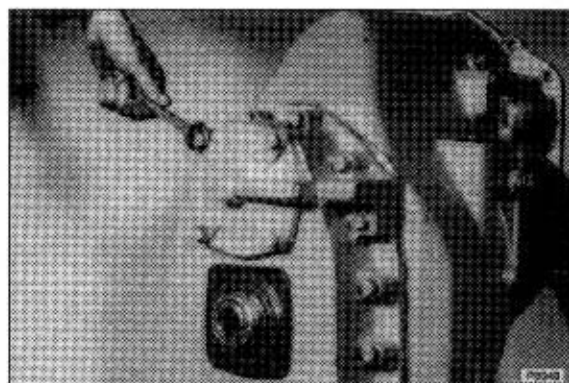
(31) Lift the emergency steering pump away and remove the muff coupling.



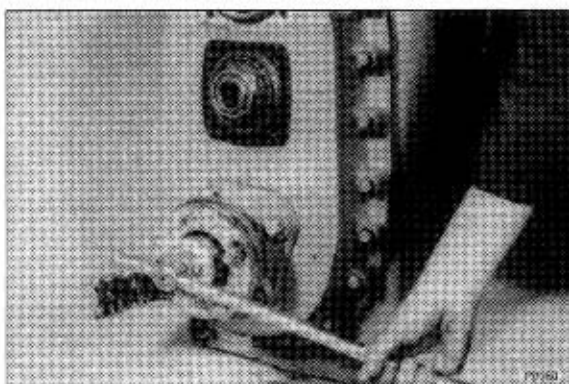
(32) Unscrew bolts and remove the idler shaft bearing cap.



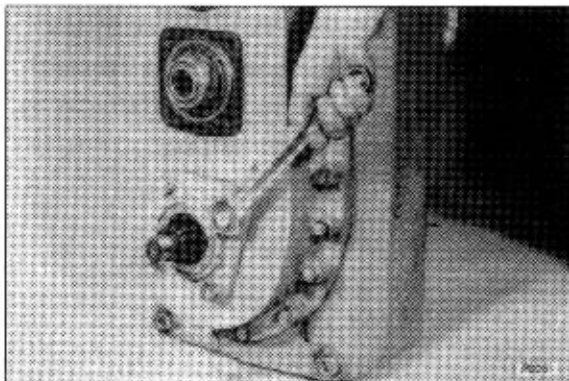
- (33) Unscrew nuts and remove the low clutch shaft bearing cap.



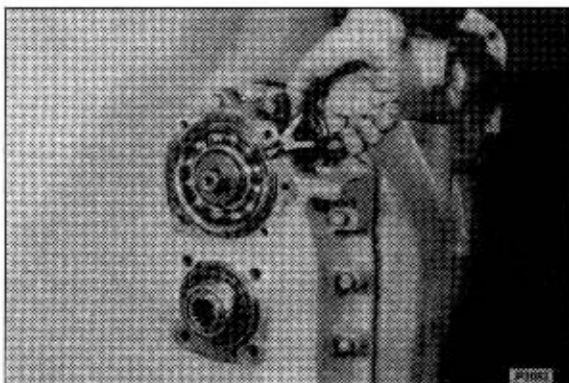
- (34) Remove the rear output flange nut, washer, O-ring and flange.



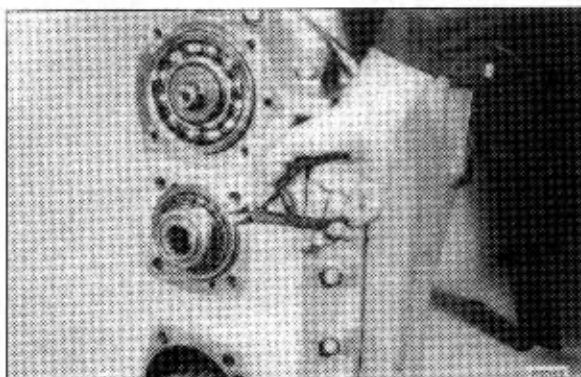
- (35) Unscrew nuts and remove the output shaft bearing cap and O-ring.



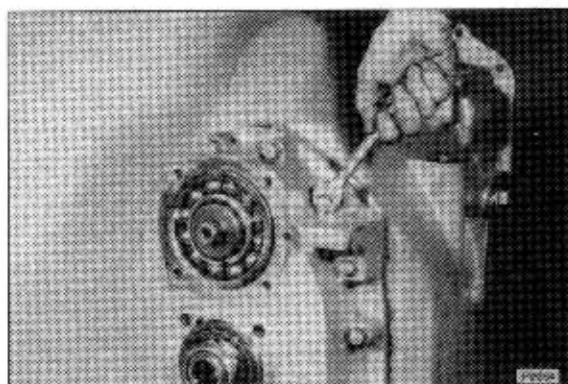
- (36) Remove the rear bearing ring from the 1st clutch shaft.



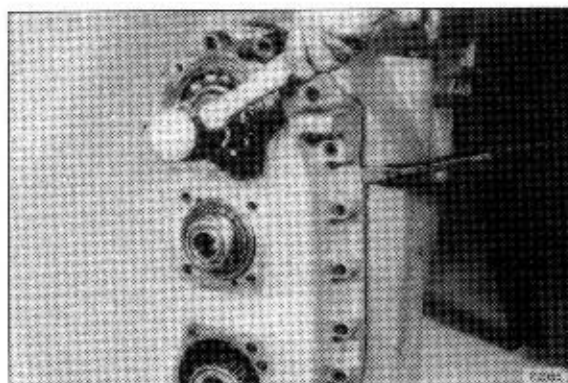
(37) Remove the rear bearing locating ring from the idler shaft.



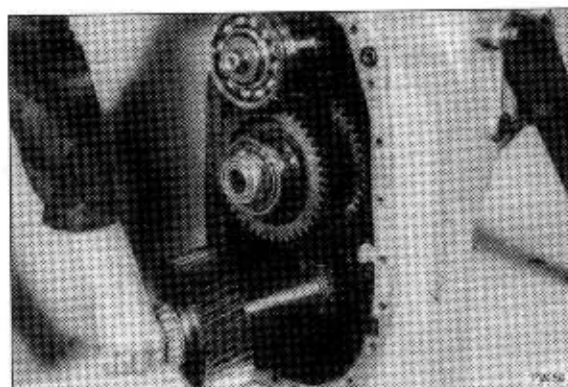
(38) Unscrew the rear cover bolts.



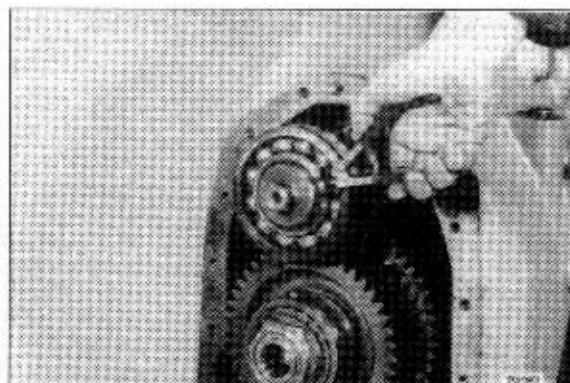
(39) Prise off the cover from the housing using the slots provided. Tap on the 1st clutch and idler shaft with a soft faced hammer to prevent the cover from binding.



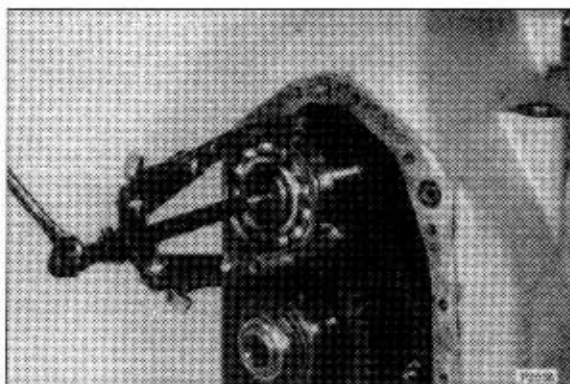
(40) Remove the output shaft assembly.



- (41) Remove the 1st clutch rear bearing retaining ring.

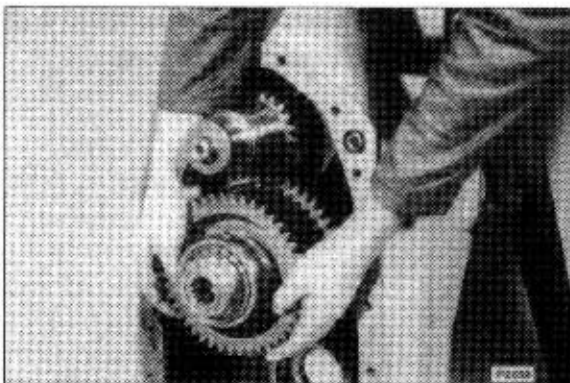


- (42) Remove the 1st clutch rear bearing.

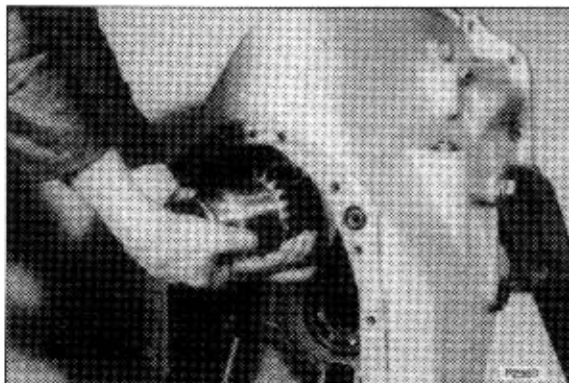


- (43) Support the idler shaft assembly and tap the idler shaft from the front of the housing and remove. Take care not to lose the lock ball from the rear bearing.

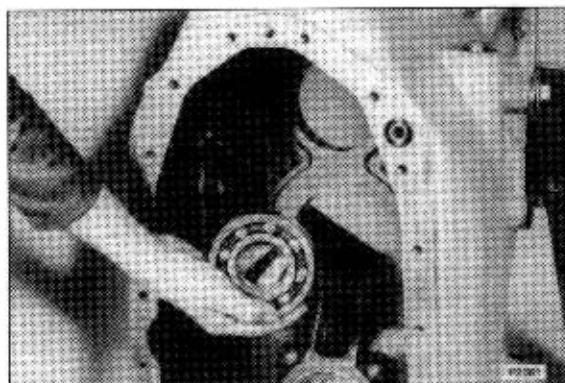
※ Because of the weight of the idler shaft it is recommended that two people carry out this operation.



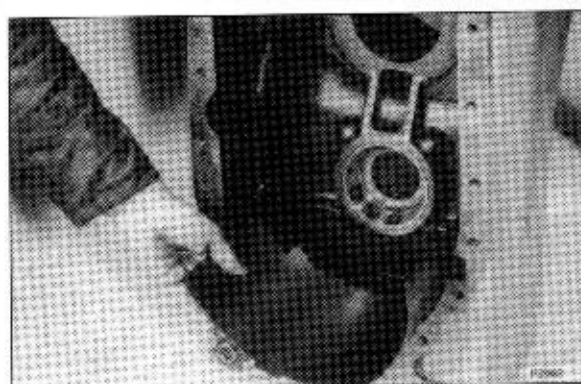
- (44) Remove the 1st clutch assembly.



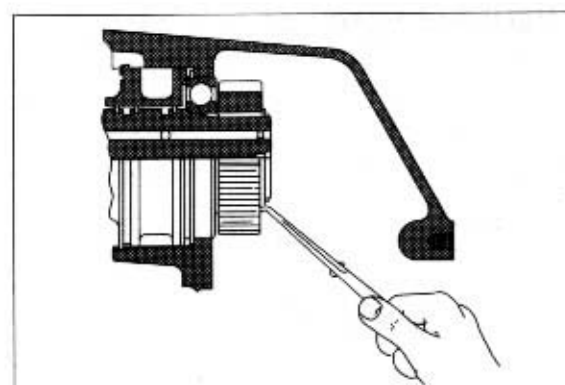
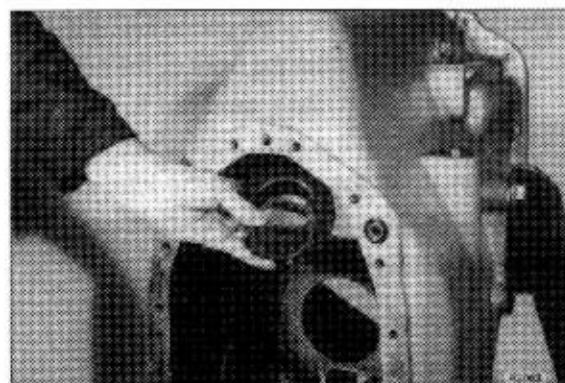
(45) Remove the idler shaft front bearing.



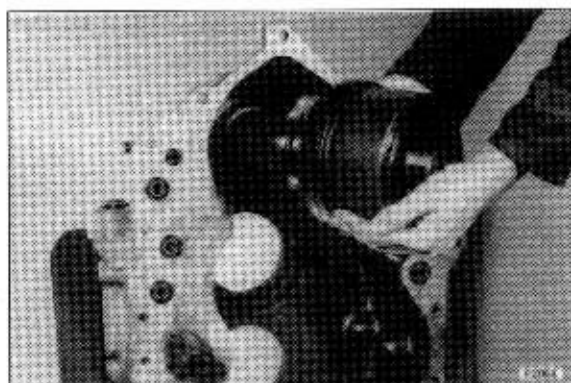
(46) Remove the oil sump baffle.



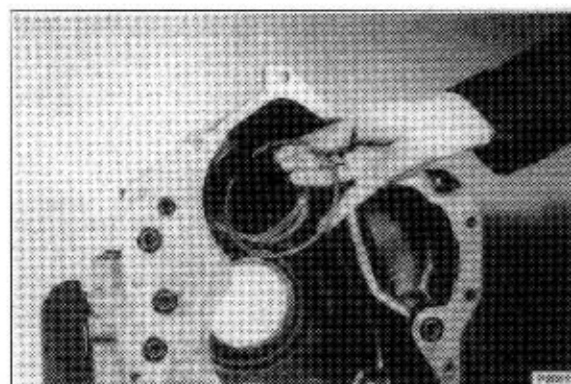
(47) Remove the forward shaft gear circlip and gear from the forward clutch shaft.



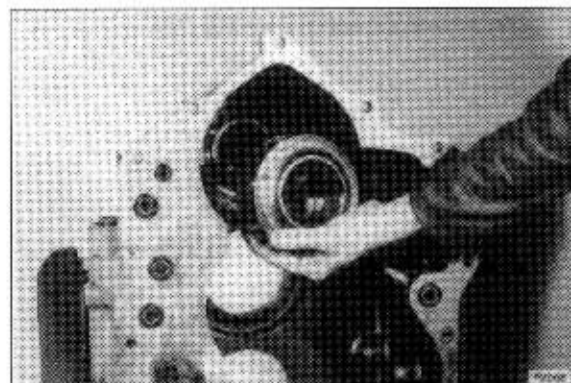
(48) Remove the forward clutch assembly.



(49) Remove the retaining ring from the sealing ring sleeve.



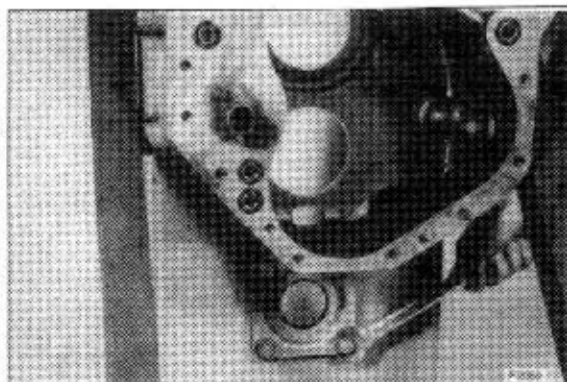
(50) Remove the sealing ring sleeve.



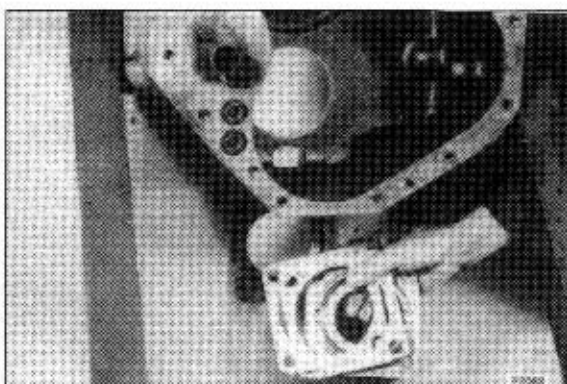
(51) Remove the forward clutch rear bearing.



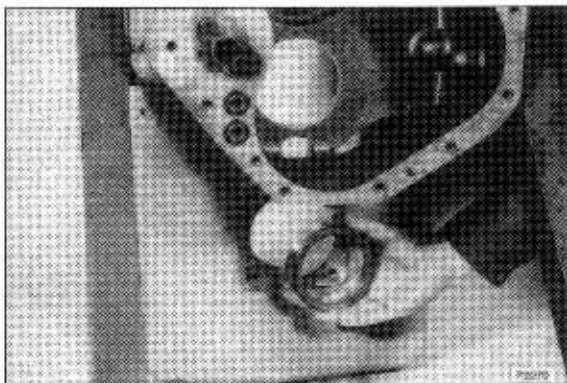
(52) Remove the bolts and washers from the output shaft front bearing cap.



(53) Remove the bearing cap, O-ring and shims.

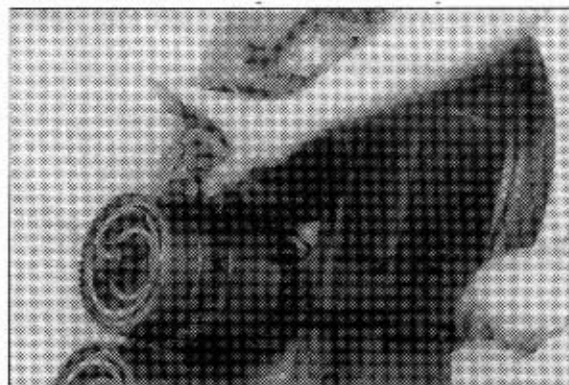


(54) Remove the taper bearing cup.



CONVERTER HOUSING DISASSEMBLY

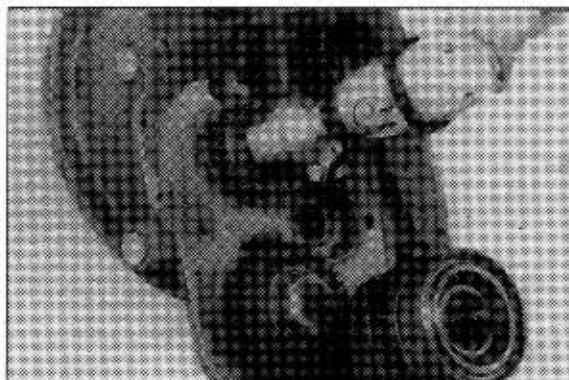
- (55) Spread reverse clutch front bearing locating ring. Pry clutch assembly from housing.



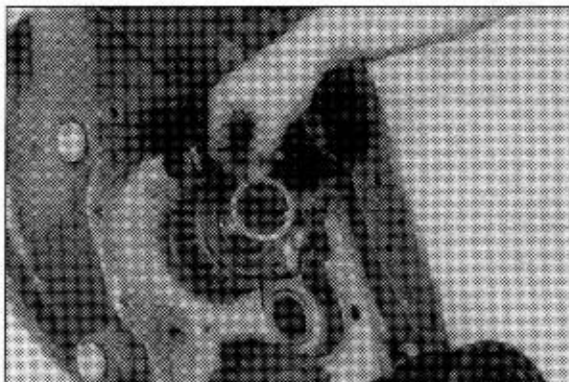
- (56) Unclinch lock nut by straightening upset metal in notch in idler shaft. Remove shaft nut.



- (57) Repeat procedure in a clause (56) for reverse idler shaft.



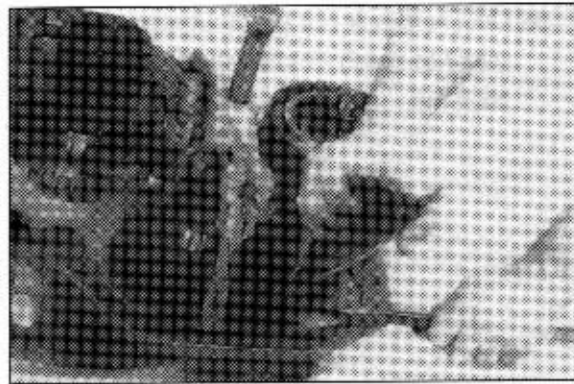
- (58) Remove bearing spacers.



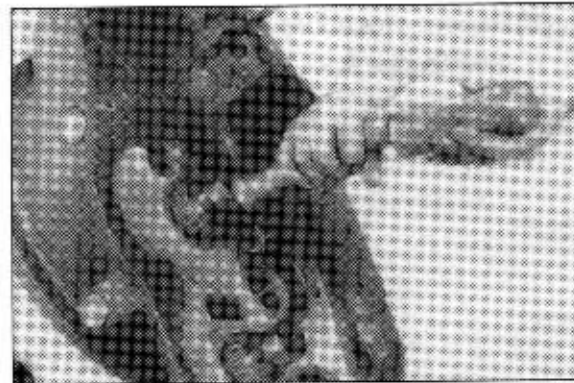
- (59) Remove reverse idler gear and outer taper bearing.



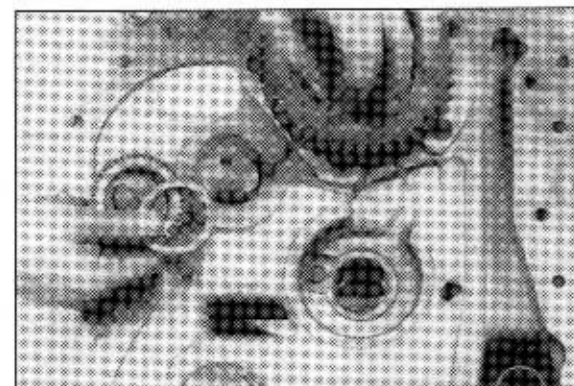
- (60) With the help of an assistant, spread the 4th speed clutch front bearing locating ring and pry clutch from converter housing while the assistant removes the idler gear and outer taper bearing.



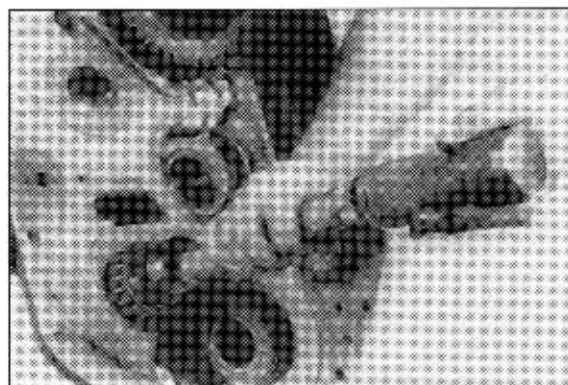
- (61) Using a soft bar, drive reverse idler shaft from taper bearing.



- (62) Remove taper bearing and thrust plate. Remove shaft. Use caution as not to lose lock ball.



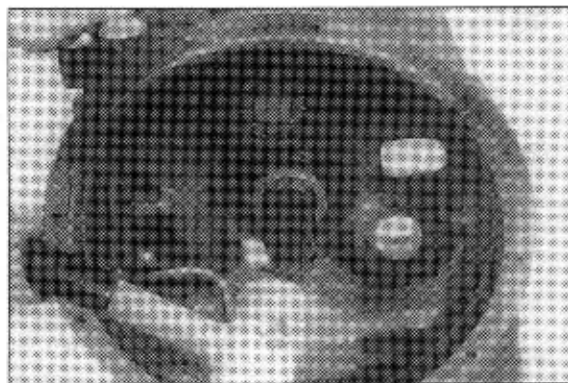
- (63) Repeat procedures in the clause (61) and (62) for idler shaft removal.



- (64) Spread the turbine shaft bearing locating ring.



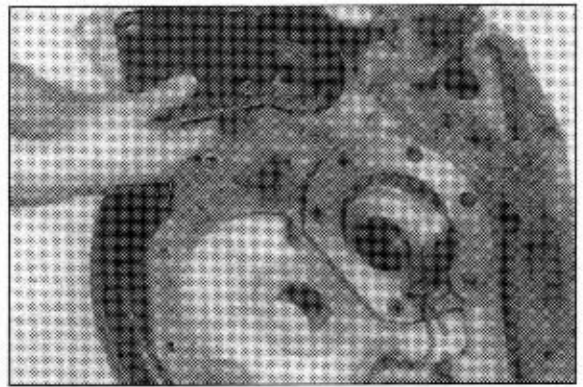
- (65) Holding ring open, tap turbine shaft from stator support.



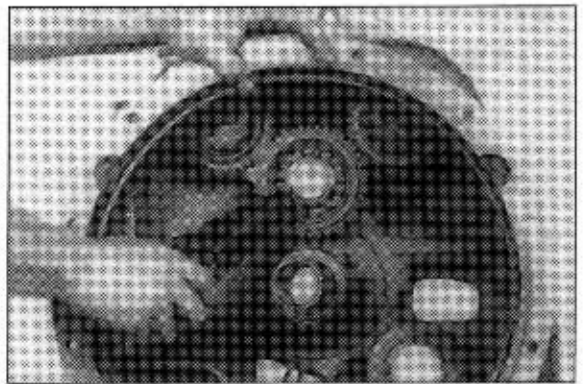
- (66) Remove turbine shaft.



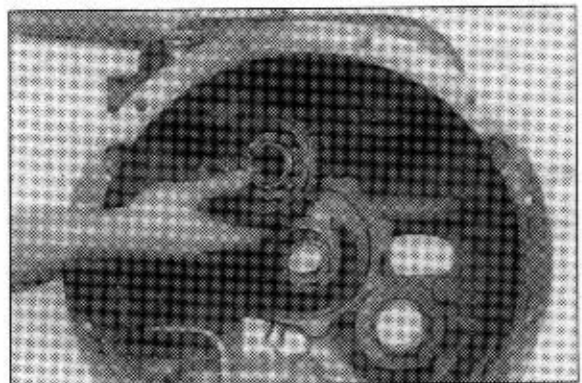
(67) If used, remove auxiliary pump drive gear cover and gasket.



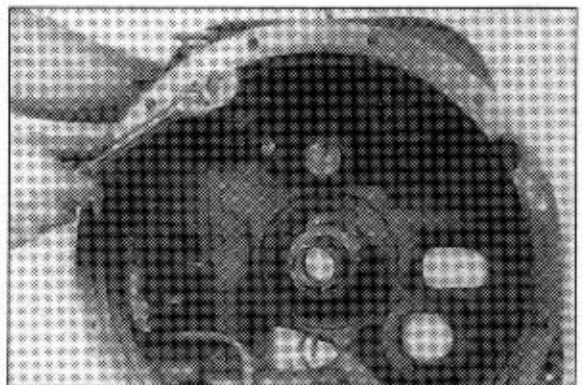
(68) Remove pump idler gear retainer ring.



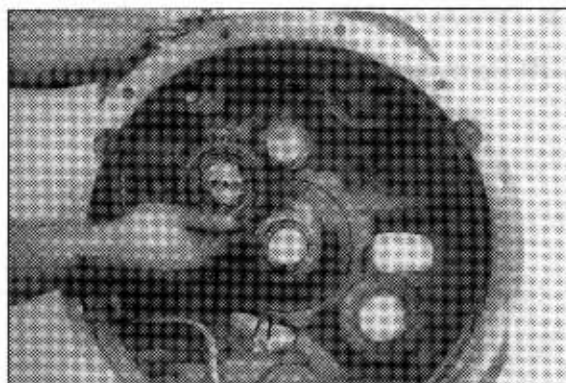
(69) Remove idler gear.



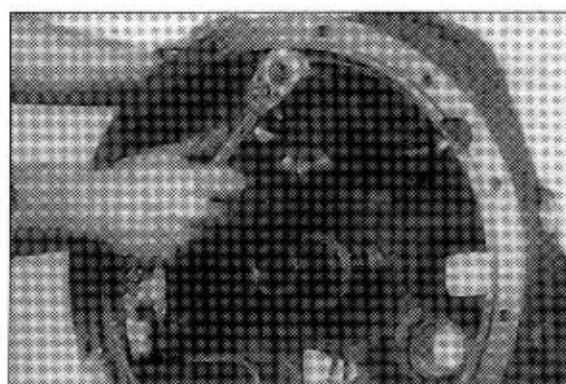
(70) Remove the charging pump drive gear support bolts.



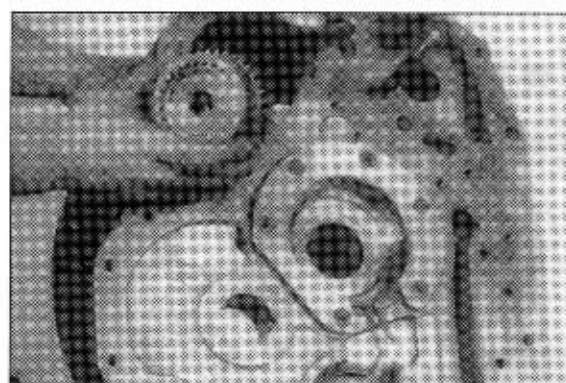
(71) Remove drive gear and support assembly.



(72) Remove the auxiliary pump drive gear support bolts.



(73) Remove auxiliary pump drive gear.



(74) If stator support is to be replaced, remove support screws and tap support from housing.



2) TYPICAL CLUTCH DISASSEMBLY(Reverse clutch shown)

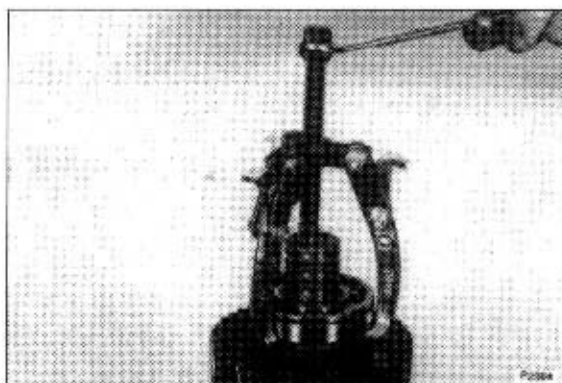
(1) Remove the oil sealing rings A.



(2) Remove the bearing retaining circlip.



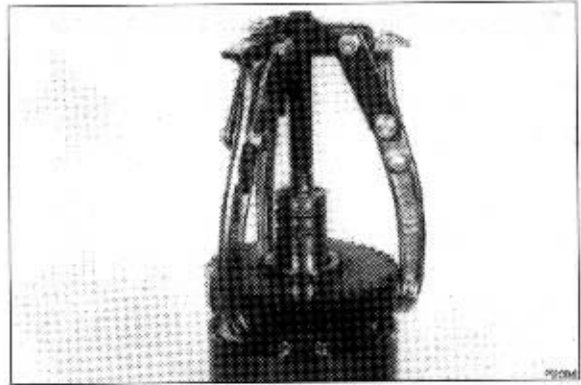
(3) Remove the front bearing.



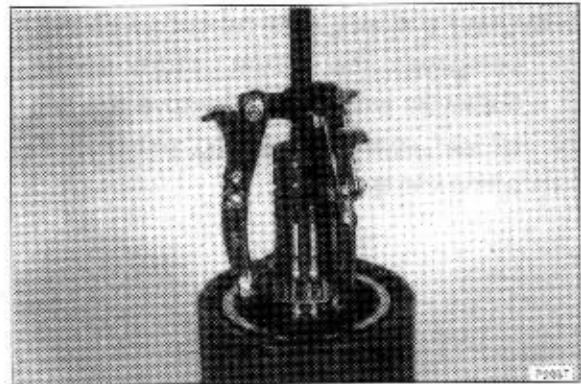
(4) Remove the clutch gear bearing retaining circlip.



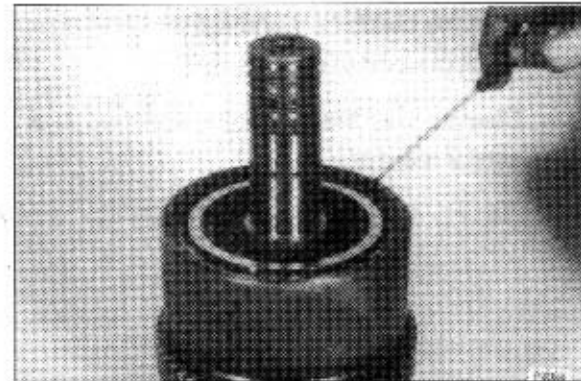
- (5) Pry the reverse gear from clutch assembly far enough to use the gear puller then remove gear.



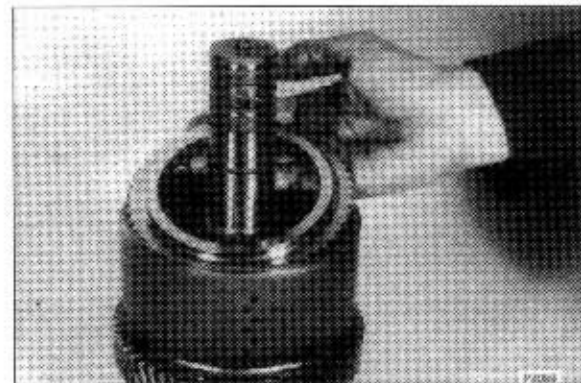
- (6) Remove the spacer and the inner bearing.



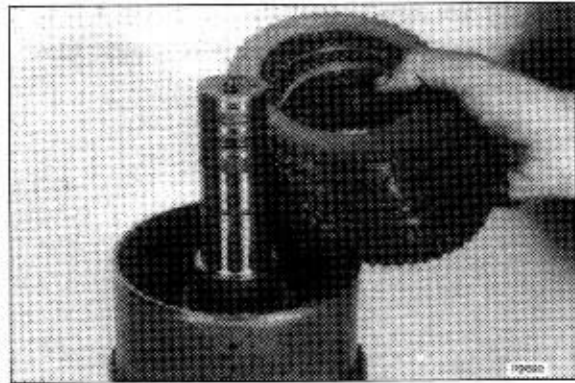
- (7) Remove the clutch end plate retaining circlip.



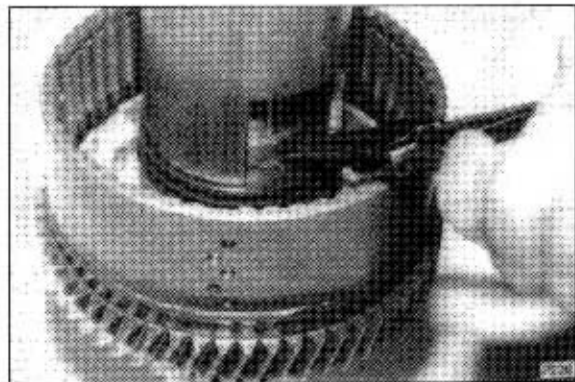
- (8) Remove the end plate.



(9) Remove the inner and outer clutch discs.

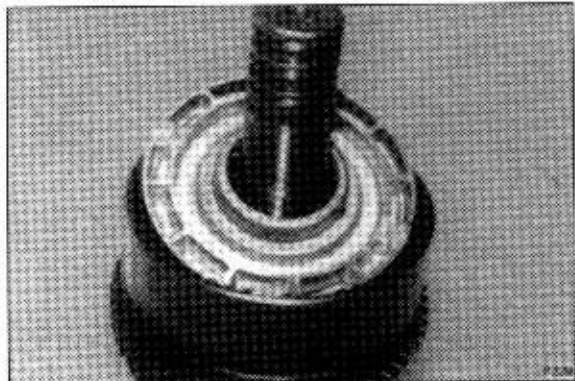


(10) Using a sleeve with cut-out as shown, compress the piston return spring (Belleville washers). Remove the ring retainer, spring retainer ring, piston return spring and spacer.



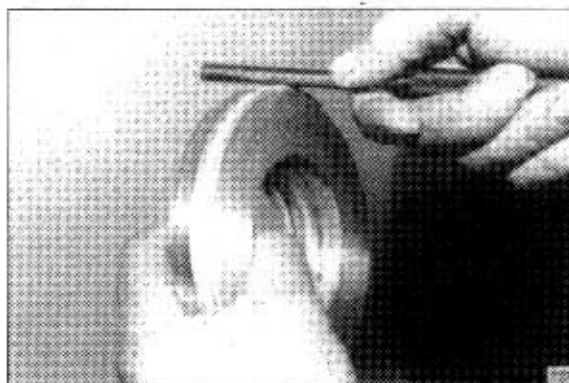
(11) Turn the clutch over and tap the shaft on a block of wood to remove piston.

Disassembly the remaining clutches in a similar manner.

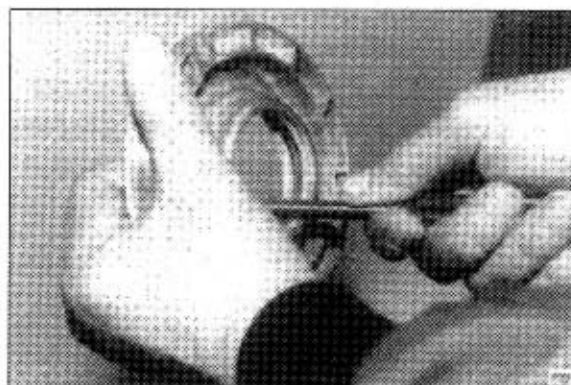


3) TYPICAL CLUTCH ASSEMBLY (Reverse clutch shown)

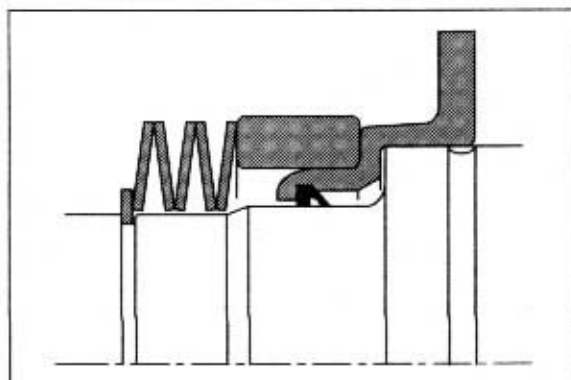
- (1) Fit the clutch outer seal ring. Size ring by rotating piston whilst holding a round object against the seal. The seal must be flush with outer diameter of the piston.



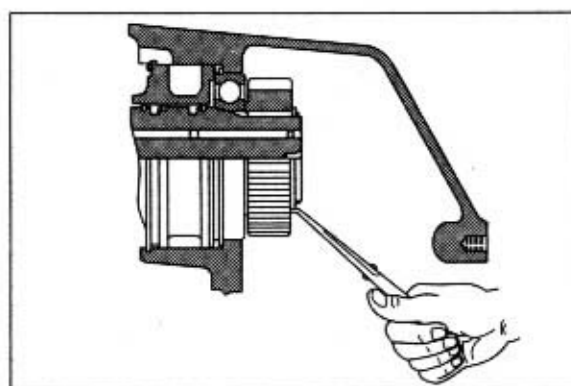
- (2) Fit the piston inner seal ring and size. Assemble the piston into clutch drum taking care not to damage seal rings.



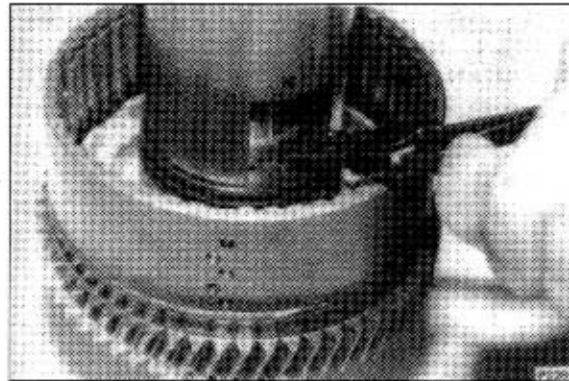
- (3) On forward, reverse and low clutches, fit the belleville washers with spacers and secure with circlip.



- (4) On ratio clutches, fit the return spring and spring retainer washer and secure with circlip.

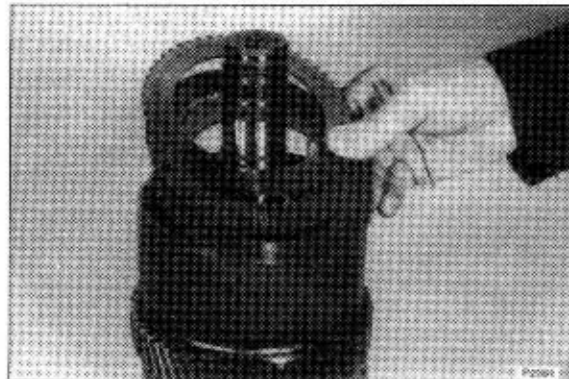


- (5) Using a sleeve with a cut-out as shown, compress the spring/belleville washers to fit circlip.

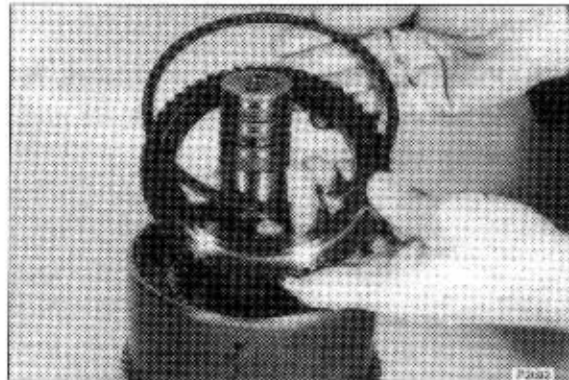


- (6) Fit a steel disc first followed by alternate friction and steel discs. The last disc should be friction.

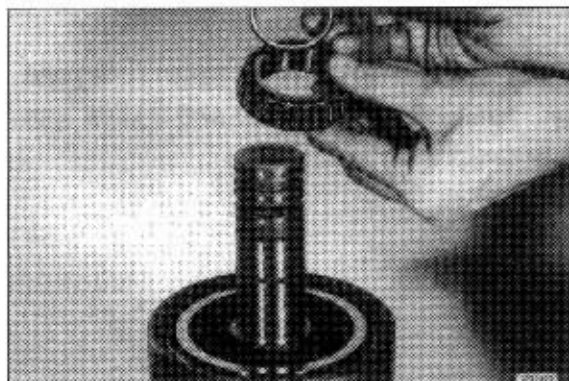
※ The friction discs in the low clutch (Identified by a yellow mark) have a higher co-efficient rating than those fitted to other clutches.



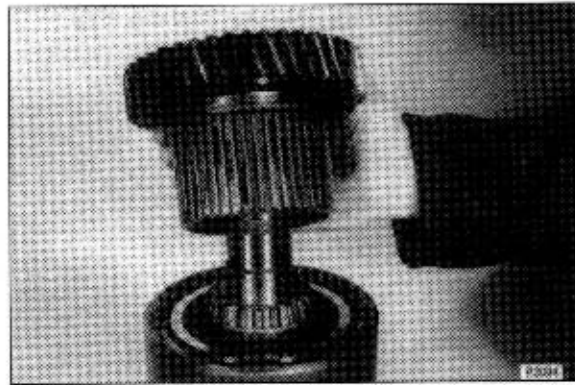
- (7) Fit the end plate and retaining ring.



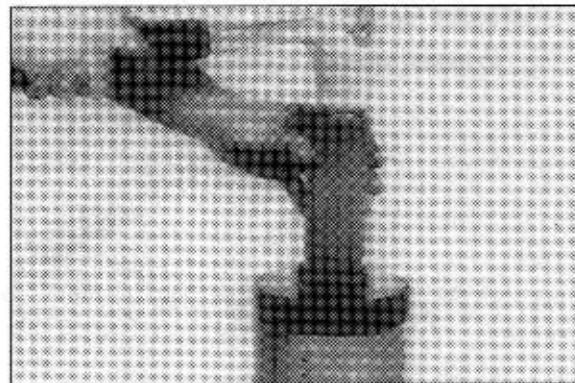
- (8) Fit the inner bearing, spacer and circlip.



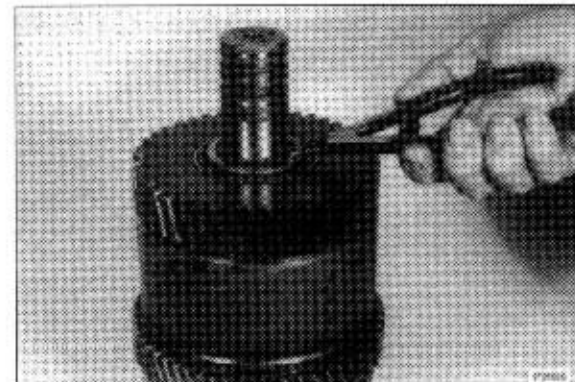
- (9) Fit the gear hub into the clutch drum. **Do not force this operation.** The outer gear splines must be engaged with the internal teeth of all friction discs.



- (10) Fit the outer taper bearing, large diameter up.



- (11) Fit the bearing retaining ring.



- (12) Fit the front bearing with the locating ring groove towards the top.



(13) Install the front bearing retaining ring.



(14) Install new oil sealing rings. Grease rings to assist reassembly into housing.

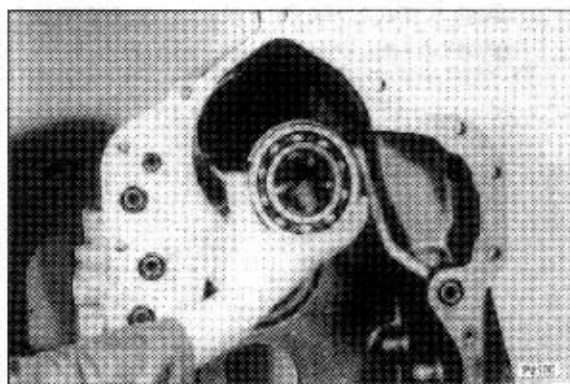


Assemble remaining clutches in a similar manner.

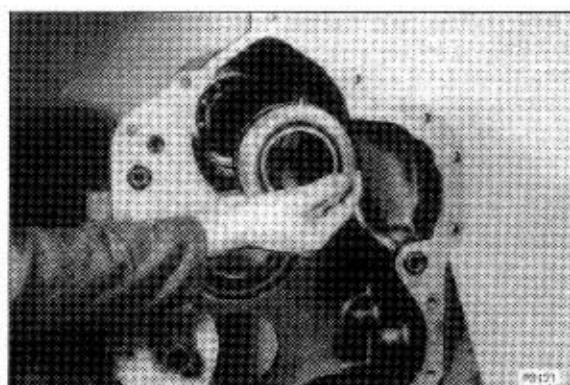
4) 4 SPEED TRANSMISSION ASSEMBLY

See previous pages for typical clutch disassembly and assembly

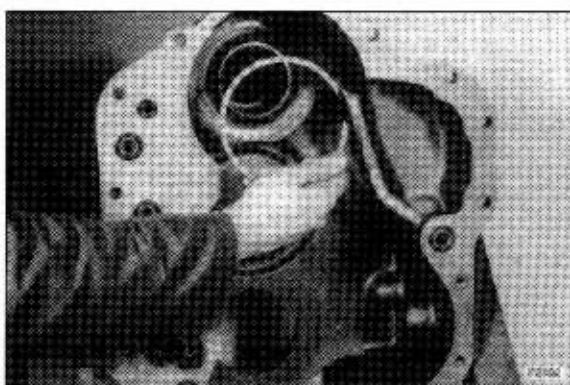
- (1) Install the forward clutch rear bearing with the locating ring toward the front of the transmission housing.



- (2) Align the clutch oil sealing ring sleeve with the notch in the housing. Tap the sleeve into position.

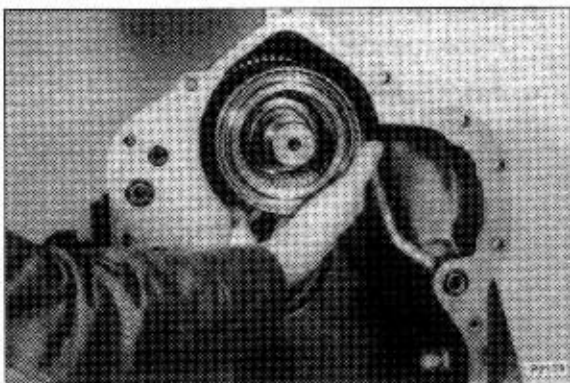


- (3) Fit the sleeve retaining ring.

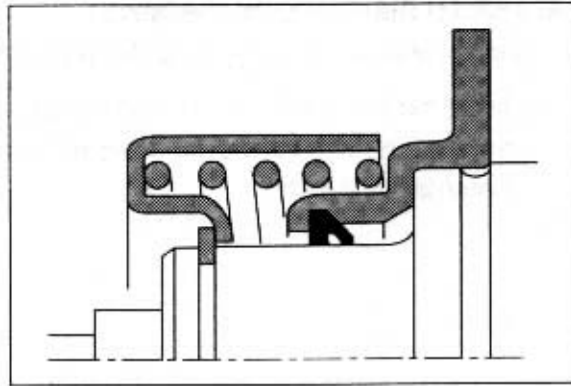


- (4) Position the forward clutch assembly into the sleeve.

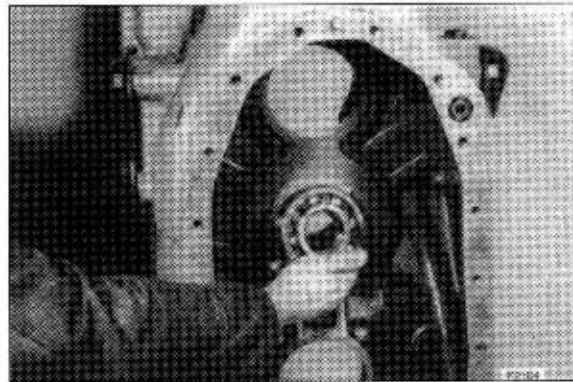
※ Take care not to damage the oil sealing rings on the clutch shaft.



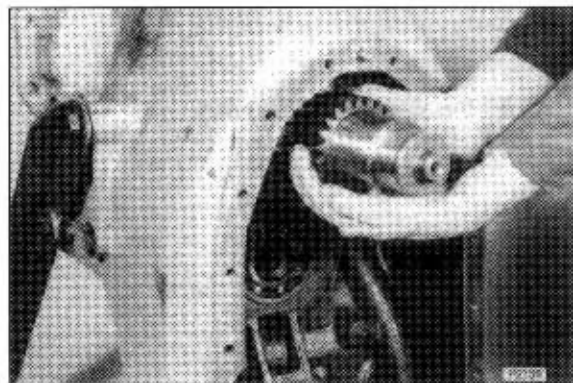
- (5) Position the forward shaft gear on the rear of the clutch shaft with the long hub of the gear toward the bearing. Fit the shaft gear circlip.



- (6) Fit the idler shaft front bearing.

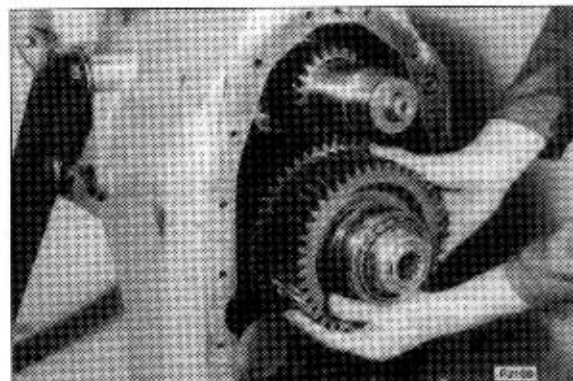


- (7) Install the 1st clutch assembly in the housing.

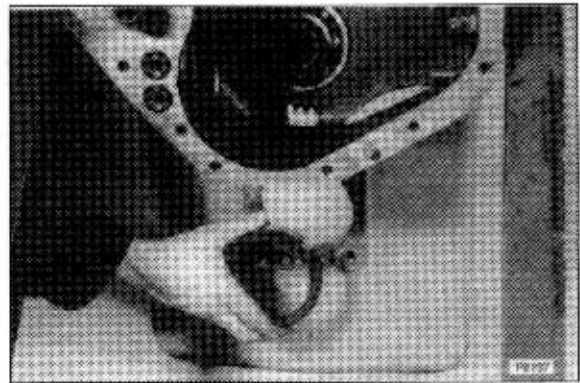


- (8) Install the idler shaft assembly into the front bearing.

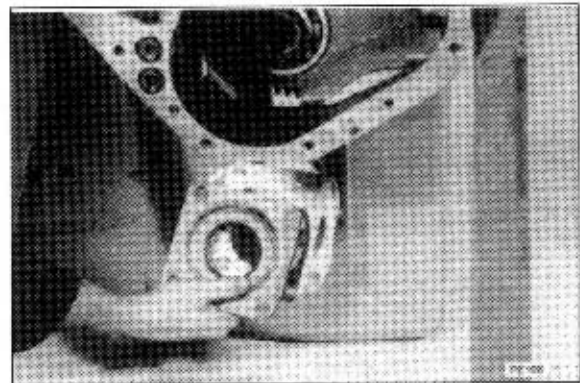
※ Because of the weight of the shaft it is recommended that two people carry out this operation.



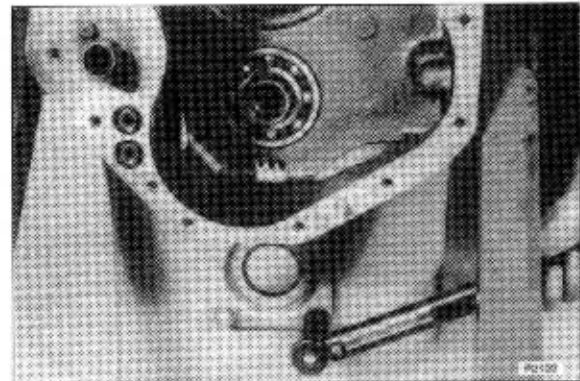
- (9) Install the output shaft taper bearing cup with the taper facing inwards.



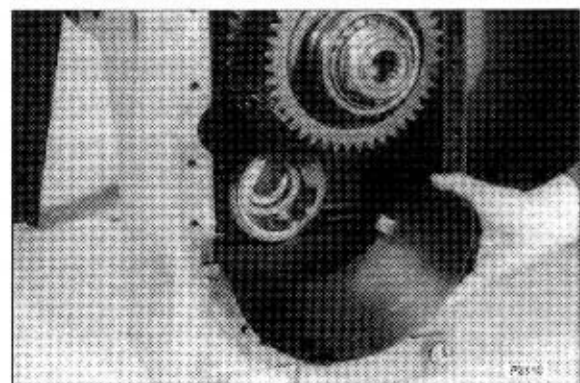
- (10) Coat the outer diameter of the oil seal with JCB Multi-gasket and press the seal into the bearing cap with the lip of the seal facing inwards. Remove any excess sealant. Fit a new O-ring and shims on the bearing cap.



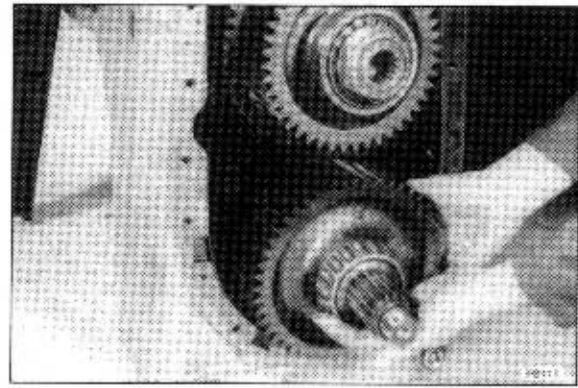
- (11) Install the bearing cap, shims, capscrews and washers, tighten screws to 11.3-12.4kgf · m(82-90lbf · ft)



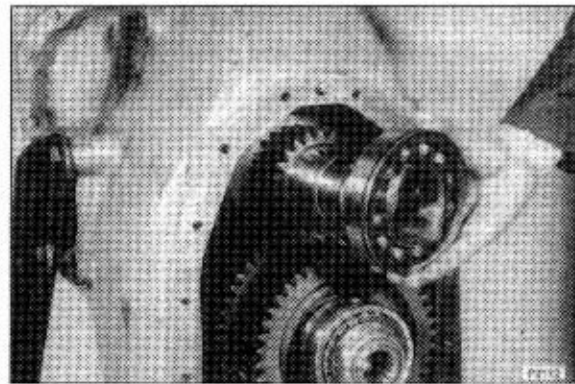
- (12) Position the oil baffle in the transmission sump.



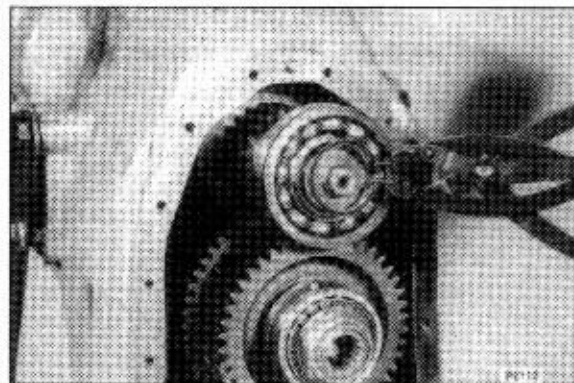
- (13) Position the output shaft assembly in the front bearing bore, take care not to damage the front oil seal.



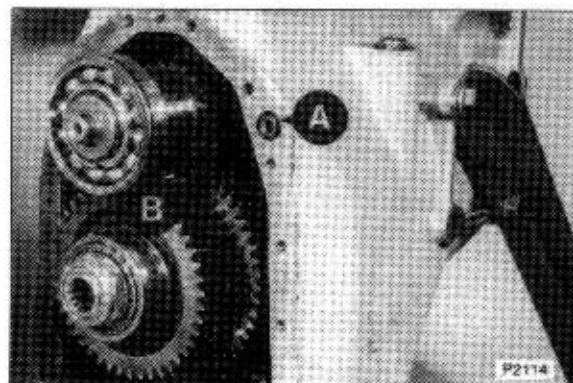
- (14) Install the 1st clutch rear bearing with the retaining ring groove outwards.



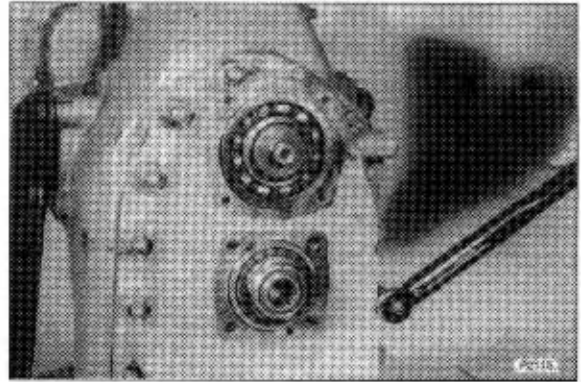
- (15) Fit the bearing retainer ring.



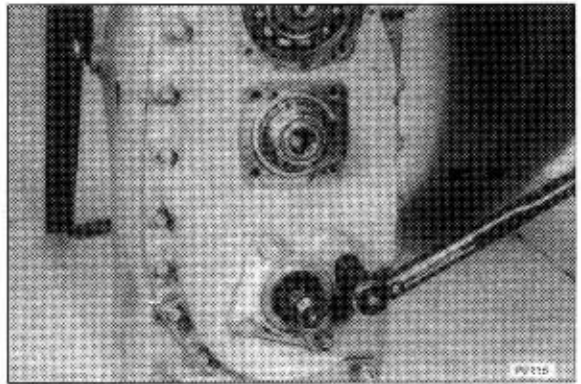
- (16) Position a new gasket on the rear of the housing. A light coat of grease will hold the gasket in place. Install a new O-ring **A** in the housing and lockball **B** in the idler rear bearing.



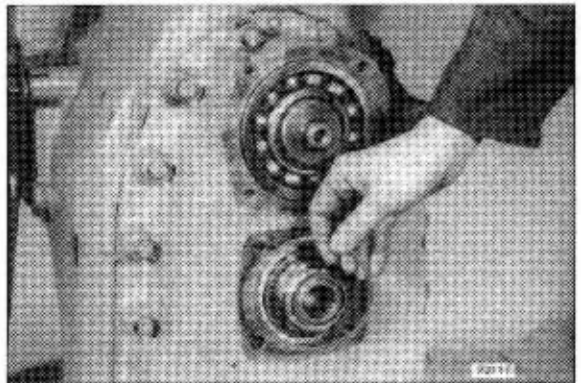
- (17) Align the lock ball in the idler shaft rear bearing with the notch in the transmission rear cover. Tap the cover into place and secure with bolts and washers. Tighten cover bolts to $7.2-7.9\text{kgf} \cdot \text{m}$ ($52-57\text{bf} \cdot \text{ft}$).



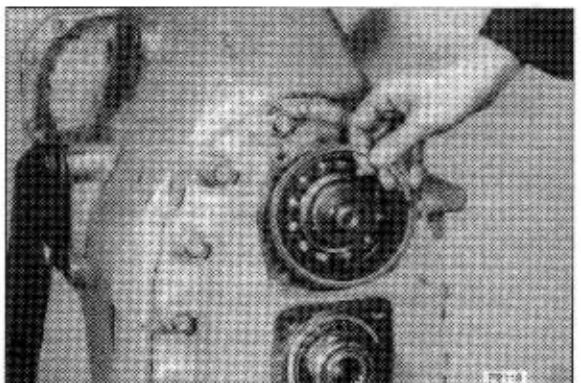
- (18) Apply a light coat of JCB Multi-gasket to the outer diameter of the rear output oil seal. Press the seal in the bearing cap with the lip of the seal in. Install the taper bearing cup and O-ring. Install bolts and washers and tighten to $11.3-12.4\text{kgf} \cdot \text{m}$ ($82-90\text{bf} \cdot \text{ft}$).



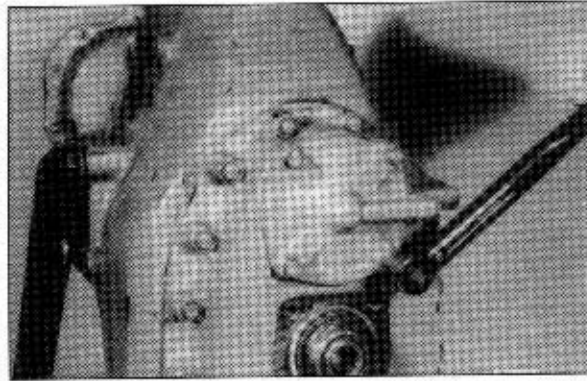
- (19) From the front, tap the idler shaft to the rear until the rear bearing locating ring groove is exposed. Fit the locating ring.



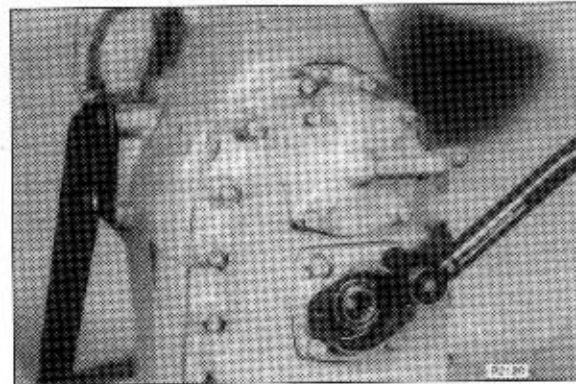
- (20) From the front, tap the 1st clutch to the rear until the rear bearing locating ring groove is exposed. Fit the locating ring.



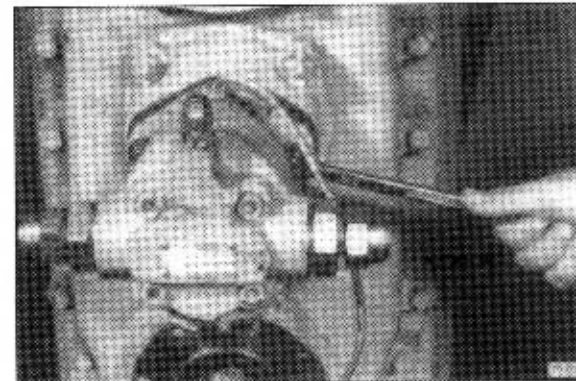
- (21) Position a new O-ring and gasket on the 1st clutch rear bearing cap. Install cap screws and washers, tighten to 5.1-5.7kgf · m(37-41lbf · ft).



- (22) Position a new gasket on the idler shaft bearing cap. Install bearing cap, bolts and lockwashers, tighten to 11.3-12.4kgf · m(82-90lbf · ft).

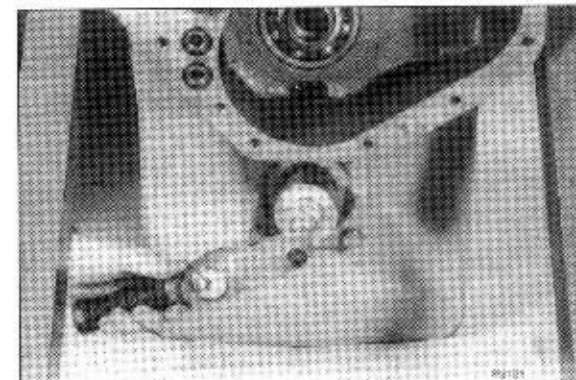


- (23) Assembly the emergency steering pump and muff coupling(if fitted).



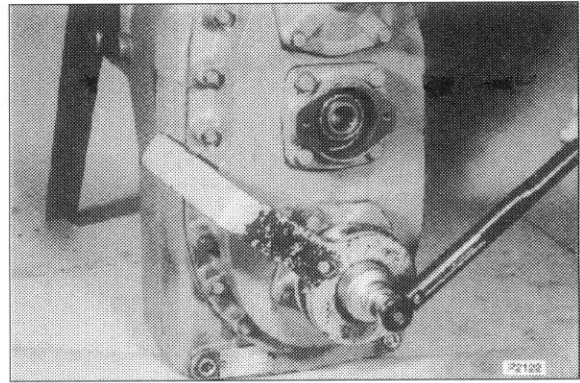
(24) Output shaft bearing preload

Tap the output shaft front and rear to seat the taper bearings. Loosen the front bearing cap bolts. Using a lbf · in torque wrench, record the rolling torque of the output shaft. Tighten the cap bolts to 11.3-12.4kgf · m(82-90lbf · ft). Check the rolling torque with the bolts tight. This must be 6.9-9.2kgf · cm(6-8lbf · in) greater than when the cap bolts were loose. Add or take off shims on the bearing cap to achieve the correct preload.

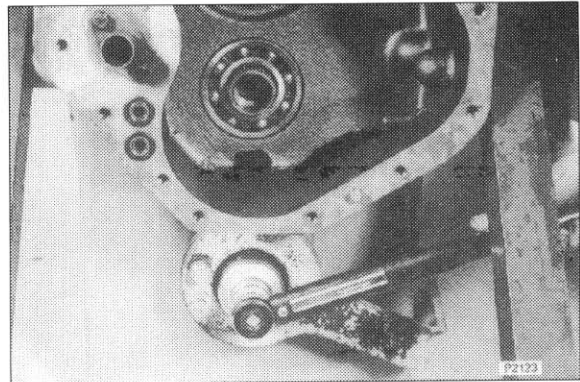


- (25) Install the rear output flange, O-ring, washer and nut.

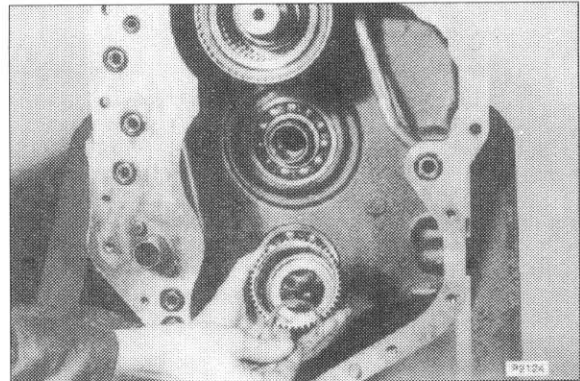
Using service tool No.992/04800 to prevent the shaft from turning. Tighten flange nut to 27.7-34.6kgf · m(200-250lbf · ft).



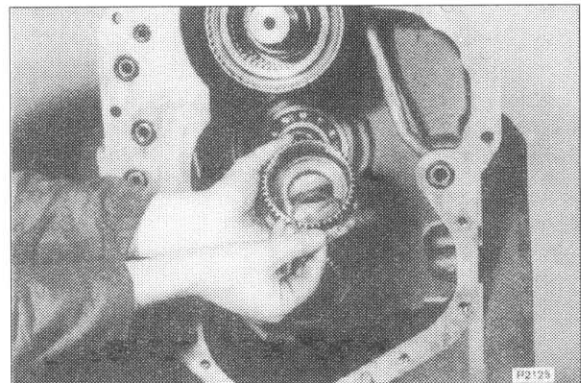
- (26) Install the front output flange, O-ring, washer and nut, tighten flange nut to 27.7-34.6kgf · m(200-250lbf · ft).



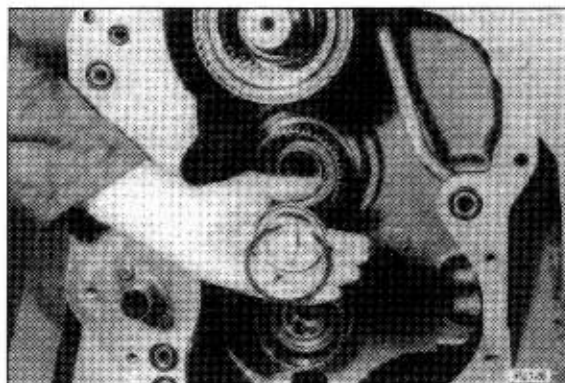
- (27) Install the 3rd gear hub onto the idler shaft and fit the 3rd gear hub circlip.



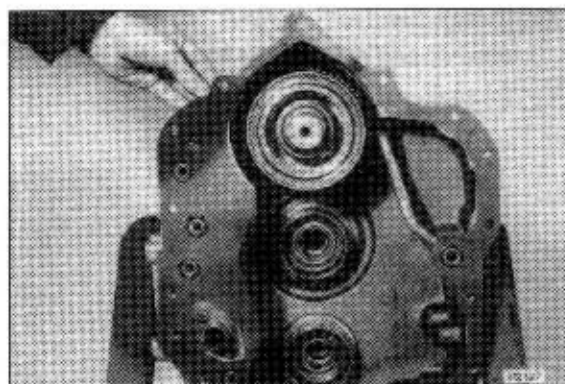
- (28) Install the 2nd gear hub onto the 1st clutch shaft and fit the 2nd gear hub circlip.



- (29) Install the 2nd gear hub retaining washer and fit the retaining washer circlip.



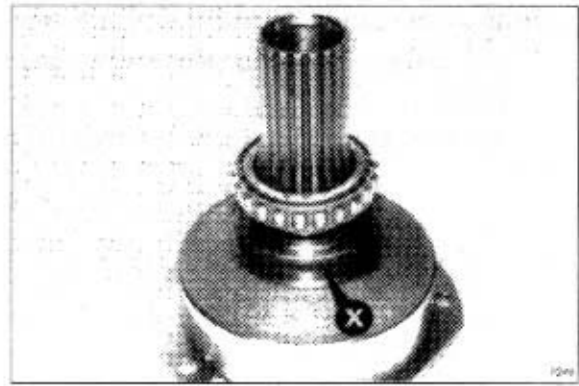
- (30) Position new O-rings and gasket on the front of the housing. A light coat of grease will hold them in place.



CONVERTER HOUSING REASSEMBLY

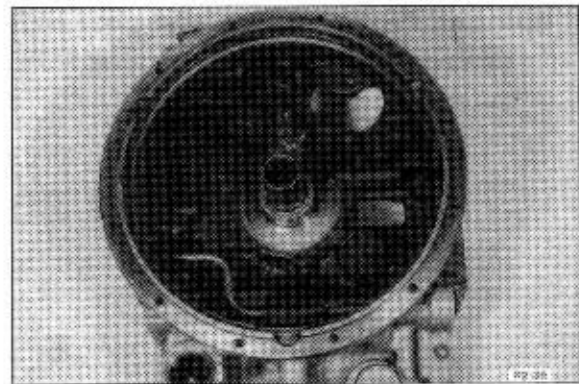
(31) Assemble new expander and sealing ring **X** onto stator support. Expander gap to be positioned 180 degrees from the seal ring hook joint. Press bearing into position.

※ Bearing part number must be up.

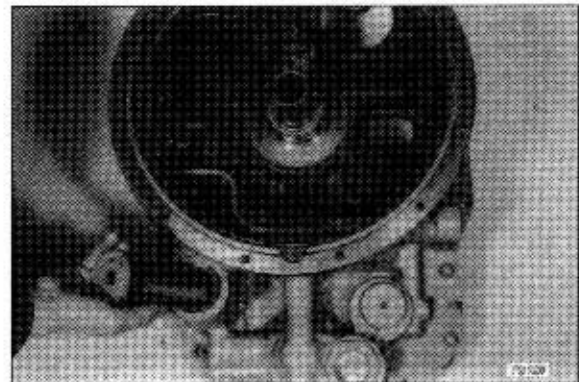


(32) Thoroughly clean the stator support mounting surface and tapped holes with solvent and allow to dry. Tap the stator support into position and install new specially coated screws. Tighten to 1.7-2.2kgf · m(12-16lbf · ft).

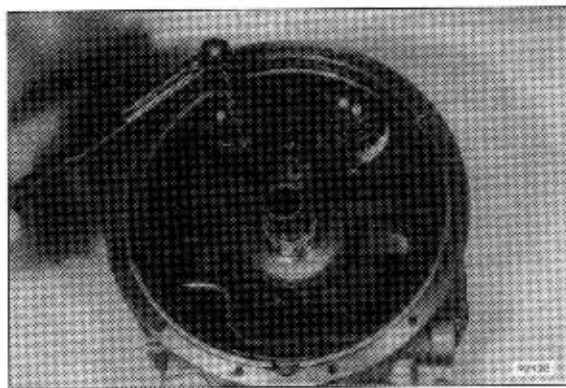
※ Assembly of the stator support to converter housing must be completed within 15 minutes from the start of screw installation. The special screw is to be used for one installation only. If the screw is removed for any reason, it must be replaced. The loctite left in the holes must be removed with the proper tap and cleaned with solvent. Dry hole thoroughly and use a new screw for reinstallation.



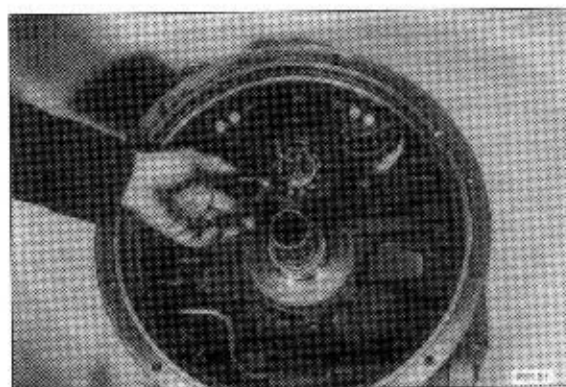
(33) Insert the sump strainer and seal.



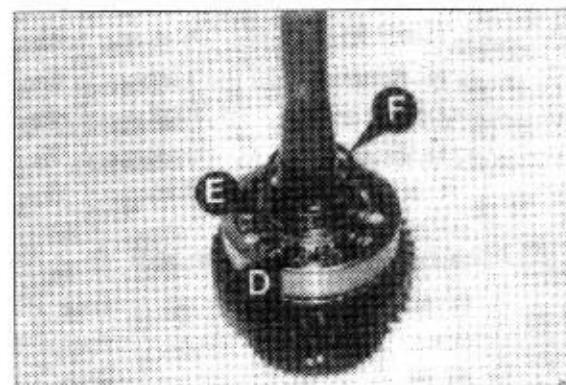
- (34) Assemble the main and charging pump drive gears. Install support screws and washers.
Tighten bolts to 3.2-3.5kgf · m (23-25lbf · ft).



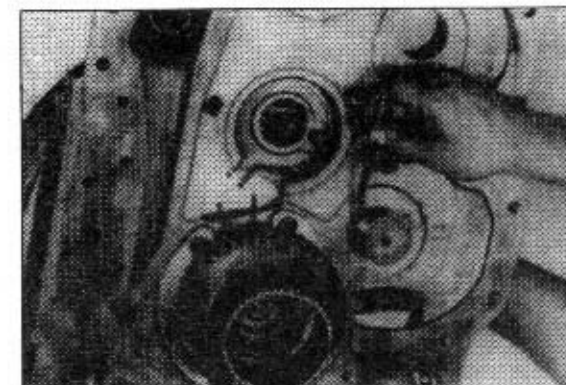
- (35) Install the pump drive idler gear and bearing on the idler gear stub shaft. Fit the idler gear circlip.



- (36) If the turbine shaft bearing was removed, press into position with the outer retaining ring groove down. Install bearing washer D and retaining ring E. Fit new piston ring F to the turbine shaft.

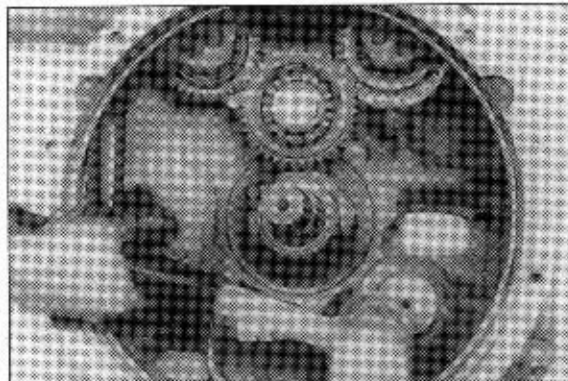


- (37) Spread ears on turbine shaft bearing retainer ring located in reaction member support. Tap turbine shaft and bearing position, being certain bearing snap ring is in full position in snap ring groove.

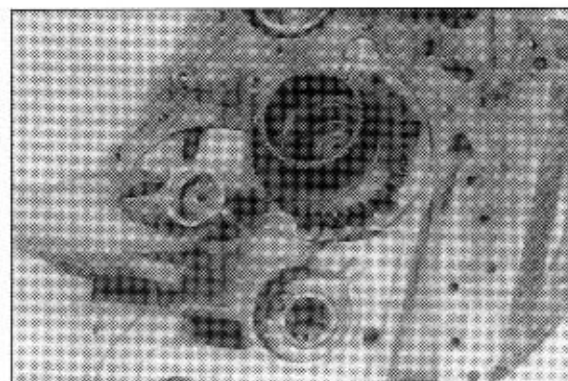


- ※ With new O-ring on shaft, position reverse idler shaft in housing. Align groove in shaft with notch in housing. Install lock ball.

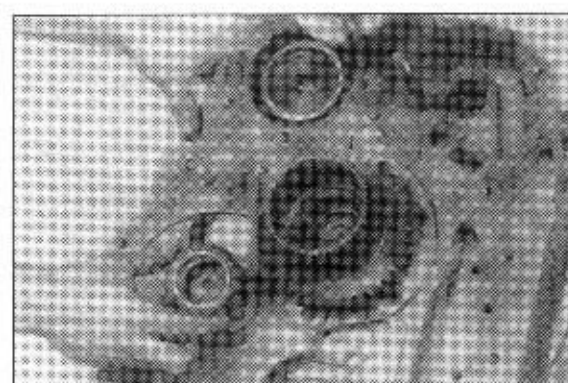
- (38) Tap shaft into position, use caution as not to lose lock ball.



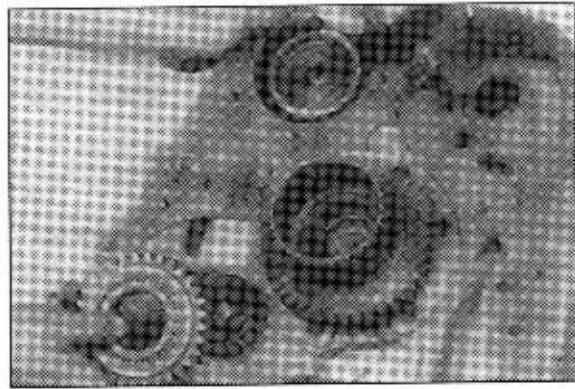
- (39) Install shaft spacer.



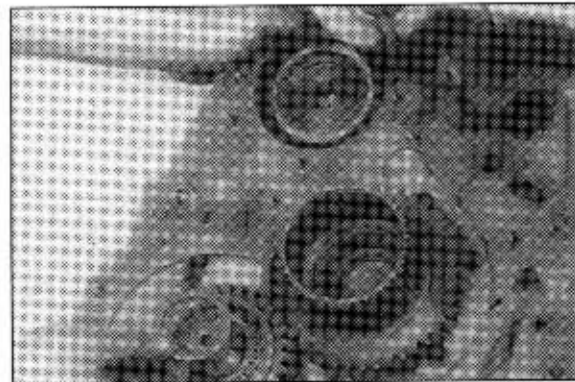
- (40) Install inner taper bearing on shaft with large diameter of taper down. Position bearing spacer on shaft.



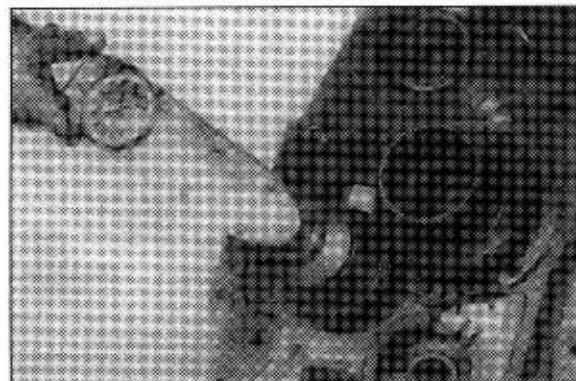
- (41) Position reverse idler gear on shaft with hub of gear up. Install outer taper bearing in gear with large diameter of taper up.



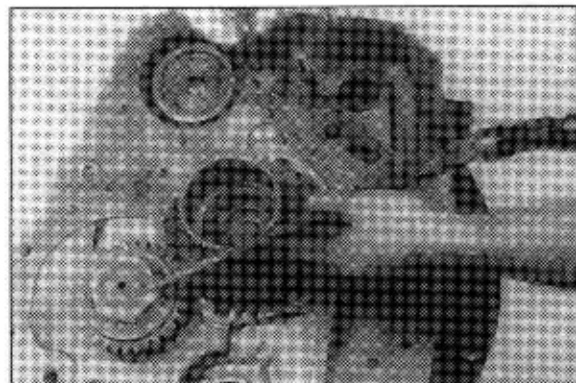
- (42) Position outer spacer on shaft.



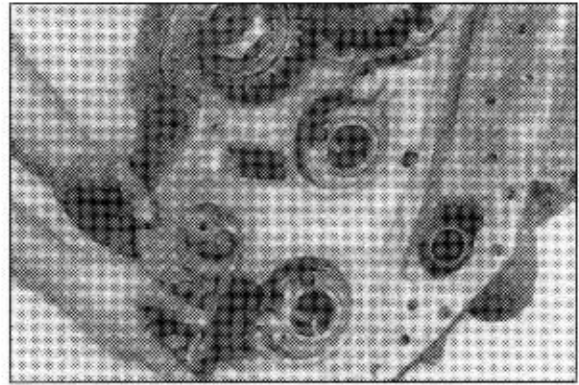
- (43) Install shaft retainer nut. Tighten nut to 27.6-34.5kgf · m(200-250lbf · ft) torque.



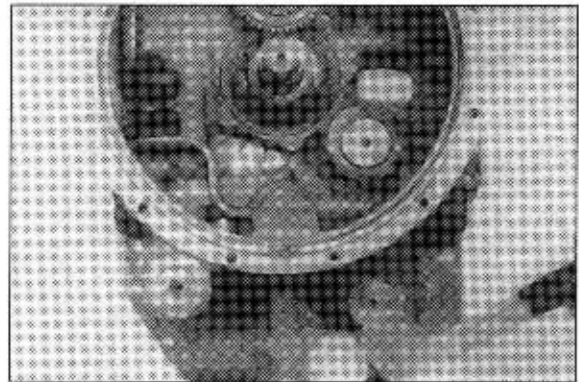
- (44) Stake nut securely in shaft notch.



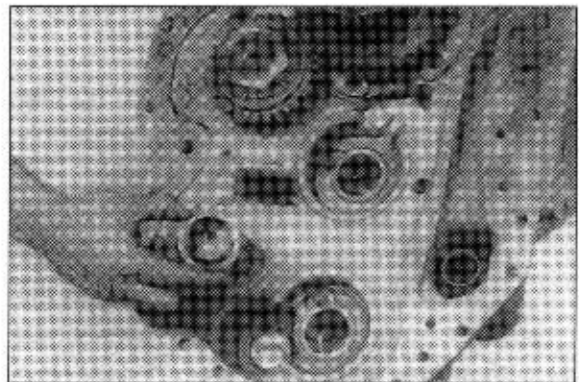
- (45) With new O-ring on shaft, position idler shaft in housing.
Align groove in shaft with notch in housing. Install lock ball.



- (46) Tap shaft into position, use caution as not to lose lock ball.



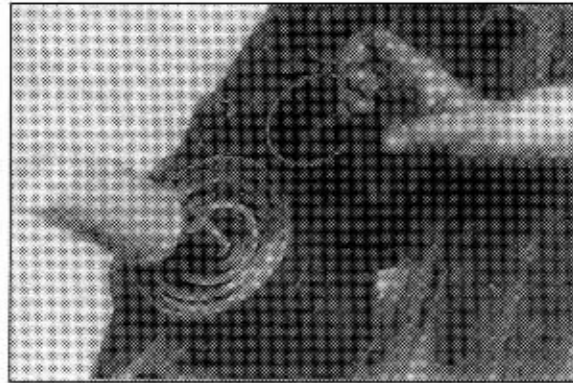
- (47) Install idler shaft spacer.



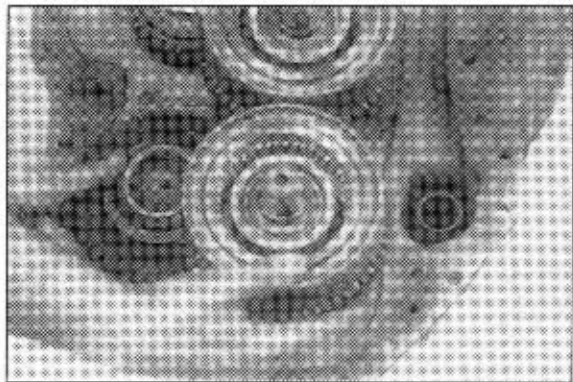
- (48) Install idler gear inner taper bearing on shaft with large diameter of taper down.
Position bearing spacer on shaft.



- (49) Spread ears on reverse clutch front bearing locating ring. Tap reverse and 2nd clutch assembly into converter housing. Align the snap ring groove in the bearing with the snap ring in the housing, being certain bearing snap ring is in full position in snap ring groove.

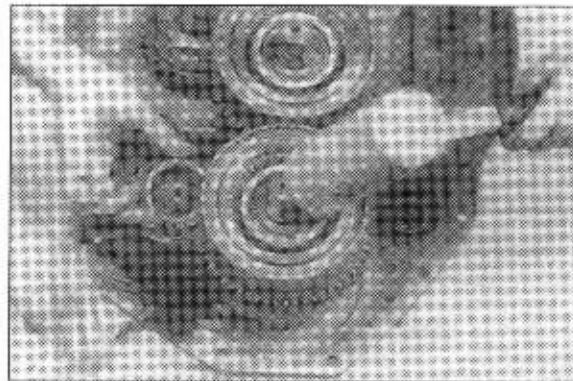


- (50) Position idler gear on bearing with hub of gear up.

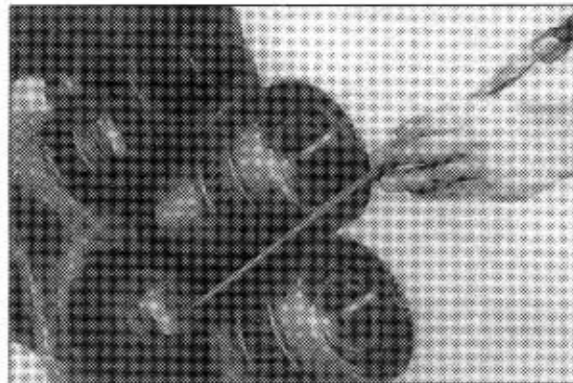


- (51) Spread ears on 4th clutch front bearing locating ring.

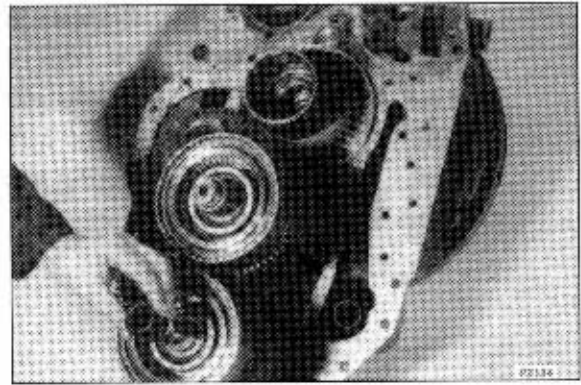
- ※ The idler gear and taper bearing cup assembly and the 4th clutch assembly must be installed in the converter housing at the same time as the idler gear must be positioned between the clutch front bearing and the clutch drum. Install the idler outer taper bearing with small diameter of taper down. Make sure locating ring is in full position in ring groove.



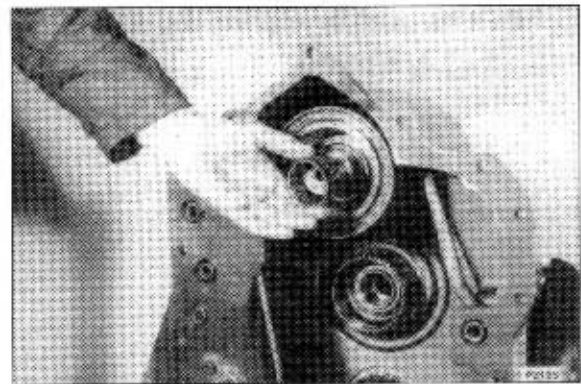
- (52) Repeat procedures shown in the clause (42) thru (45).



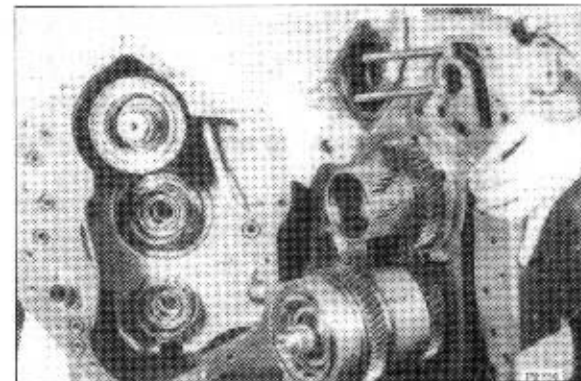
- (53) Position the pilot bearings on the 2nd and 3rd clutch shafts, a light coat of grease will hold the bearings in place.



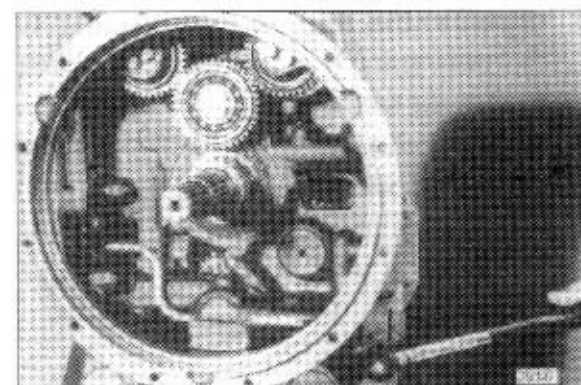
- (54) Install forward clutch pilot bearing.



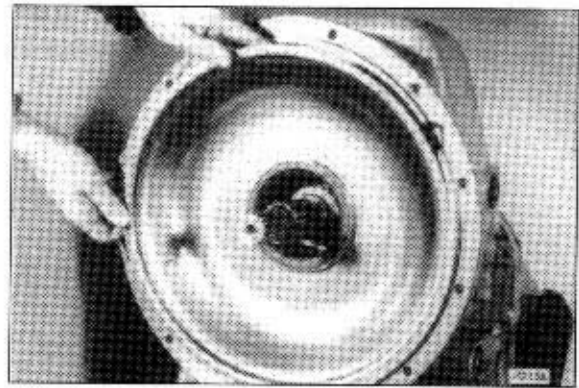
- (55) Fit the converter housing to transmission casing taking care to align the clutch pilots into the clutch disc hubs. Turn the turbine shaft back and forth to align the clutch discs with the hubs. **Do not force this operation.** When all clutches are properly aligned the converter housing will be tight against the transmission housing.



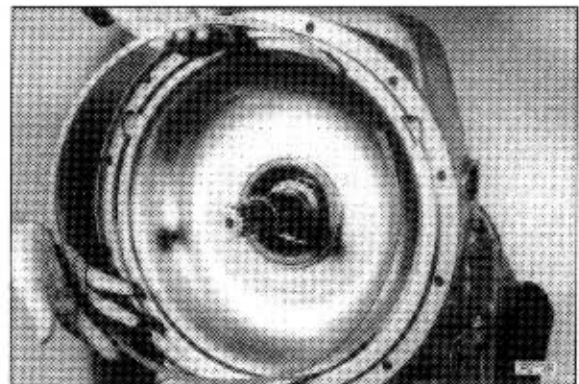
- (56) Install bolts and washers and tighten to 5.1-5.7kgf · m(37-41lb · ft).



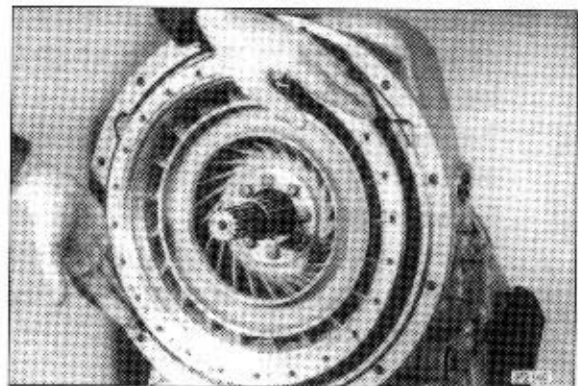
- (57) Apply a light coat of JCB Multi-gasket to the outer diameter of the oil baffle inner oil seal and press the seal into the baffle with the lip facing towards impeller hub bearing. Position new outer sealing ring on to the baffle and fit to the housing.



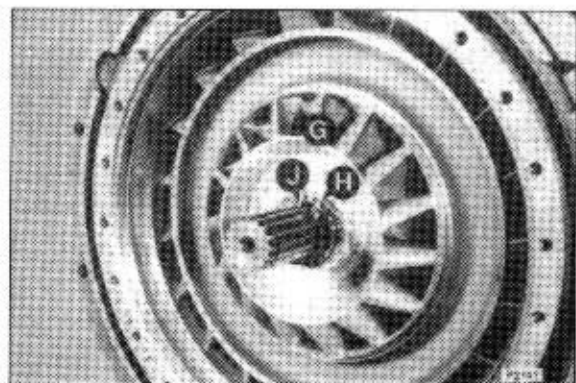
- (58) Fit the oil baffle retaining ring making sure it is fully in position.



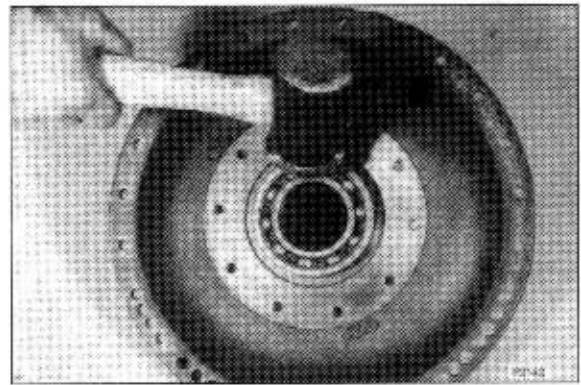
- (59) Fit the impeller and hub assembly taking care not to damage the baffle oil seal. Take extreme care not to damage or unhook the sealing ring on the support. Fit the hub spacer.



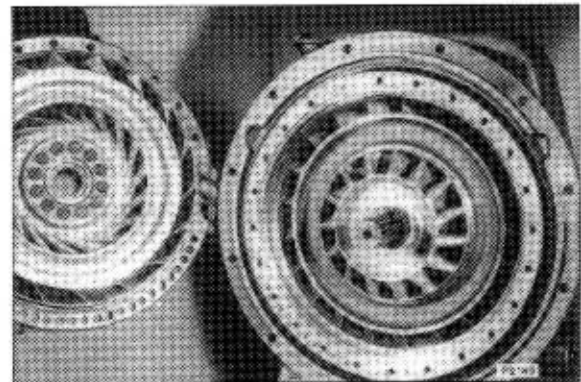
- (60) Assemble the reaction member G, retaining ring H and turbine locating circlip J on the turbine shaft.
* The thick sides of the reaction member blades must be out.



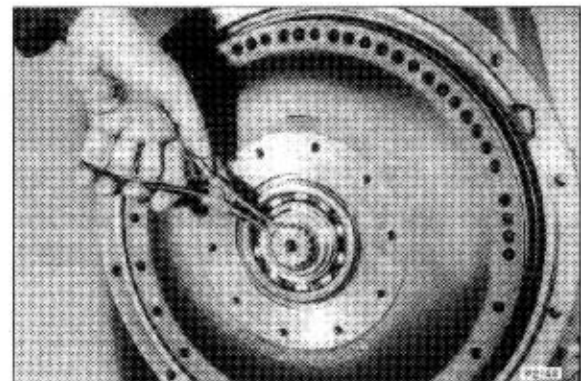
- (61) Install the impeller cover bearing with the locating ring towards the top.



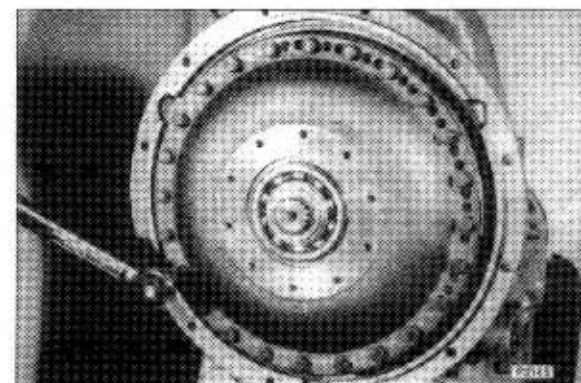
- (62) Fit the oil baffle retaining ring making sure it is fully in position.



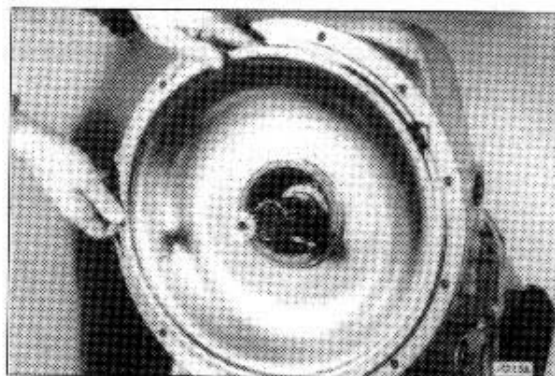
- (63) Install the turbine hub retaining ring.



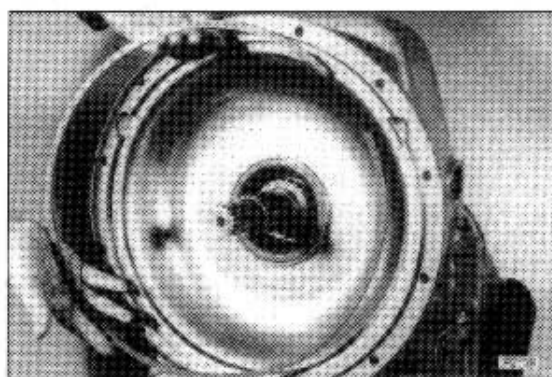
- (64) Install cover bolts and tighten to 3.2-3.5kgf · m(23-25 lbf · ft).



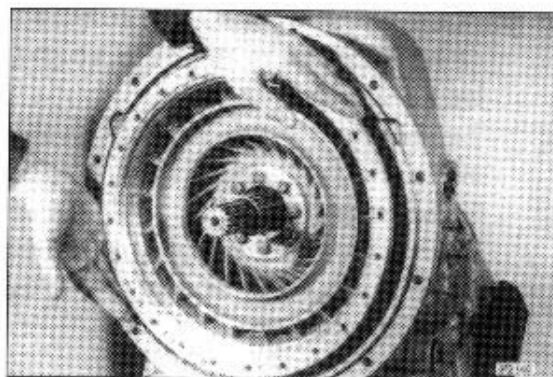
- (57) Apply a light coat of JCB Multi-gasket to the outer diameter of the oil baffle inner oil seal and press the seal into the baffle with the lip facing towards impeller hub bearing. Position new outer sealing ring on to the baffle and fit to the housing.



- (58) Fit the oil baffle retaining ring making sure it is fully in position.

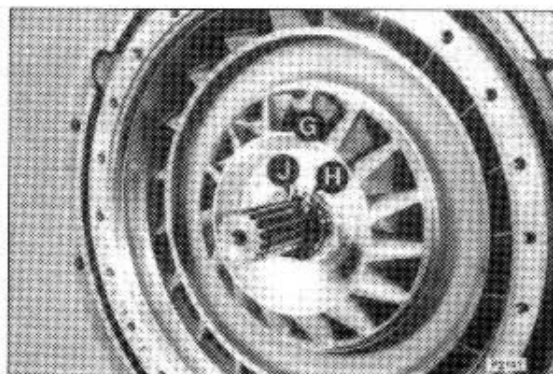


- (59) Fit the impeller and hub assembly taking care not to damage the baffle oil seal. Take extreme care not to damage or unhook the sealing ring on the support. Fit the hub spacer.

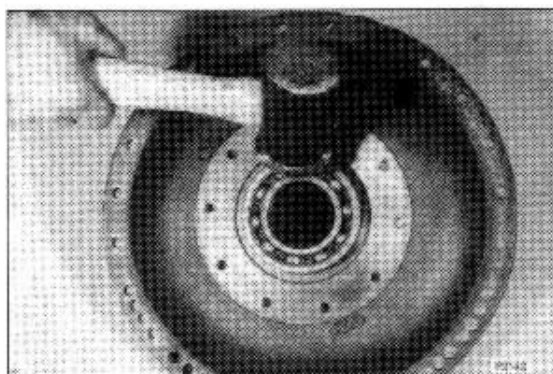


- (60) Assemble the reaction member G, retaining ring H and turbine locating circlip J on the turbine shaft.

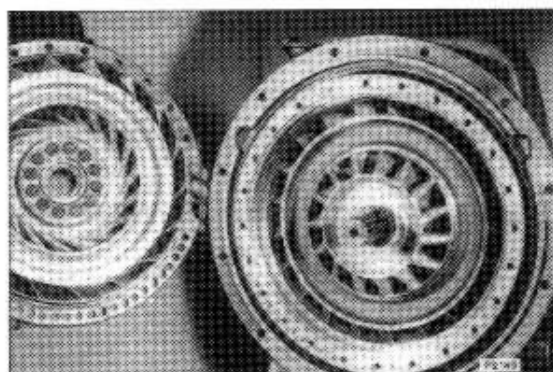
- ※ The thick sides of the reaction member blades must be out.



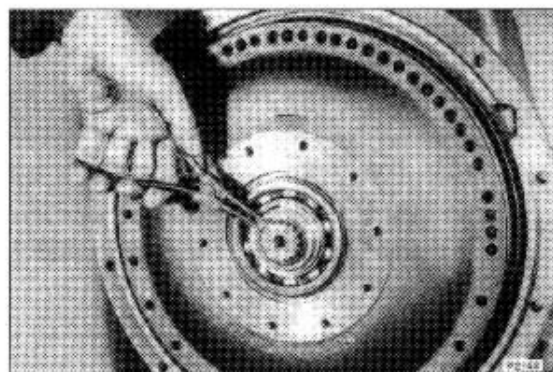
- (61) Install the impeller cover bearing with the locating ring towards the top.



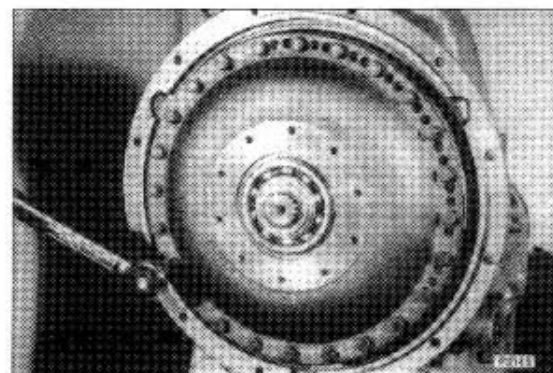
- (62) Fit the oil baffle retaining ring making sure it is fully in position.



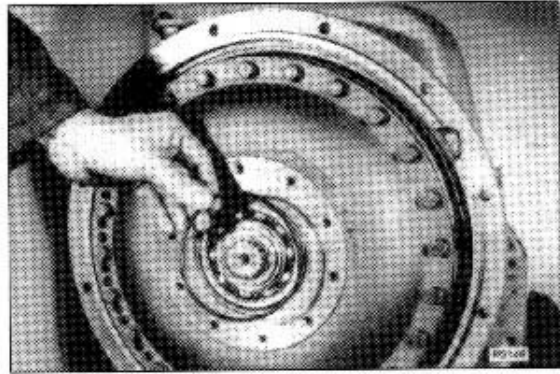
- (63) Install the turbine hub retaining ring.



- (64) Install cover bolts and tighten to 3.2-3.5kgf · m(23-25 lbf · ft).

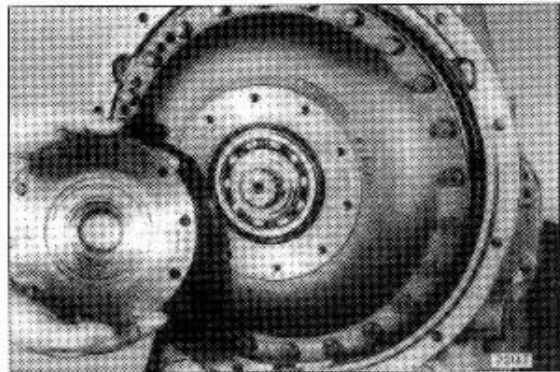


- (65) Position a new O-ring over the impeller cover bearing.

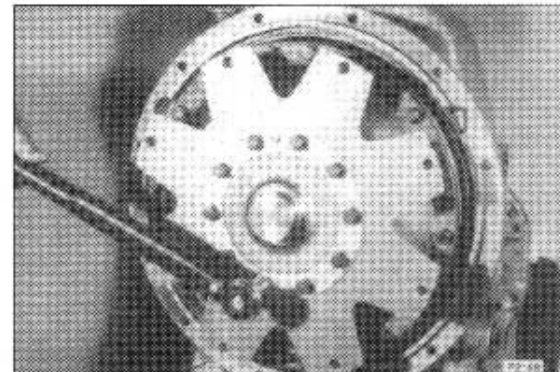


- (66) Thoroughly clean tapped holes and studs (if fitted) with solvent. Apply loctite 262 to the holes and stud ends. Position the impeller cover bearing cap and install studs.

※ Allow the loctite to cure fully before fitting transmission to engine.

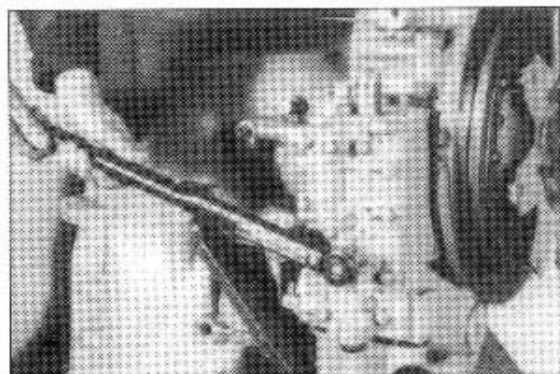


- (67) Assemble the drive plate group and backing ring onto studs (if fitted), with the dimples on the backing ring out. Install washers and stud nuts and tighten to 3.6-4.0kgf · m (26-29 lbf · ft). If bolts are fitted, apply solvent and loctite in a similar way and tighten to 3.6-4.0kgf · m (26-29 lbf · ft).

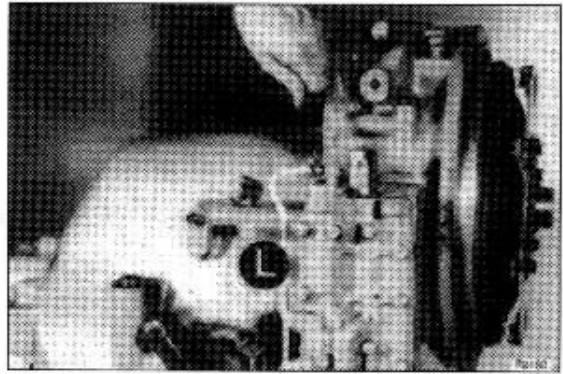


- (68) Fit the control valve block using a new O-ring and gasket and tighten bolts to 3.2-3.5kgf · m (23-25 lbf · ft).

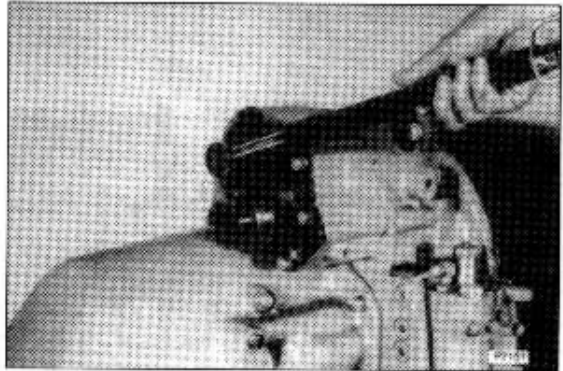
※ See control valve disassembly and assembly for torque tightening sequence.
※ Connect the shuttle valve solenoid wires K. Apply loctite 262 on upper right-hand bolt.



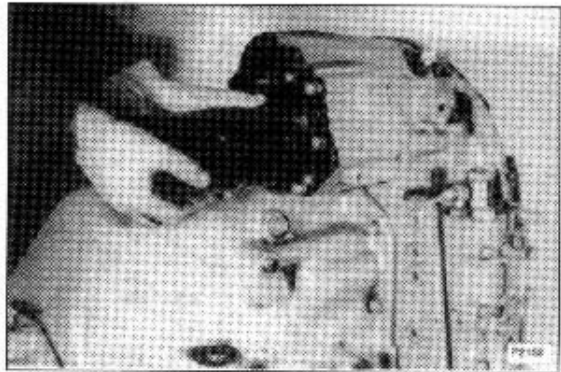
- (69) Connect the cross-over pipe **L** and tighten the unions.



- (70) Using a new gasket and O-ring install the charging pump. Tighten bolts to 5.2-5.7kgf · m(37-41lb · ft).

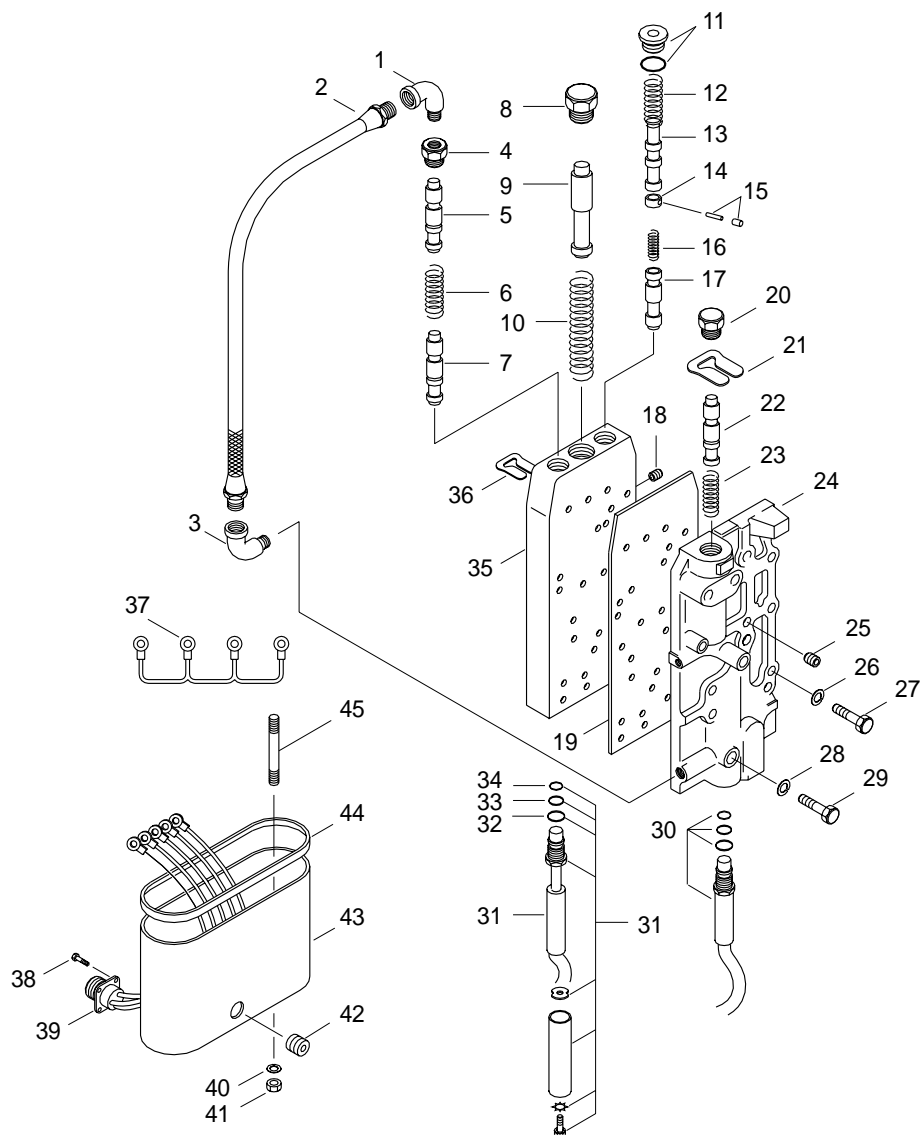


- (71) Smear the seal of a new oil filter cartridge and fit to the pump housing. Fit the dipstick/filler tube(Not shown).



2. CONTROL VALVE

1) STRUCTURE



1	Elbow	16	Spring	31	Solenoid coil
2	Tube assy	17	Shift spool	32	O-ring
3	Elbow	18	Pipe plug	33	O-ring
4	Valve plug	19	Gasket	34	O-ring
5	Shift spool	20	Plug	35	Control valve housing
6	Spring	21	Spool stop	36	Spool stop
7	Shift spool	22	Spool	37	Ground wire harness
8	Plug	23	Spring	38	Screw
9	Valve spool	24	Valve body	39	Receptacle & wire assy
10	Spring	25	Pipe plug	40	Lock washer
11	Plug & O-ring	26	Lock washer	41	Nut
12	Spring	27	Screw	42	Grommet
13	Shift spool	28	Lock washer	43	Dust cover
14	Spool stop	29	Screw	44	Dust cover seal
15	Roll pin & plug stop	30	Shuttle valve solenoid	45	Mounting stud

2) DISASSEMBLY AND ASSEMBLY

The numerical sequence shown on the illustration is intended as a guide to disassembling.

For assembly the sequence should be reversed.

(1) When disassembly

Depress spool 22 to remove stop 21.

Renew oil seals when spools 5 and 13 are removed.

Depress spool 9 to remove stop 36.

(2) When assembly

Depress spool 9 to fit stop 36.

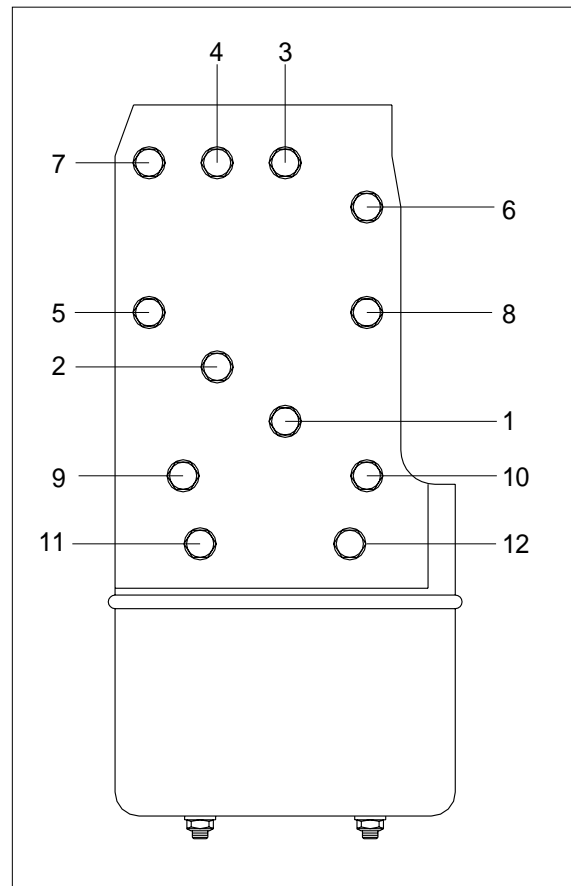
Take care not to cut lips of oil seals when refitting spools 5 and 13.

Depress spool 22 to fit stop 21.

※ Refer to tightening sequence as shown in the figure.

Torque settings

Item	N · m	kgf · m	lbf · ft
27, 29	31-33	3.2-3.4	23-25

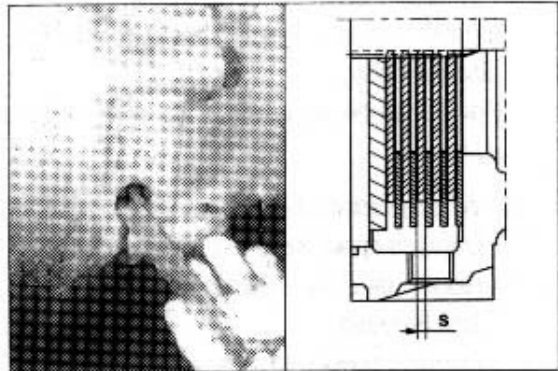


3. AXLE

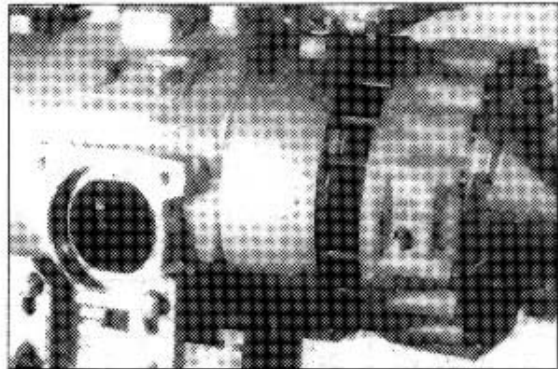
1) BRAKES

WEAR CHECK AND REPLACEMENT OF BRAKE DISCS

(1) Use till minimum thickness of $s = 4.5\text{mm}$.

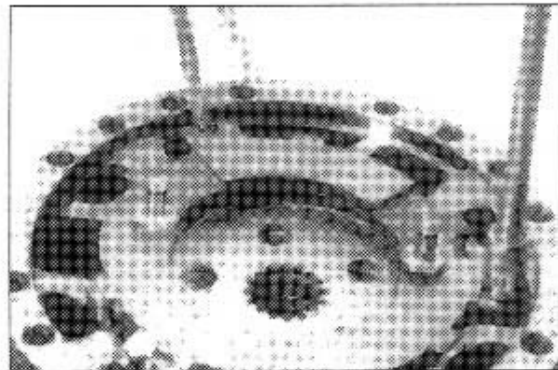


(2) Loose fixing nuts and remove horizontally the axle housing.

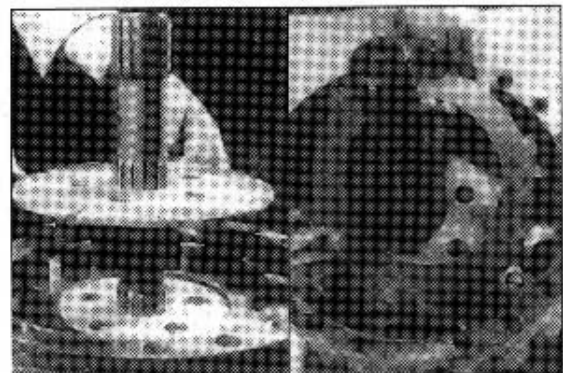


(3) Remove brake discs.

※ If the brake discs must not been replaced, remove the complete pack without changing the position of the discs.



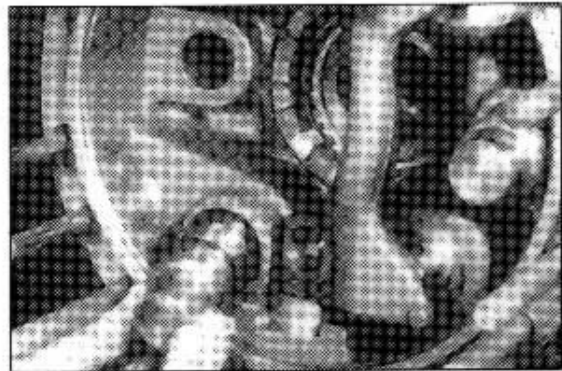
(4) For assembling proceed in opposite sense, align lubrication holes.



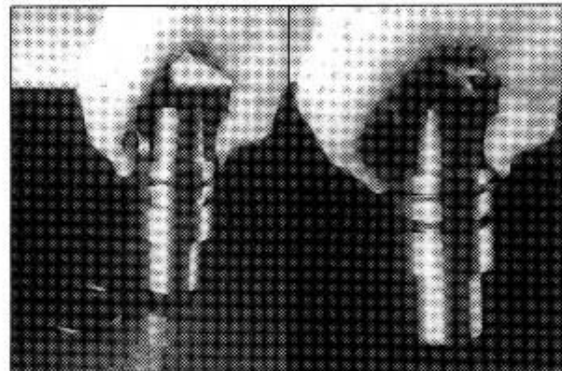
- (5) Adjustment of brake disc gap. Adjusting bolts counterclockwise and turn them a 3/4 revolution clockwise ; This corresponds to a gap of 0.75mm between the brake discs.



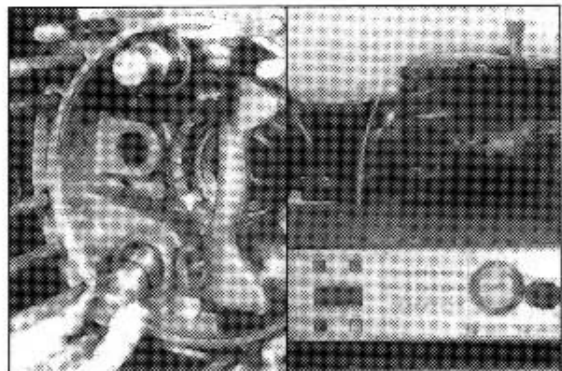
- (6) Remove brake pistons.

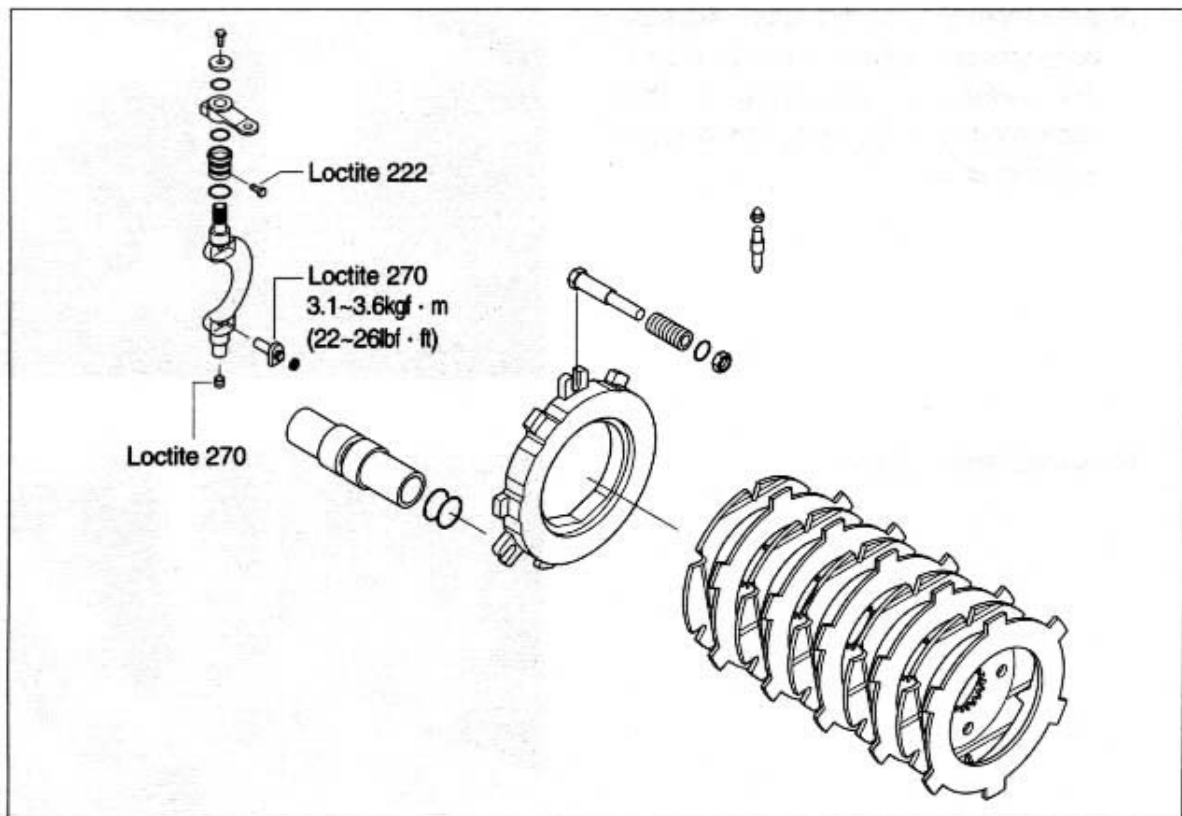


- (7) Install O-rings and brake pistons.
* Observe that neither the pistons nor the cylinders have scratches or incrustations.



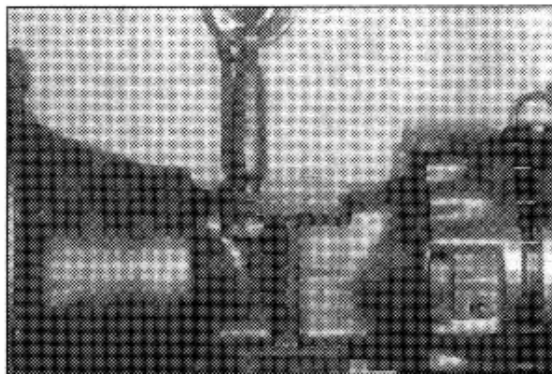
- (8) Tight checking with compressed air at 0.5~1bar for 10 minutes each side.



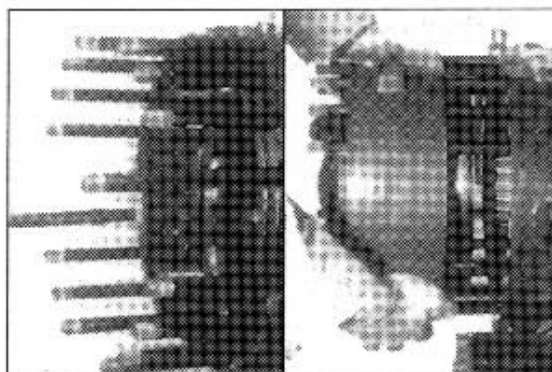


2) SAFETY BRAKE

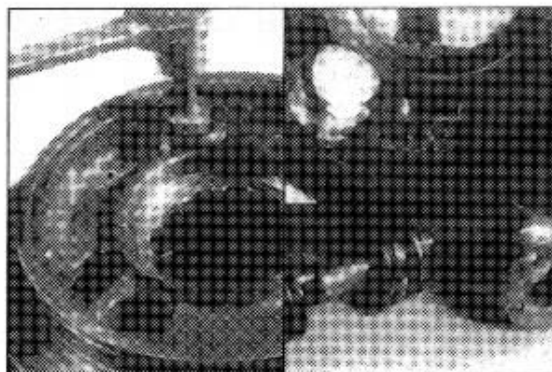
- (1) Introduce in the hydraulic circuit 25~35 bar pressure, then remove the axle housing.



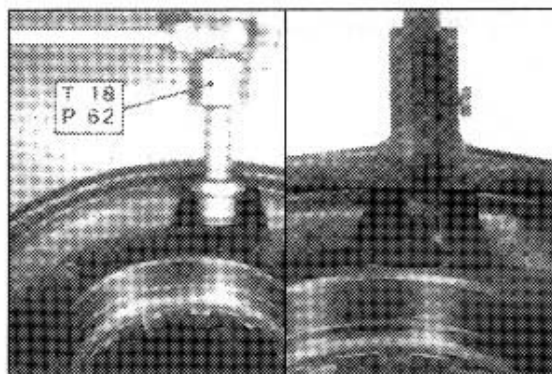
- (2) Loose the 4 assembling stud bolts and disassemble the intermediate covers.

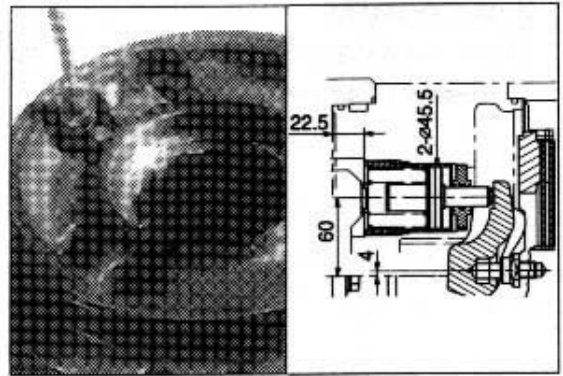


- (3) Disassembling of spring applied safety brake pistons. Reassemble the components in opposite sense.

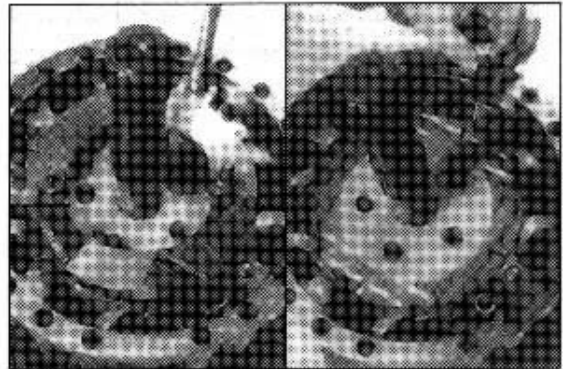


- (4) Check quote of cover.

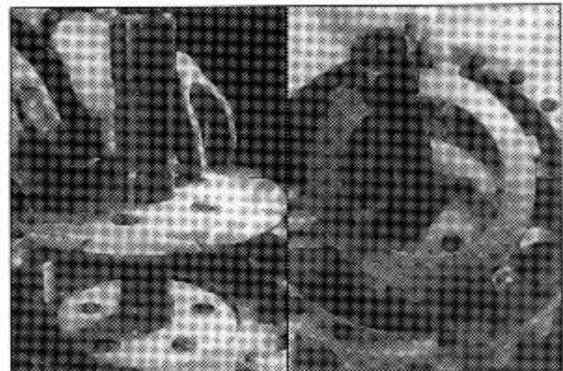




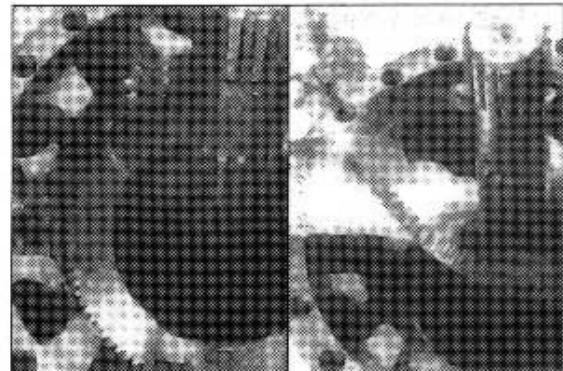
(5) Remove brake discs.



(6) For assembling align lubrication holes of brake discs.



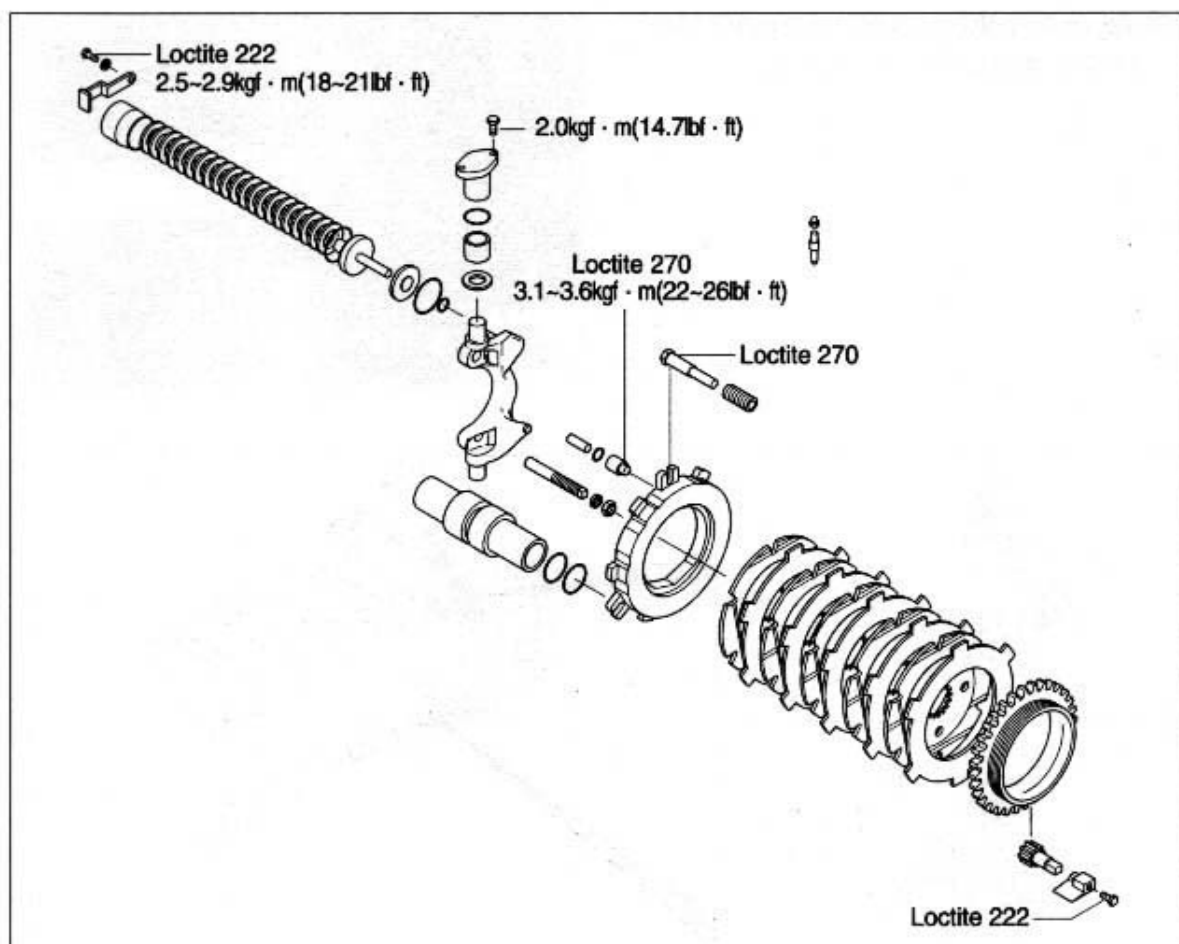
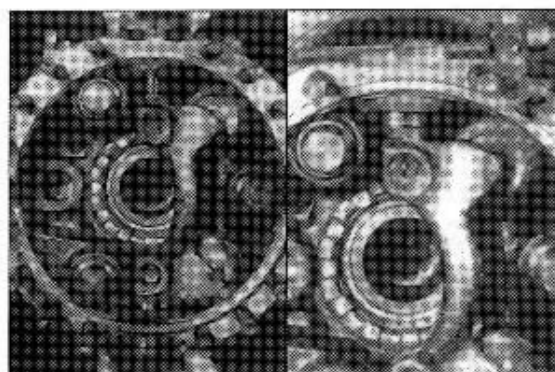
(7) Remove pinion and ring gear.



(8) Assemble of internal leverism.

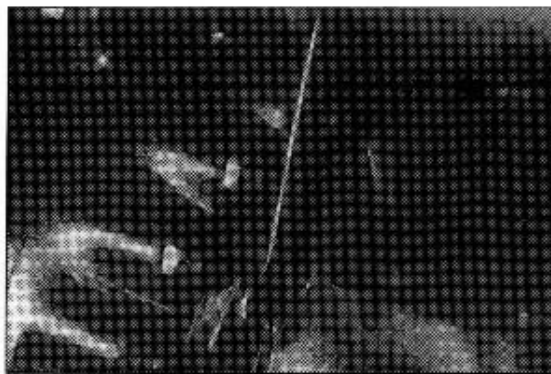


(9) Introduce in the hydraulic circuit 25~35 bar pressure and assemble the axen.

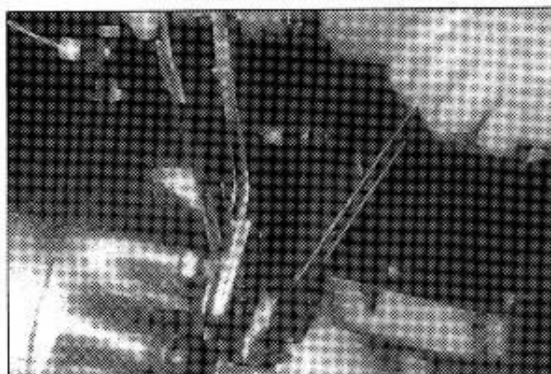


ADJUSTMENT

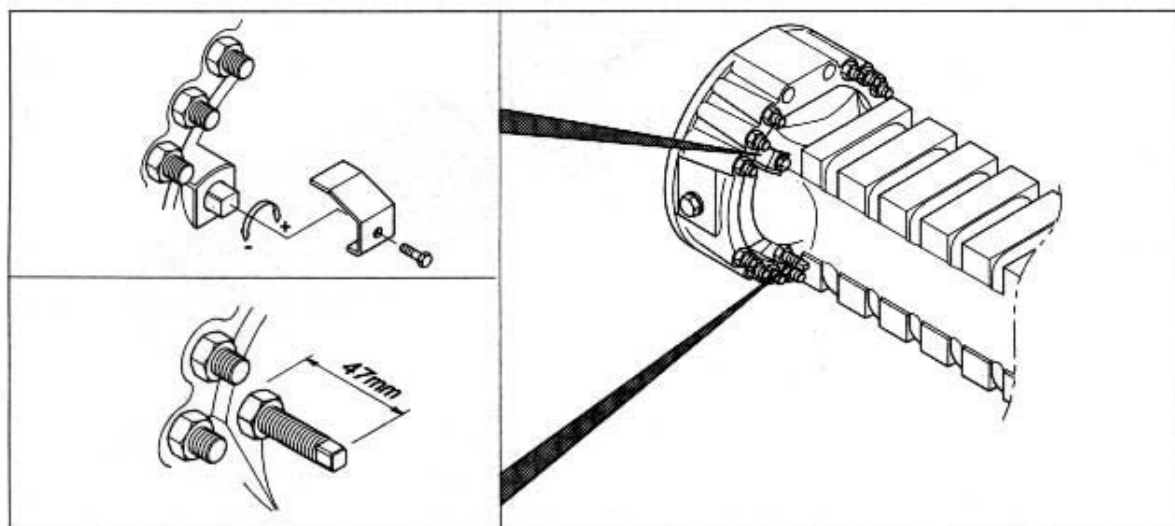
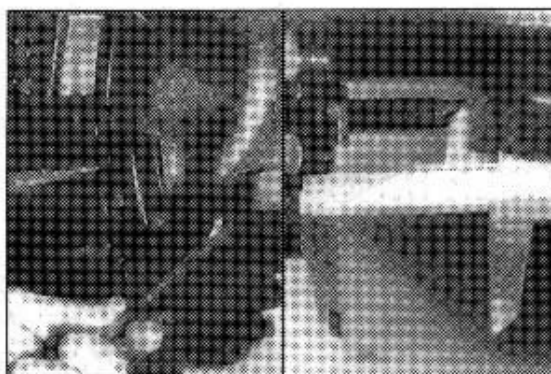
- (1) Introduce pressure in the hydraulic circuit with 25~35 bar.
Remove bolt and locking plate.



- (2) Turn the pinion with 0.82kgf · m(5.9lbf · ft) torque counterclockwise till it stops. Adjust the gap between the brake discs by turning 3 complete revolutions clockwise.

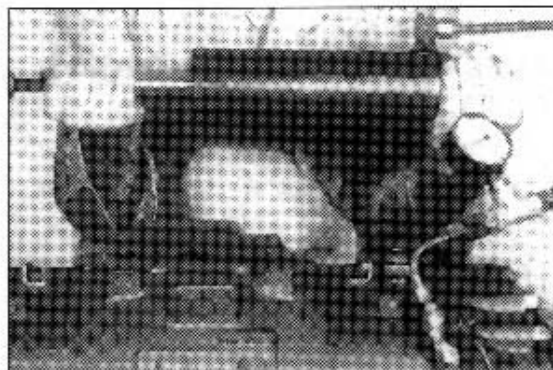


- (3) Adjust the bolts to unlock the safety brake at 47mm and lock the counter nut.



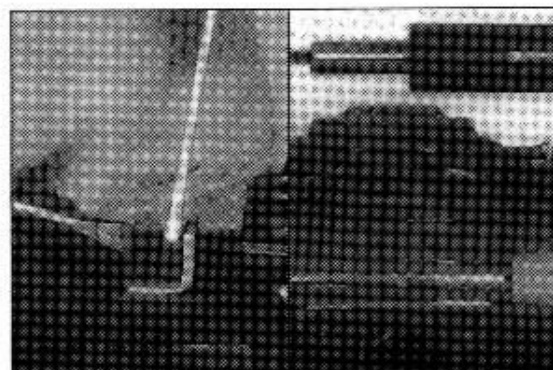
DISASSEMBLY

- (1) Actuate the hydraulic circuit with *bar.
See following page.

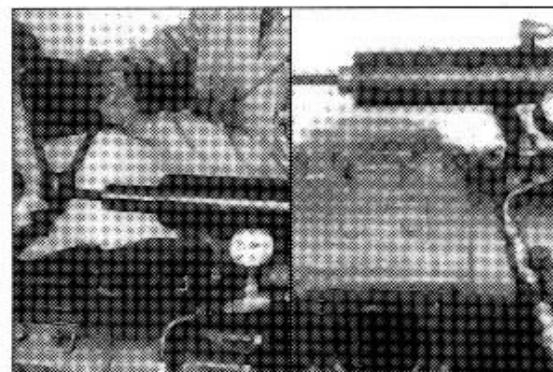


ADJUSTMENT

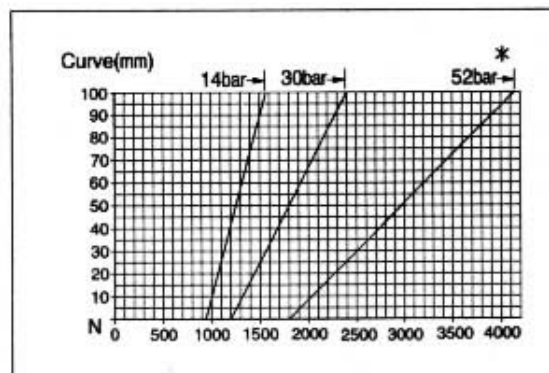
- (1) See brake disk play adjustment on page 3-94. Near the adjuster screw to the level until the idle stroke has been eliminated (Internal spring action).



- (2) Mount the brake cylinder after pressurizing and adjust the screw so that the two levers rest on the end of travel screws.
Now tighten the lock nut using loctite 242.

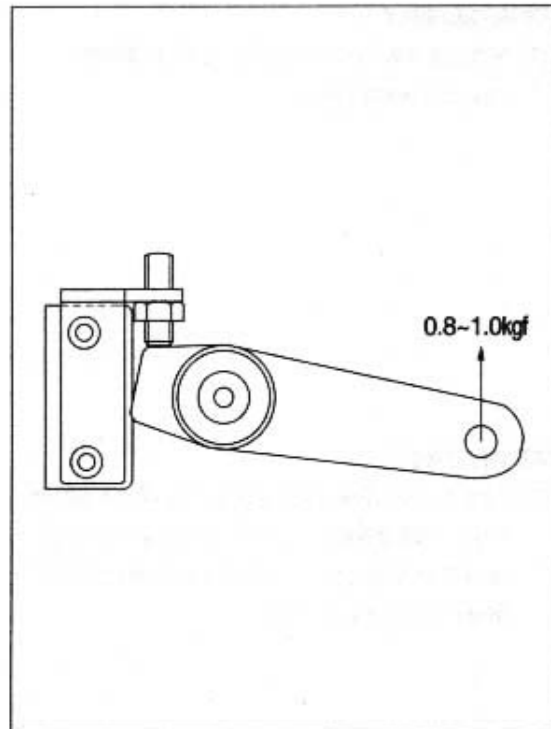


- (3) Pressure according to the type of cylinder and spring load curve.



**PARKING BRAKE ADJUSTMENT OF CAT 3
AXLES WITH ADJUSTABLE MECHANICAL
STOPS.**

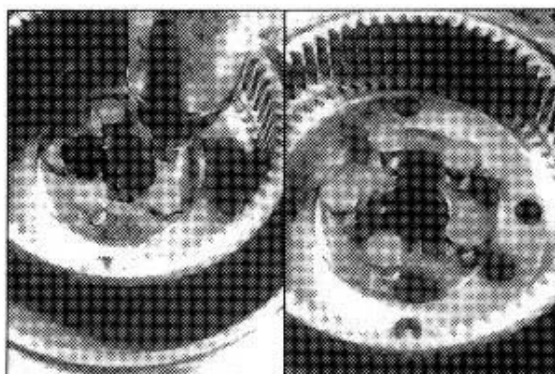
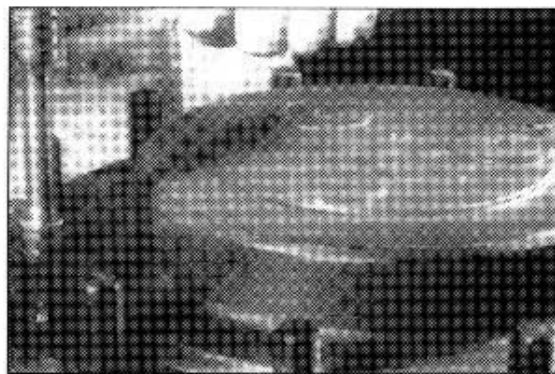
1. Free both transmission levers from the control wire and from further connections.
2. Apply an 0.8~1.0kgf load to the levers so that the lever rests on the thruster disk without deforming the lever mechanisms.
3. Once in this position, set the adjuster screws of the stops in contact with the levers without deforming the lever mechanisms.
4. Reconnect the control wires to the levers once this position has been obtained.
5. Check that both transmission levers rest against the stop screws during the brake disengagement phase.



3) WHEEL HUB

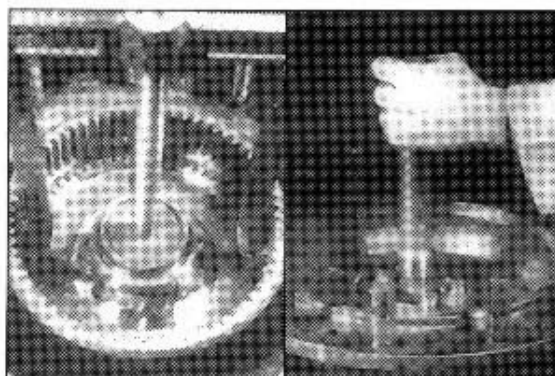
DISASSEMBLING AND ASSEMBLING

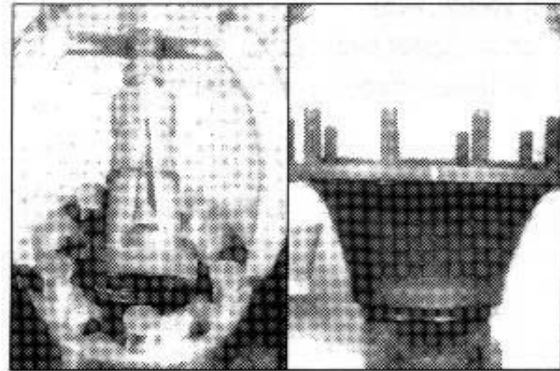
(1) Disassembling of wheel hub.



(2) Disassembling the crown wheel

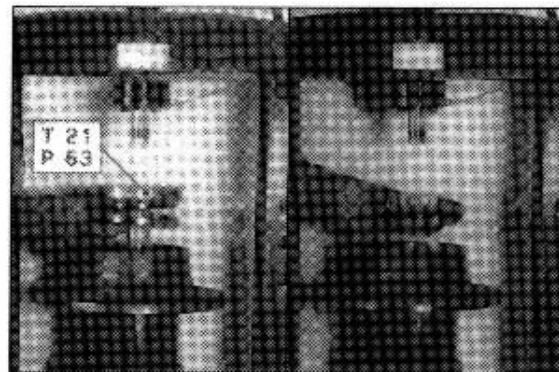
- ① Use partially threaded M18×1.5 screws to support the puller.



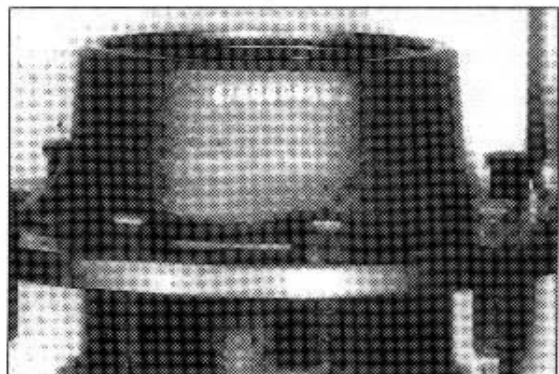
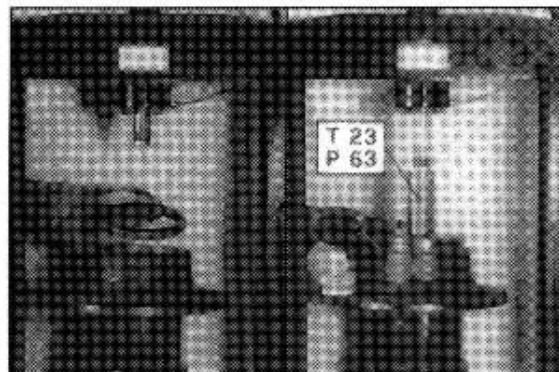


② Assembling of wheel hub

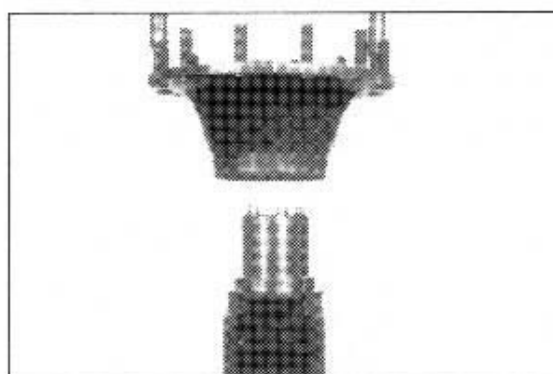
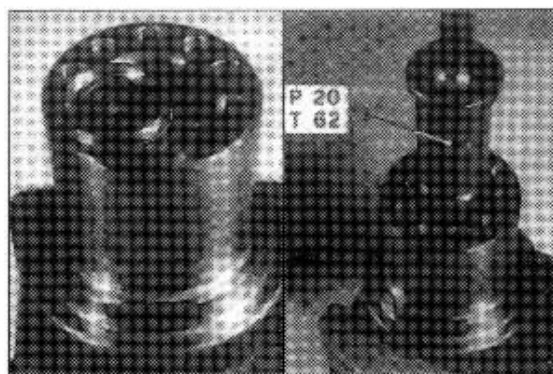
- a. Installation of outer races of taper roller bearings.
- b. Assembling of bearing.



- c. Fitting of seal.
- d. Fitting of wheel studs.

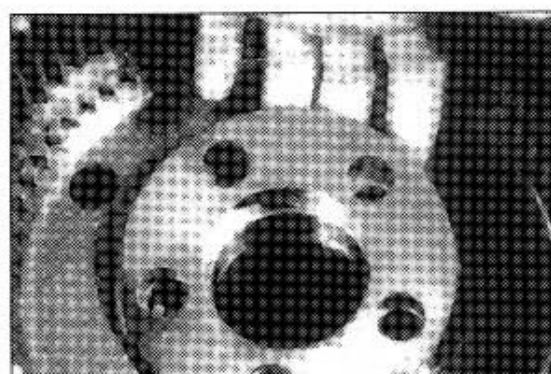
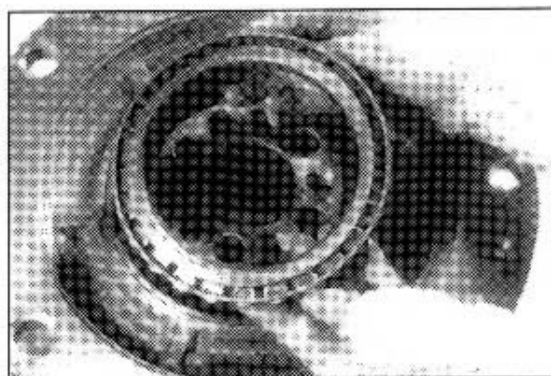


- ③ Assembling of wheel hub, seal and center rings.



4) WHEEL HUB ONTO AXLE HOUSING

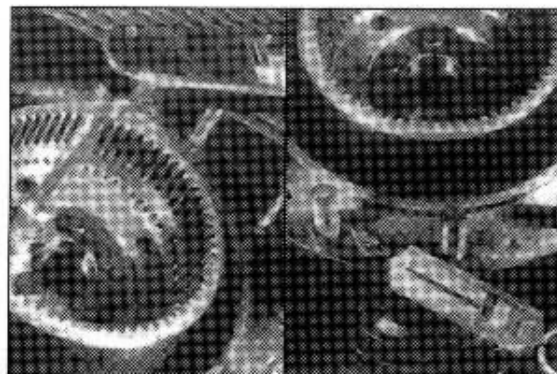
- (1) Fitting the gear rim on the wheel center.



- (2) M18×1.5, 10K screws. Mount with
loctite 270.
Clamping torque 46.9~47.4kgf · m
(339~343lbf · ft).

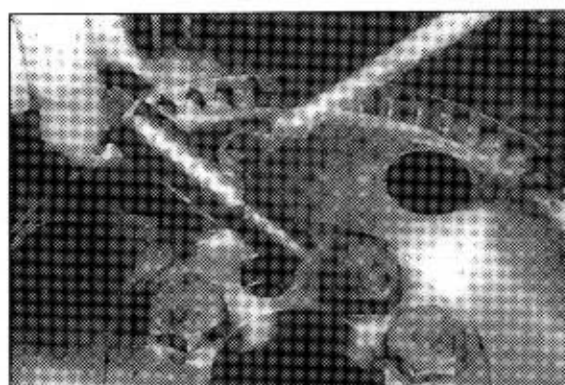
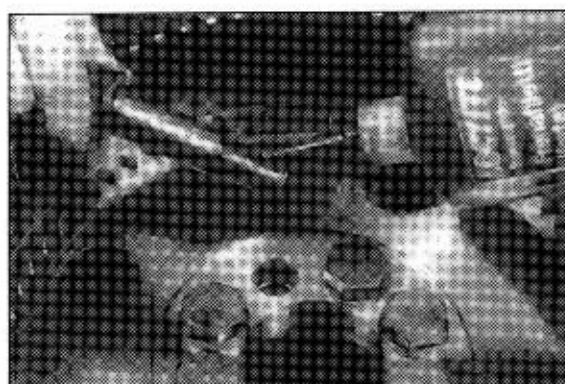
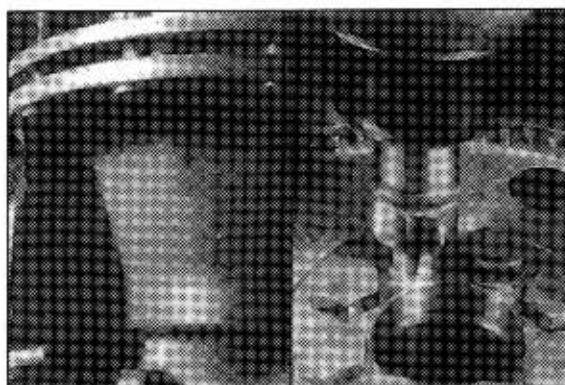


(3) Torque of new bearings with seal : From
3.1~4.1kgf · m(22~30lbf · ft).



5) WHEEL CENTER VERSION WITH 10 PILOT BOLTS

- (1) Demounting the wheel center version with 10 pilot bolts.

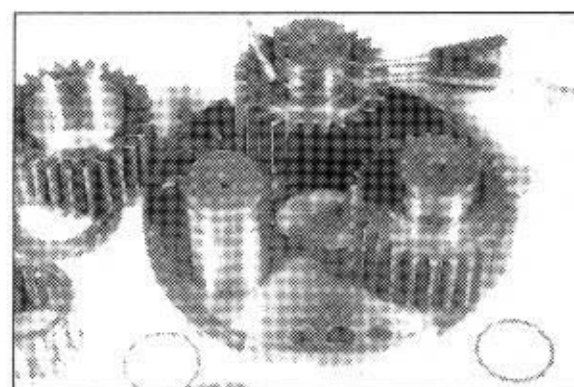
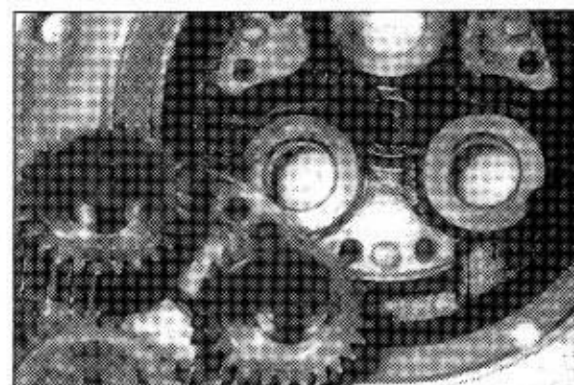
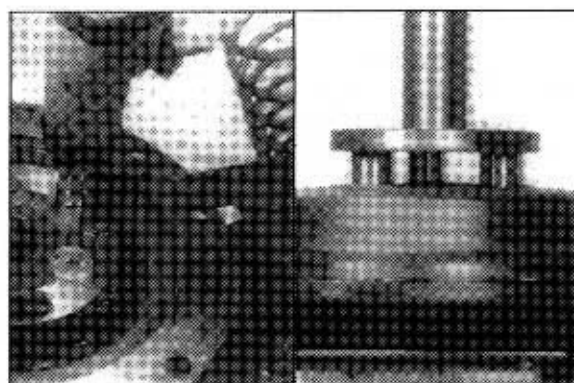
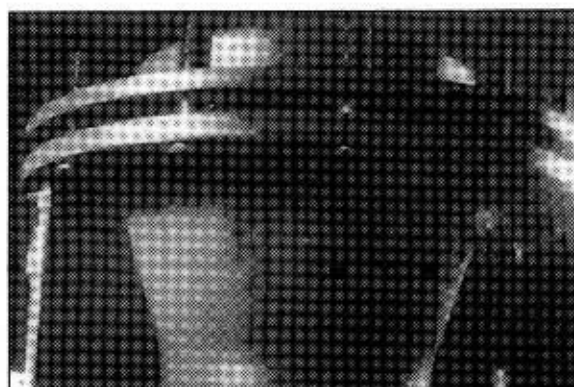


- (2) Clamping torque for bolts M18×1.5, 10K
46.9~47.4kgf · m(339~343lbf · ft).
Torque of new bearings with seal : From
3.1~4.1kgf · m(22~30lbf · ft).

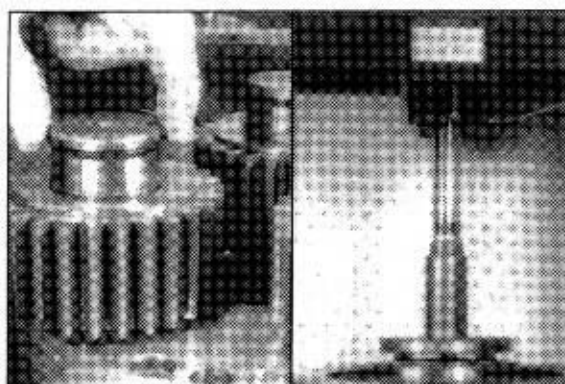
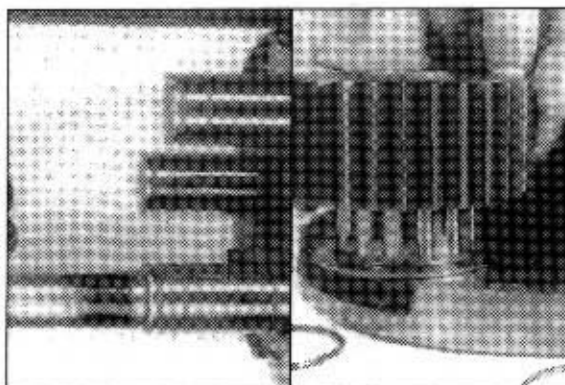


6) PLANETARY REDUCTION 6.23

(1) Disassembly

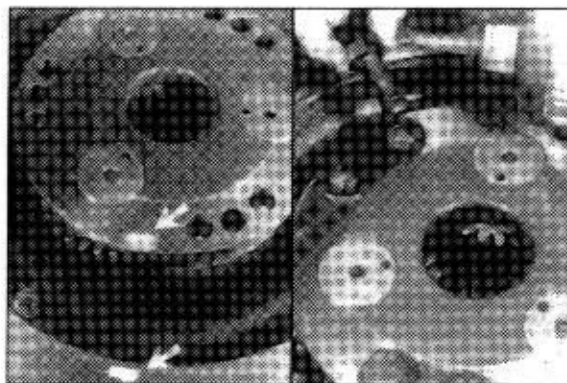


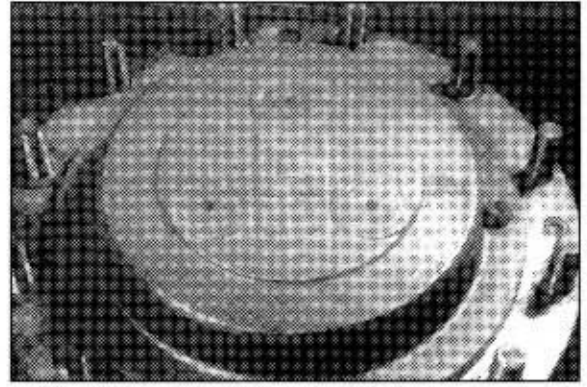
(2) Reassembly



(3) Check the reference numbers.

Torque the screws at $32.1 \sim 32.6 \text{ kgf} \cdot \text{m}$
($232 \sim 236 \text{ lbf} \cdot \text{ft}$).

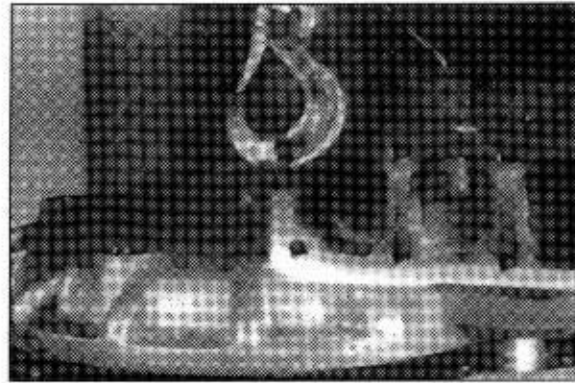




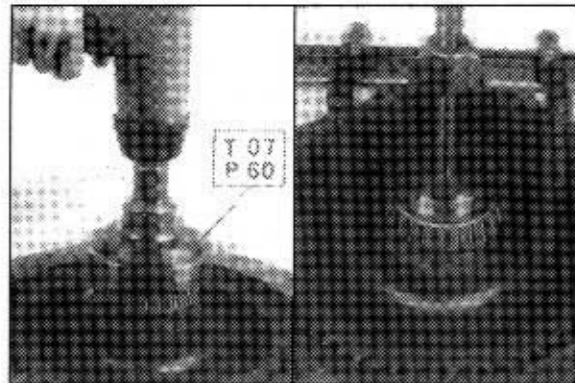
7) FINAL DRIVE 244-143

DEMOUNTING

(1) Use partially tightened screws as pullers.



(2) Lock the ring nut then remove the hub gear.

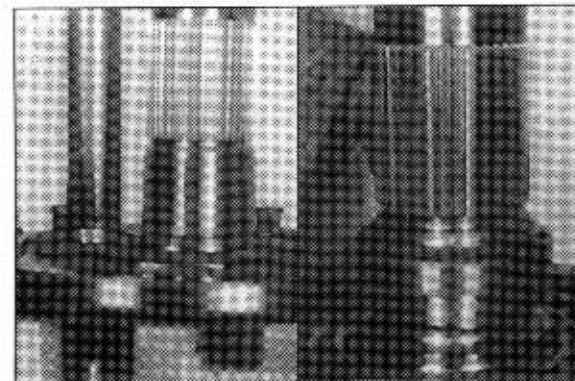


(3) Disassembly the hub cover.
Replace the retaining ring.

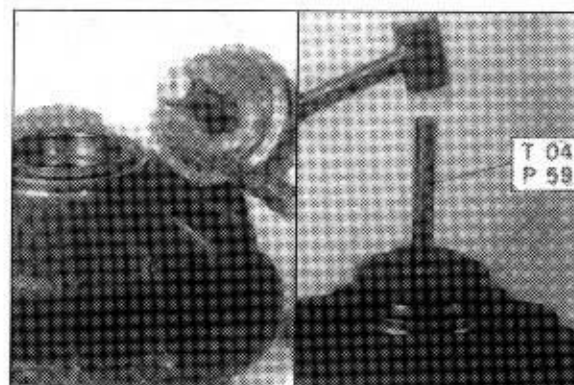


ASSEMBLY

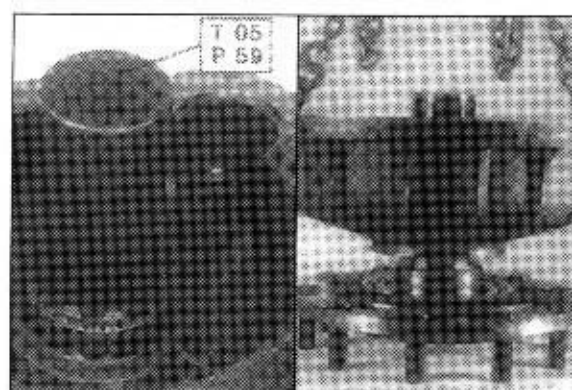
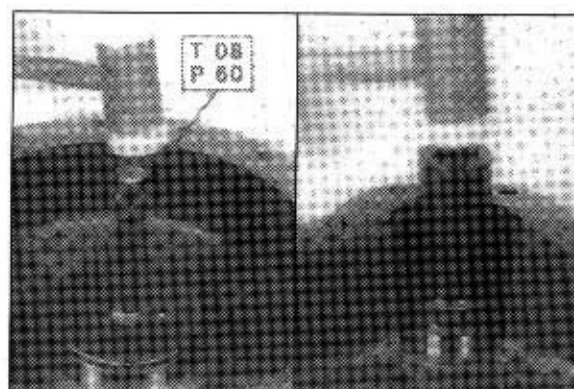
(1) Assembling the stud bolts.



(2) Dust excluder and oil ring.



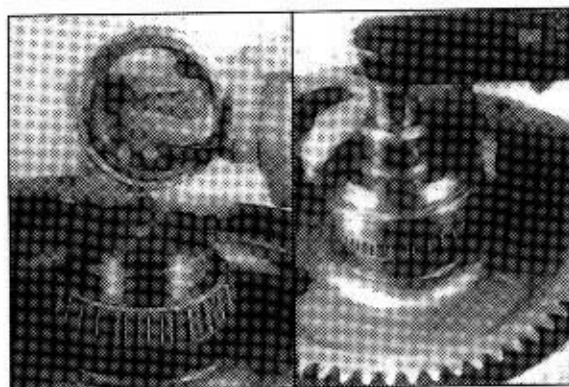
(3) Mounting the bearings.



(4) Heat the gear to 140°C for assembly.



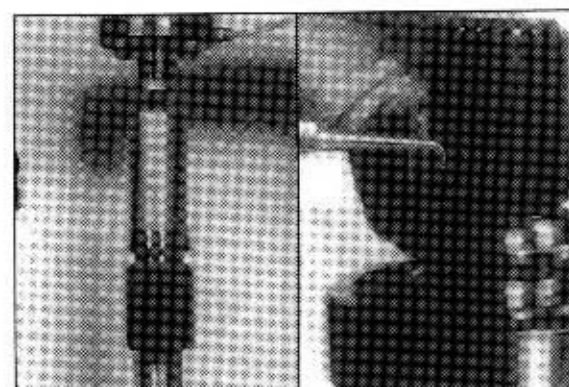
- (5) Tighten the ring nut at 81.6~91.8kgf · m
(590~664lbf · ft) using loctite 270.



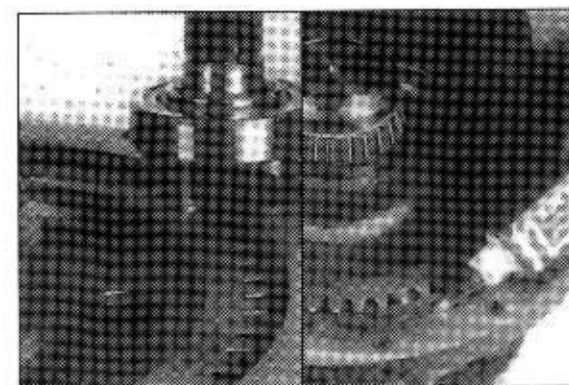
- (6) Chamfer the ring nut.



- (7) Pinion assembly.

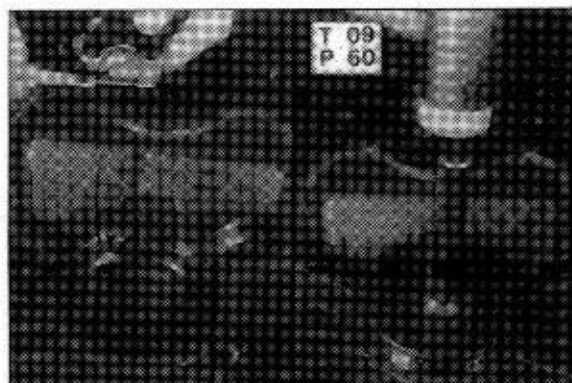


- (8) Assembly with loctite 275 on the surfaces.
Take great care to clean the surfaces.



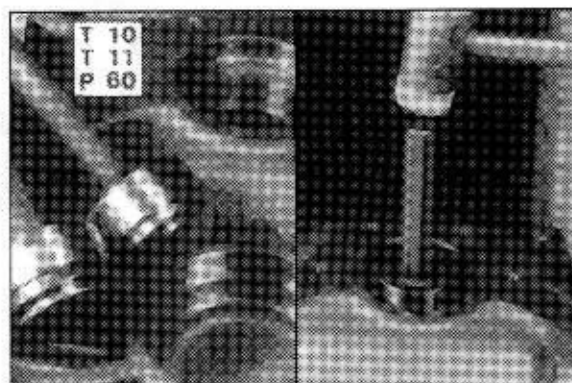
ASSEMBLY AND ADJUSTMENT

- (1) Preassembly with the same shims as those removed during disassembly, or with 1.00mm shims.



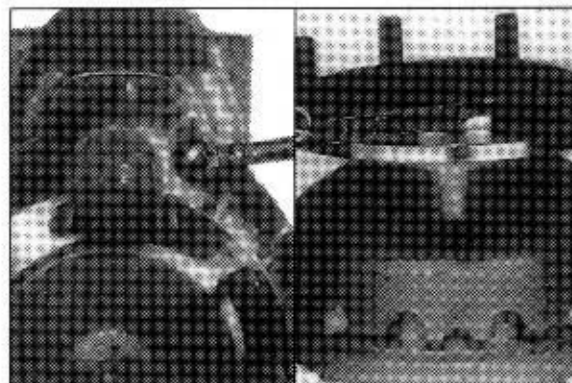
- (2) Axle shaft oil seal assembly.

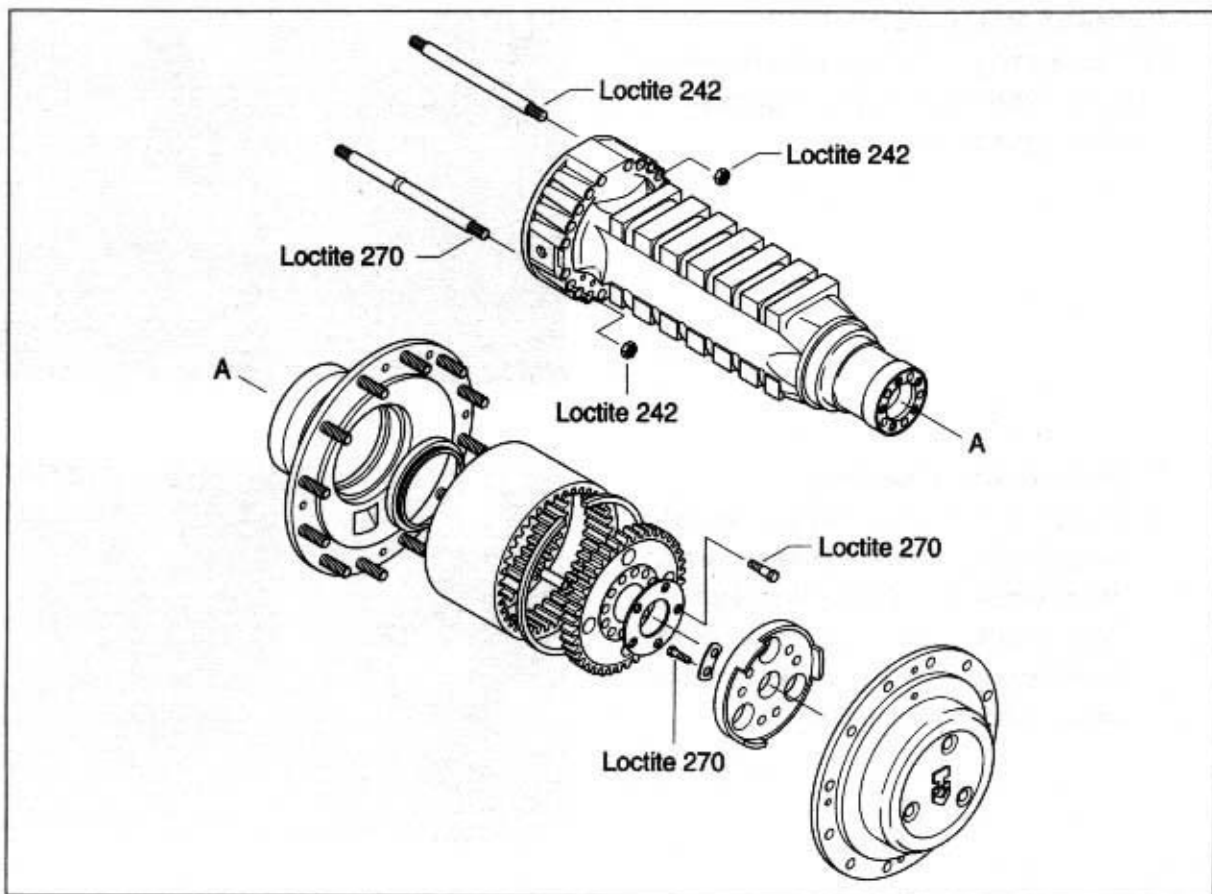
- ① Check the rotation torque applied tangentially to the wheel studs, which must be max 14.3~20.4kgf(With ring). To correct, add or remove shims considering that a 0.05mm variation cause a variation of ~2.0kgf.



- ② Assembly using loctite 275.

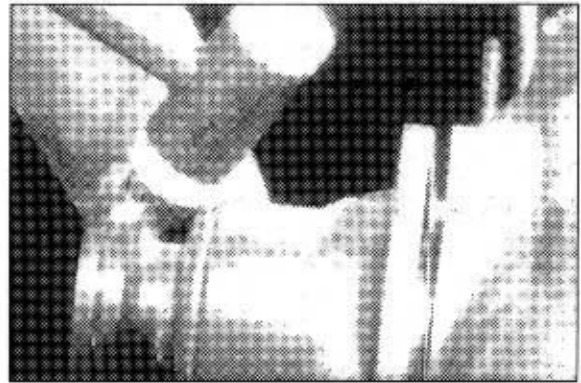
Tighten the screws with a torque wrench 23.4~23.8kgf · m(170~172lbf · ft).



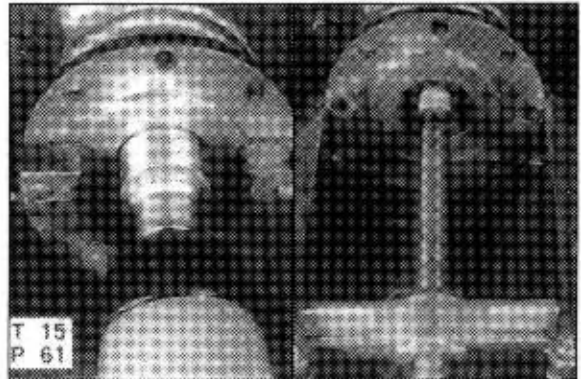


8) REAR AXLE BEVEL PINION SUPPORT

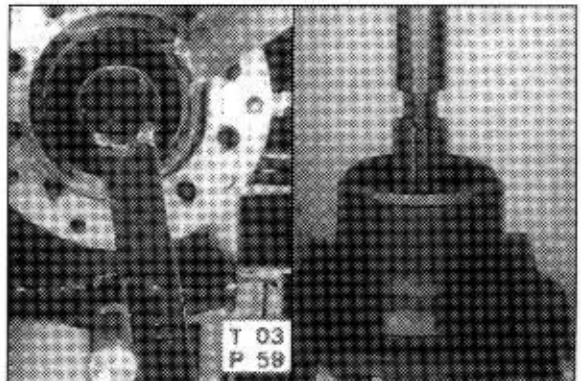
(1) Removal of bevel pinion support.



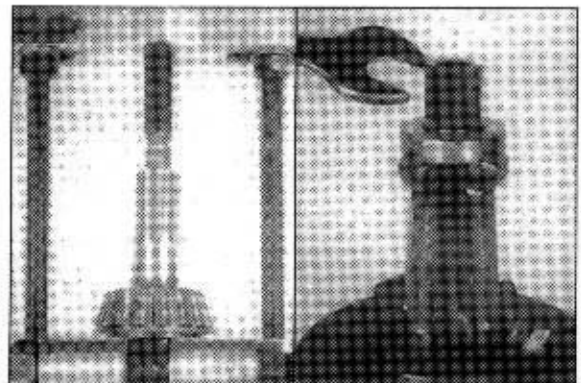
(2) Flange input.



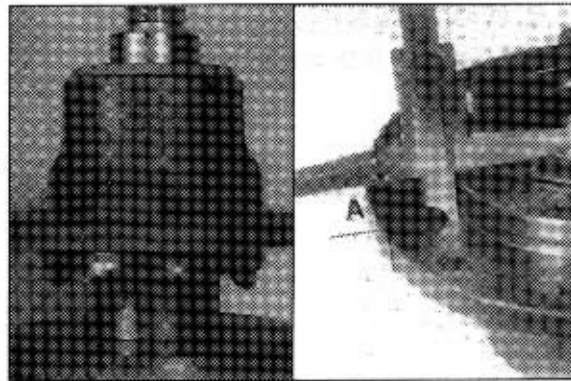
(3) Flanged to the reduction gear.



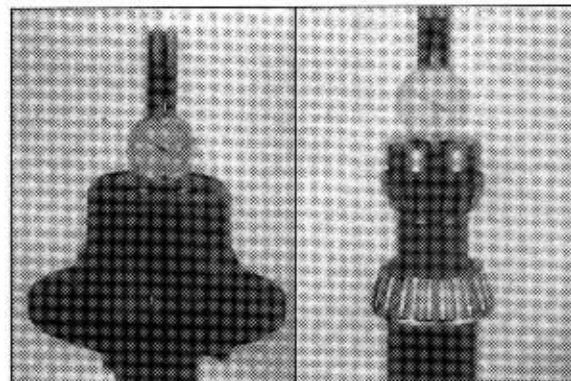
(4) Demounting the bearing plus thrust plates.



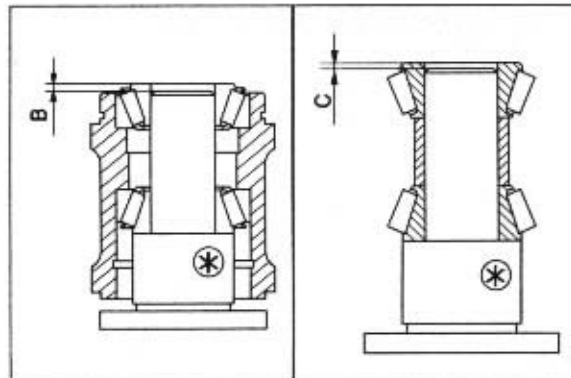
- (5) Assemble the external races.
Taper roller bearings.
Check cover measurement A.



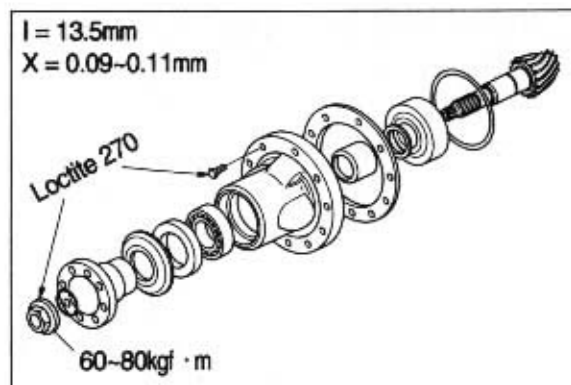
- (6) Determination of shim pack S1 for the preload of the taper roller bearings $S1 = B - C + X$.
 X = Value to add in order to obtain the correct preload of the taper roller bearings.



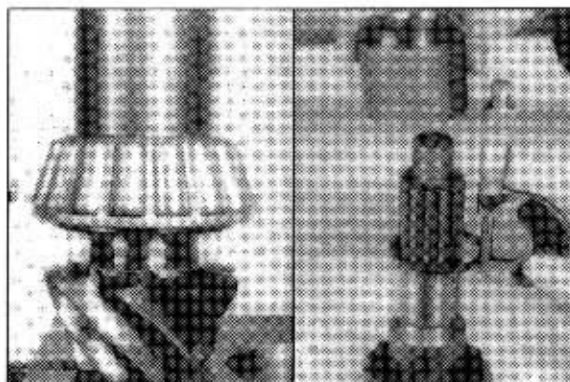
⊗ T26/P65 Flange input.



Value X = See figure.



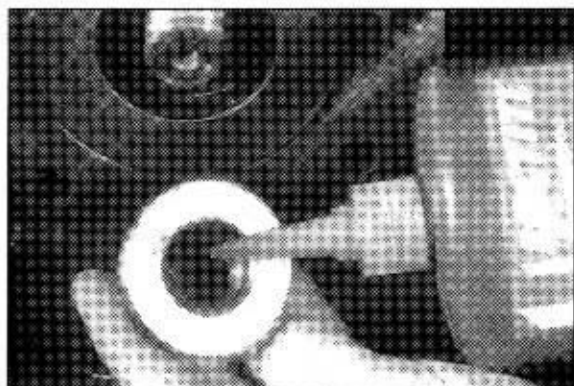
(7) Assembly of bevel pinion support and seal.



(8) Fitting the dust guard on the flange.

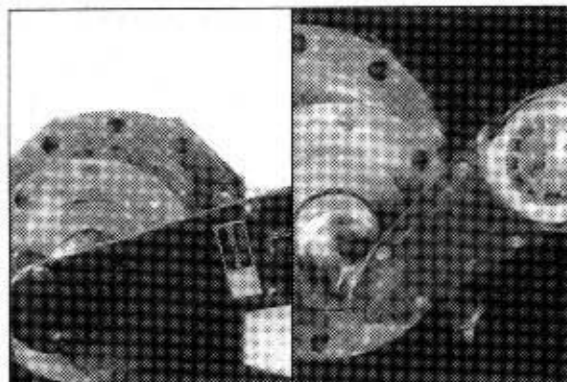


(9) Assembly with loctite 242.

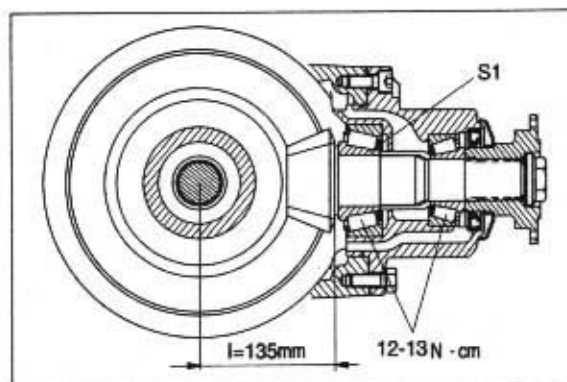


FLANGE INPUT VERSION

(1) Tighten the nut with a torque wrench.



(2) Check rotation torque : See figure

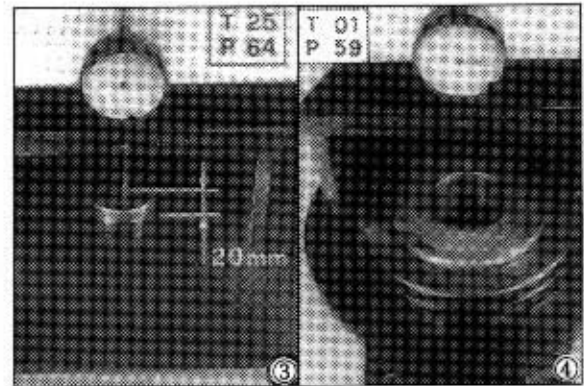


9) FRONT AXLE PINION SUPPORT

- (1) Demounting the pinions and bearing plates.



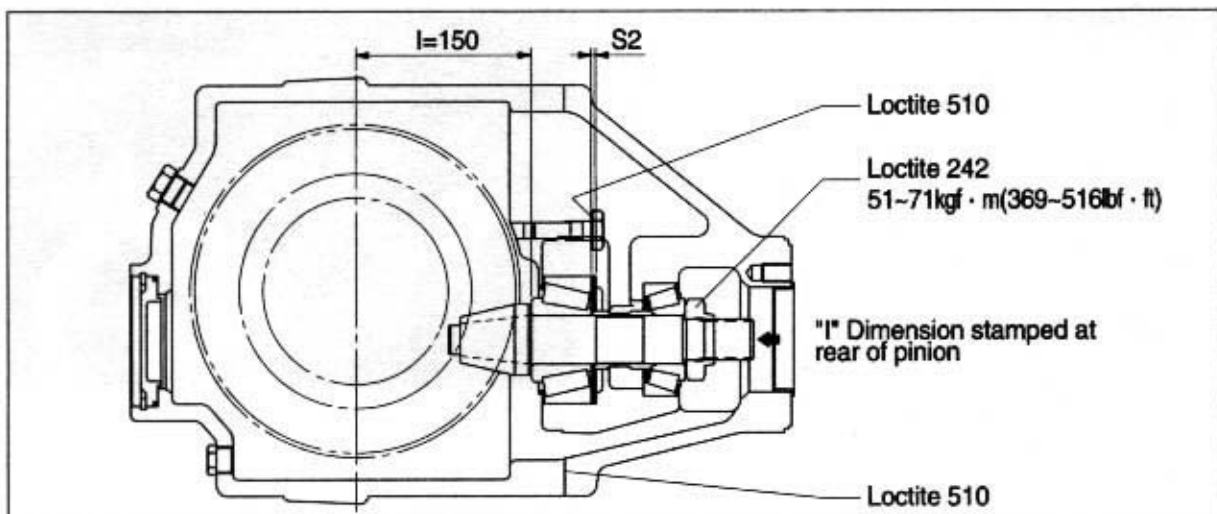
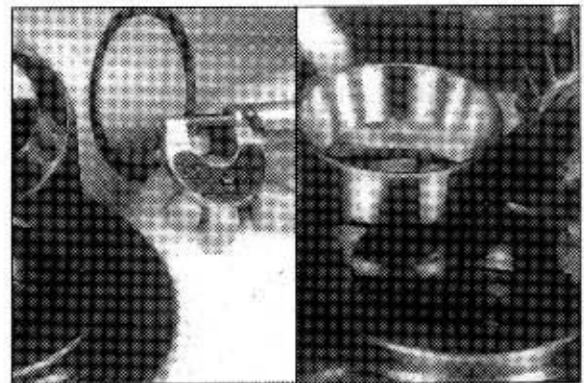
- (2) How to establish shims S2 to position the bevel pinion. Insert the dummy bearing and check the difference (Photo ④) after having zeroed the instrument on a surface plate with a 20mm shim (Photo ③). Measured difference corresponds to S2. Add or remove the differential shims when the center distances differ from 150mm (Dimension stamped on the pinion).



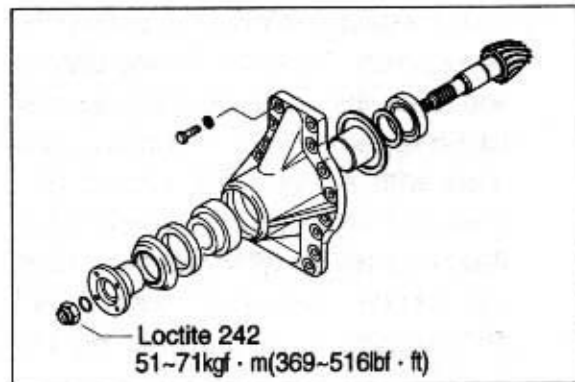
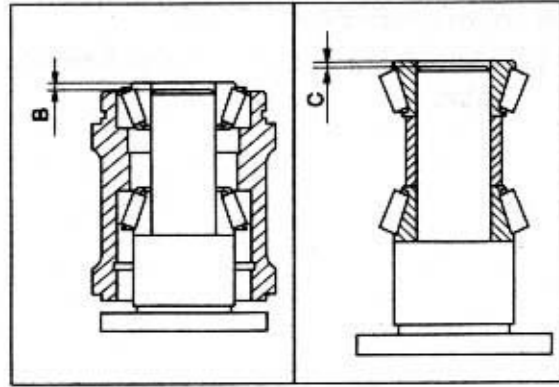
Example

Center distance : 149.8

Shims = $(150 - 149.8) + S2$



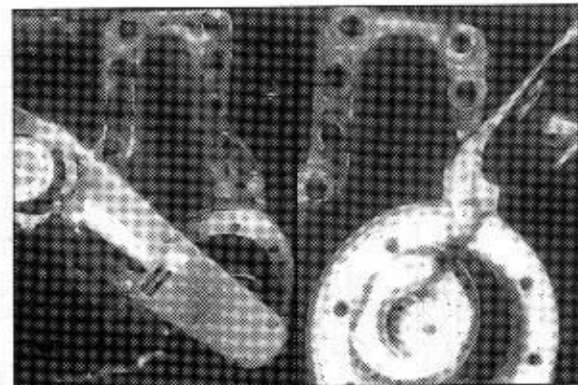
- (3) Establishing the pinion bearing preload shims. See page 3-118 and figure.



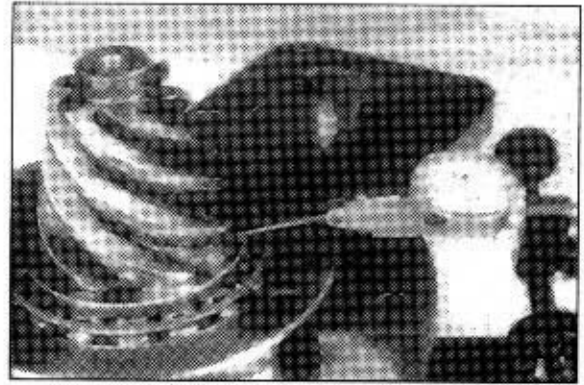
- (4) Check the measurement(Photo ①) after having mounted the shims and thrust plate. It must be 0.10mm~0.15mm less than zero. This difference is annulled by the effect of bearing interference in the definitive assembly.



- (5) Chamfer.



- (6) Check the final center distance and stamp it on the cover.



10) 276 -176 -143 AXLE ADJUSTMENT OF BEVEL GEAR SET

- (1) Determination of shim pack S2 for adjustment of bevel pinion position : $S2 = (l + A) - (D + r)$.

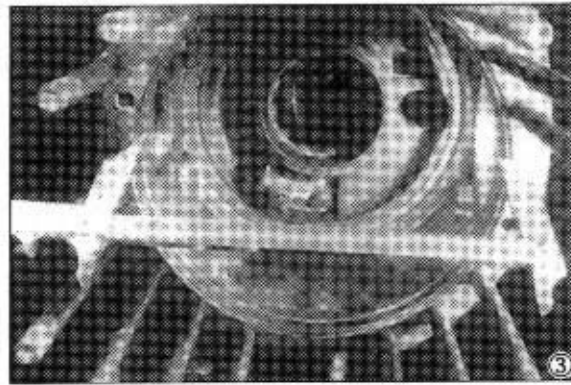


Photo ② = D, Photo ① = $\phi/2 = r$
Photo ③ = l (Dimension stamped on the pinion).

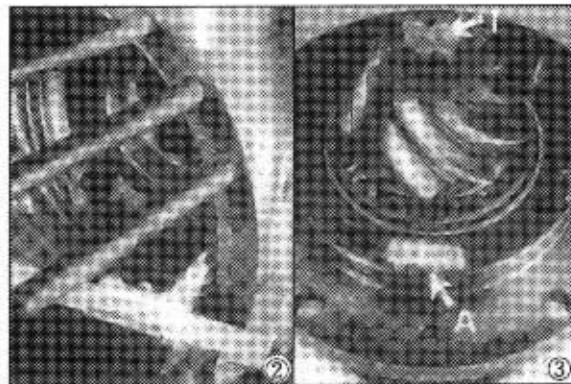
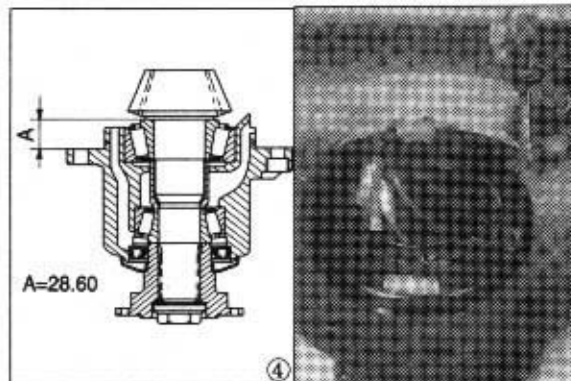
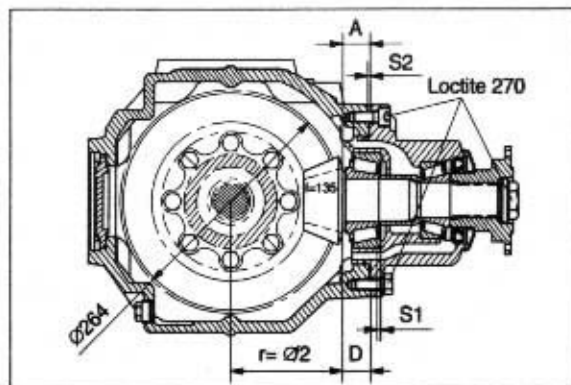


Photo ④ = A (Dimension stamped on the cover pinion).



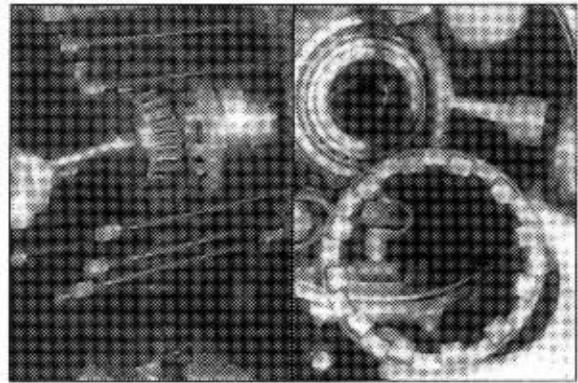
- (2) Assembly of bevel pinion support with shim pack S2.



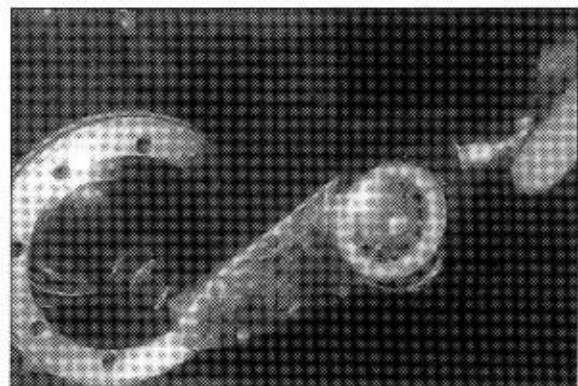
(3) Assembling central axle housing.

- ※ Be careful not to damage the tight surfaces of the O-rings while inserting the differential case into the central axle housing.

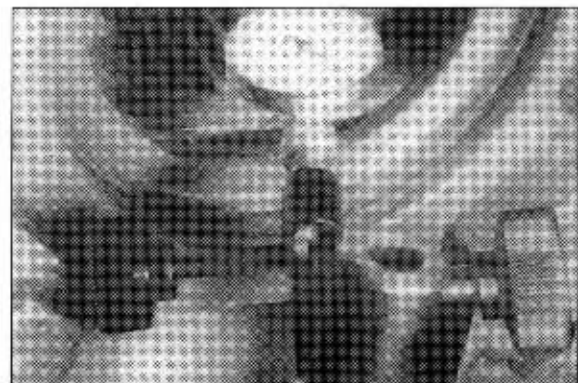
Play : 0.18~0.25



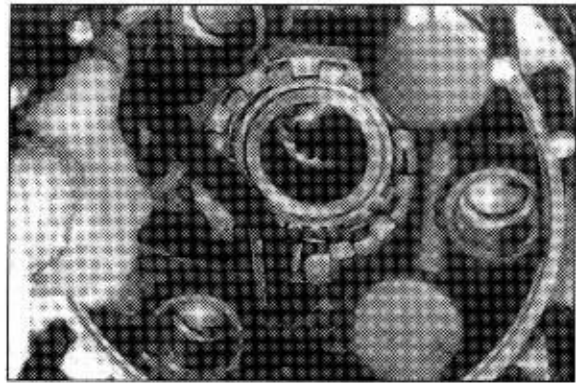
- (4) Screw in the adjusting nuts to obtain approximate 0.20~0.27mm backlash between the teeth of the bevel gear set, without preloading the taper roller bearings. Check the rotating torque of pinion and differential. Tighten nut on opposite site to the crown wheel to obtain a 0.05~0.07kgf · m(0.37~0.52lbf · ft) higher rotating torque on the pinion.



- (5) Mark both ring nuts. To adjust the backlash move ring nuts only. Loosen the one on bevel crown wheel side and tighten the opposite one for the equal measure if the backlash is too low ; Viceversa if the backlash is too high.

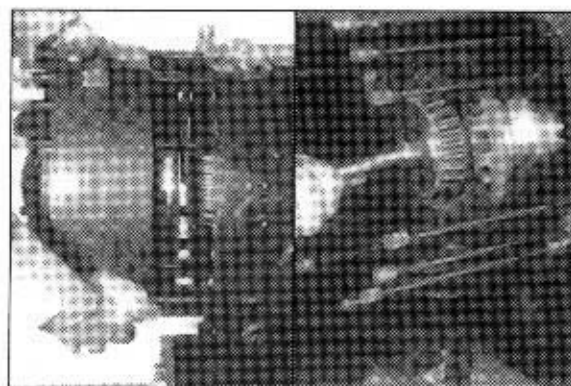
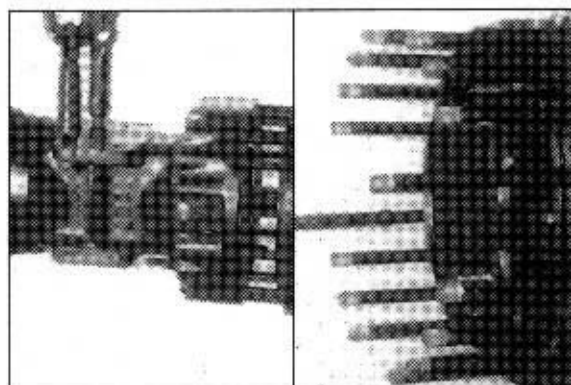


- (6) Mount locking tabs in the best position and punch in place.

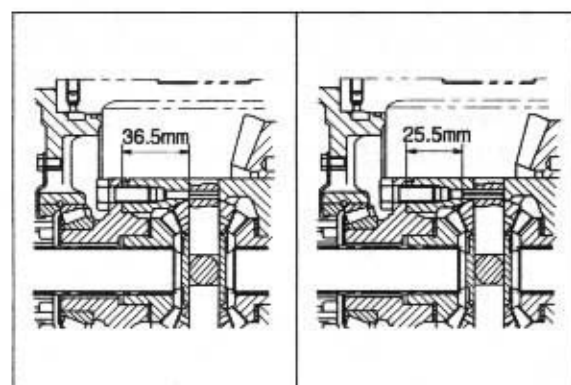
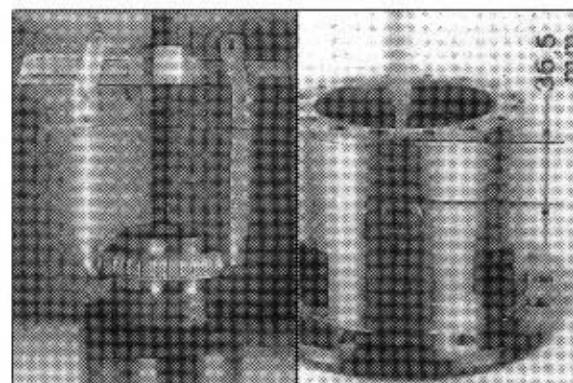


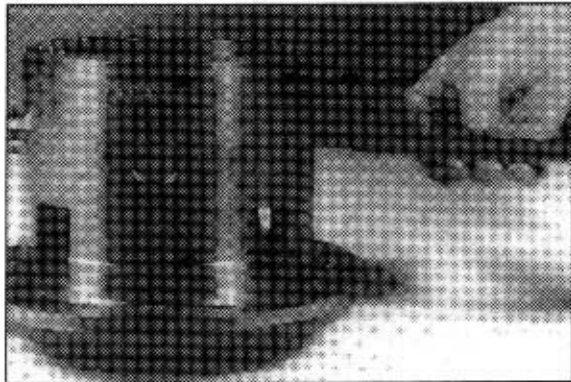
11) DIFFERENTIAL HOUSING

(1) Removal of the differential from the axle.

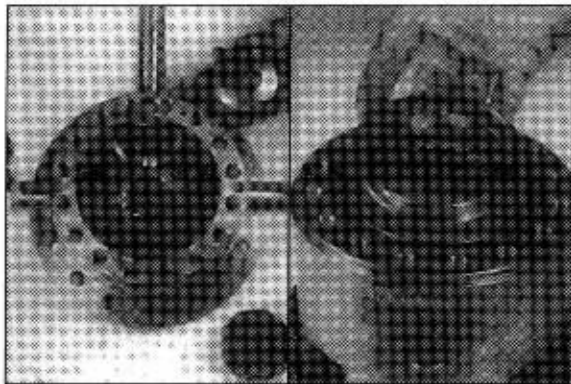


※ Replace the fitting bolts of the crown wheel every time that they have to be removed.

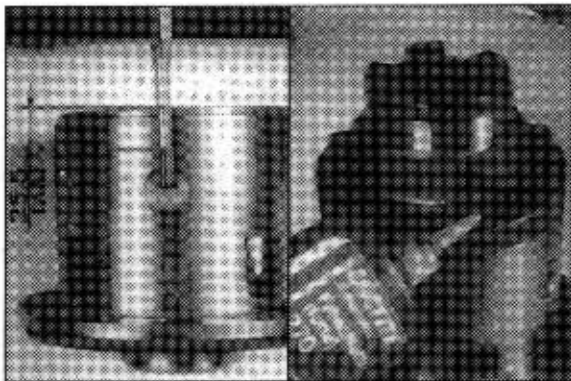




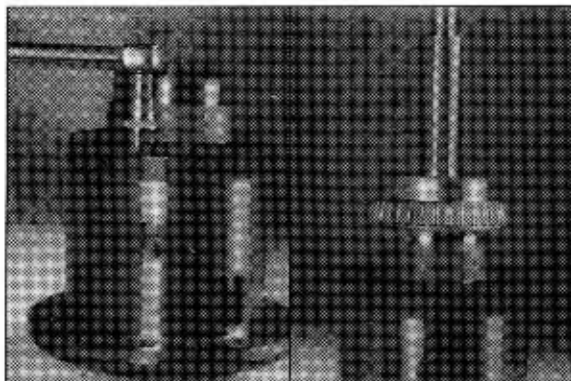
(2) Mounting sun wheels and planet gears.

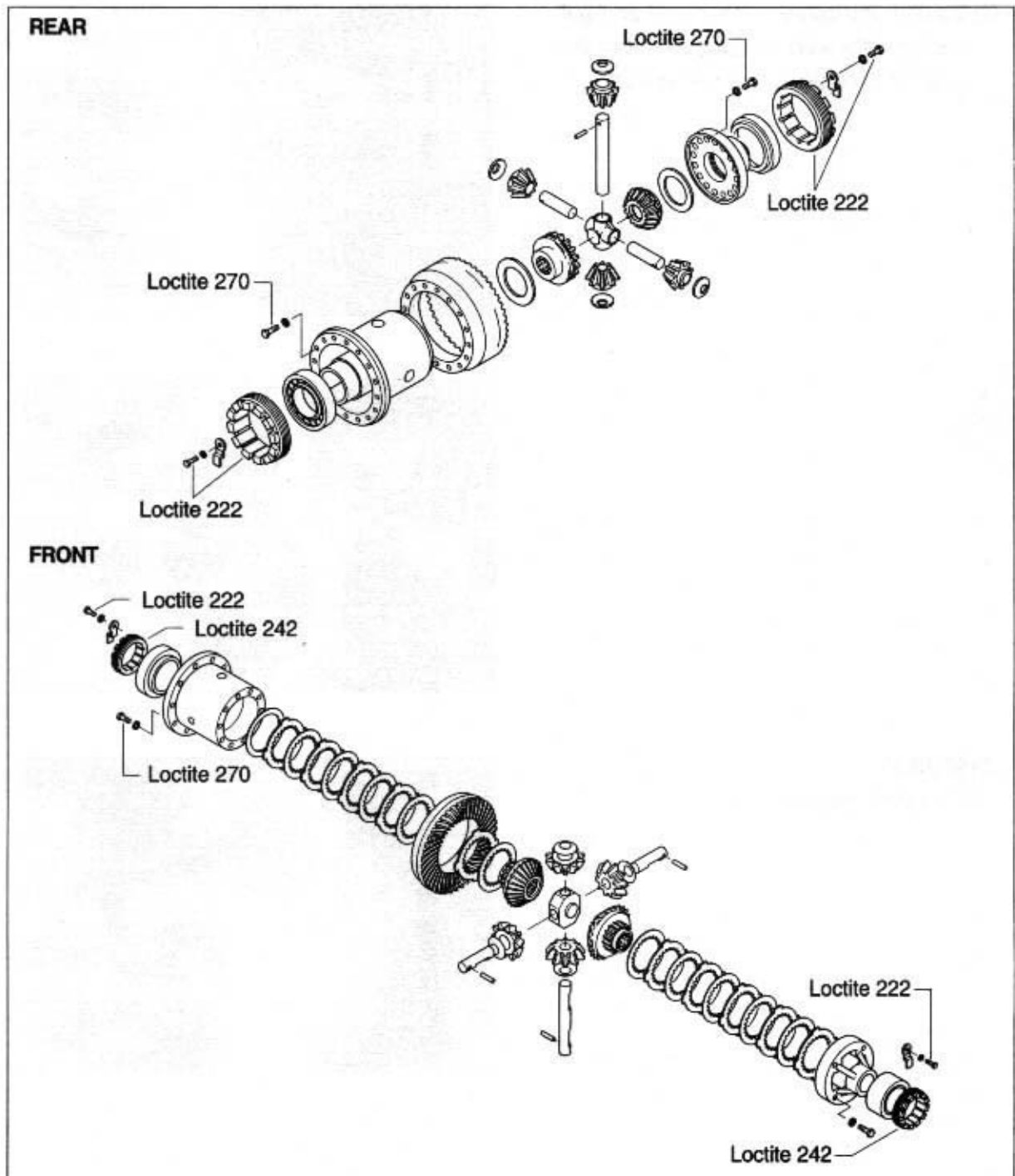
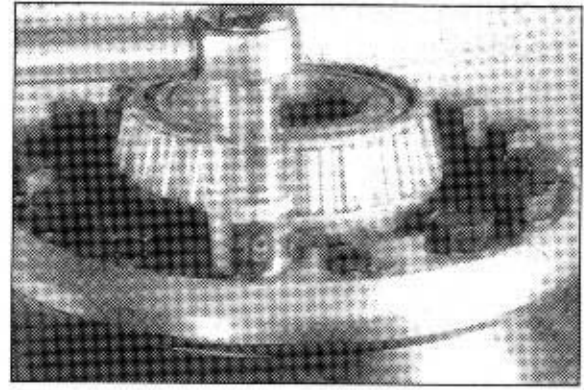


(3) Insert the spring pins half way up the pin.



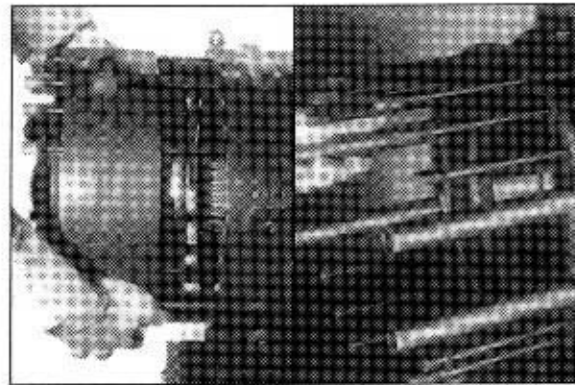
(4) Torque all bolts $M12 \times 35 \times 1.25-10K$ and $M12 \times 30 \times 1.25-10K$ with a torque wrench bolts clamping torque $13.8 \sim 14.1 \text{ kgf} \cdot \text{m}$ ($100 \sim 102 \text{ lbf} \cdot \text{ft}$).
Use loctite 270.



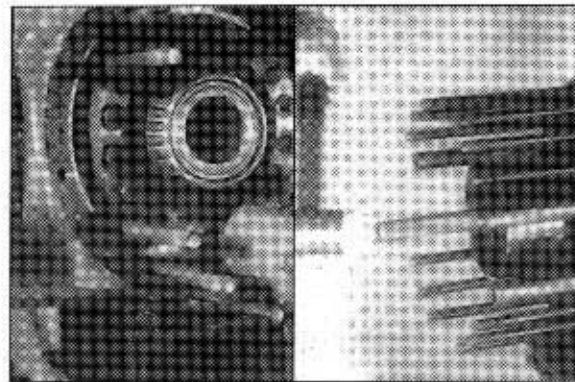


12) CENTRAL PART OF FRONT AXLE DISASSEMBLY

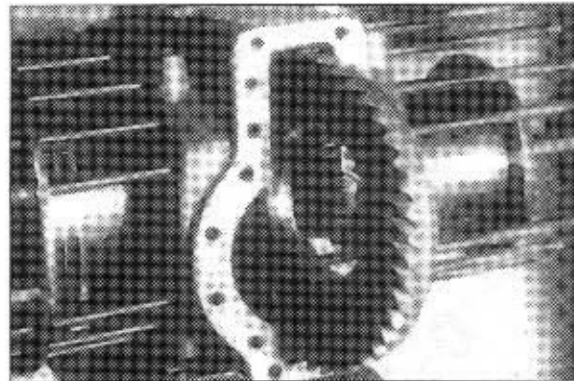
- (1) Demount the intermediate cover on the opposite side to the gear rim and insert tool.



- (2) Slacken the screws. Insert tool and pull out the differential housing. Remove the gear rim from the pinion bearing side.

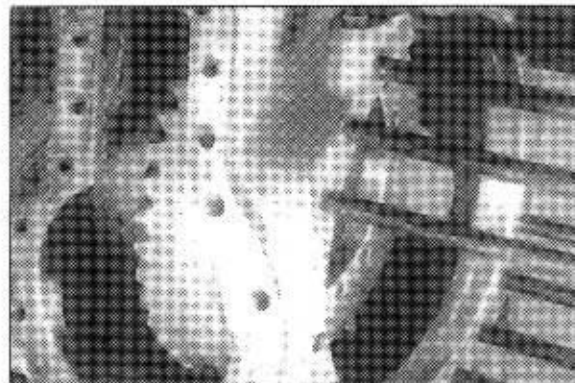


T24
P64



ASSEMBLY

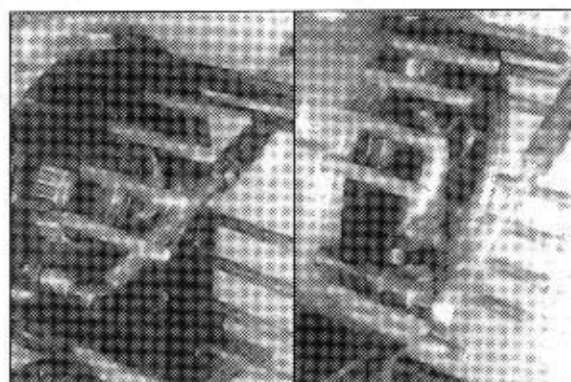
- (1) Center the gear rim on tool.



- (2) Insert the differential housing with tool and torque the screws.



- (3) Take care to prevent damage to the brake retention zones when assembling the parts.



- (4) Mount the intermediate cover on the gear rim side using tools. Fit on the other intermediate cover.

