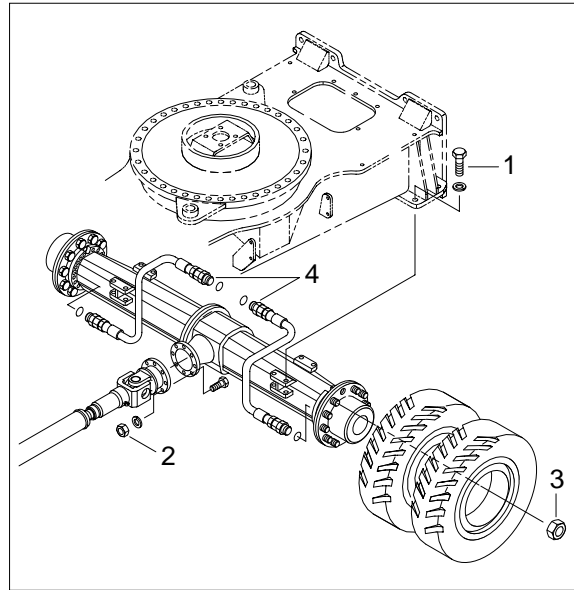


GROUP 12 REAR AXLE

1. REMOVAL REAR AXLE

- 1) Rear axle mounting bolt(1, M24)
 - Tightening torque : $58 \pm 6.3(\text{kgf} \cdot \text{m})$
($419.5 \pm 45.6\text{lb} \cdot \text{ft}$)
- 2) Propeller shaft mounting bolt(2, M10)
 - Tightening torque : $5.9 \pm 0.6\text{kgf} \cdot \text{m}$
($42.7 \pm 4.3\text{lb} \cdot \text{ft}$)
- 3) Wheel nut(3, M22)
 - Tightening torque : $60^{+0}_{-5} \text{kgf} \cdot \text{m}$
($434^{0}_{-36} \text{lb} \cdot \text{ft}$)
- 4) Hose assy(4, PF 3/8)
 - Tightening torque : $5\text{kgf} \cdot \text{m}$ ($36.2\text{lb} \cdot \text{ft}$)
- 5) Axle weight : 490kg(1080lb)



2. GENERAL INSTRUCTIONS

1) GENERAL WORKING INSTRUCTIONS

- (1) This manual has been developed for the skilled serviceman, trained by axle manufacturer.
- (2) During all operations, pay attention to cleanliness and skilled working.
Therefore, axle removed from the machine, must be cleaned prior to open them.
- (3) We assume that the special tools, specified by manufacturer, will be used.
The special tools are available from manufacturer.
- (4) After the disassembly, all components must be cleansed, especially corners, cavities and recesses of housing and covers.
- (5) The old sealing compound must be carefully removed.
- (6) Check lubricating holes, grooves and pipes for free passage. They must be free of residues, foreign material or protective compounds.
- (7) The latter refers especially to new parts.
- (8) Parts which have been inevitably damaged in a disassembly operation, must be generally replaced by new ones, e.g. rotary seal rings, O-rings, U-section rings, cap boots, protective caps etc..
- (9) Components such as roller bearings, thrust washers, synchronizing parts etc. which are subject to normal wear in automotive operation, must be checked by the skilled Serviceman.
He will decide if the parts can be reused.
- (10) For the heating of bearings etc., hot plates, rod heaters or heating furnaces must be used.
- (11) Never heat parts directly with the flame. An auxiliary solution would be to immerse the bearing in a vessel filled with oil, which is then heated with the flame.
In this way, damage to the bearings could be avoided.
- (12) Ball bearings, covers, flanges and parts like that must be heated to about 90 to 100°C.
- (13) Hot-mounted parts must be reset after cooling in order to assure a proper contact.
- (14) Before pressing shafts, bearings etc. in position, both parts must be lubricated.
- (15) During to reassembly, all specified adjustment values, testing specifications and tightening torque must be respected.
- (16) After the repair, units are filled up with oil.
- (17) After the oil filling, the oil level plugs and oil drain plugs must be tightened to the specified tightening torque.

2) IMPORTANT INSTRUCTIONS CONCERNING THE LABOUR SAFETY

- (1) In principle, repairers are themselves responsible for the labour safety.
- (2) The observance of all valid safety regulations and legal rules is a precondition to prevent damage to individuals and products during the maintenance and repair operations.
- (3) Before starting the work, the repairers have to make themselves familiar with these regulations.
- (4) The proper repair of these products requires especially trained personnel.
- (5) The repairer himself is obliged to provide for the training.

3) LUBRICANT SPECIFICATIONS

- (1) Gear oils with limited - slip additives.
- (2) API GL-5
- (3) MIL-L-2105D(SAE 85W-90, 85W-140 with LS-Additive)

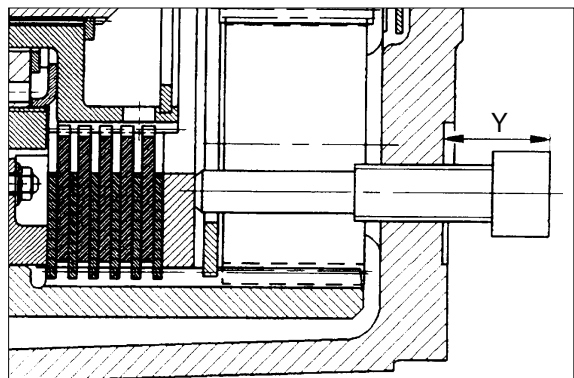
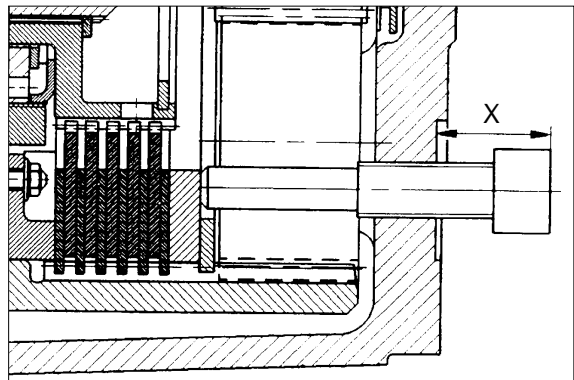
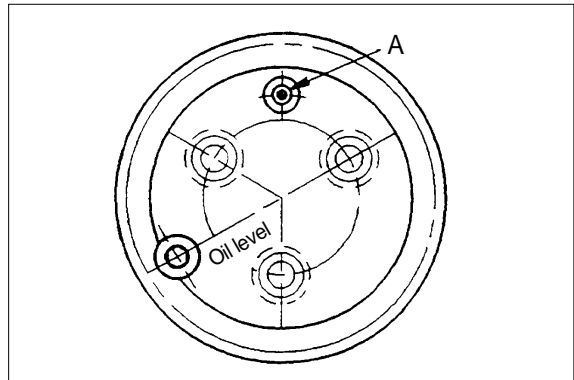
4) BRAKE LINING WEARING TEST

(1) General

- ① The brake lining wearing test gives a limited information about the overall condition of the brake plate pack - without disassembly of the planetary carrier, resp. of the plates.
- ② The wearing test has to be carried out in case of the following criteria :
 - In the course of the oil change intervals
 - Braking noises
 - Reduced braking power
 - Change of deceleration of the brake fluid level as well as of the brake pressure
 - In case of a general change of the brake performance.
- ③ Carry out the wearing test on both final drive sides.
 - Permitted piston stroke max. : 6.25mm
 - Piston stroke in new condition of the plate pack : 2.4~2.8mm

(2) Carry out the wearing test

- ① Turn the planetary carrier until screw plug A(M16 × 1.5) is in the upper position(12 o'clock position).
Now, remove the screw plug.
- ② Apply the brake(Required brake pressure min. 40bar).
- ③ Screw measuring screw(M16 × 1.5) in until contact is obtained and tighten it with a torque of 1kg · m.
- ④ Determine dimension X according to the figure on the right.
- ⑤ Release the brake and equalize the plate clearance by resetting the measuring screw.
Torque limit 1kg · m.
- ⑥ Determine dimension Y according to the figure on the right.
- ⑦ The difference of the two dimensions (X-Y) corresponds to the piston stroke (Actual state).

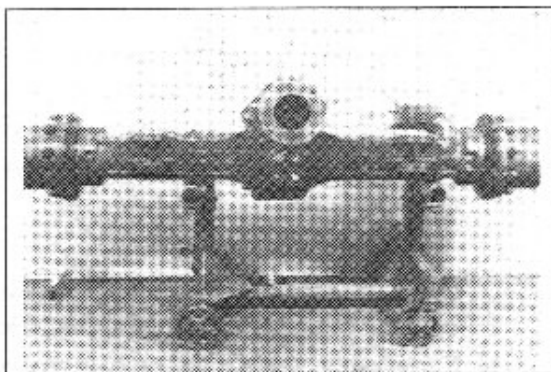


(3) Result

If the max. permitted piston stroke(5.0mm) is exceeded, the lining plates must be renewed on both final drive sides.

3. FINAL DRIVE DISASSEMBLY AND ASSEMBLY

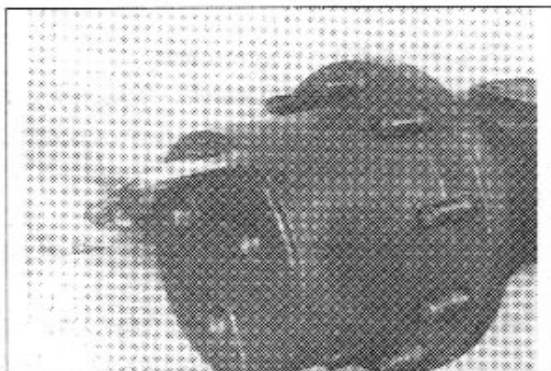
Adjacent figure shows the total view of the axle.



1) DISASSEMBLY - FINAL DRIVE

(1) Planetary carrier

- ① Remove screw plug and drain oil.



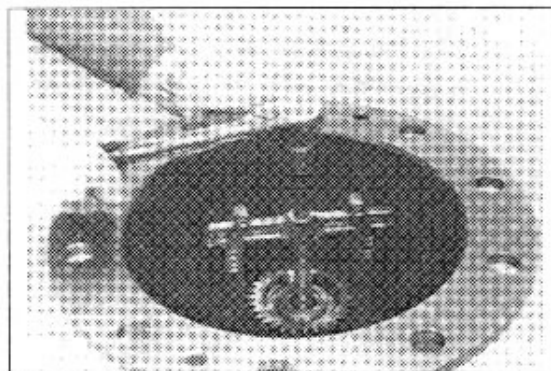
- ② Loosen socket head screws and separate planetary carrier from the hub.



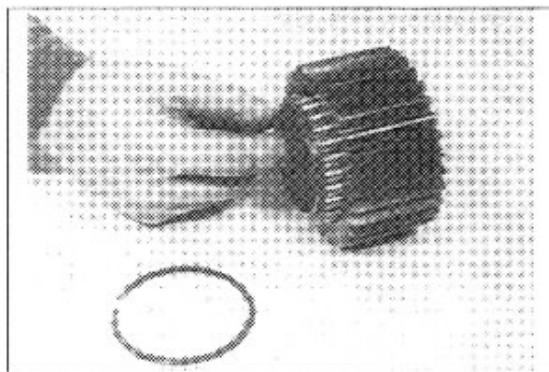
- ③ Squeeze out circlips and pull off planetary gears.

Two leg puller

5870 970 002

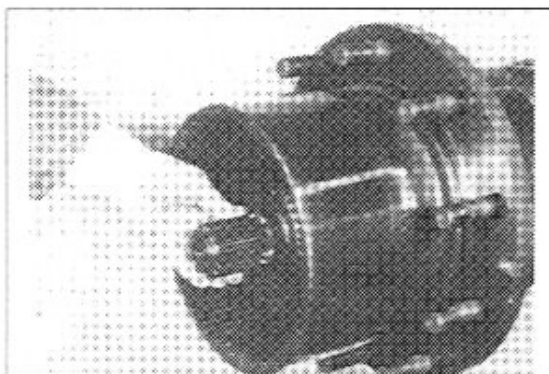


- ④ Squeeze out L shaped rings and pull bearing inner race (Together with cylindrical rollers) out of the planetary gear.



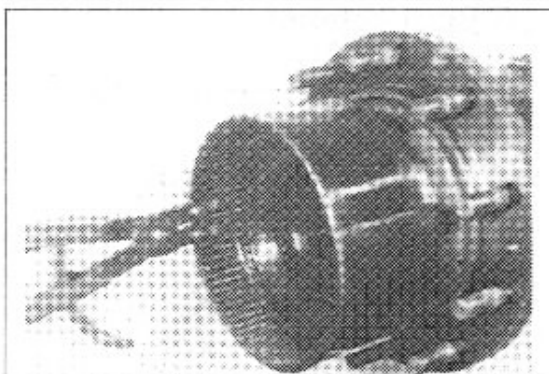
Internal gear - Internal gear carrier

- ⑤ Pull sun gear shaft together with the inner plate carrier from the stub shaft, resp. out of the plate pack.
Remove released thrust washer.

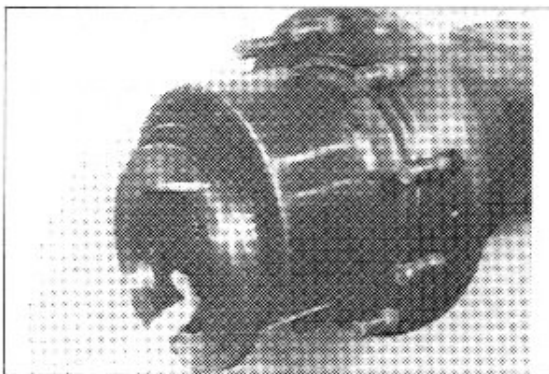


- ⑥ Squeeze out circlip.
Clamping pliers

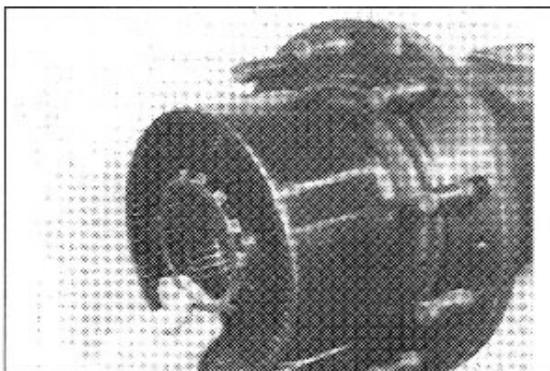
5870 900 011



- ⑦ Remove backing plate and plate pack.



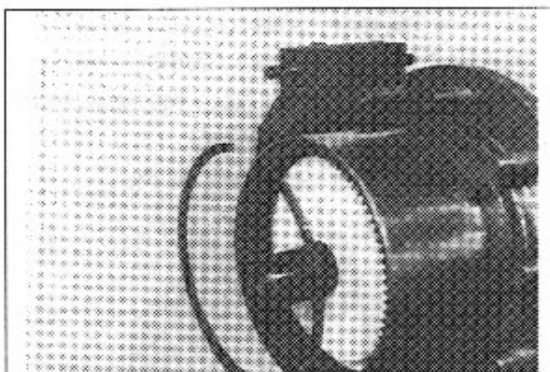
- ⑧ Remove lock plate.



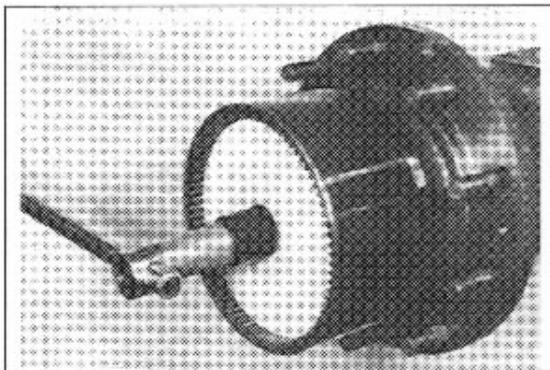
- ⑨ Apply hook spanner, assemble centering disk and fix it axially by means of circlip.

Hook spanner 5870 401 105

Centering disk 5870 912 011

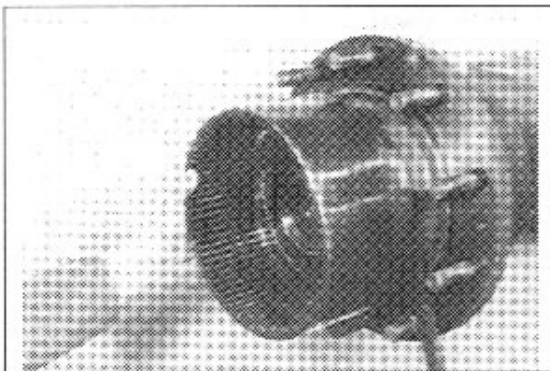


- ⑩ Loosen slotted nut.

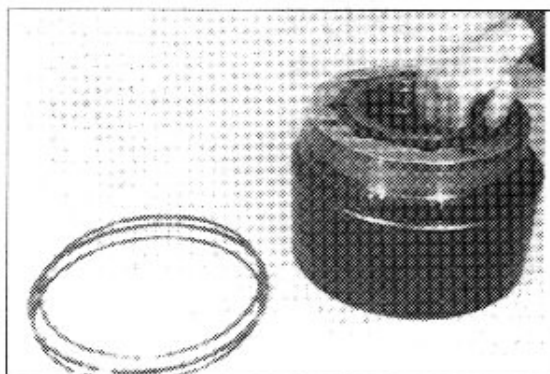


- ⑪ Separate internal gear assembly from the hub carrier.

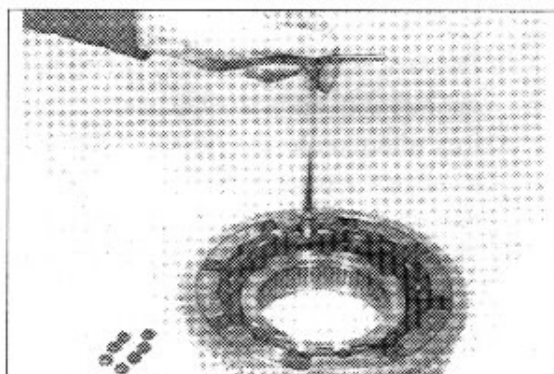
Pry bar 5870 345 065



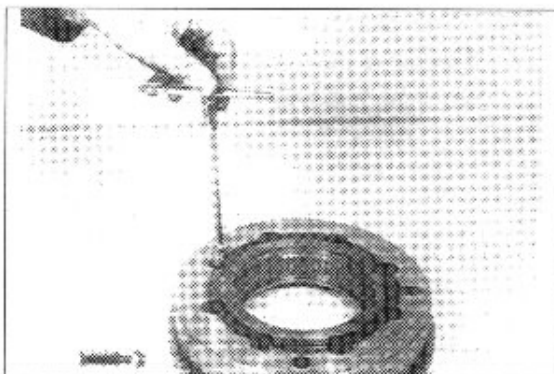
- ⑫ Squeeze out snap rings(3 pieces) and separate internal gear from internal gear carrier.



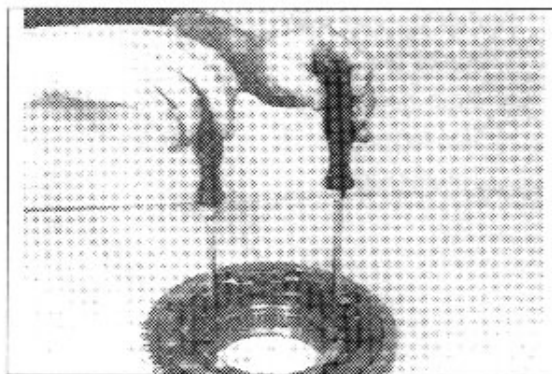
- ⑬ Loosen lock nuts.



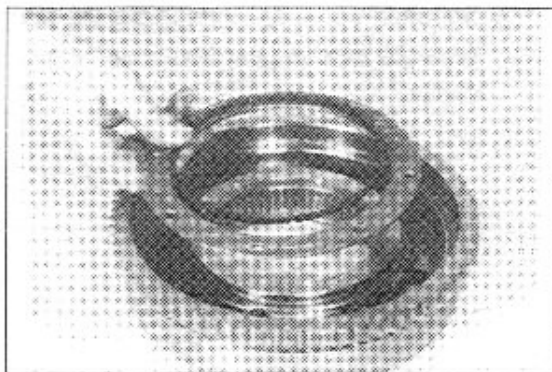
- ⑭ Loosen all hexagon head screws and remove them together with compression springs and spring caps.



- ⑮ Press piston out of the bore of the internal gear carrier.
Adjusting spanner 5870 400 001



- ⑩ Squeeze out snap ring and remove it together with disk.

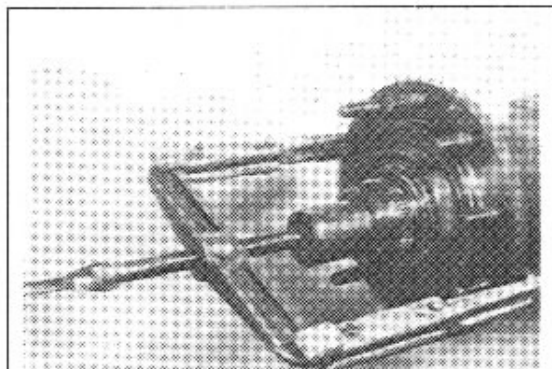


Hub

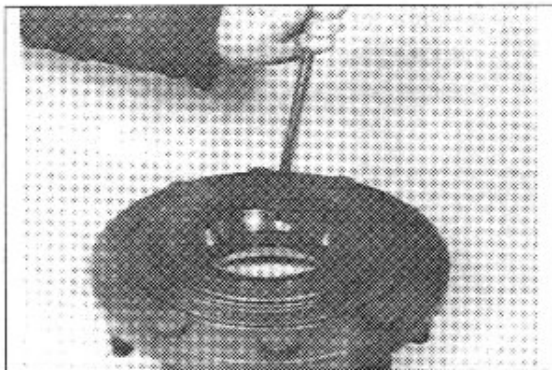
- ⑪ Remove retaining ring and O-ring and pull hub from the hub carrier end.
* Pay attention to the released bearing inner race and spacing ring.

Two leg puller 5870 970 007

Thrust piece 5870 100 019



- ⑫ Lift out plug in ring.
If required, drive both bearing outer races out of the hub bores.

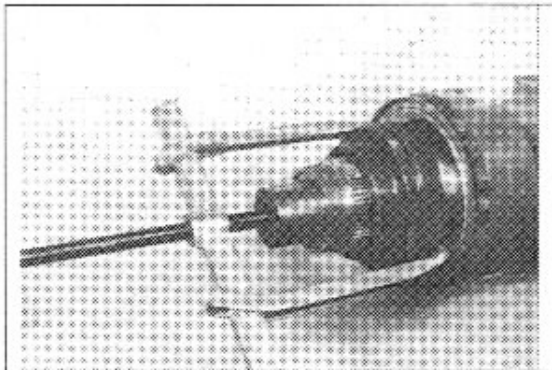


- ⑬ Pull tapered roller bearing from the hub carrier end.

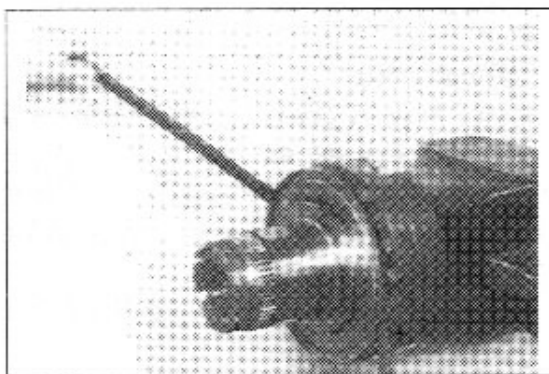
Grab sleeve Super 5870 028 009

Two leg puller 5870 970 007

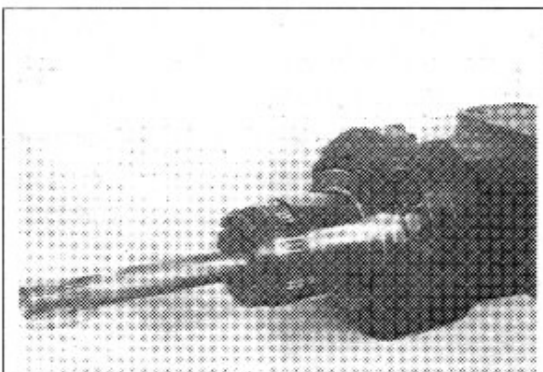
Thrust piece 5870 100 019



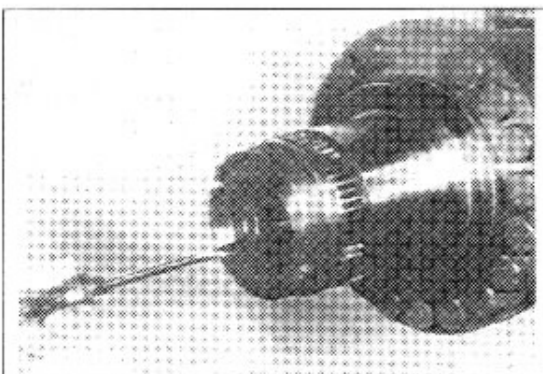
- ⑳ Lift off cover plate from the collar of the hub carrier.



- ㉑ Pull stub shaft out of the axle housing.

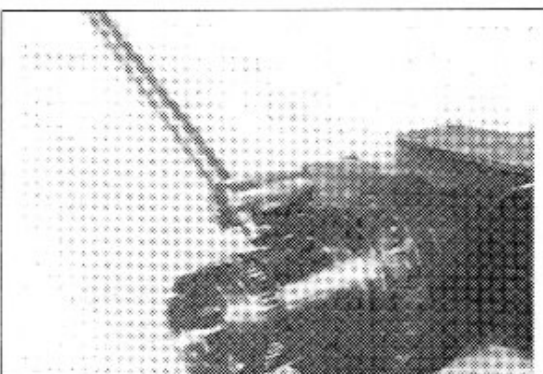


- ㉒ Lift out shaft seal.



- ㉓ Loosen hexagon head screws and separate hub carrier from the axle housing.

※ Mark hub carrier with axle housing.



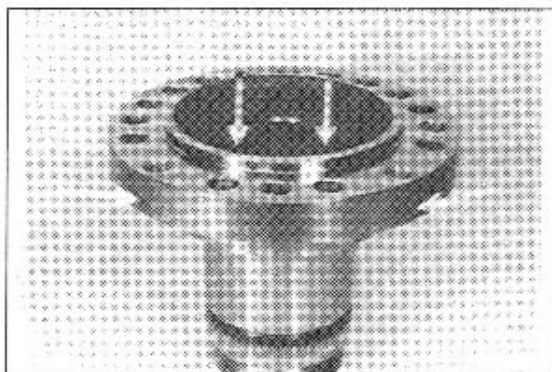
2) REASSEMBLY

(1) Hub carrier

- ① If required, close bores(4X) by means of king plugs, see arrows.

※ Clean oil bores carefully from residues (Protective compounds) prior to install the screw plugs.

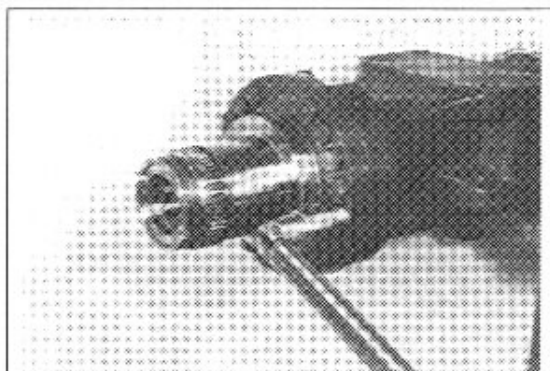
Lever riveting tongs 5870 320 014



- ② Fasten hub carrier at the axle housing by means of hexagon head screws.

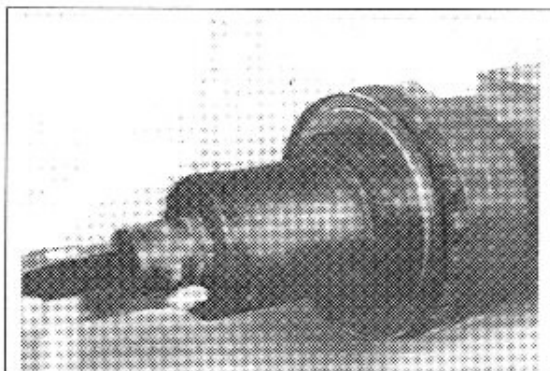
- Torque limit : 39.8kgf · m(287.6lbf · ft)

※ Pay attention to the installation position, see matching marks. Cover flange facing with sealing compound(Curil T).



- ③ Replace cover plate firmly against shoulder.

Driver 5870 048 130



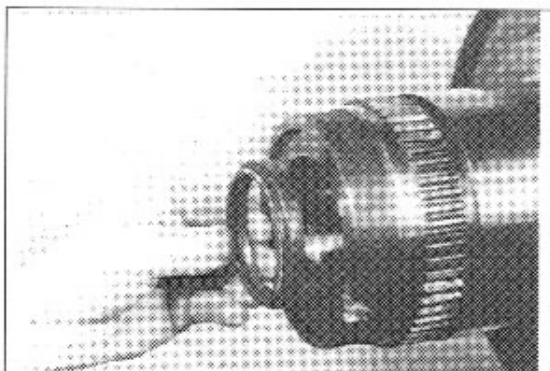
- ④ Install shaft seal with the protruding sealing lip showing towards the outside into the hub carrier bore until contact is obtained.

※ Cover outer diameter with sealing compound(Curil T).

Lubricate sealing lips.

Driver 5870 055 102

Handle 5870 260 002



Hub

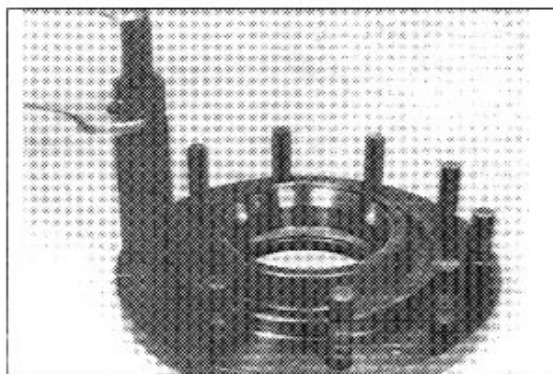
- ⑤ Install wheel studs into the hub bores.

Wheel stud puller basic set

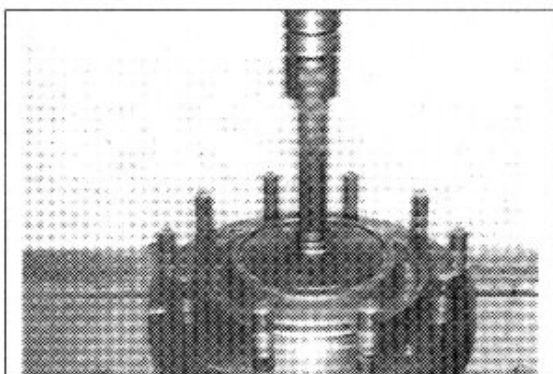
5870 610 001

Insert M22 × 1.5

5870 610 002



- ⑥ Insert bearing outer races into both hub bores until contact is obtained.



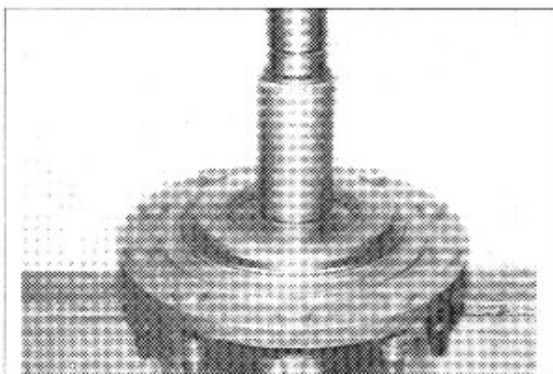
- ⑦ Press in shaft seal flush mounted.

* Cover outer diameter with sealing compound (Curil T).

Driver

5870 051 018

(Combined with head lever press)



Adjust rolling resistance of the wheel bearing (Figure 18 to 12)

Nominal value for new bearings
1.3~1.8kgf · m (9.6~13.3lbf · ft) (With shaft seal)

- * For already run in bearings try to find the lower value.

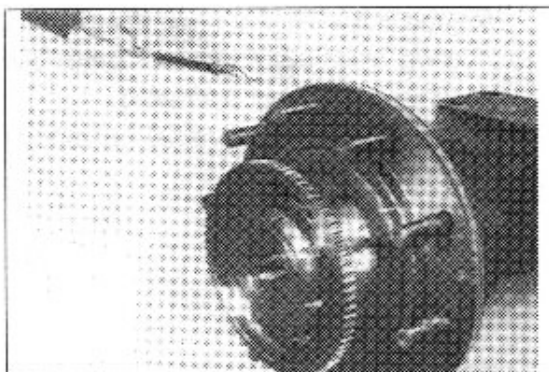
⑫ Check rolling resistance of the wheel bearing "T=F × R"

T = Rolling resistance in kgf · m

F = Traction force in kgf · m

R = Radius in m

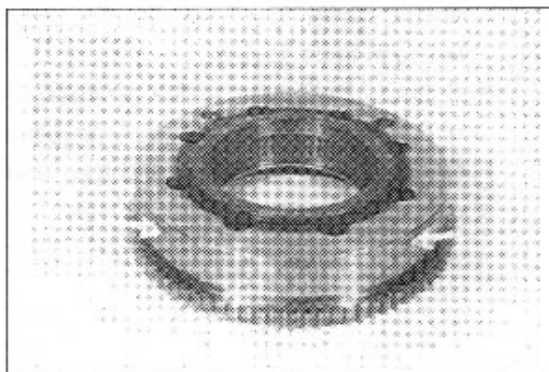
- * If the required rolling resistance 1.3~1.8kgf · m(9.6~13.3lb · ft) has not been obtained, correct by means of a corresponding ring(Figure ⑨, page 8-261). Afterwards loosen slotted nut again and remove internal gear carrier.



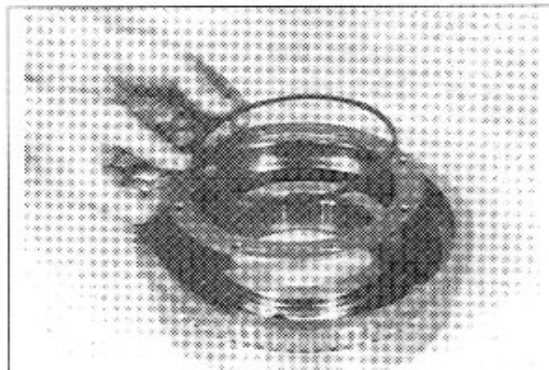
Internal gear-Internal gear carrier

- ⑬ Close both bores by means of king plugs, see arrows.

Lever riveting tongs 5870 320 016



- ⑭ Insert disk and fix it by means of snap ring.

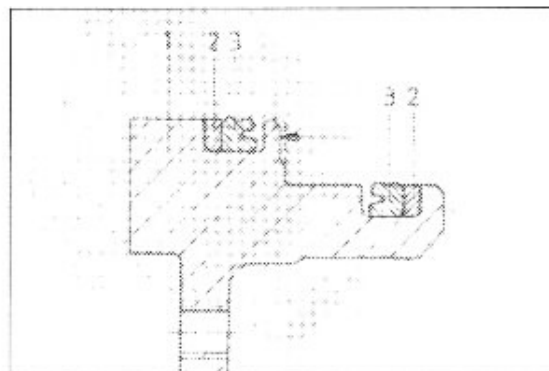


- ⑮ Heat both retaining rings and insert them into the recesses of the piston.

Install grooved rings with the sealing lip showing towards the pressure chamber (Arrow), see draft.

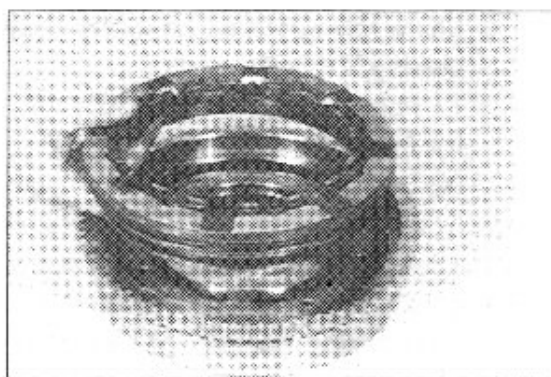
- * Lubricate retaining and grooved rings (Use W10 oil).

- 1 Piston
- 2 Retaining ring
- 3 Grooved ring



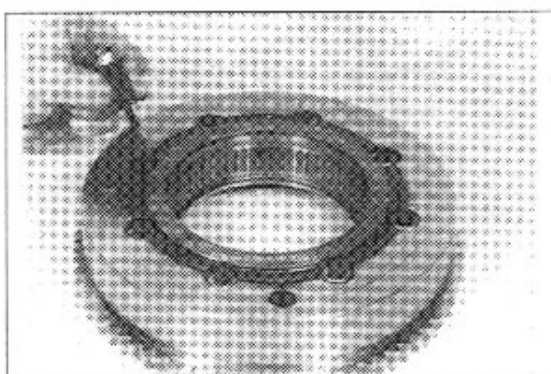
- ⑩ After the retaining rings have cooled down, insert piston into the internal gear carrier until contact is obtained.

※ Pay attention to a radial installation position.

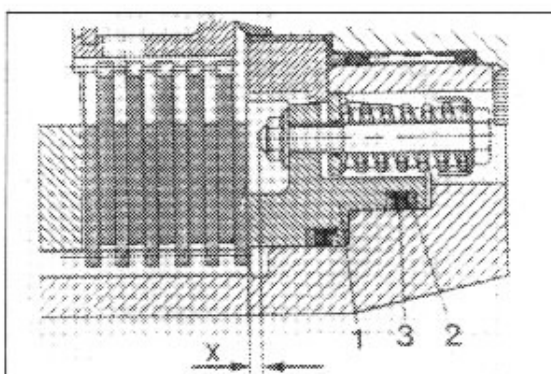


- ⑪ Assemble spring caps and compression springs and fix piston by means of hexagon head screws.

※ Screw in the screws until a dimension X of 0.5~1.0mm measured from the plane face/piston to the screw end has been obtained, see below figure.



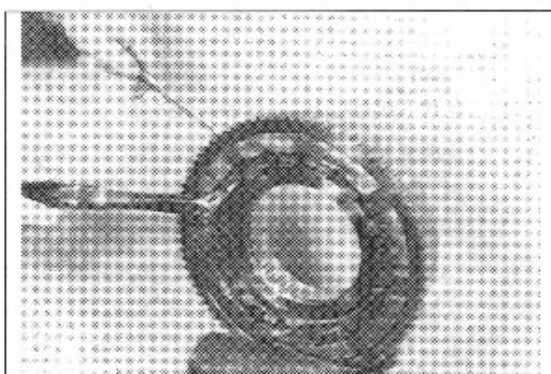
- 1 Piston
- 2 Retaining ring
- 3 Grooved ring
- X 0.5~1.0mm



- ⑫ Hold hexagon head screws tight and check them by means of lock nuts.

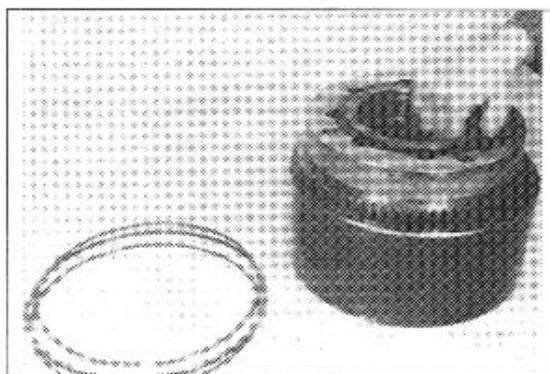
• Torque limit : 1.1kgf · m(8.1lbf · ft)

Secure locking nut with loctite No.242.

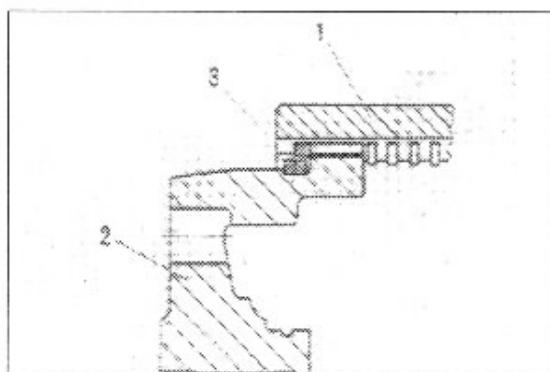


- ①⑨ Install preassembled internal gear carrier into the internal gear and fix it by means of snap rings(3 pieces).

※ Installation position, see draft see figure below.

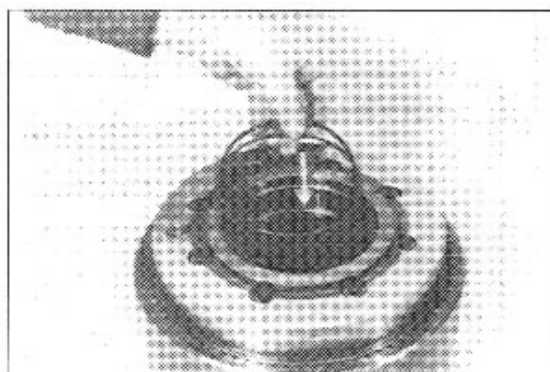


- 1 Internal gear
- 2 Ring gear carrier
- 3 Snap ring



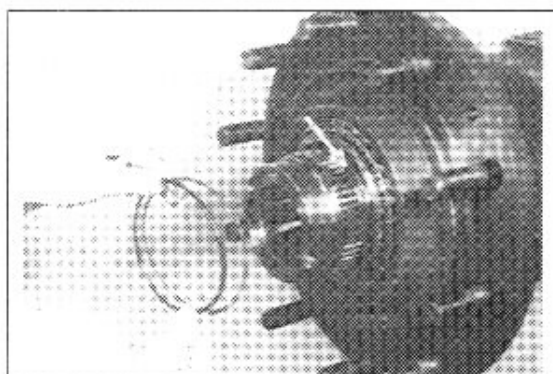
- ②⑩ Insert retaining ring and O-ring into the recess of the internal gear carrier, see arrow.

※ Install O-ring showing towards the pressure chamber(Towards above).
Lubricate retaining and O-ring(Use W10 oil).

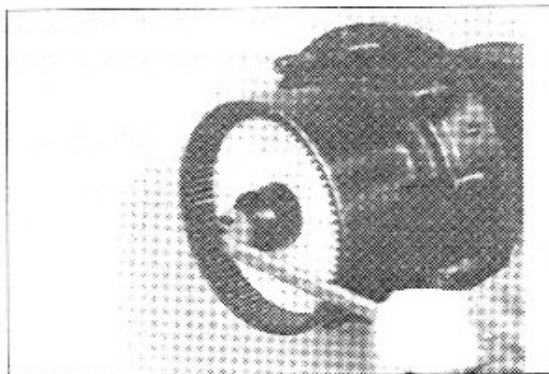


- ②⑪ Insert split retaining ring as well as O-ring into the annular groove of the hub carrier (See arrow) and lubricate.

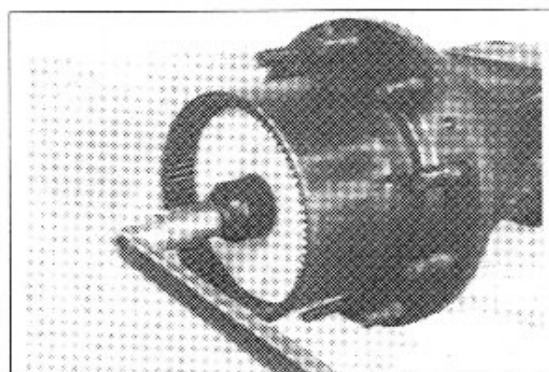
※ Both ends of the retaining ring must have contact(Use assembly grease), in order to allow a correct installation of the internal gear carrier(Figure ②⑫ page 8-266).



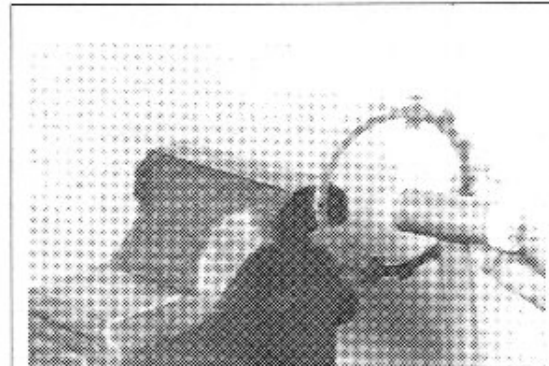
- ②③ Guide internal gear assembly over the splines of the hub carrier and pull it, using slotted nut, carefully upon the O-ring and the retaining ring.
- * During the assembly of the internal gear carrier(Compl.) pay attention to the precise overlapping of the oil bores(Hub carrier/internal gear carrier).



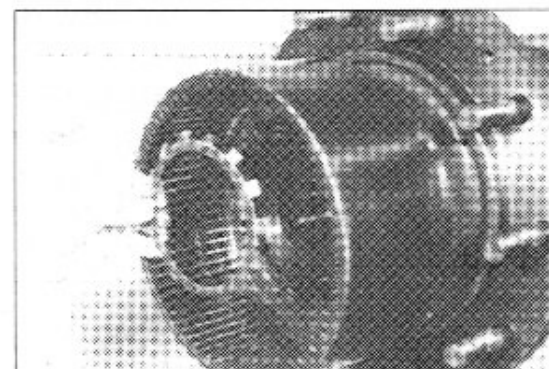
- ②④ Tighten slotted nut.
- Torque limit : 122.4~142.8kgf · m
(885~1033lbf · ft)
- * During the tightening, rotate hub several times in both senses.
- Within the tolerance envelope of the torque limit, it is possible to secure the slotted nut by means of lock plate(Aim at higher value).
- | | |
|----------------|--------------|
| Hook spanner | 5870 401 105 |
| Centering disk | 5870 912 011 |



- ②⑤ After having determined the two lobes to be beaded, by a provisional installation of the lock plate at the slotted nut, bead the lobes in a vise.



- ②⑥ Fix slotted nut by means of lock plate.

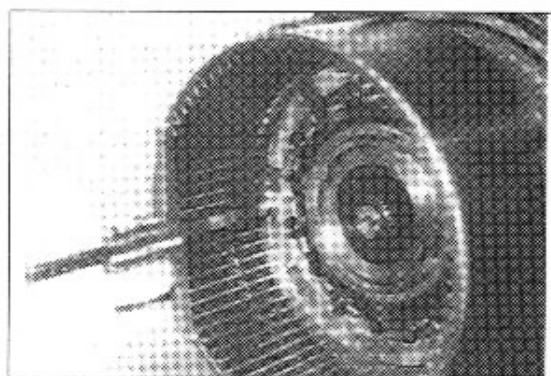


Multi disk brake

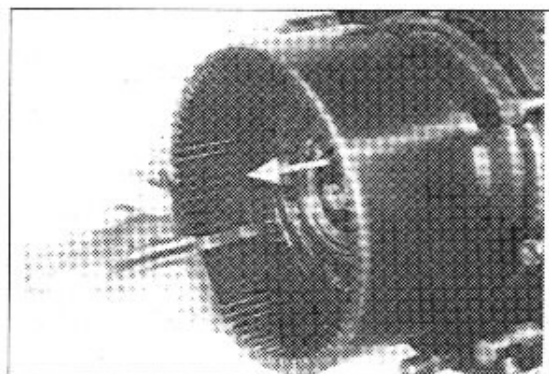
- ②⑥ Clearance = piston stroke to be adjusted according to the following table(Figure ②⑦ to example III).

| Inner plates | Inner plates | Clearance piston stroke in mm |
|--------------|--------------|-------------------------------|
| 2 | 4 | 1.6~2.0 |
| 3 | 6 | 2.4~2.8 |
| 4 | 8 | 3.2~3.6 |
| 5 | 10 | 4.0~4.4 |

- ②⑦ Determine dimension **A** from the face internal gear to the place face piston.
 · Dimension **A** e.g. 90.5mm



- ②⑧ Engage circlip and place it against the outer plane of the recess(Direction of arrow), until contact is obtained. Measure dimension **B** from the face internal gear to the inside shoulder of the circlip.
 · Dimension **B** e.g. 63.5mm
 After wards, remove circlip again.



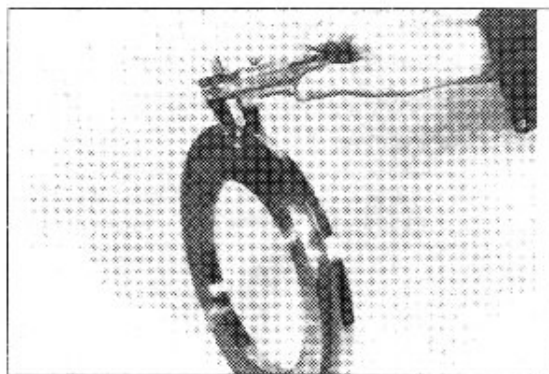
Example I

Dimension **A** 90.5mm
 Dimension **B** 63.5mm

 Difference = Dimension **I** 27.0mm

- 29 Determine dimension **C**(Backing plate thickness).

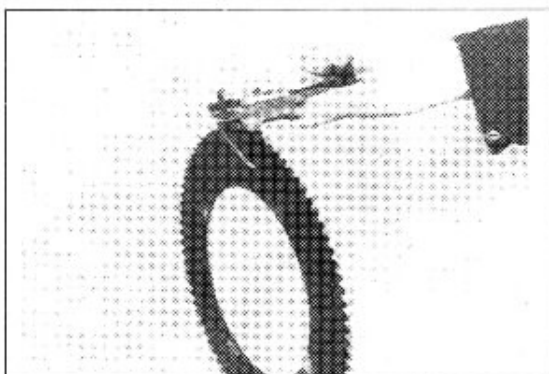
• Dimension **C** e.g. 9.5mm



Determine total thickness of the plate pack(Inner plates and outer plates)

- ※ Measure each of the undulated outer plates.

• Dimension **D**(Plate pack) e.g. 15.5mm



Example I

Dimension **A** 9.5mm

Dimension **B** + 15.5mm

Gives dimension **I** 25.0mm

Example II

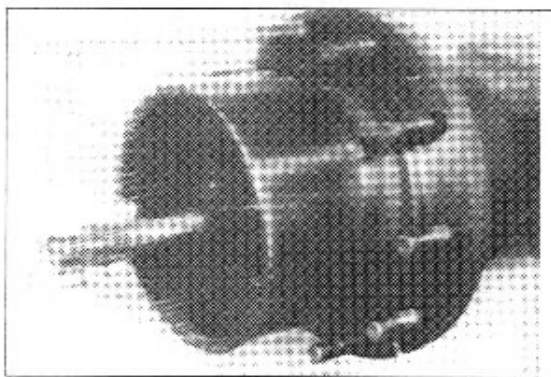
Dimension **I** 27.0mm

Dimension **II** - 25.0mm

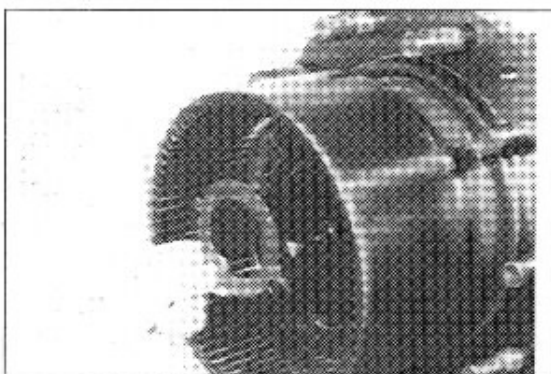
Difference = Plate play e.g. 2.0mm

- ※ If the required clearance(See table, page 8-267) is not obtained, correct by means of a corresponding outer plate.

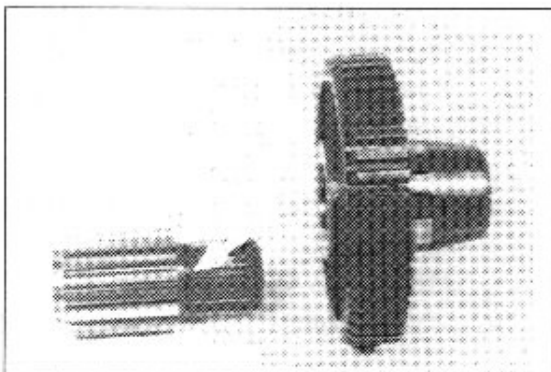
- ③⑩ Introduce stub shaft into the axle housing until the splines have been received in the differential.



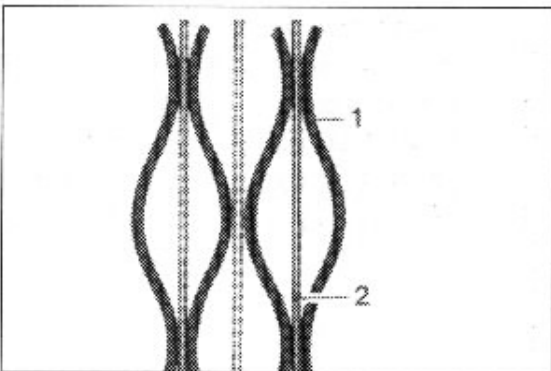
- ③⑪ Make thrust washer adhere with grease.
 ※ If no correct contact of the thrust washer on the hub carrier is obtained, both lobes of the lock plate(Inside) must be reset.



- ③⑫ Insert O-ring into the annular groove, see arrow and assemble sun gear shaft into the inner plate carrier until contact is obtained.
 Further slide the inner disc carrier over the splines of the plug shaft against the thrust washer.



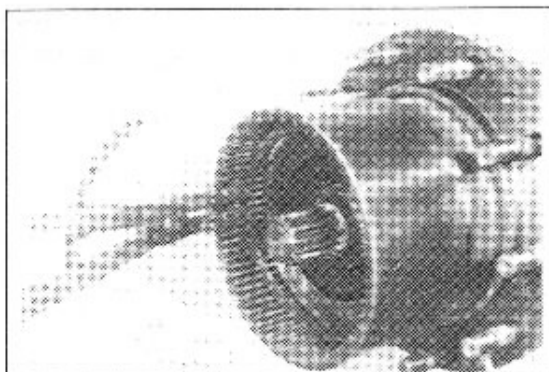
- ③⑬ Install alternating outer(1) and inner plates(2).
 ※ Pay attention the sequence of the corrugated outer discs, see figure.
 ※ If required, install thinner outer plates(s = 2.0mm) at the piston and backing plate side.



- ③④ Insert backing plate and fix it by means of circlip.

Clamping pliers

5870 900 011



- ③⑤ Install adapter piece(Use new O-ring) and screw in bleeder, see arrow.

Check brake hydraulic system for tightness(Figure ③⑤, below)

- ※ Bleed brake hydraulic system prior to start the test, and operate several times afterwards.

High pressure test

Pressurize brake with 120bar. After 5 minutes, the pressure drop may not exceed 2%(117bar).

Low pressure test

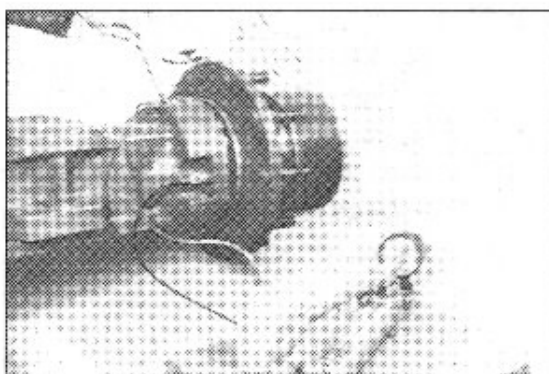
Pressurize brake with 5bar. After 5 minutes, there may be no visible pressure drop.

Test medium

Motor oils SAE 10W, corresponding to MIL-L 2104 C

ATF oils type A suffix A dexron II D.

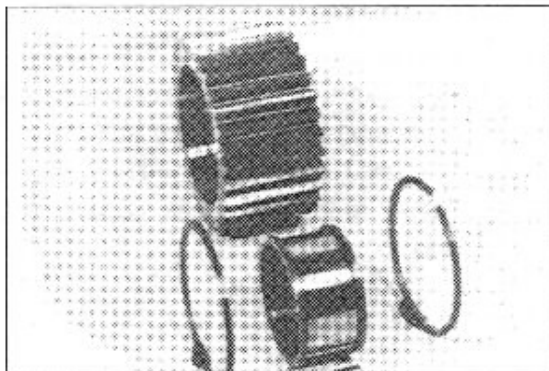
HP hand pump compl. 5870 287 007



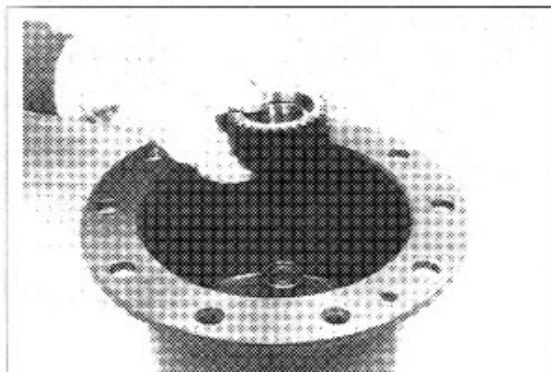
Planetary carrier

- ③⑥ Install components as illustrated on the adjacent figure.

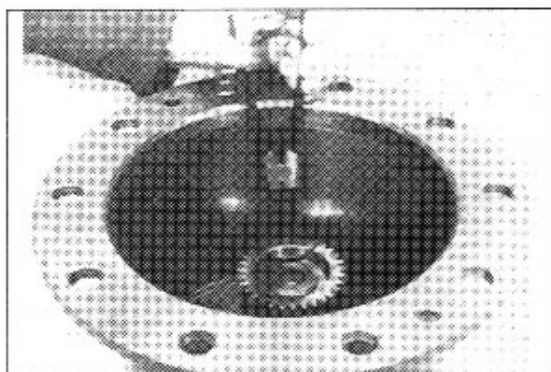
- ※ Cover cylindrical rollers with grease.
Broad stop face of L shaped rings is showing towards the bearing rollers.



- ③⑦ Heat bearing inner race and replace planetary gears firmly against shoulder.
 * Large radius of the bearing inner race is showing towards the planetary carrier (Towards below).

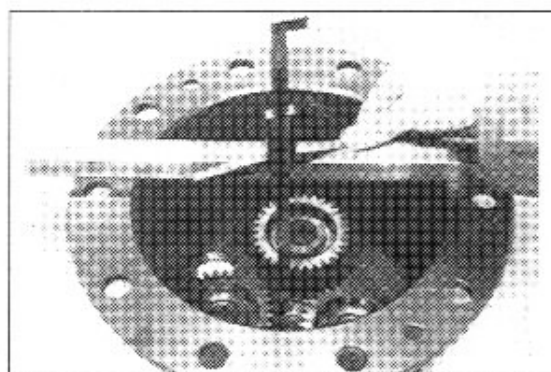


- ③⑧ Fix planetary gears by means of circlips.

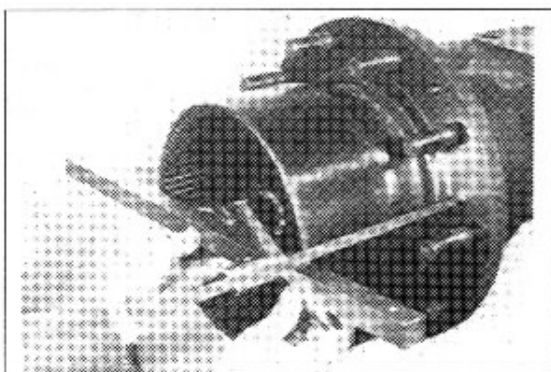


Adjust end play of the sun gear - half shaft 0.4 to 0.6mm

- ③⑨ Measure dimension **A** from the flange facing to the contact face of the thrust washer.
 • Dimension **A** e.g. 205.2mm



- ④⑩ Slide in sun gear, resp. inner plate carrier firmly against shoulder.
 Determine dimension **B** from the face/ sun gear shaft to the flange facing / hub.
 • Dimension **B** e.g. 202.5mm



Example

Dimension A 205.2mm

Dimension B - 202.5mm

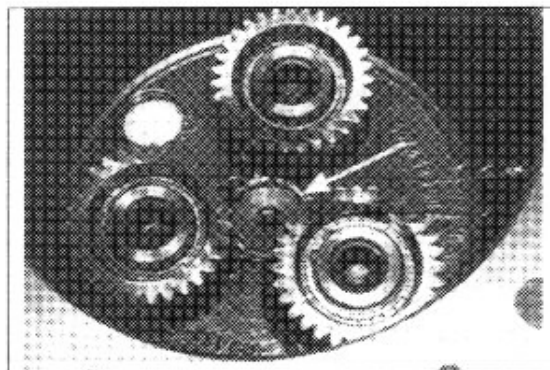
Difference 2.7mm

Required end play e.g. - 0.5mm

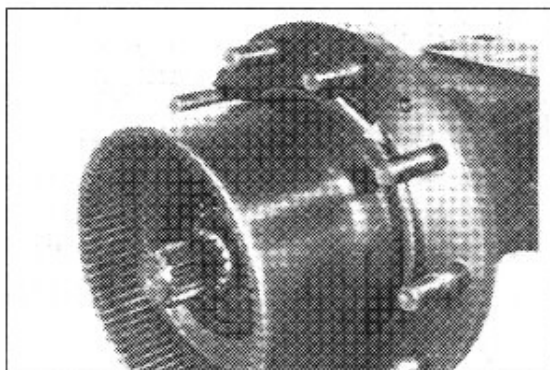
Difference =

Thickness of the thrust washer e.g. 2.2mm

- ⑪ Insert thrust washer(e.g. $s=2.2\text{mm}$) and fix it by means of snap ring, see arrow.



- ⑫ Insert O-ring into the annular groove of the hub, see arrow.



- ⑬ Assemble planetary carrier and fasten it by means of two socket head screws.

• Torque limit : $8.8\text{kgf} \cdot \text{m}$ ($63.4\text{lbf} \cdot \text{ft}$)

- ※ Pay attention to the lubrication instructions for at page 8-199, prior to put the axle into service.

