

GROUP 5 SWING DEVICE

1. REMOVAL AND INSTALL OF MOTOR

1) REMOVAL

- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

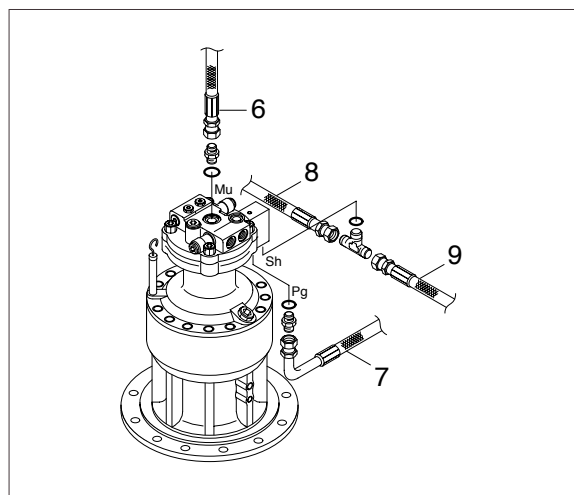
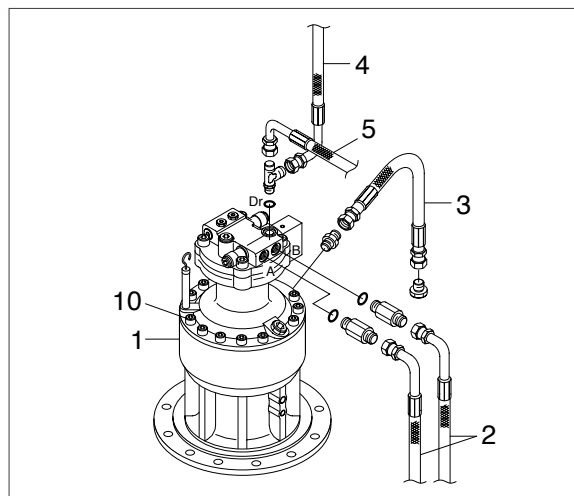
▲ Escaping fluid under pressure can penetrate the skin causing serious injury. When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

- (4) Disconnect hose assembly(2, 3).
- (5) Disconnect pilot line hoses(4, 5, 6, 7, 8, 9).
- (6) Sling the swing motor assembly(1) and remove the swing motor mounting bolts (10).
 - Motor device weight : 68kg(150lb)
 - Tightening torque : 10.5kgf · ft(76lbf · ft)

- (7) Remove the swing motor assembly.
When removing the swing motor assembly, check that all the piping have been disconnected.

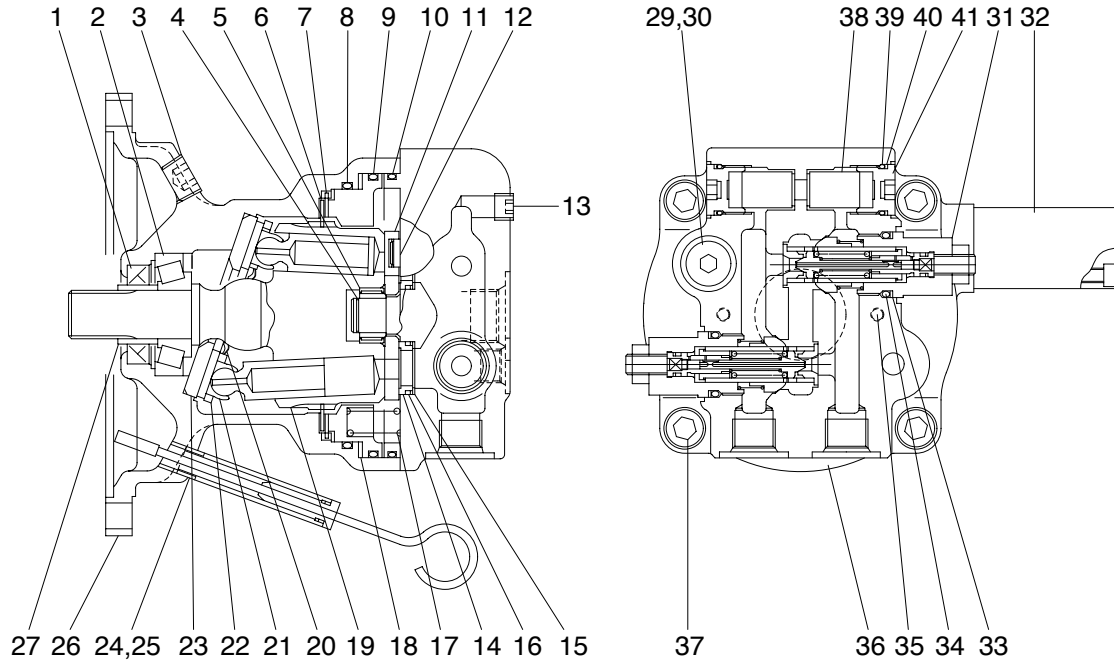
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Bleed the air from the swing motor.
Remove the air vent plug.
Pour in hydraulic oil until it overflows from the port.
Tighten plug lightly.
Start the engine, run at low idling and check oil come out from plug.
Tighten plug fully.
- (3) Confirm the hydraulic oil level and check the hydraulic oil leak or not.



2. DISASSEMBLY AND ASSEMBLY OF SWING MOTOR

1) STRUCTURE



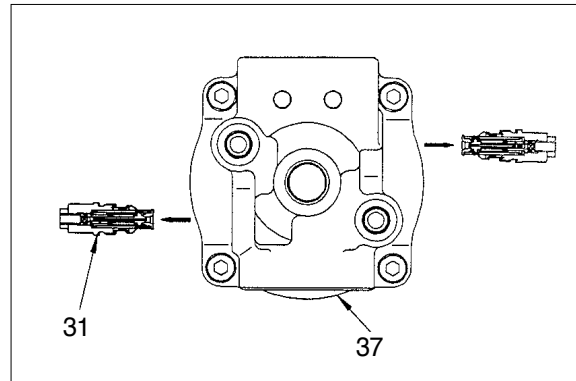
1	Taper roller bearing	15	Scrowave	29	Cap
2	Plug	16	Tefron ring	30	O-ring
3	Snap ring	17	Spring	31	Relief valve assembly
4	Needle bearing	18	Piston	32	Time delay valve
5	Lining plate	19	Cylinder	33	Back up ring
6	Plate	20	Backing spring	34	O-ring
7	O-ring	21	Piston assembly	35	Parallel pin
8	O-ring	22	Return plate	36	Socket bolt
9	O-ring	23	Cam plate	37	Cover
10	Balance plate	24	Level gauge assy	38	Plug
11	Piston	25	O-ring	39	O-ring
12	Tefron ring	26	Housing	40	Back up ring
13	Plug	27	Collar	41	Cap
14	Bushing	28	Oil seal		

2) DISASSEMBLY

(1) Removal of the relief valve assembly and time delay valve

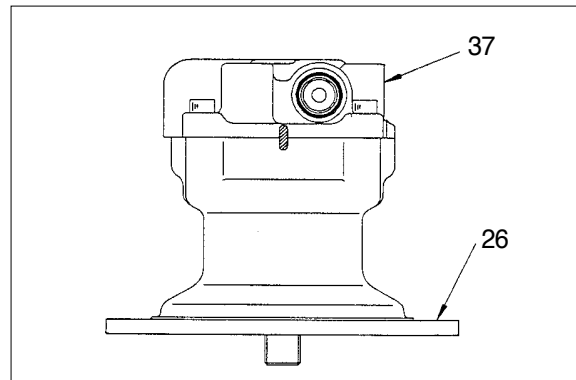
Remove the relief valve assembly(31) with 27mm wrench.

Assemble removed relife valve assembly (31) to original state when reassembling. Loosen hexagon socket bolt with 5mm hexagon wrench and remove time delay valve(32).



(2) Marking at swing motor

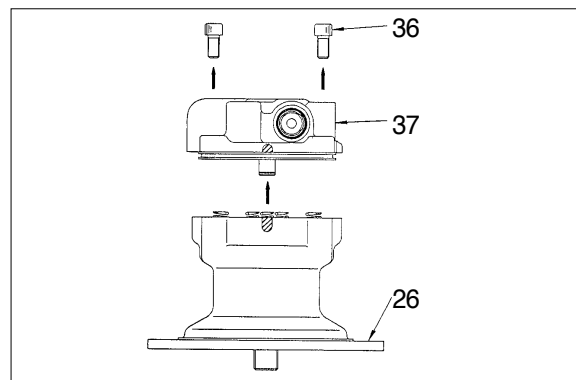
Before disassembling motor, make a matching mark between cover(37) and housing(26). This precaution will assist in reassembly.



(3) Removal of cover assembly

Loosne hexagon socket bolt(36) with 10mm hexagon wrench.

Place shaft of motor assembly to downward and take cover(37) out.

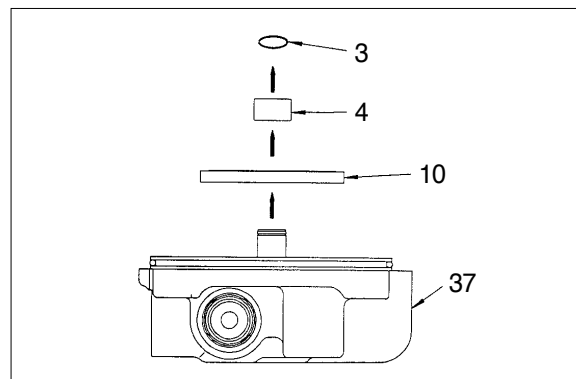


(4) Remove balance plate

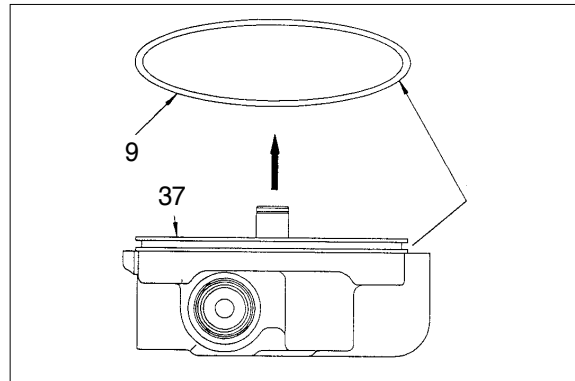
Remove snap ring(3) with steel pointer and remove inner race of needle bearing (4) and balance plate(10) by bearing puller.

Work carefully to avoid damaging the sliding face of the balance plate.

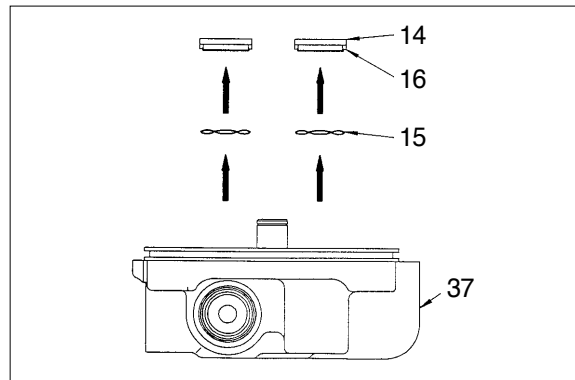
Before removing, check and record location of balance plate(10) to prevent misassembling.



(5) Remove O-ring(9) from cover(37).

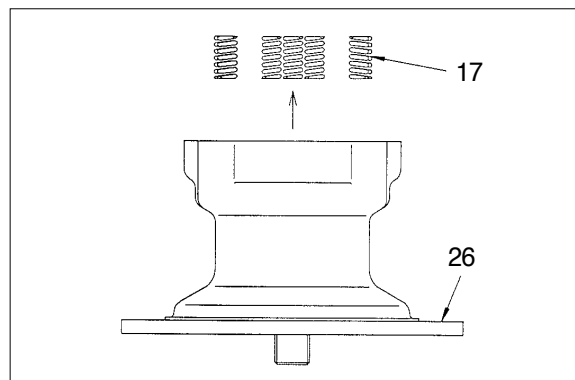


(6) Remove bushing(14) with teflon ring(16) and spring(15).



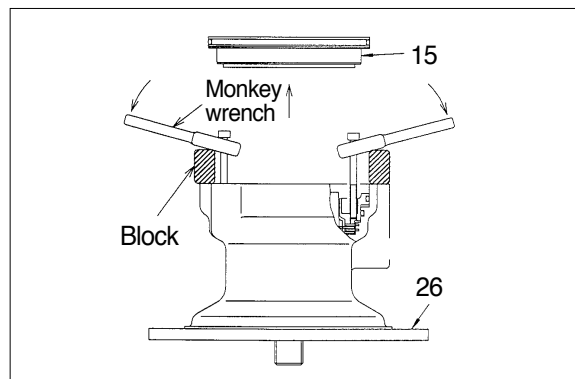
(7) Removal of spring(17, break area)

Remove spring(17) from piston(18).
Check and record original position of each
spring(17) for correct assembling.



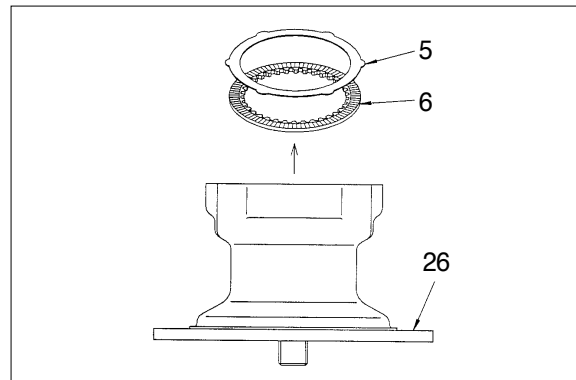
(8) Removal of brake piston

When removing piston(18) from
housing(26), there is a sliding resistance
against tightening of O-rings(7, 8).
Use tap holes(M6) on piston(18) to take
them out, as shown in the diagram.



(9) Remove O-rings(7, 8) from housing(26) and piston(18).

(10) Remove friction plate(6) and lining plate (5) from housing(26).



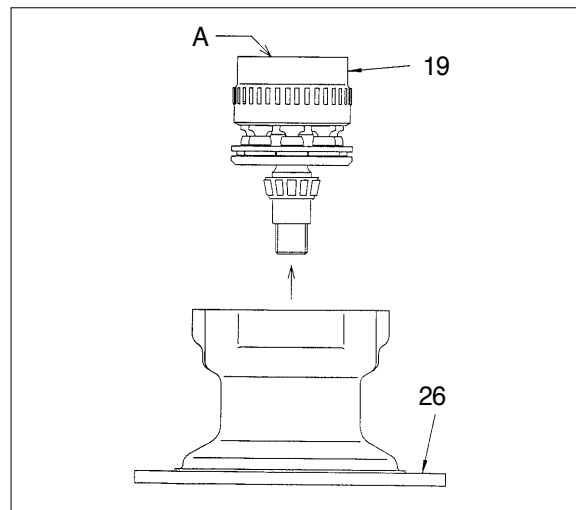
(11) **Removal of cylinder assembly**

Holding end of cylinder assembly(19) with hand, draw out cylinder assembly from housing.

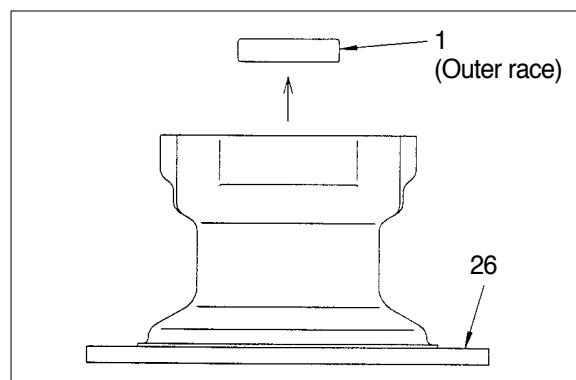
Oil seal(28) and outer race of taper roller bearing(1) are left inside of housing.

End surface A of cylinder(19) is sliding face. So, protect the surface with a soft cloth against damage.

Make a matching mark on piston hole of cylinder(19) and piston assembly(21) to fit piston into the same hole when reassembling.

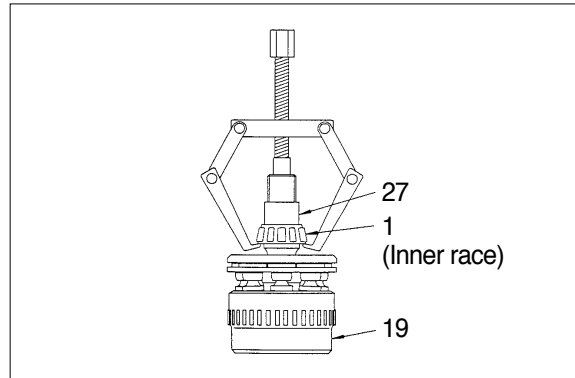


(12) Separate outer race of taper roller bearing (1) from housing.

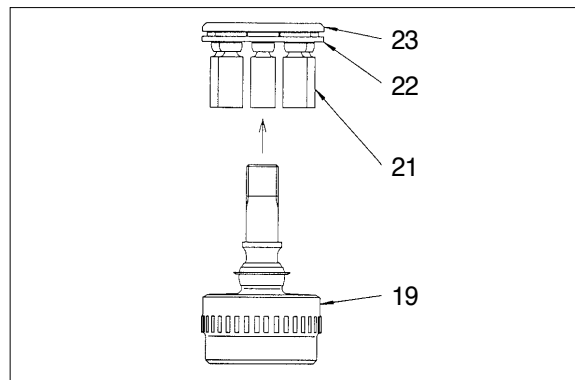


- (13) Remove oil seal(28) from housing(26) with driver and hammer.
Do not reuse oil seal after removal.

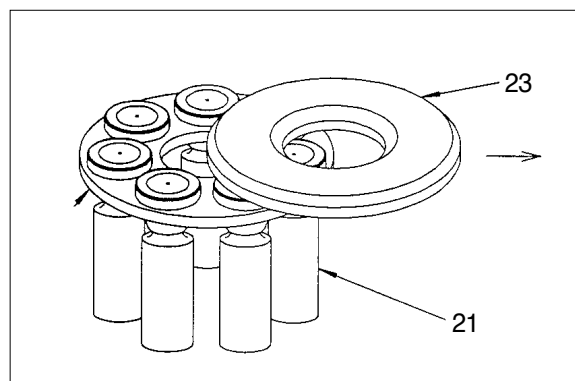
- (14) Disassembly of the cylinder assembly**
Removal of inner race of taper roller bearing(1).
Lift out cylinder(19) with 2 inner race of roller bearing(1) by applying gear puller at the end of spline in the cylinder.



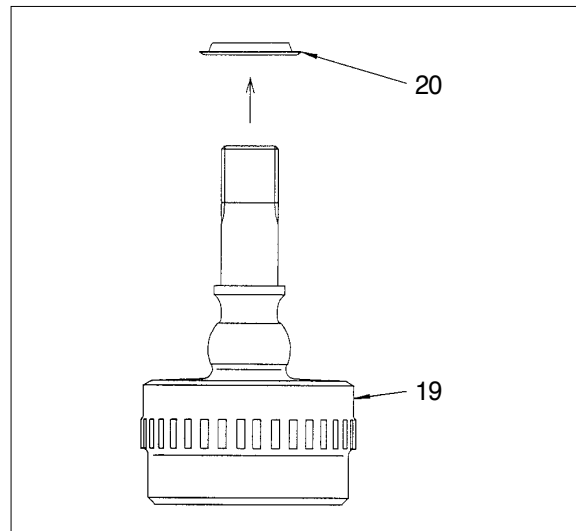
- Separate cam plate(23), piston assembly(21), return plate(22) from cylinder(19).



- Get cam plate(23) slide on sliding face of piston assembly(21) and remove it.
Work carefully to avoid damaging the sliding face of the cam plate.



Remove backing spring(20) from cylinder (19).



This completes disassembly.

3) ASSEMBLY

(1) Preparation

Before reassembling, perform below procedure.

Check each part for damage caused by using or disassembling. If damaged, remove scratches by rubbing with **Wet and dry** sandpaper of appropriate coarseness.

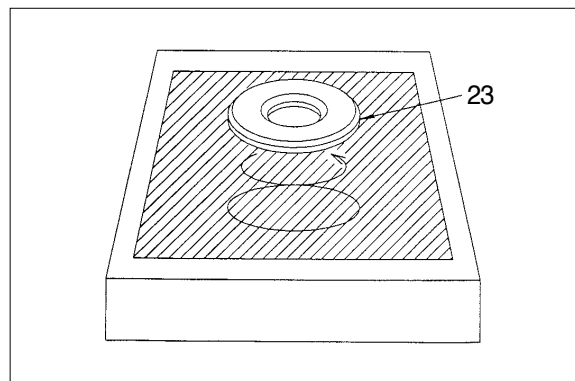
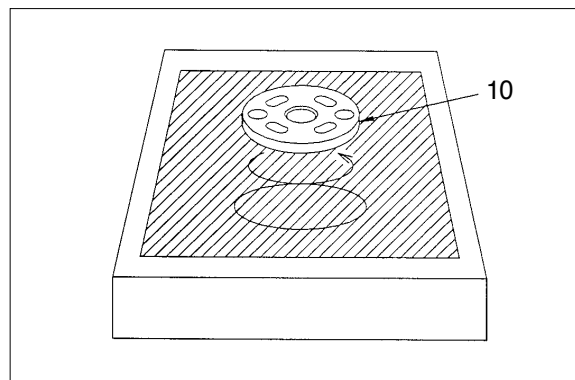
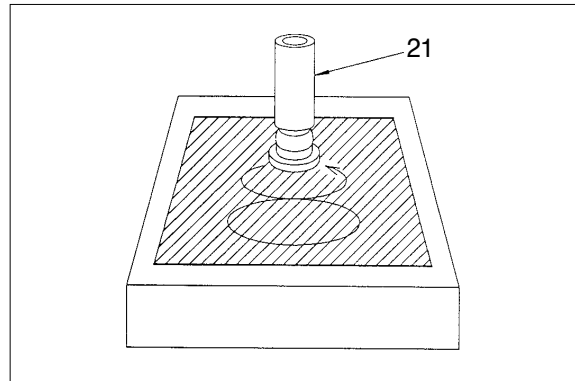
Clean each part with clean washing oil and dry with an air jet.

Replace all seals.

Paper lap the sliding face of piston assembly(21), balance plate(10) and cam plate(23) with sandpaper #2000 on a true flat surface.

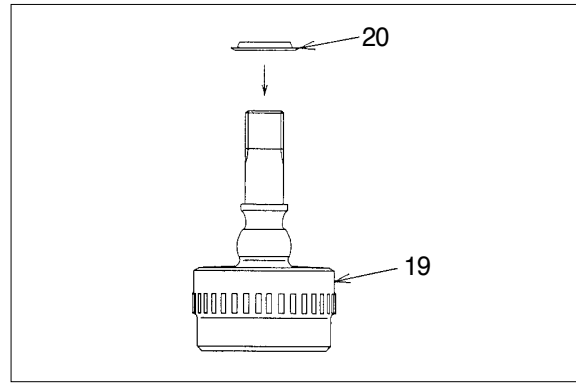
When assembling, lubricate the sliding parts with specified clean hydraulic oil.

When assembling piston assembly(21) to piston hole of cylinder(19), make sure to fit each one back into the hole it occupied before disassembly.

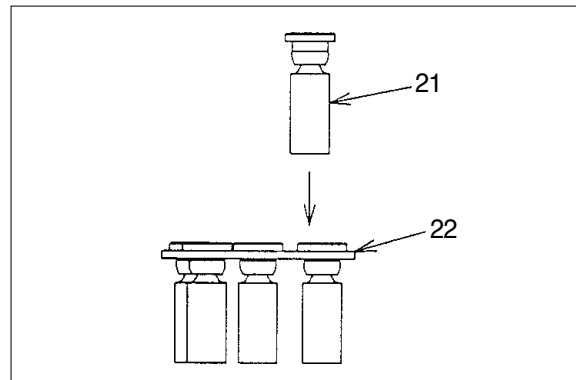


(2) Assembly of cylinder assembly

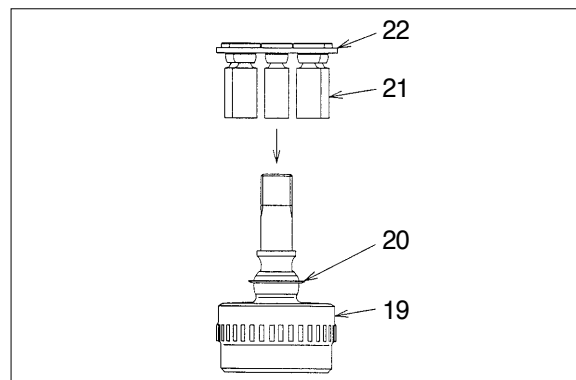
Lubricate grease on round area (Contacting area with spring(20)) of cylinder(19) and assemble spring(20).



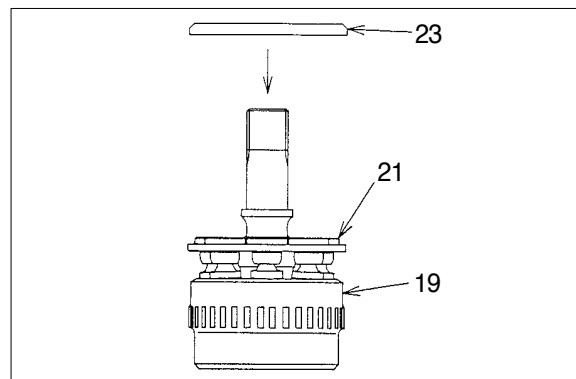
Insert piston assembly(21) in hole of return plate(22).



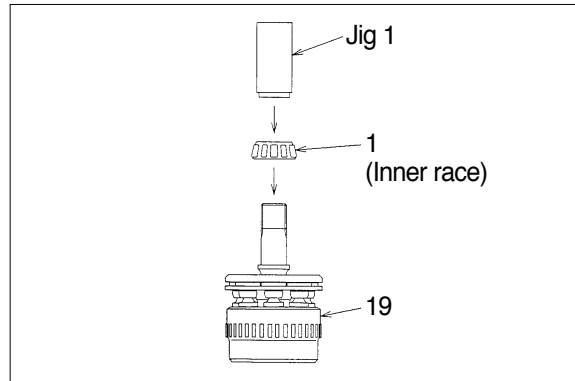
Assemble piston assembly(21) and return plate(22) to cylinder(19).
When assembling, check matching mark between them. Before assembling.
Before assembling, lubricate specified hydraulic oil inside of each piston hole of cylinder(19).



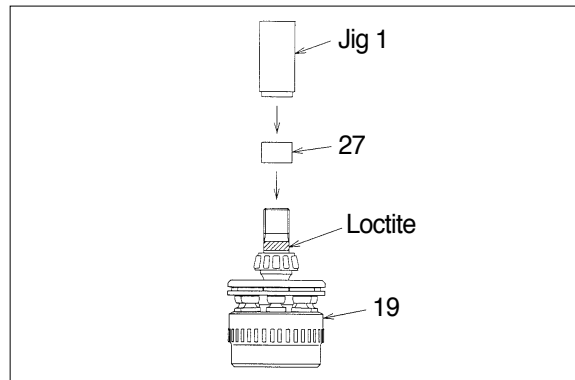
Lubricate specified hydraulic oil on shoe sliding face of piston assembly(21) and assemble cam plate(23).



Assemble inner race of taper roller bearing(1) to cylinder(19).
 End surface of cylinder(19) is sliding face. So, protect the surface with a soft cloth against damage.

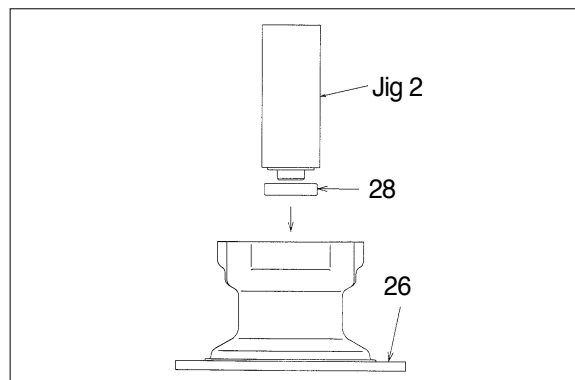


Apply loctite(515 or 518) to bearing mounting area of inner race of cylinder (19) lightly.
 Assemble inner race(27) to cylinder(19).

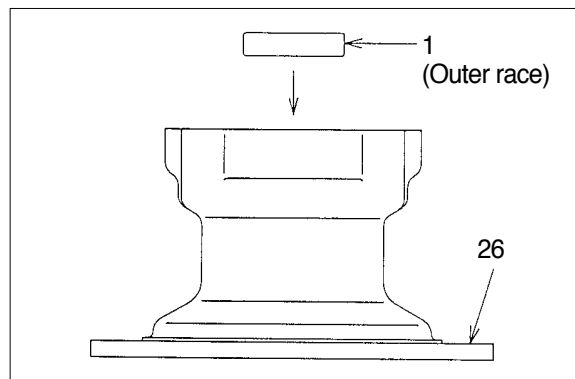


(3) Assembly of oil seal

Apply three bond(kk 1211) of white color on outer surface of oil seal(28) and use the seal press insertion jig to press it into place.



(4) Assemble outer race of taper roller bearing(1) into the housing(26).



(5) Assembly of cylinder assembly

Hold end of cylinder assembly(19) with hands and assemble cylinder assembly to housing(26).

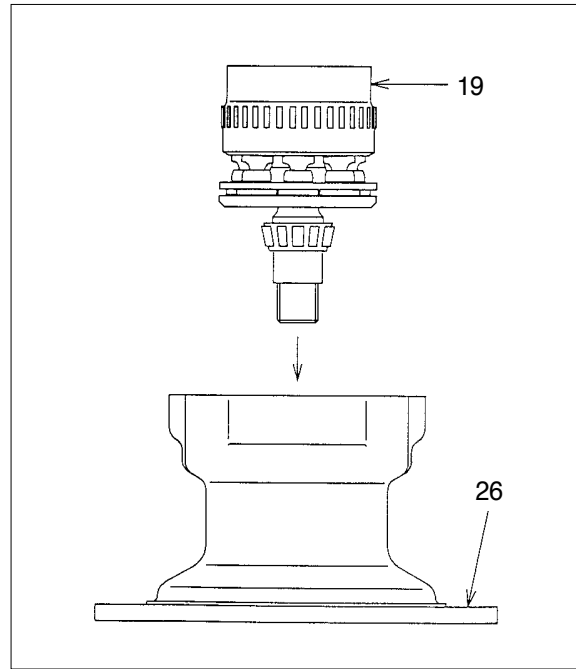
Lubricate oil seal with grease.

Be careful to prevent damage of seal by spline of shaft.

When assemble cylinder assembly, splined shaft of the cylinder is protruded from the end of housing, therefore put pads with length 30~50mm under bottom of housing.

Check that backing spring(20) is held in place by the probe part of the return plate (22).

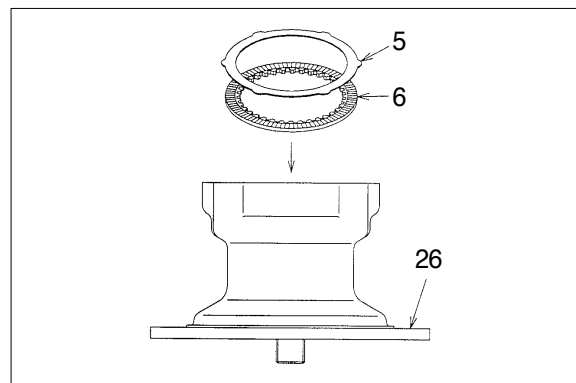
Check that end surface of cylinder is about 7.5mm lower than top of housing.



(6) Assemble friction plate(6) and lining plate (5).

Apply hydraulic oil to each side.

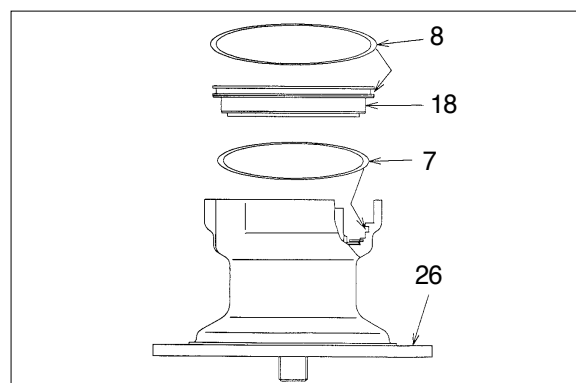
Take care to fit the plates in the correct sequence.



(7) Insert O-ring(7) into housing(26).

Insert O-ring(8) into piston(18).

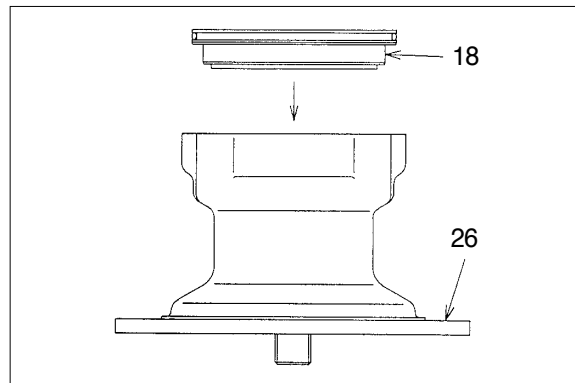
Lubricate O-ring with grease.



(8) Assembly of brake piston

Lubricate specified hydraulic oil on outer sliding face of piston(18) and assemble brake piston to housing(26).

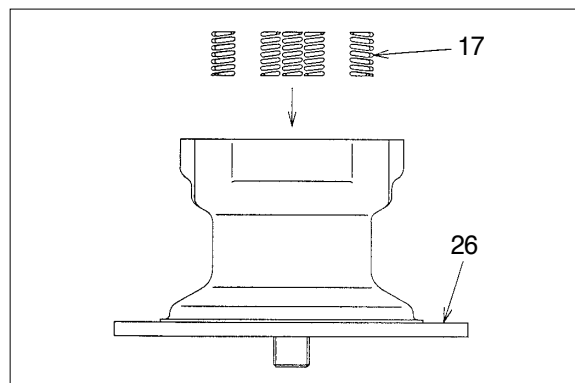
It is too tight to assemble piston(18) because O-rings(7, 8) are fitted, therefore it is recommended to push piston(18) horizontally by hands at once.



(9) Assembly of spring(17, brake unit)

Assemble spring(17) to piston(18) of brake unit.

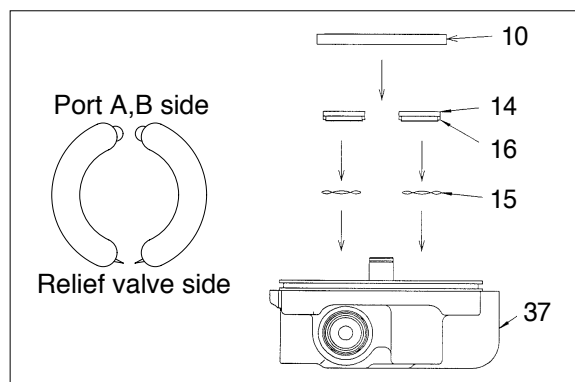
Insert spring(17) into original position.



(10) Assemble spring(15) and bushing(14) with teflon ring(16) to bushing hole of cover(37).

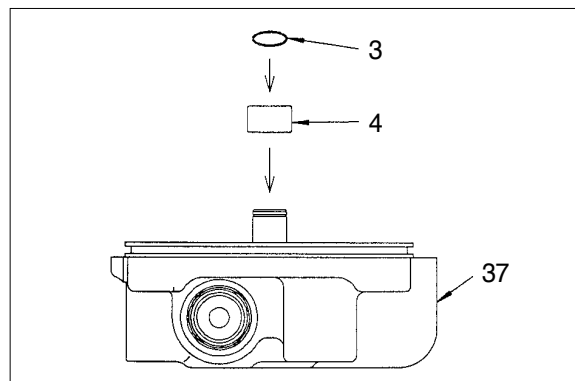
Assemble balance plate(10) to cover(37).

Be cautions of assembling direction of balance plate.

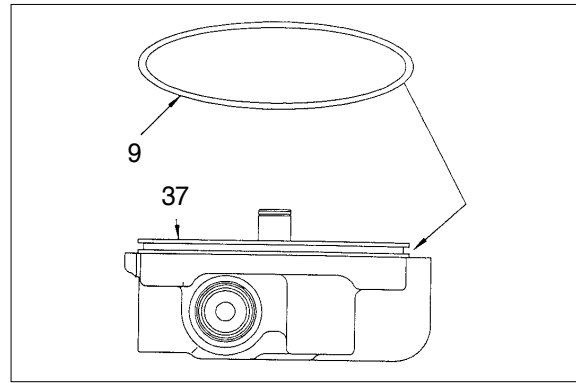


(11) Assembly of inner race of needle bearing

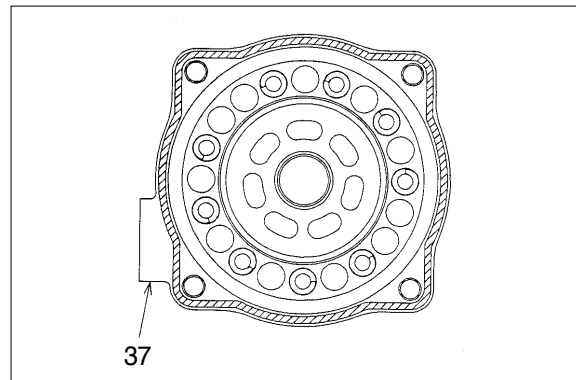
Assemble inner race of needle bearing(4) and snap ring(3) to cover(37).



- (12) Assemble O-ring(9) to cover(37).
Lubricate O-ring with grease.

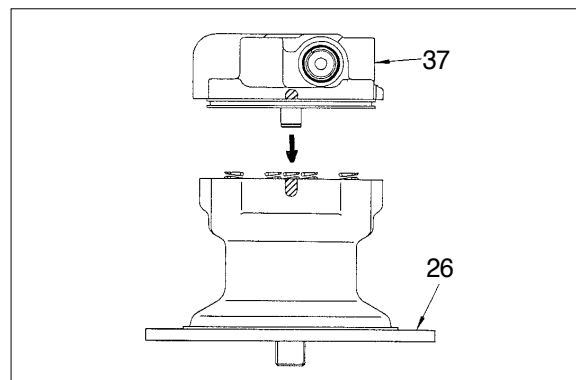


- (13) Apply fluid packing(Three bond kk1211) of white color as shown in the figure.

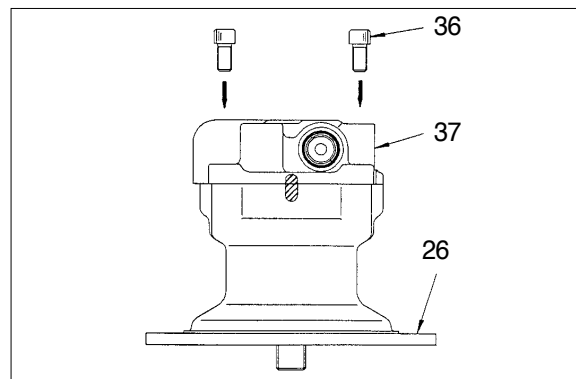


(14) Assembly of cover

- Assemble cover(37) and balance plate (10) to housing(26) lightly, holding them up with hands.
Fit matching marks on housing(26) and cover(37) made before disassembling.



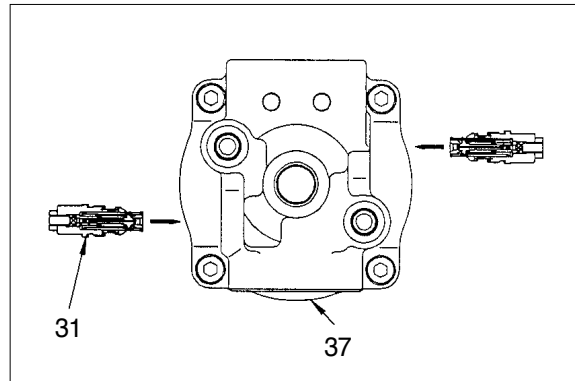
- (15) Tighten cover(37) and housing(26) with 10mm hexagonal socket bolt(36).
· Tightening torque : 10.5kgf · m(80.0lbf · ft)



(16) Assembly of relief assembly

Assemble relief valve assembly(31) to cover(37) with 27mm hexagon bolt.

- Tightening torque : 4kgf · m(30.0lbf · ft)



(17) Check of assembly

Load pilot pressure of 30kgf/cm² to brake release port after opening inlet and outlet port.

Check if output shaft is rotated smoothly around torque of 2~3kgf · m.

If not rotated, disassemble and check.

At this time, open the drain port.

This completes assembly.

Check the relief valves setting to the regulation pressure.

3. REMOVAL AND INSTALL OF REDUCTION GEAR

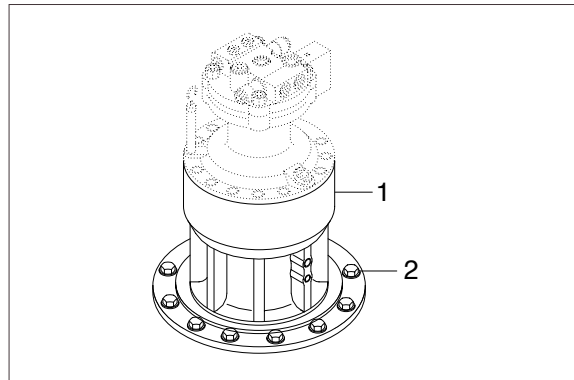
1) REMOVAL

- (1) Remove the swing motor assembly.
For details, see **removal of swing motor assembly**.
- (2) Slide reduction gear assembly(1) and remove mounting bolts(2).
- (3) Remove the reduction gear assembly.
 - Motor device weight : 68kg(150lb)
 - Tightening torque : $29.7 \pm 3.2\text{kgf} \cdot \text{m}$
($215 \pm 23\text{lb} \cdot \text{ft}$)



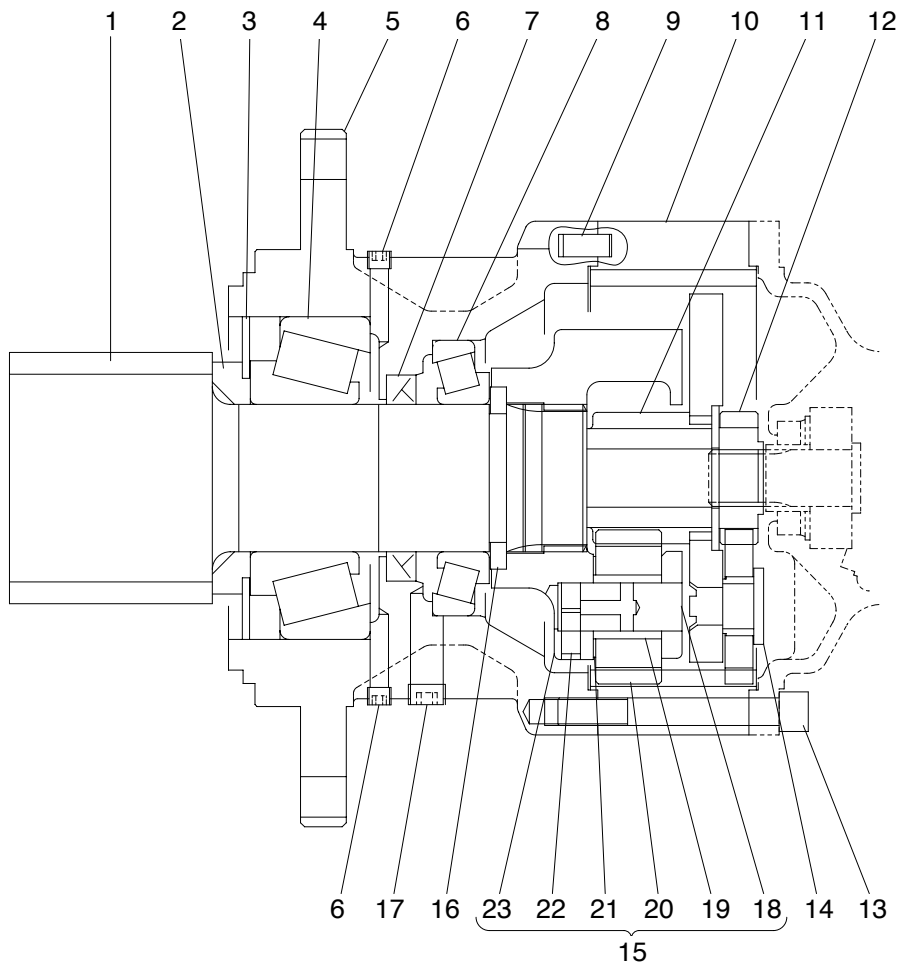
2) INSTALL

- (1) Carry out installation in the reverse order to removal.



4. DISASSEMBLY AND ASSEMBLY OF REDUCTION GEAR

1) STRUCTURE



1	Pinion shaft	9	Pin	17	Plug
2	Collar	10	Ring gear	18	Shaft 2
3	Plate	11	Spur gear 4	19	Bushing
4	Roller bearing	12	Sun gear	20	Planetary gear 5
5	Gear casing	13	Holder assembly 1	21	Thrust plate
6	Plug	14	Hexagon socket bolt	22	Spring pin
7	Oil seal	15	Holder assembly 2	23	Holder 2
8	Roller bearing	16	Collar		

2) DISASSEMBLY

(1) Removal of sun gear and 1st holder assembly

Remove sun gear(12) and holder assembly1(13) itself.

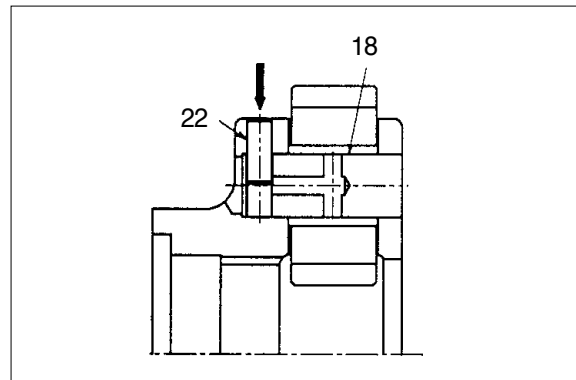
(2) Removal of spur gear 4 and 2nd holder assembly

Remove super gear 4(11) and holder assembly 2(15) itself.

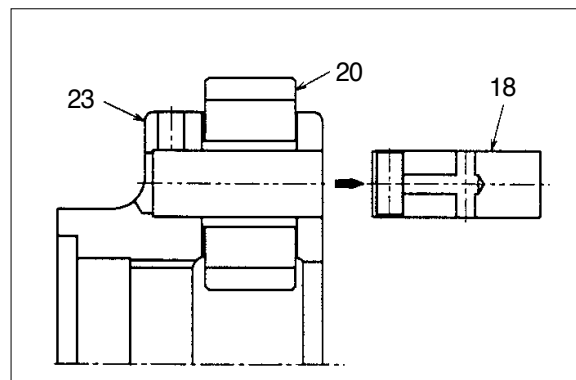
(3) Disassembly of 2nd holder assembly

Insert spring pin(22) into shaft 2(18) by hammering.

Do not reuse spring pin after removal.



Remove shaft 2(18) from holder 2(23) planetary gear 5(20) with hands.



(4) Removal of ring gear

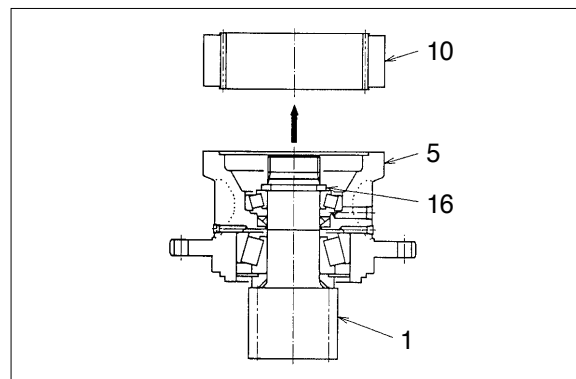
Remove ring gear(10) from gear casing (5).

Fluid packing is applied on contacting face of ring gear(10) and gear casing(5).

Therefore, remove ring gear(10) through tap hole of gear casing(5) with (-) driver.

(5) Removal of collar

Remove collar(16) from shaft(1) with (-) driver.

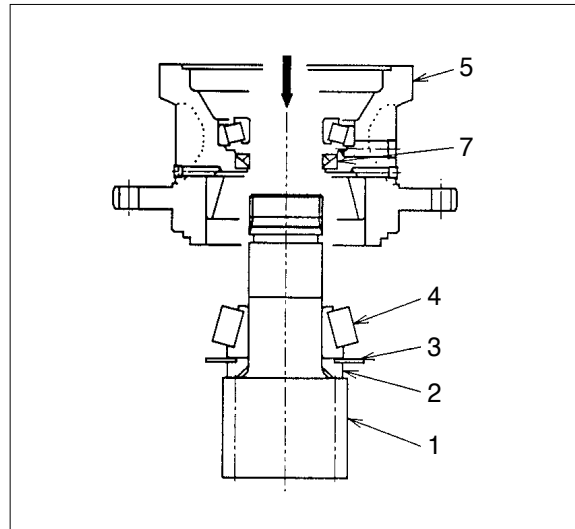


(6) Removal of pinion shaft assembly

Press end face of pinion shaft with hydraulic press to gain space (Approx. 300mm) needed for removing pinion shaft (1) at flange part of gear casing (5) and remove pinion shaft (1), collar (2), plate (3), roller bearing (4) as assembly.

Do not reuse oil seal (7).

Do not disassemble and more if bearing etc. is not damaged.



3) ASSEMBLY

(1) Preparation

Before reassembling, perform below procedure.

Check each part for damage caused by using or disassembling. If damaged, remove scratches by rubbing with **Wet and dry** sandpaper of appropriate coarseness. Clean each part with clean washing oil and dry with an air jet.

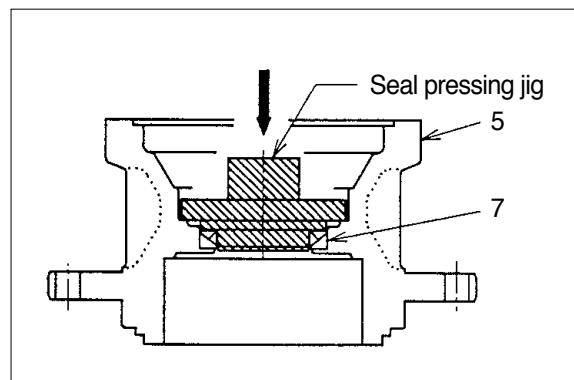
Replace all seals.

(2) Lubricate on outer face of tapered roller bearing(4) with grease.

(3) Installation oil seal

Remove oil from assembled face of oil seal of gear casing(5) and oil seal(7).

Apply fluid packing(Three bond kk1211 of white color) on outer face of oil seal(7) and assemble at pressing jig of gear casing(5). After inserting with press, lubricate on oil seal lip with grease.



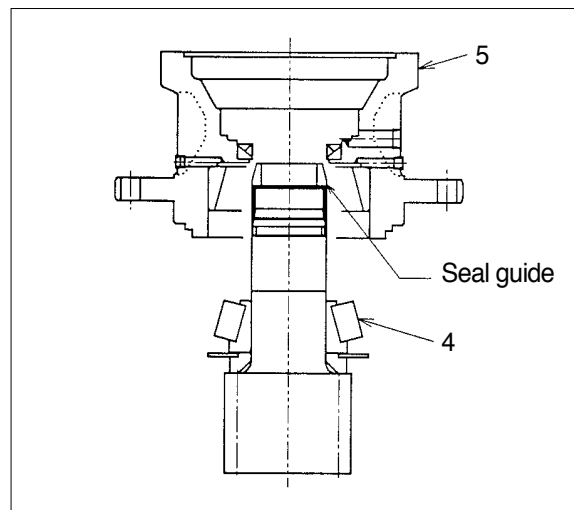
(4) Assembly of pinion shaft assembly

Place pinion shaft assembly(1) with pinion downward.

Assemble outer race of tapered roller bearing(4) to gear casing(5). Hoist them and assemble to pinion shaft assembly(1).

Lubricate on outer race of tapered roller bearing(4) with grease.(Because not to fall it when hoist and assembly gear case).

Use the seal guide to ensure that the splined end of the pinion shaft(1) does not damage the lip of oil seal(7).

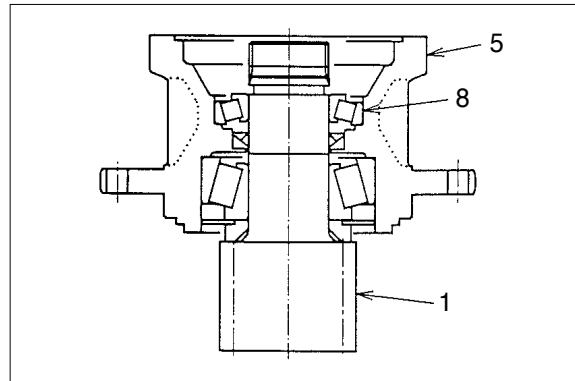


(5) Assembly of tapered roller bearing

Put gear casing(5) with output shaft downward.

Heat tapered roller bearing(8) to 50°C and assemble to shaft.

Do not heat bearing more than 100°C.



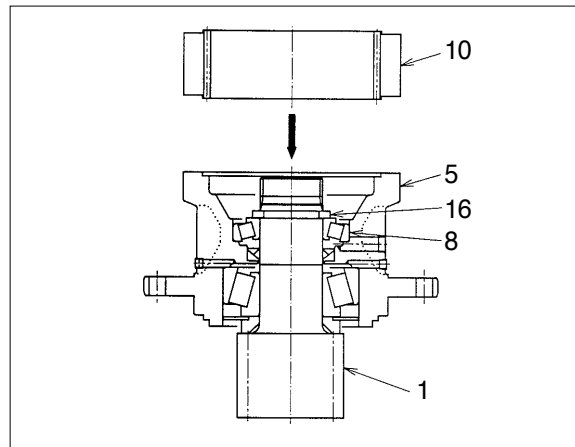
(6) Assembly of collar

Thickness of collar(16) is adjusted to that clearance between collar(16) and groove of shaft is $\pm 0.06\text{mm}$.

(7) Assembly of ring gear

Remove oil from mating faces between gear casing(5) and ring gear(10) and from pin(9). Assemble pin to gear casing(5) and apply fluid packing(Three bond kk1215 of gray color).

Assemble ring gear(10).



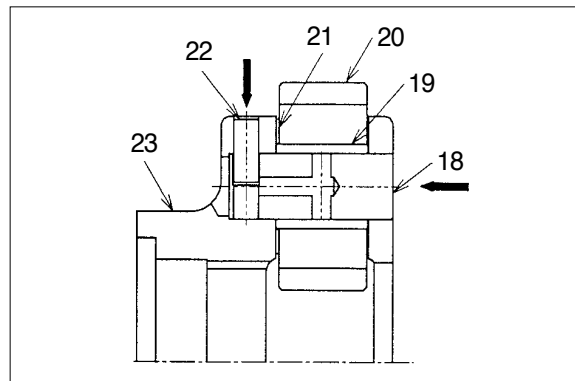
(8) Assembly of holder assembly

Fit the bushing(19) into planetary gear(20) and insert them together with their thrust plates(21) into the holder 2(23) then insert the shaft 2(18).

Lubricate gear oil to inside of planetary gear(20), the inside and outside of the bush and the outside of the shaft.

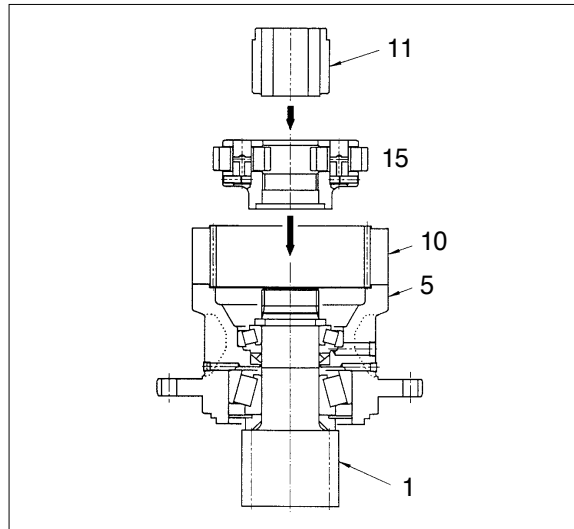
Tap the spring pin(22) in.

Tap the spring pin in with its split facing the planetary gear side.



(9) Assembly of 2nd holder assembly and spur gear 4

Insert holder assembly bearing engage with internal teeth of ring gear(10). Rotate holder assembly lightly so that splines of pinion shaft(1) are engaged. Insert spur gear 4(11) to planetary gear 5 (20).



(10) Assembly of sun gear and 1st holder assembly

Insert holder assembly being engaged with internal teeth of ring gear(10). Rotate holder assembly lightly so that spur gear 4(11) is engaged with teeth of holder assembly 1(13). Insert sun gear(12).

(11) Check rotation of sun gear by turning 1st holder assembly(13) with hands.

This completes assembly.

