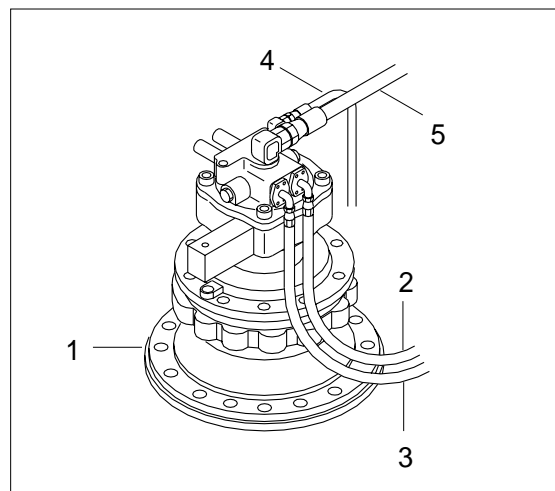


GROUP 5 SWING DEVICE

1. REMOVAL AND INSTALL OF MOTOR

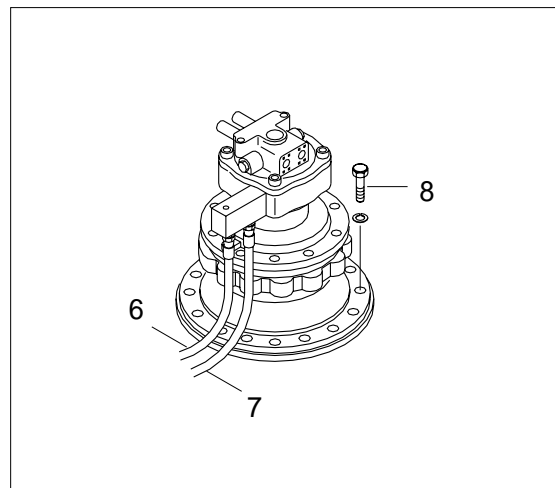
1) REMOVAL

- (1) Lower the work equipment to the ground and stop the engine.
- (2) 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.
- (3) Disconnect hoses(2, 3, 4, 5, 6, 7)
- (4) Sling the swing motor assembly(1) and remove the swing motor mounting bolts(8)
 - Motor device weight : 360kg(794lb)
 - Tightening torque : 97.8kgf · m (707.4lbf · ft)
- (5) Remove the swing motor assembly.
 - ※ When removing the swing motor assembly, check that all the piping have been disconnected.



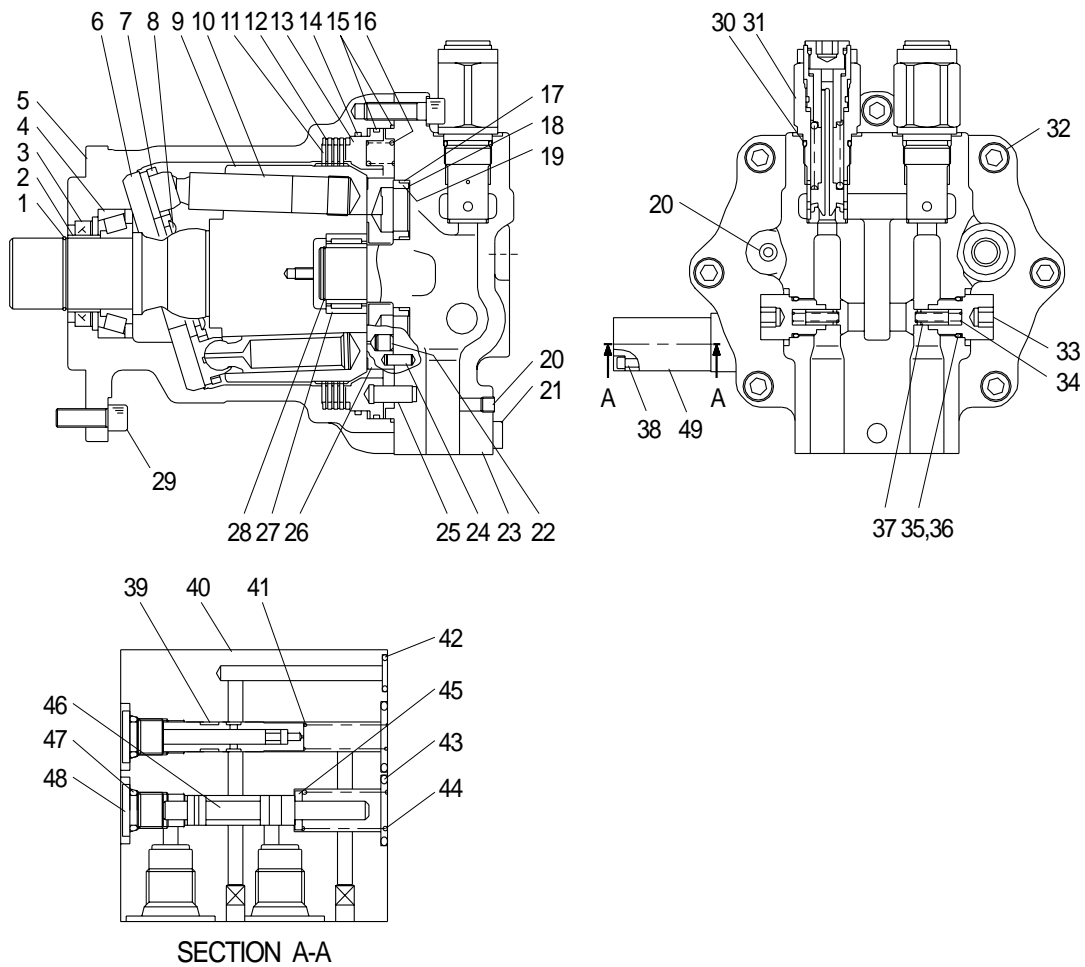
2) INSTALL

- (1) Carry out installation in the reverse order to removal
- (2) Bleed the air from the swing motor.
 - ① Remove the air vent plug.
 - ② Pour in hydraulic oil until it over flows from the port.
 - ③ Tighten plug lightly.
 - ④ Start the engine, run at low idling, and check oil come out from plug.
 - ⑤ Tighten plug fully.
- (3) Confirmed the hydraulic oil level and check the hydraulic oil leak or not.



2. SWING MOTOR

1) STRUCTURE



1	Snap ring	18	Dish spring	35	O-ring
2	Inner race	19	Bushing	36	Back up ring
3	Oil seal	20	Plug	37	Check
4	Roller bearing	21	Socket bolt	38	Socket bolt
5	Housing	22	Piston	39	Poppet assembly
6	Cam plate	23	Cover	40	Manifold
7	Return plate	24	Parallel pin	41	Spring
8	Spring	25	Parallel pin	42	O-ring
9	Cylinder assembly	26	Balance plate	43	O-ring
10	Piston assembly	27	Needle bearing	44	Spring
11	Friction plate	28	Snap ring	45	Spacer
12	Separate plate	29	Socket bolt	46	Spool
13	Piston	30	O-ring	47	O-ring
14	O-ring	31	Relief assembly	48	Cap
15	O-ring	32	Socket bolt	49	Time delay valve
16	Spring	33	Cap		
17	Teflon ring	34	Spring		

2) DISASSEMBLY

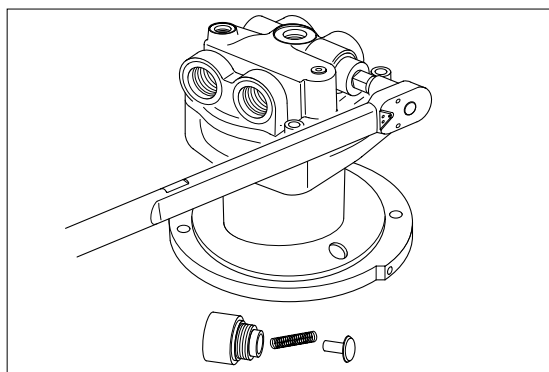
(1) Removal of relief valve assembly

Remove cap of relief valve assembly(31) with 46mm hexagonal wrench.

※ Assemble removed relief valve assembly (31) to original state when reassembling.

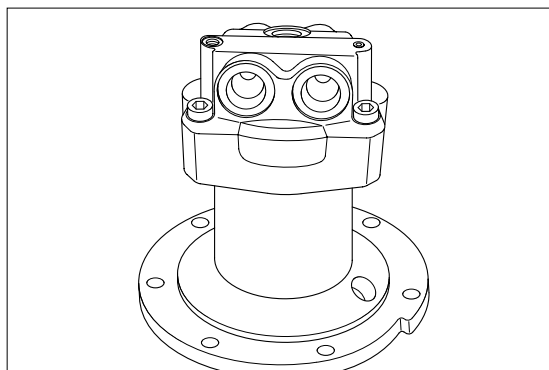
(2) Removal of make up valve

Loosen cap(33) with 14mm hexagonal wrench, and remove check valve(37) and spring(34).



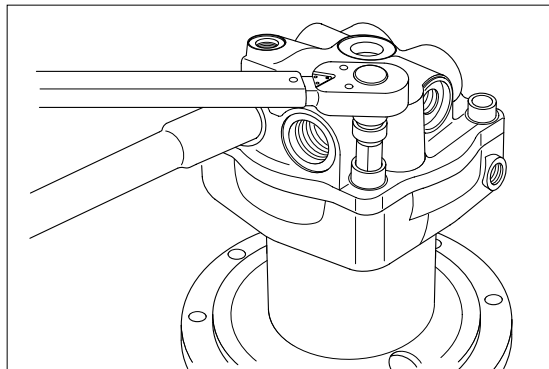
(3) Marking at swing motor

Before disassembling motor, make a matching mark between swing motor and reduction gear for reassembling.



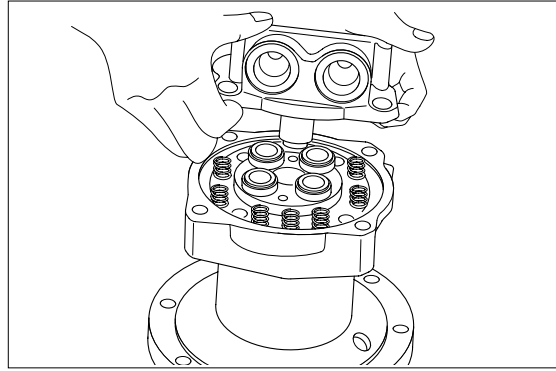
(4) Remove mounting bolts of cover

Loosen cover(23) and housing(5) with 12mm hexagonal wrench, and remove them.

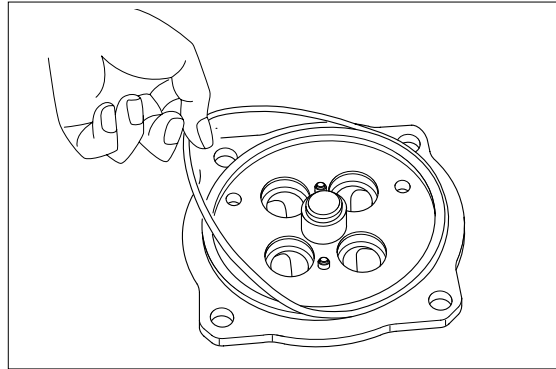


(5) Removal of cover assembly

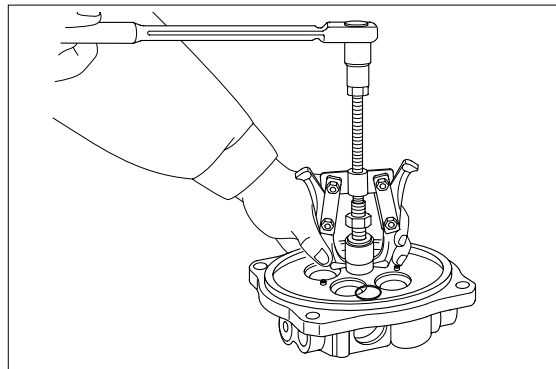
Place shaft of motor assembly to downward and take cover(23) out.



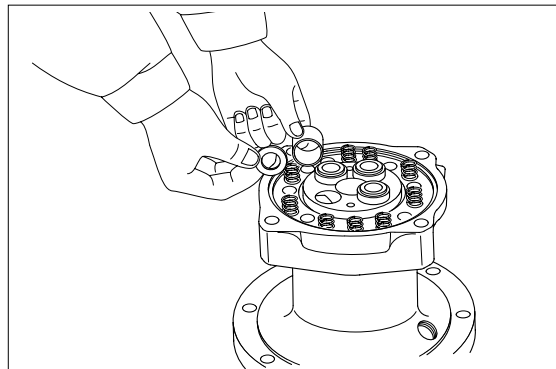
(6) Remove O-ring(15) from cover.



(7) Remove snap ring(28) with steel pointer and remove inner race of needle-bearing(27) by bearing puller.



(8) Remove bushing(19) and dish spring(18) from teflon ring(17).

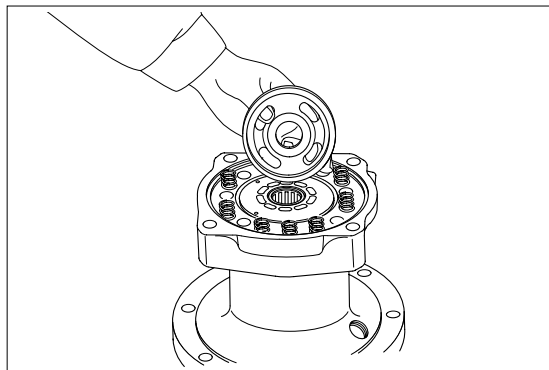


(9) Remove balance plate

Balance plate(26) is adhered on end surface of cylinder assembly(9) by oil viscosity. Take off balance plate(26) with hands. Assembling method of balance plate(26) depends on cover(33).

(Band groove and round groove of high · low pressure transmission area)

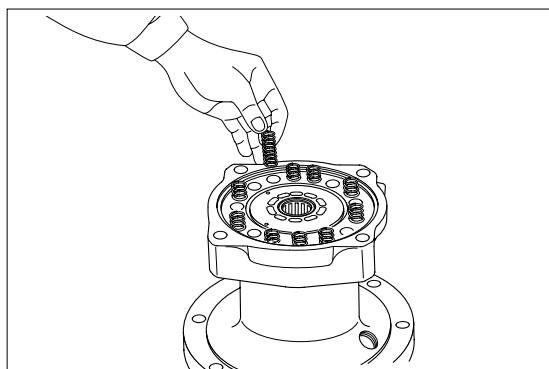
Before removing, check and record location of balance plate(26) to prevent disassembling.



(10) Removal of spring(16, break area)

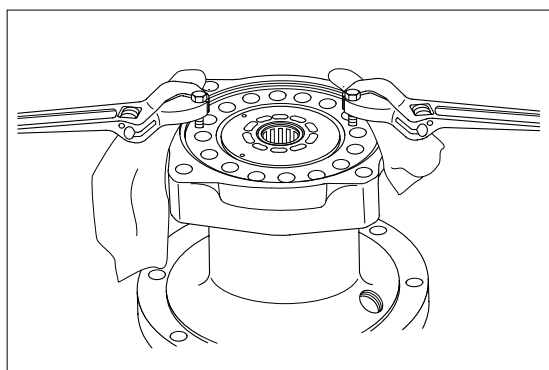
Remove spring(16) from piston(13).

Check and record original position of each spring(16) for correct assembling.

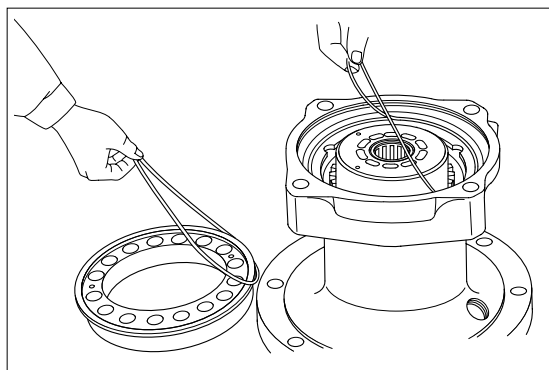


(11) Removal of brake piston

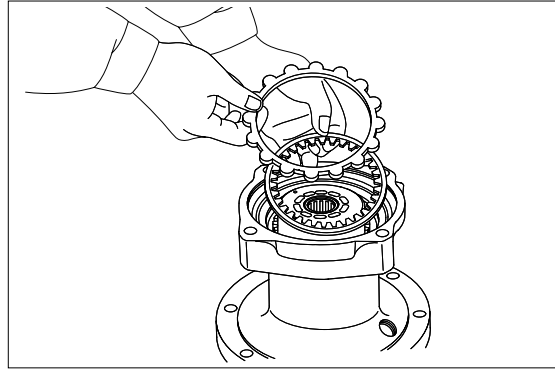
When removing piston(13) from housing (5), there is a sliding resistance against tightening of O-rings(14,15). Use tap hole(M6) on piston(13) as shown in the picture.



(12) Remove O-rings(14,15) from piston(13) and piston housing(5).



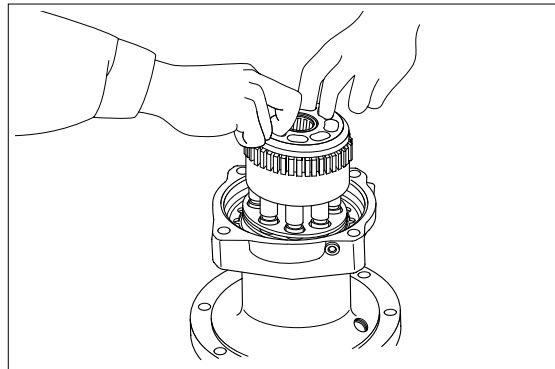
- (13) Remove friction plate(11) and mating plate(12).



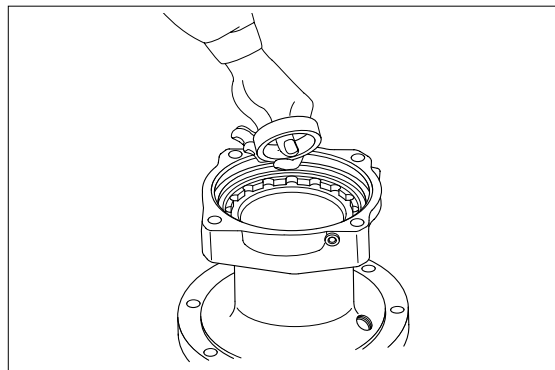
(14) Removal of cylinder assembly

Holding end of cylinder(9) with hand, draw out cylinder assembly from housing.

- ※ Oil seal(3) and outer race of taper roller(4) are left inside of housing.
- ※ End surface of cylinder(9) is sliding face. So, protect the surface with a scrap of cloth against damage.
- ※ Make a matching mark on piston hole of cylinder(9) and piston assembly(10) to fit piston into the same hole when assembling



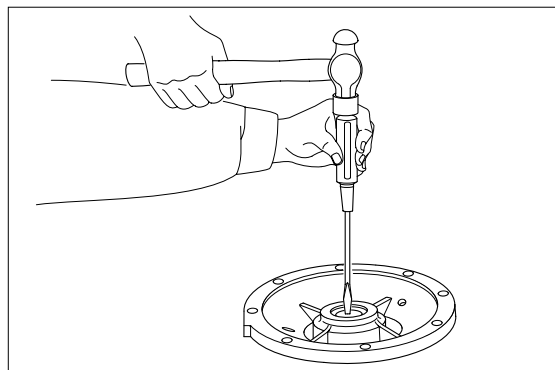
- (15) Separate outer race of taper roller bearing(4) from housing.



(16) Removal of oil seal

Remove oil seal(3) from housing(5) with driver and hammer.

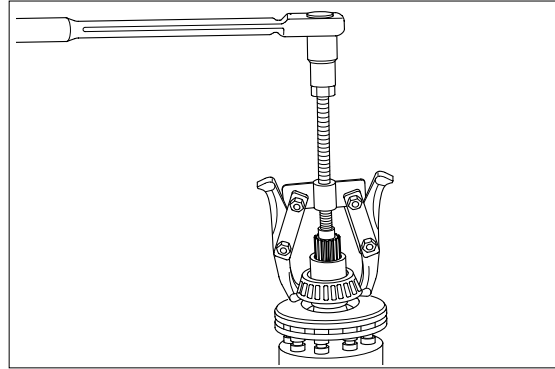
- ※ Do not reuse oil seal after removal.



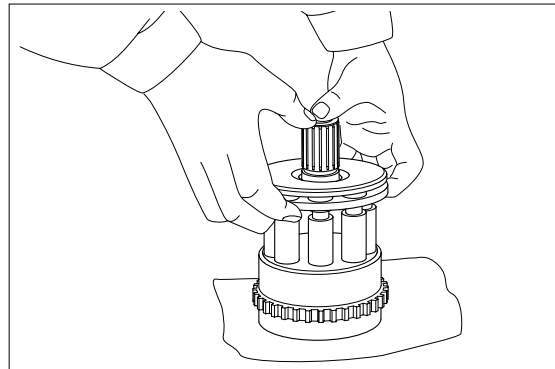
(17) Disassembly of cylinder assembly

- ① Removal of inner race of taper roller bearing(4).

After removing snap ring, lift out cylinder(9) with 2 inner race of roller bearing(4) by applying gear puller at the end of spline in the cylinder.

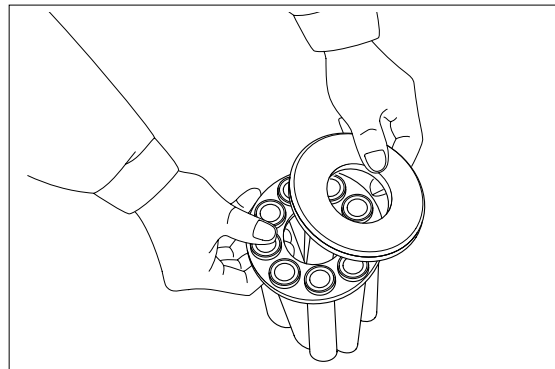


- ② Separate cam plate(6), piston assembly (10), return plate(7) from cylinder(9).



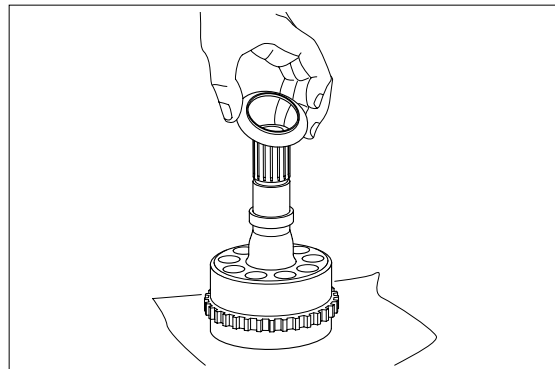
- ③ Get cam plate(6) slide on sliding face of piston assembly(10) and remove it.

※ Be cautious not to damage on sliding face of cam plate.



- ④ Remove spring(8) from cylinder(9).

This completes disassembly.

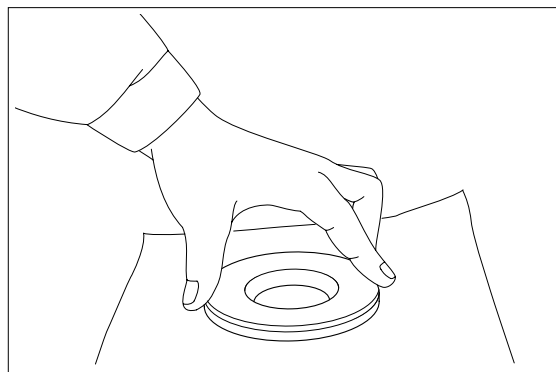
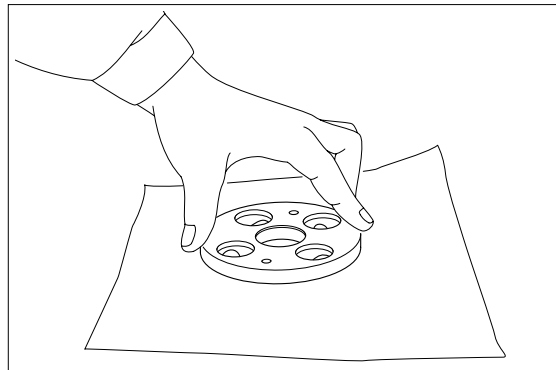
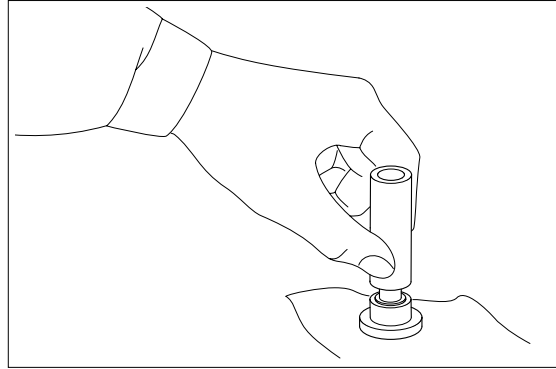


3) ASSEMBLY

(1) Preparation

Before reassembling, perform below procedure.

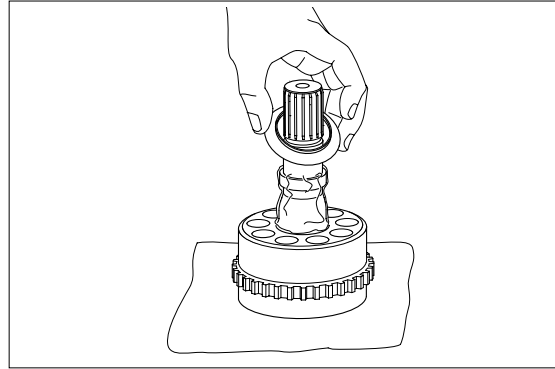
- ① Check each part for damage caused by using or disassembling. If damaged, eliminate damage by grinding with proper sandpaper, wash them with cleaning oil and dry with compressed air.
- ② Replace seal with new one.
- ③ Grind sliding face of piston assembly (10), balance plate(26) and cam plate (6) with sandpaper #2000.



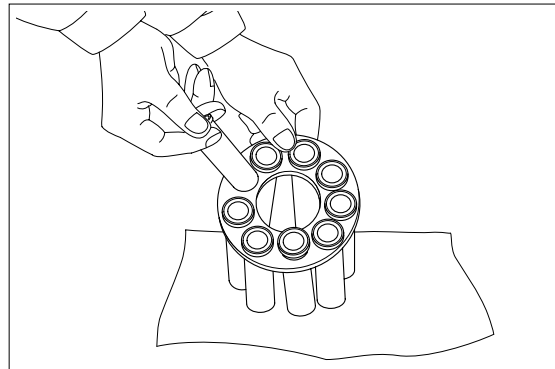
- ④ When assembling, lubricate with specified clean hydraulic oil.
- ⑤ When assembling piston assembly(10) to piston hole of cylinder(9), check matching mark between them.

(2) Assembly of cylinder assembly

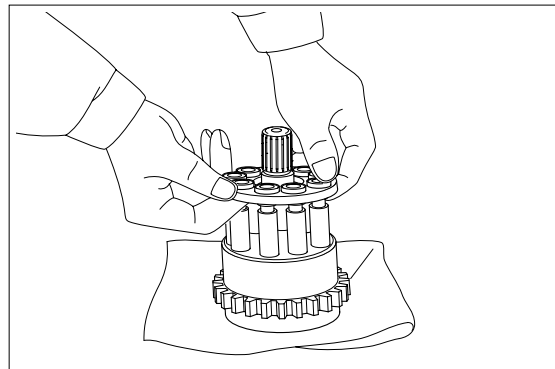
- ① Lubricate grease on round area (contacting area with spring(8)) of cylinder(9) and assemble spring(8).



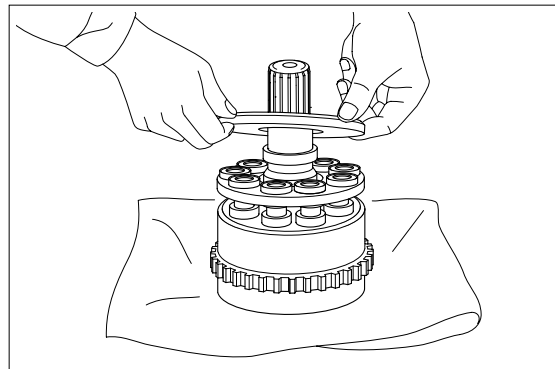
- ② Insert piston assembly(10) in hole of return plate(7).



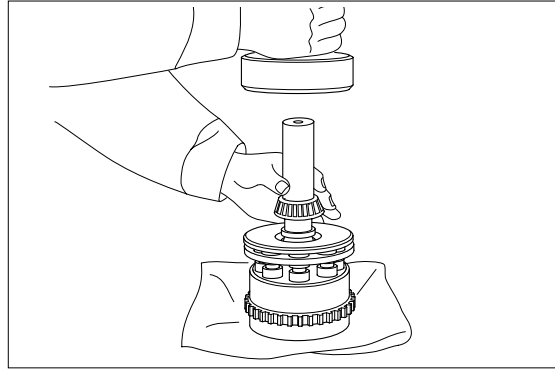
- ③ Assemble piston assembly(10) and return plate(7) to cylinder(9). When assembling, check matching mark between them. Before assembling, lubricate specified hydraulic oil in piston hole of cylinder(9).



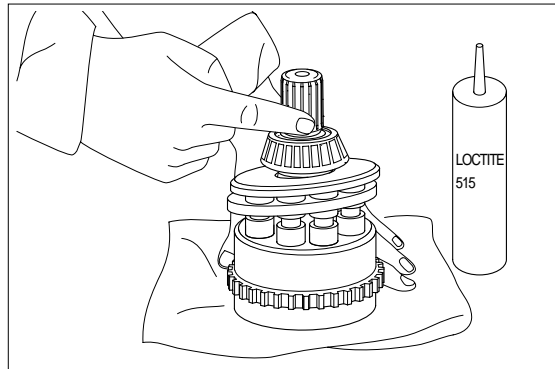
- ④ Lubricate specified hydraulic oil on shoe sliding face of piston assembly (10) and assemble cam plate(6).



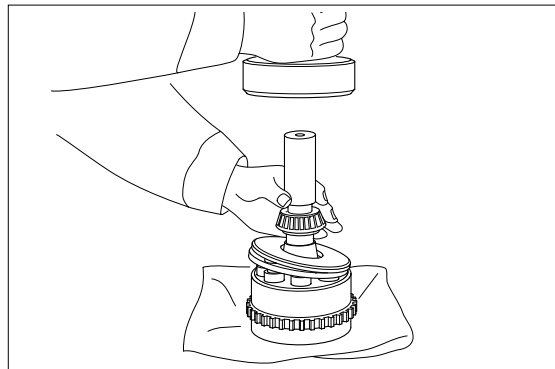
- ⑤ Assemble inner race of taper roller bearing(4) to cylinder(9).



- ⑥ Apply Loctite to bearing mounting area of inner race of cylinder(9) lightly.



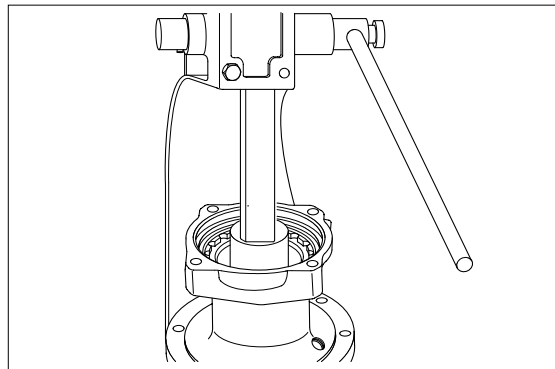
- ⑦ Assemble inner race(2) to cylinder(9).
Fit snap ring(1).



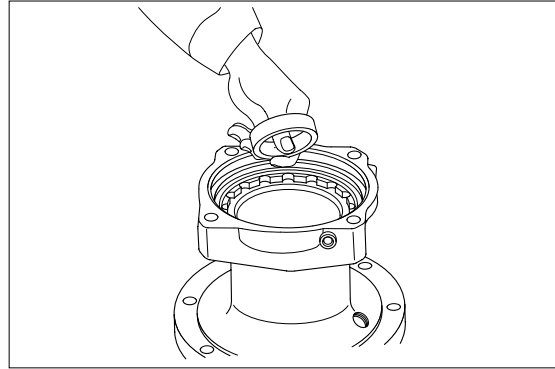
(3) Assembly of oil seal

Apply three bond of white color on outer surface of oil seal(2) and assemble and insert it.

- ※ Before assembling, lubricate lip of oil seal with grease.



- (4) Assemble outer race of taper roller bearing(4) to motor housing(5).

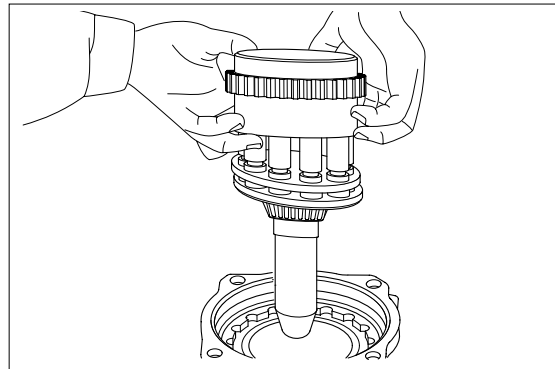


(5) Assembly of cylinder assembly

Hold end of cylinder(9) with hands and assemble cylinder assembly to housing (5). Be careful to prevent damage of seal by spline of shaft.

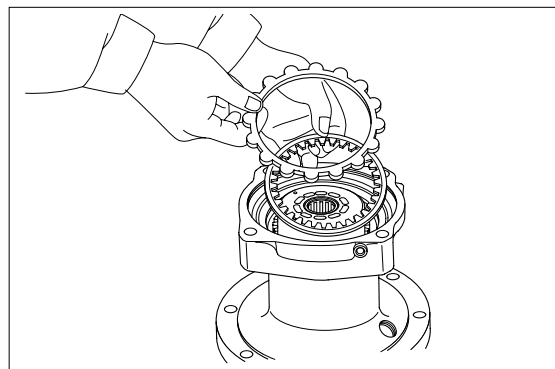
- ※ When assemble cylinder assembly, spline shaft of cylinder is protruded from end of housing, therefore put pads with length 60~80mm under bottom of housing.

Make sure that spring(8) is placed on the groove of return plate(7).



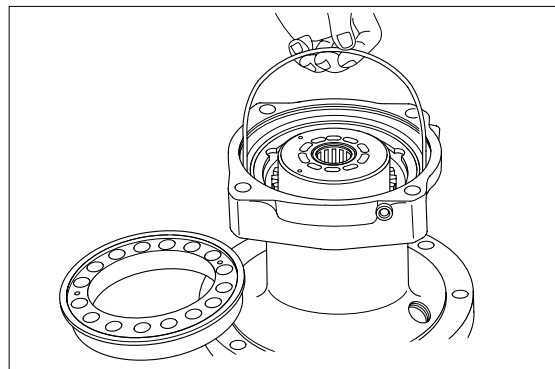
- (6) Assemble friction plate(11) and mating plate(12).

- ※ Lubricate specified hydraulic oil on each side.



- (7) Insert O-rings(14,15) into housing(5) and piston(13).

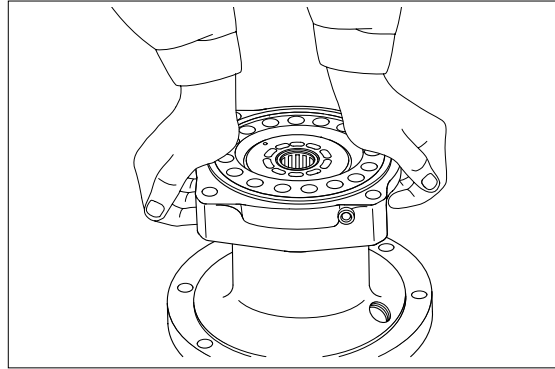
- ※ Lubricate O-ring with grease.



(8) Assembly of brake piston

Lubricate specified hydraulic oil on outer sliding face of piston(13) and assemble brake piston to housing(5).

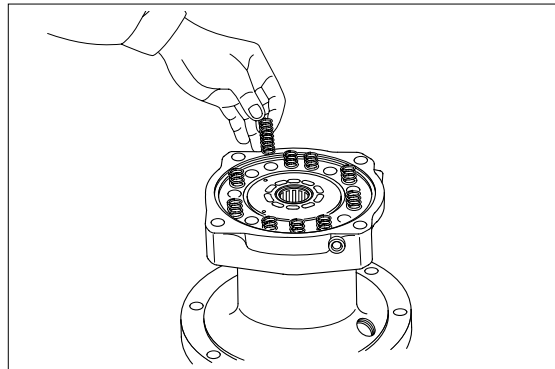
- ※ It is too tight to assemble piston(13) because O-rings(14,15) are fitted, therefore it is recommended to push piston(13) horizontally by hands at once.
- ※ Pay attention to the fitting hole alignment with cover.



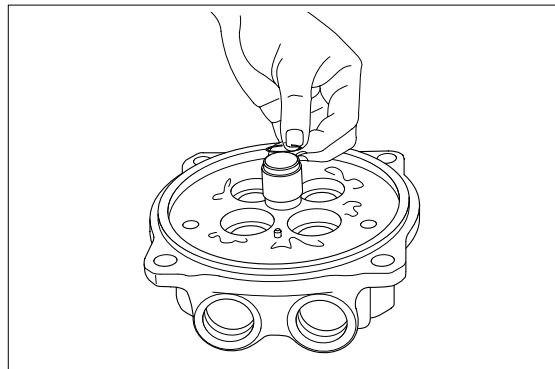
(9) Assembly of spring(16, brake unit)

Assemble spring(16) to piston(13) of brake unit.

- ※ Insert spring(16) into original position.

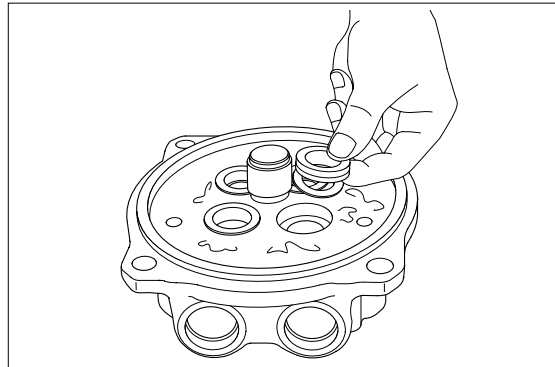


(10) Assemble inner race of needle bearing (27) and snap ring(28) to cover(23).

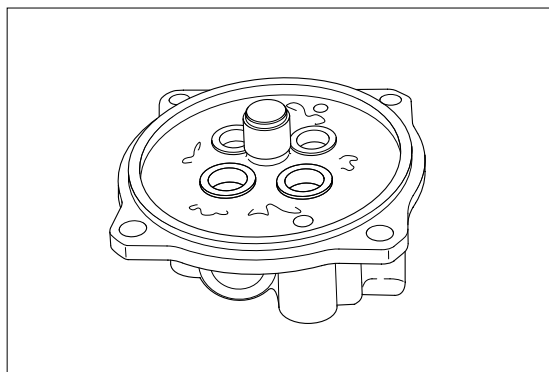


(11) Assemble bushing(19) with teflon ring(17) and dish spring(18) to bushing hole of cover(33).

- ※ Lubricate on both end surfaces of bushing(19) and outer face of teflon ring(17) with grease and assemble cover to housing, and parts are adhered on cover by grease viscosity which makes assembling easy.



- (12) Lubricate locating pin [24, for anti rotation of balance plate(26)] of cover(23) with grease sufficiently and install locating pin to housing.

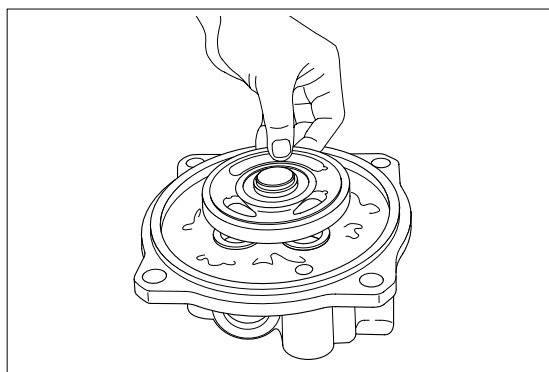


(13) Assembly of balance plate

Assemble balance plate(26) to cover(23).

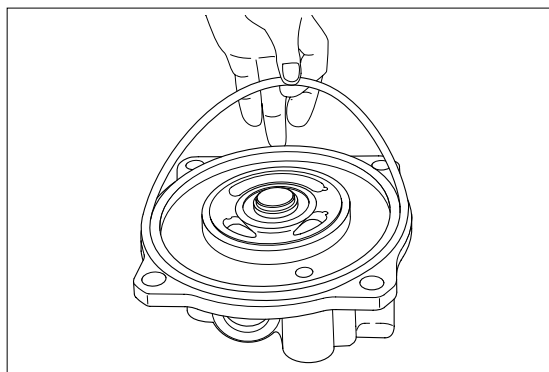
- ※ Be cautious of assembling direction.

Make sure that piston(22) is inserted into balance plate.

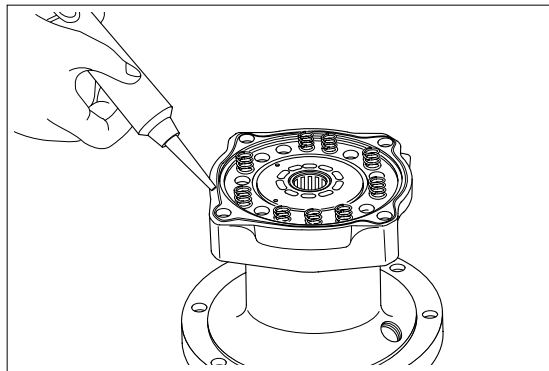


- (14) Assemble O-ring(15) to cover(23).

- ※ Lubricate O-ring with grease.



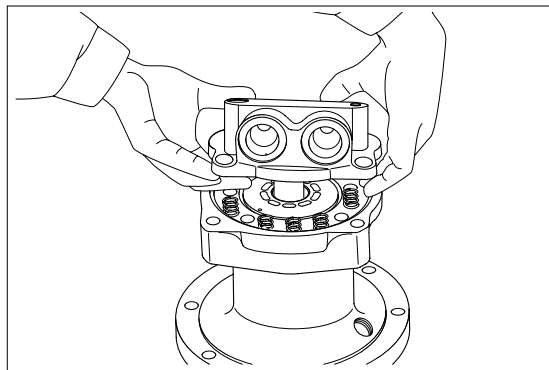
- (15) Apply three bond of white color to distinguish oil leakage from remaining oil in bolt hole(M14) of cover(23).



(16) Assembly of cover

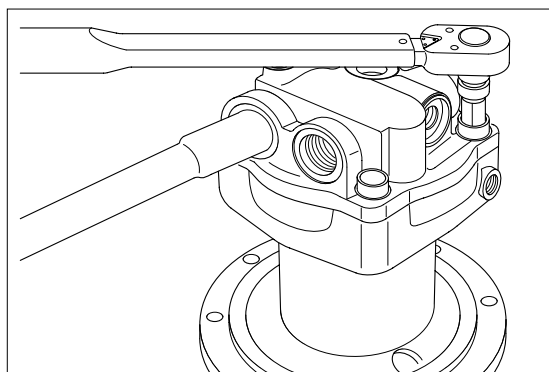
Assemble cover(23) and balance plate (26) to housing(5) lightly, holding them up with hands.

- ※ When assembling, be careful not to detach balance plate(26) and bushing (19) from cover(23).
- ※ Fit matching marks on housing(5) and cover(23) made before disassembling.



(17) Tighten cover(23) and housing(5) with 12 mm hexagonal socket bolt(21).

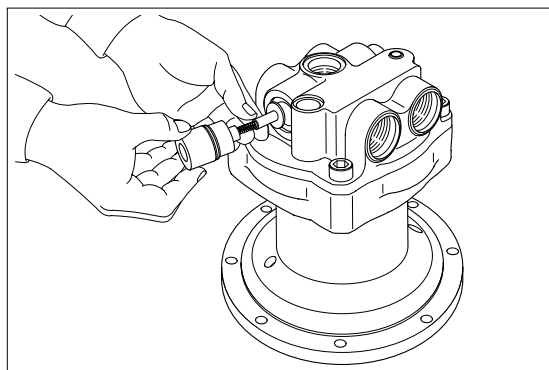
- Tightening torque : 16kgf · m
(116 lbf · ft)



(18) Assembly of make up valve

Assemble check(37) and spring(34) to cover(23) and tighten cap(33) with 14mm hexagonal socket bolt.

- Tightening torque : 14kgf · m
(101 lbf · ft)

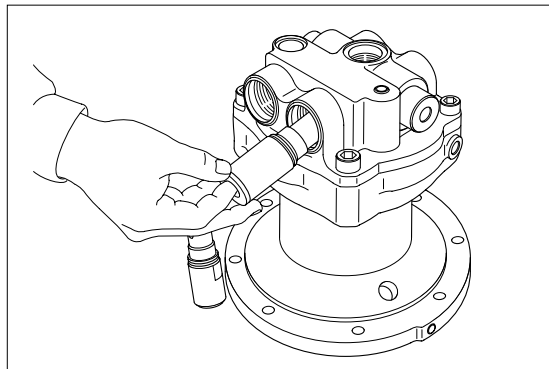


(19) Assembly of relief assembly

Assemble relief assembly(31) to cover(23) with 46 mm hexagonal socket.

- Tightening torque : 14kgf · m
(101 lbf · ft)

- ※ Be cautious of assembling method.



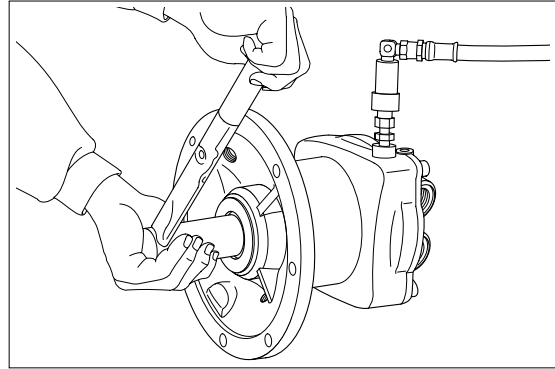
(20) Check of assembly

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

Check if output shaft is rotated smoothly around torque of 3~5 kgf · m.

If not rotated, disassemble and check.

This completes assembly.



3. REMOVAL AND INSTALL OF REDUCTION GEAR

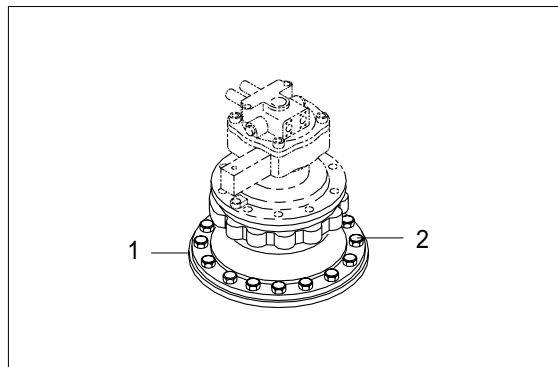
1) REMOVAL

- (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 : 360kg (790lb)



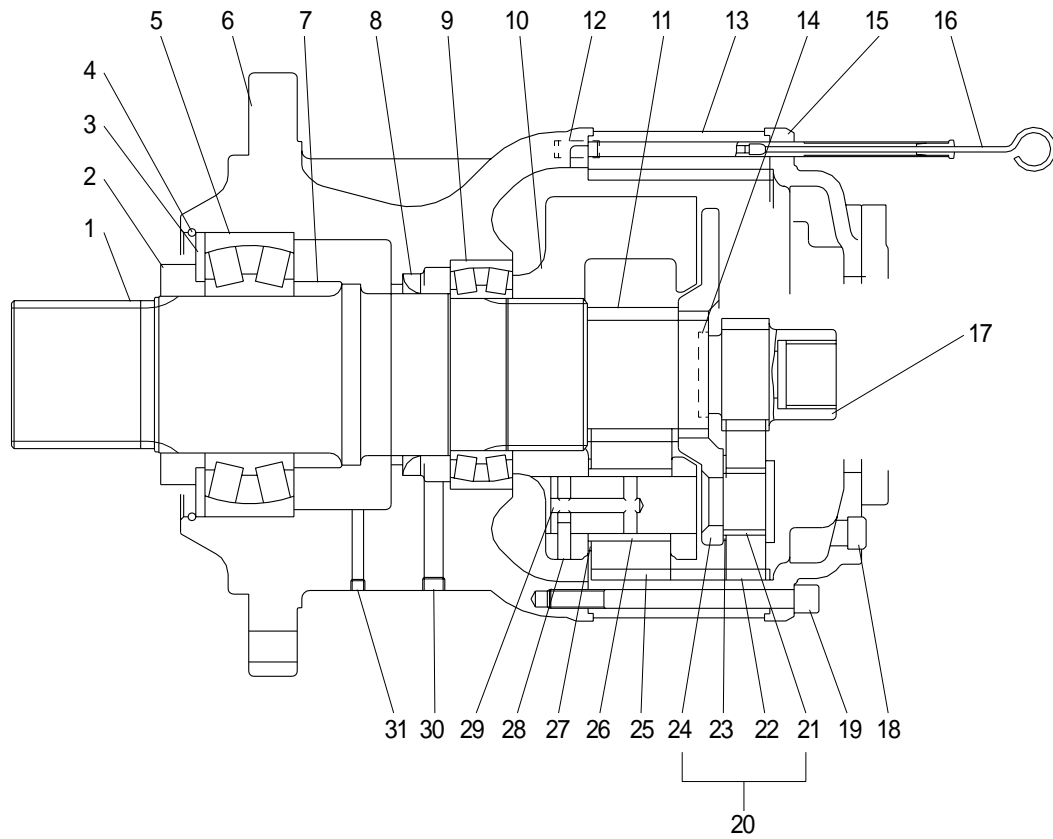
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
 - Mounting bolt : $94.5 \pm 10.5 \text{ kgf} \cdot \text{m}$
($684 \pm 76 \text{ lb} \cdot \text{ft}$)



4. REDUCTION GEAR

1) STRUCTURE



1	Shaft	12	Parallel pin	23	Thrust plate 1
2	Collar	13	Ring gear	24	Holder 1
3	Plate	14	Thrust plate	25	Gear 5
4	Snap ring	15	Cover	26	Bushing 2
5	Roller bearing	16	Level gauge	27	Thrust plate 2
6	Gear casing	17	Sun gear	28	Spring pin
7	Collar	18	Plug	29	Shaft 2
8	Oil seal	19	Socket bolt	30	Plug
9	Roller bearing	20	Holder 1 assembly	31	Plug
10	Holder 2	21	Shaft 1		
11	Gear 4	22	Gear 2		

2) DISASSEMBLY

(1) Removal of cover

- ※ Loosen the socket bolt(19) with 14mm hexagonal socket and remove the cover(15).

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

Remove sun gear(17), install eye bolt to tap(M8) of shaft(21) and remove holder assembly itself.

Shaft 1(21) is pressed into holder(24) and tighten by press.

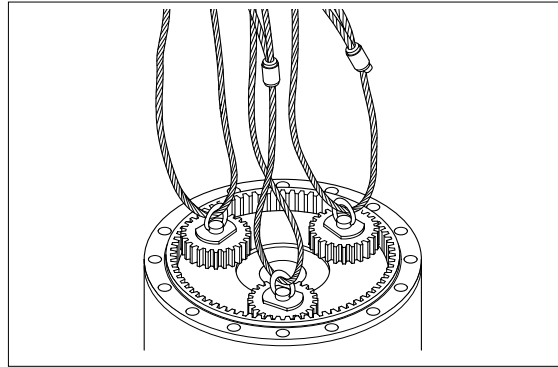
Therefore, it is impossible to disassemble any more.

24 : Holder 1

21 : Shaft 1

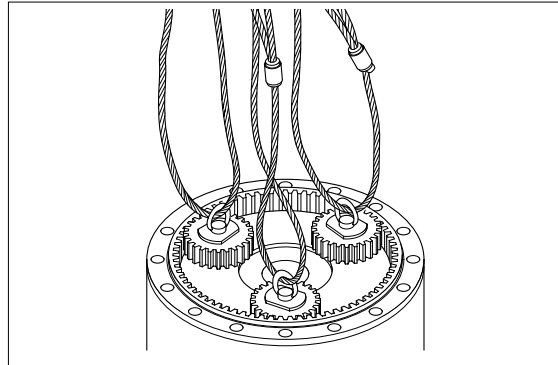
22 : Sun gear 2

23 : Plate



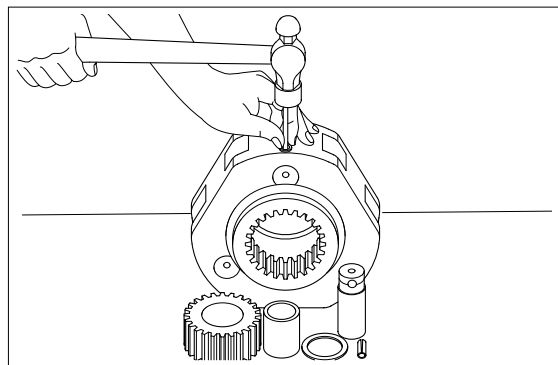
(3) Removal of sun gear 4 and 2nd holder

Remove sun gear(11), install eye bolt to tap(M8) of shaft(29) and remove holder assembly itself.

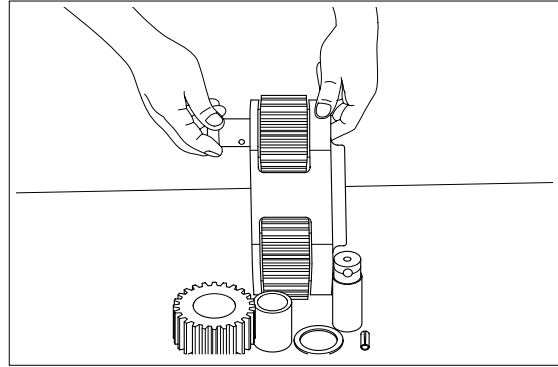


(4) Disassembly of 2nd holder assembly

- ① Insert spring pin(28) into shaft(29) by hammering.
- ※ Do not reuse spring pin after removal.



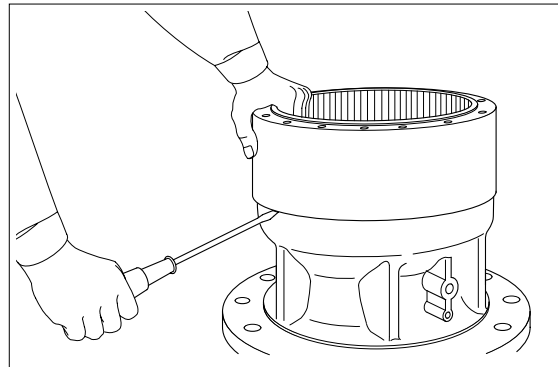
- ② Remove shaft(29) from holder(10), holding gear(25) with hands.



(5) Removal of ring gear

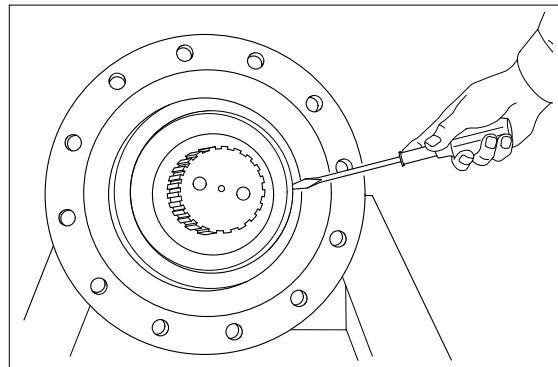
Remove ring gear(13) from casing(6).

- ※ Fluid packing is applied on contacting face of ring gear and gear casing. Therefore, remove ring gear from casing by minus screw driver.



(6) Removal of pinion shaft assembly

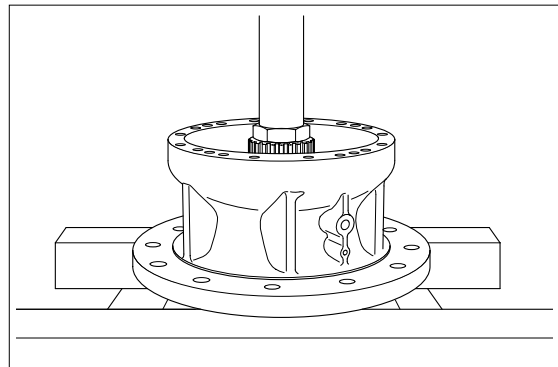
- ① Remove snap ring(4) through hole of gear casing with (-)driver.



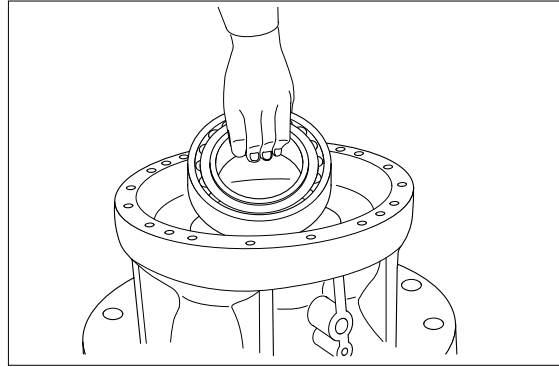
- ② Install hydraulic press at the end face of shaft, and remove shaft(1), collar(2), plate(3) and roller bearing(5) as assembly.

Use support (approx 300mm), to gain space needed for removing shaft at flange part of gear casing.

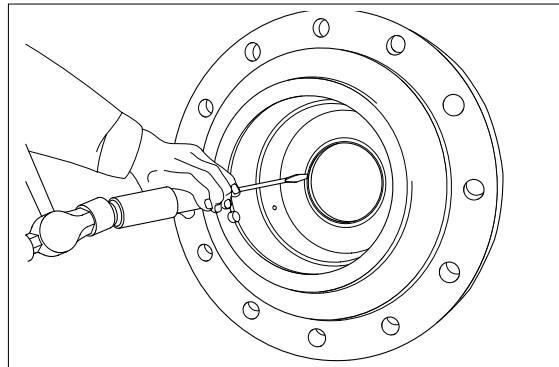
- ※ Do not reuse oil seal after removal.



- ③ Remove roller bearing(9) from gear casing(6).

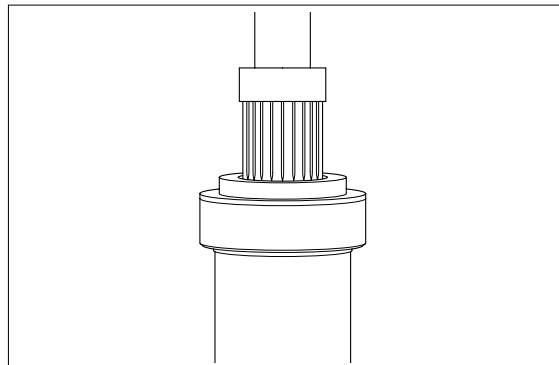


- ④ Remove oil seal(8) from gear casing(6).



(7) Disassembly of shaft assembly

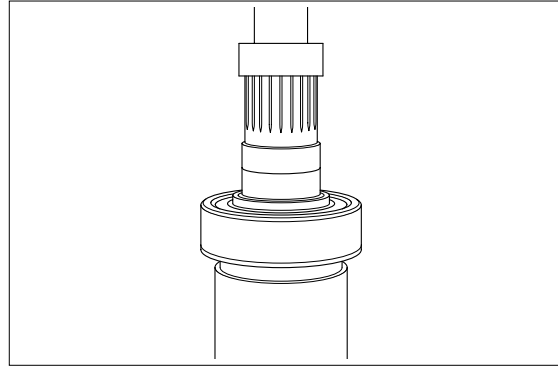
Insert motor side of shaft(1) into steel tube (inner dia : \varnothing 145mm) and push the end of output shaft side with hydraulic press and then remove roller bearing(5), plate(3) and collar(2) as assembly from shaft(1).



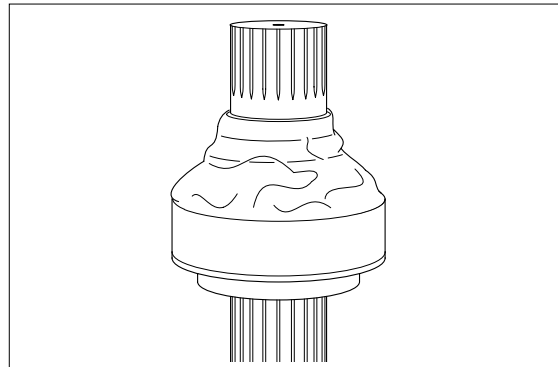
3) ASSEMBLY

(1) Assembly of shaft assembly

- ① Heat roller bearing(5) up to 50°C plus surrounding temperature and assemble it to shaft with hydraulic press and then assemble plate(3) and collar(2) in this order.
※ Pay attention to the assembling direction of plate(3).

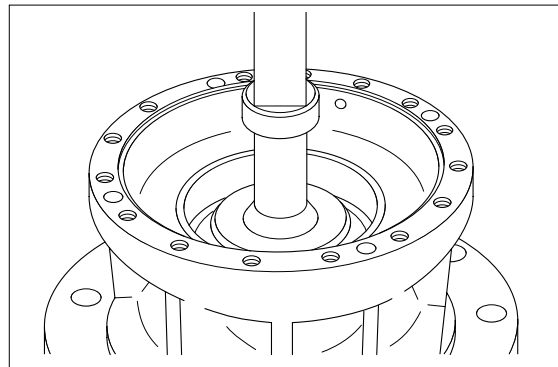


- ② Lubricate on outer face of roller bearing (5) with grease.
Capacity : 600 cc



(2) Installation of oil seal

Remove oil from assembled face of oil seal of gear casing(6) and oil seal(8).
Apply fluid packing(three bond of white color) on outer face of oil seal and assemble at pressing jig of gear casing.
After inserting with press, lubricate oil seal with grease.



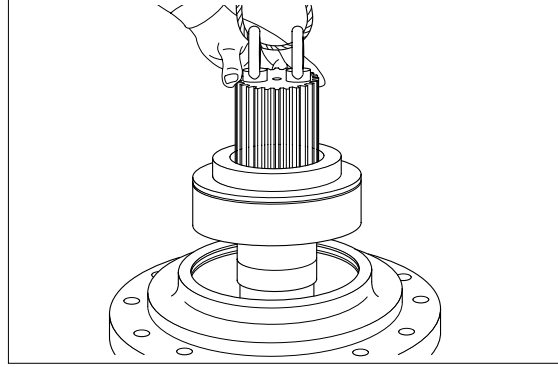
(3) Assembly of pinion shaft assembly

- ① Be careful lest oil seal lip damage by spline of pinion shaft(1).
Assemble pinion shaft assembly by using seal guide.

- ② Put pinion shaft of gear casing(6) upward.

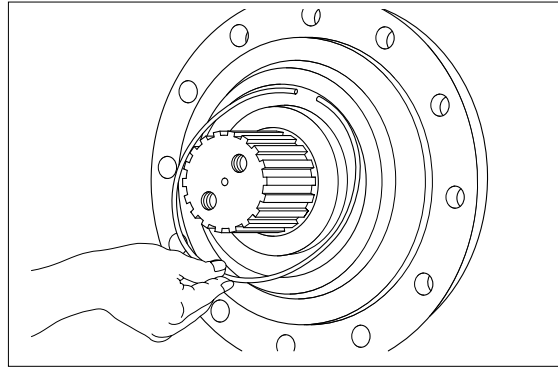
Assemble pinion shaft assembly to gear casing by tightening eye bolt into tap hole (M16) of output side of pinion shaft(1).

- ※ Place support (approx 150mm) below of gear case(6) for seal protector contact with work table.



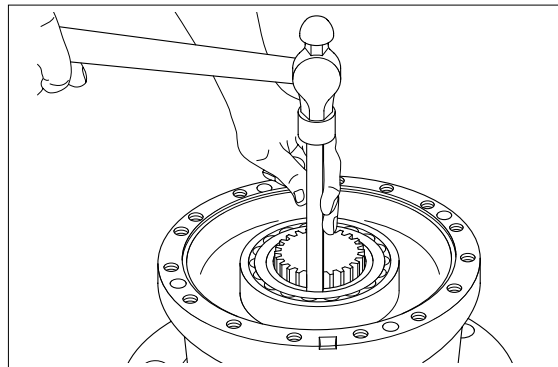
- ③ Assemble snap ring(4).

- ※ When assembling, loosen cutting place of snap ring about 30mm from connections of gear casing for easy disassembly.



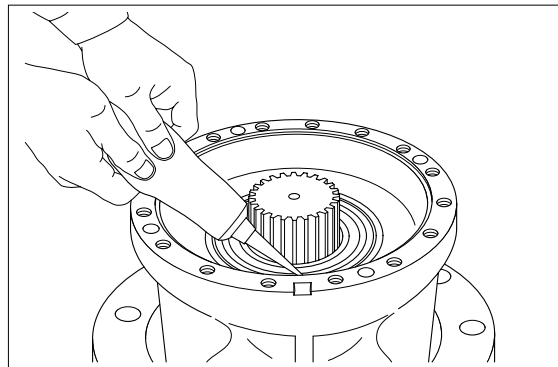
(4) Install of roller bearing

Put gear casing under output shaft and heat roller bearing(9) up to 50°C plus surrounding temperature and then assemble it to the shaft.

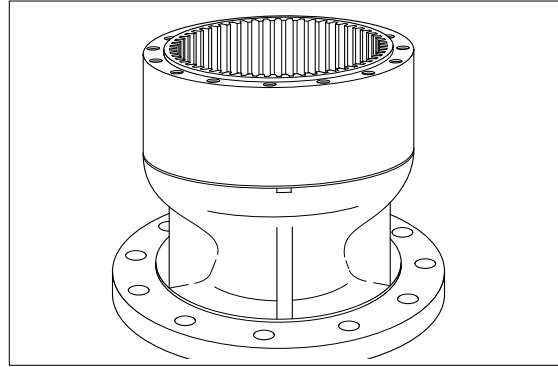


(5) Assembly of ring gear

- ① Remove oil from mating faces between gear casing(6) and ring gear(13), and from pin(12). Assemble collar of gear casing and apply fluid packing(three bond of grey color).

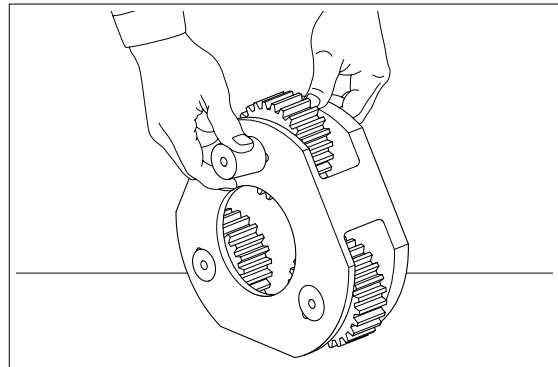


② Assemble ring gear(13).

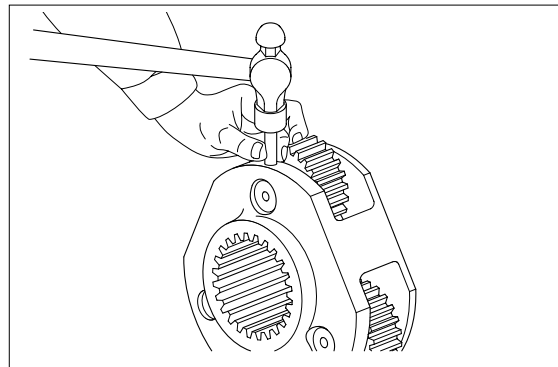


(6) Assembly of holder assembly

- ① Assemble gear 5(25) to holder 2(10) with thrust plate(27) and insert shaft 2(29).
- * Lubricate gear oil to inside of gear and outside of shaft.

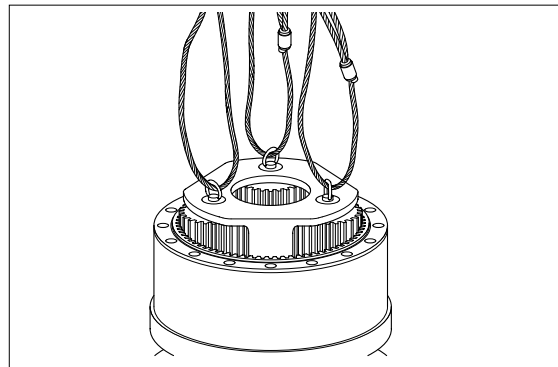


- ② Insert spring pin(28) by hammering.
- * Insert as the clearance between spring pins toward gear(25).

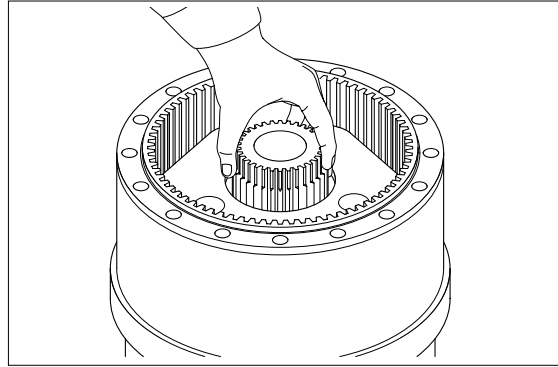


(7) Assembly of holder assembly and sun gear 4

- ① Mount eye bolt into tap hole(M8) of shaft 2(29) and lift holder assembly and then insert holder assembly being engaged with internal teeth of ring gear(13). Rotate holder assembly lightly so that splines of pinion shaft(1) are engaged.

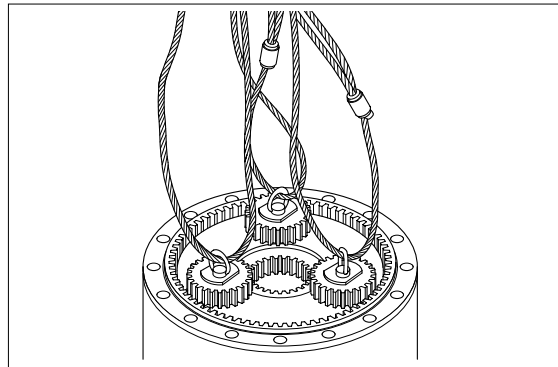


- ② Insert gear 4(11) to gear 5(25).

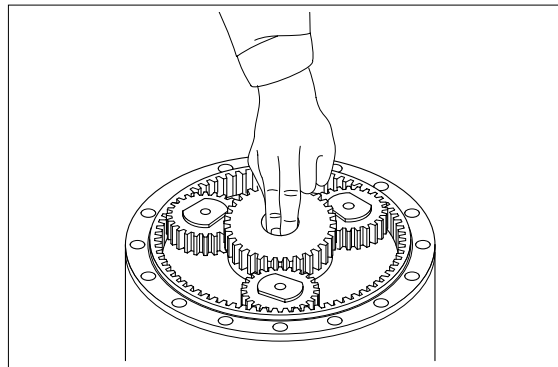


(8) Assembly of sun gear 1st holder assembly

- ① Mount eye bolt into tap hole(M8) of shaft assembly 1(21) and lift holder assembly and then insert holder assembly being engaged with internal teeth of ring gear(13). Rotate holder assembly lightly so that gear 4(11) is engaged with teeth of holder 1(24).



- ② Insert sun gear(17) to gear 2(22).



- (9) Check rotation of sun gear by turning plunge part of gear casing with hands.

(10) Assembly of cover

Remove oil from mating faces between ring gear and cover(15) and apply fluid packing.

Assemble cover(15) and tighten socket bolt(19) with 14mm hexagonal socket.

Tightening torque : 29 kgf · m

(412.5 lbf · ft)

This completes assembly

