

GROUP 5 SWING DEVICE(~#0408)

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 pipe assy(4, 5, 6, 7).

(4) Disconnect pilot line hoses(2, 3, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17).

(5) Sling the swing motor assembly(1) and remove the swing motor mounting bolts(18).

· Motor device weight : 50kg(110lb)

· Tightening torque : 58.4kgf · m
(422.4lbf · ft)

(6) 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.

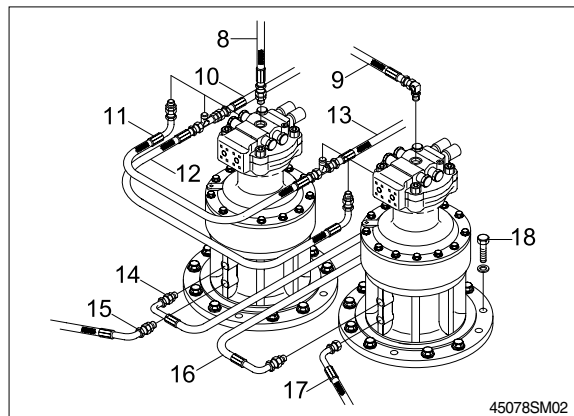
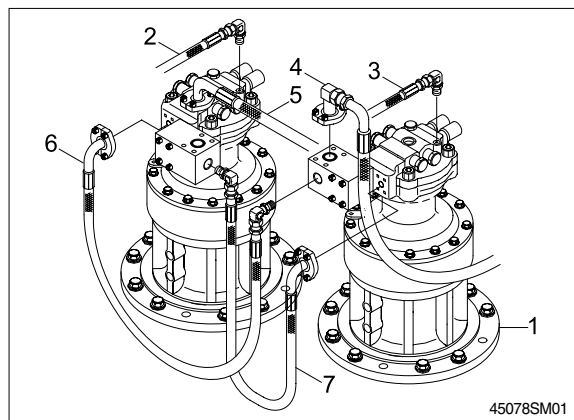
② Pour in hydraulic oil until it over flows from the port.

③ Tighten plug lightly.

④ Start the engine, run at low idling, and check oil come out from plug.

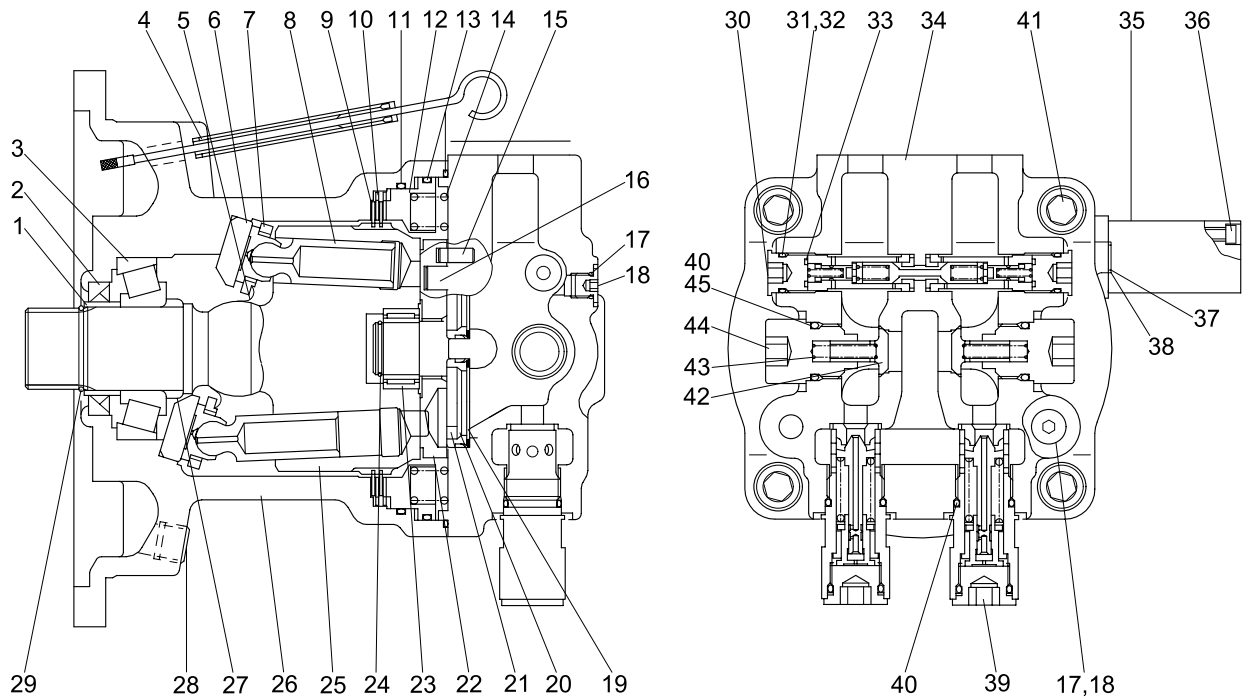
⑤ Tighten plug fully.

(3) Confirmed the hydraulic oil level and check the hydraulic oil leak or not.



2. SWING MOTOR

1) STRUCTURE



45070SM06

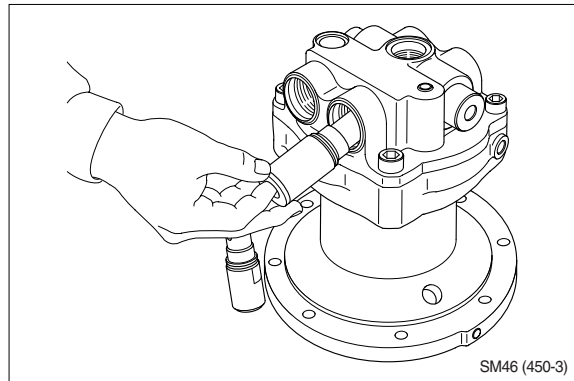
1	Inner ring	16	Piston	31	Back up ring
2	Oil seal	17	O-ring	32	O-ring
3	Taper roller bearing	18	Cap	33	O-ring
4	Level gauge assy	19	Scrowave	34	Cover
5	Backing spring	20	Teflon ring	35	Time delay valve
6	Cam plate	21	Bushing	36	Hexagon socket bolt
7	Return plate	22	Balance plate	37	O-ring
8	Piston assy	23	Needle bearing	38	O-ring
9	Lining plate	24	Snap ring	39	Relief valve
10	Plate	25	Cylinder assy	40	O-ring
11	O-ring	26	Housing	41	Hexagon socket bolt
12	Piston	27	Collar	42	Check
13	O-ring	28	Plug	43	Spring
14	Spring	29	Snap ring	44	Cap
15	Parallel pin	30	Bypass valve assy	45	Back up ring

2) DISASSEMBLY

(1) Removal of relief valve assembly

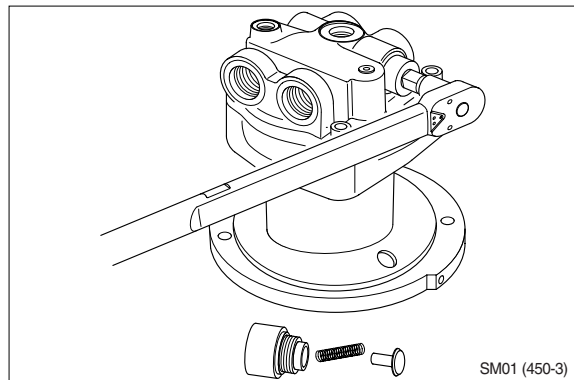
Remove cap of relief valve assembly(39) with 14mm hexagonal wrench.

※ Assemble removed relief valve assembly (39) to original state when reassembling.



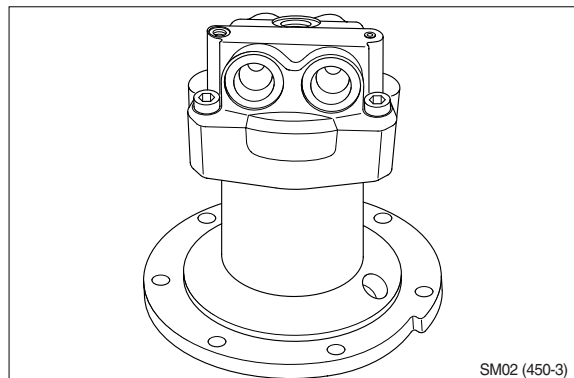
(2) Removal of make up valve

Loosen cap(44) with 14mm hexagonal wrench, and remove check valve(42) and spring(43).



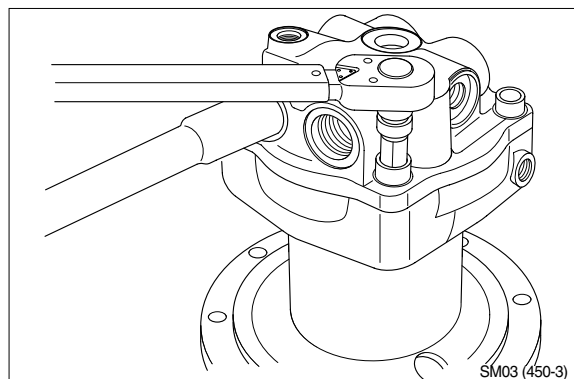
(3) Marking at swing motor

Before disassembling motor, make a matching mark between cover(34) and housing(26) for easy reassembling.



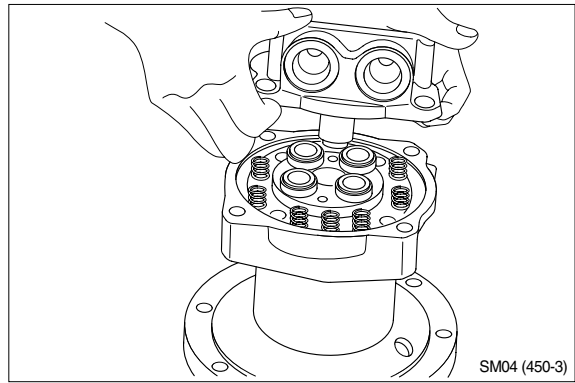
(4) Remove mounting bolts of cover

Loosen hexagon socket bolt(41) with 14mm hexagonal wrench.

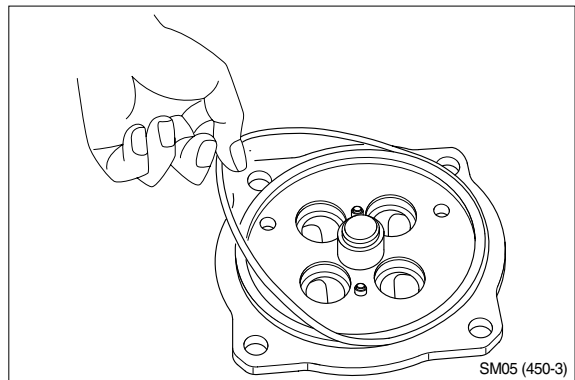


(5) Removal of cover assembly

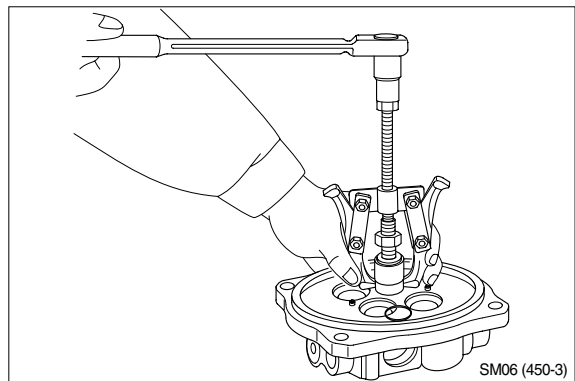
Place shaft of motor assembly to downward and take cover(34) out.



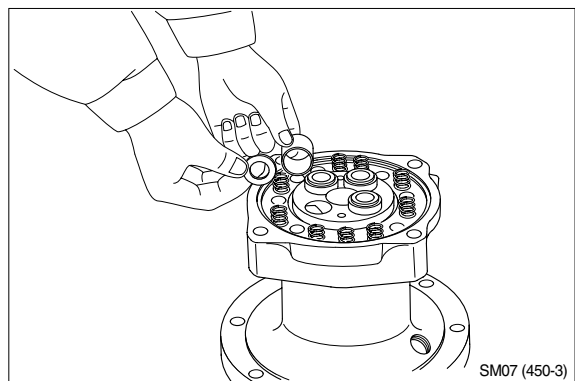
(6) Remove O-ring(13) from cover.



(7) Remove snap ring(24) with steel pointer and remove inner race of needle-bearing(23) by bearing puller.



(8) Remove bushing(21) and coned disk spring(19) from teflon ring(20).

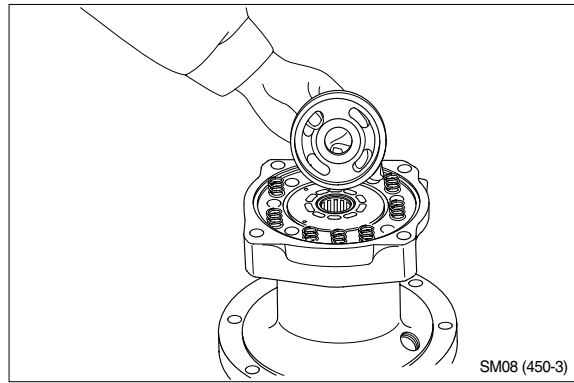


(9) Remove balance plate

Balance plate(22) is adhered on end surface of cylinder(25) by oil viscosity. Take off balance plate(22) with hands. Assembling method of balance plate(22) depends on cover(34).

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

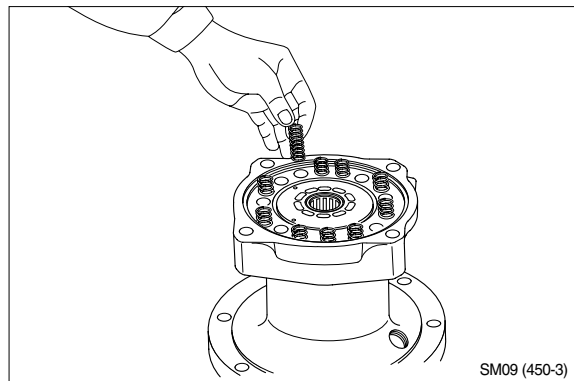
Before removing, check and record location of balance plate(22) to prevent misassembling.



(10) Removal of spring(14, break area)

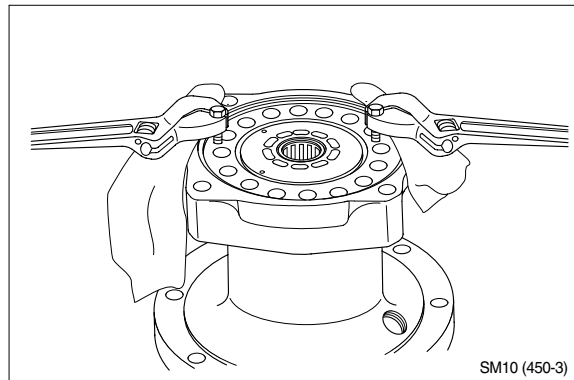
Remove spring(14) from piston(12).

Check and record original position of each spring(14) for correct assembling.

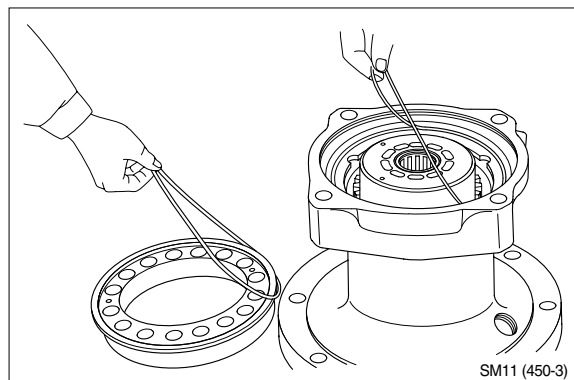


(11) Removal of brake piston

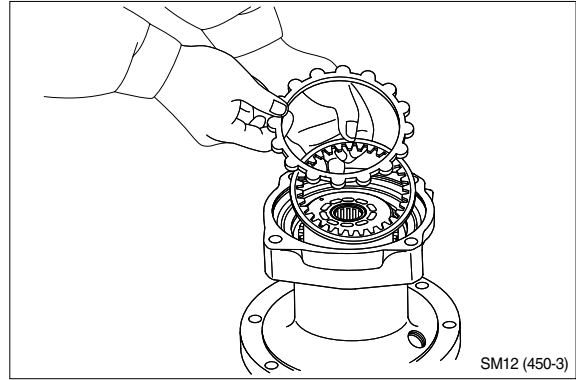
When removing piston(12) from housing (26), there is a sliding resistance against tightening of O-rings(11,13). Use tap hole(M6) on piston(12) as shown in the picture.



(12) Remove O-rings(11,13) from piston(12) and housing(26).



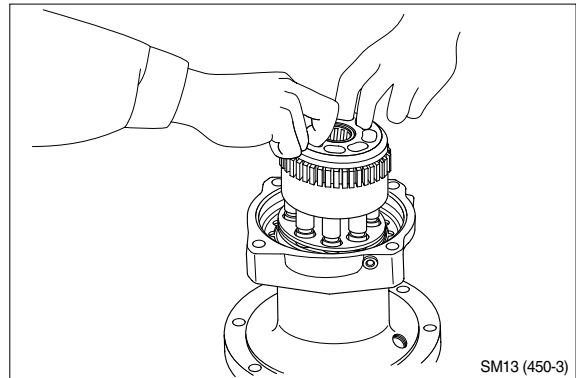
(13) Remove friction plate(9) and lining plate(10) from housing(26).



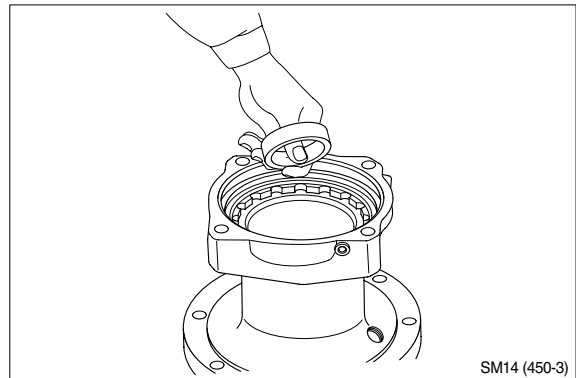
(14) Removal of cylinder assembly

Holding end of cylinder assembly(25) with hand, draw out cylinder assembly from housing.

- ※ Oil seal(2) and outer race of taper roller bearing(3) are left inside of housing.
- ※ End surface of cylinder(25) is sliding face . So, protect the surface with a scrap of cloth against damage.
- ※ Make a matching mark on piston hole of cylinder(25) and piston assembly(8) to fit piston into the same hole when reassembling.



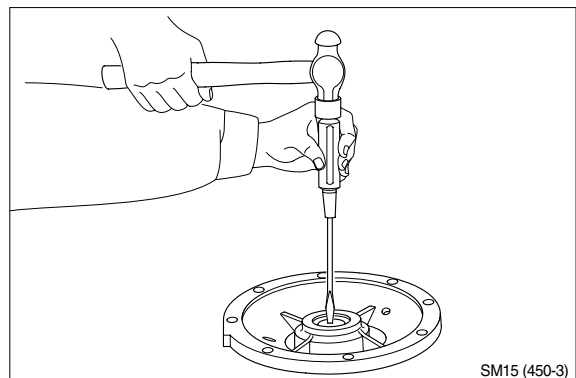
(15) Separate outer race of taper roller bearing(3) from housing.



(16) Removal of oil seal

Remove oil seal(2) from housing(26) with driver and hammer.

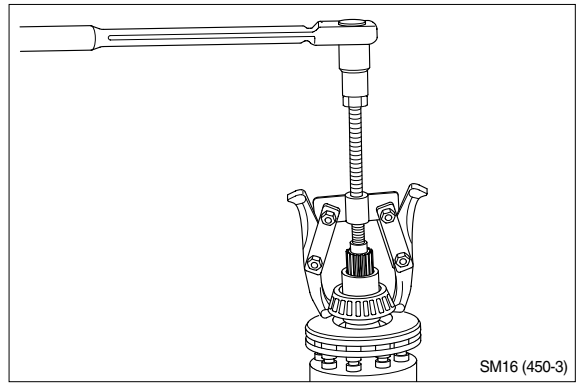
- ※ Do not reuse oil seal after removal.



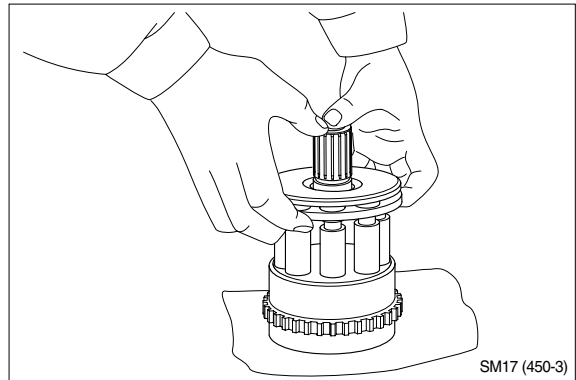
(17) Disassembly of cylinder assembly

- ① Removal of inner race of taper roller bearing(3).

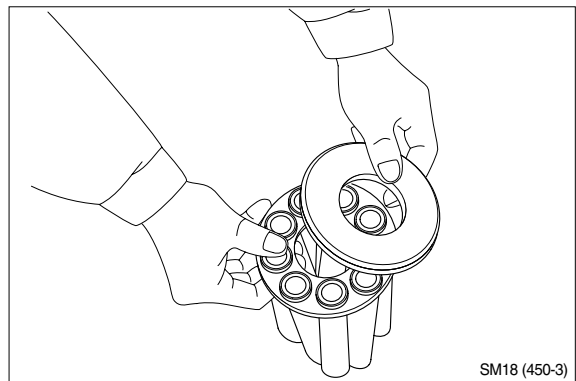
After removing snap ring(29), lift out cylinder(25) with 2 inner race of roller bearing(3) by applying gear puller at the end of spline in the cylinder.



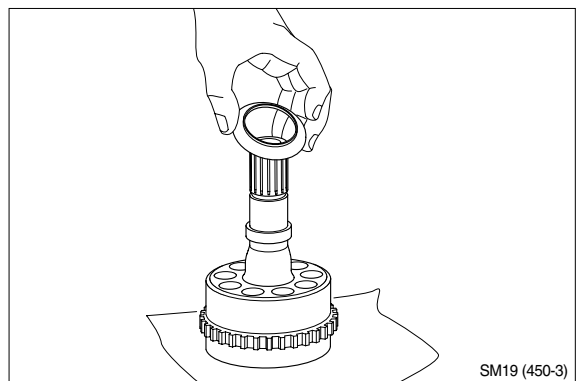
- ② Separate cam plate(6), piston assembly (8), return plate(7) from cylinder(25).



- ③ Get cam plate(6) slide on sliding face of piston assembly(8) and remove it.
※ Be cautious not to damage on sliding face of cam plate.



- ④ Remove backing spring(5) from cylinder(25).



This completes disassembly.

3) ASSEMBLY

(1) Preparation

Before reassembling, perform below procedure.

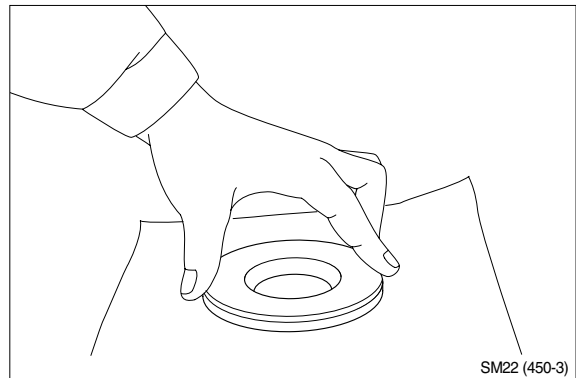
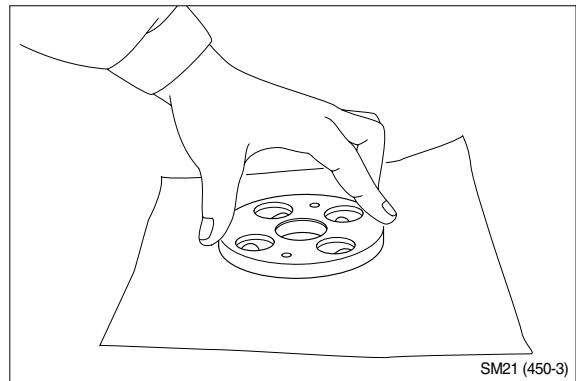
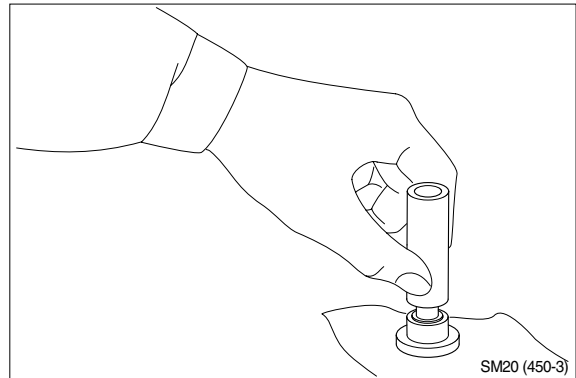
- ① Check each part for damage caused by using or disassembling. If damaged, eliminate damage by grinding with proper sandpaper, wash them with cleaning oil and dry with compressed air.

Replace seal with new one.

- ② Grind sliding face of piston assembly (8),
- ③ balance plate(22) and cam plate(6) with sandpaper #2000.

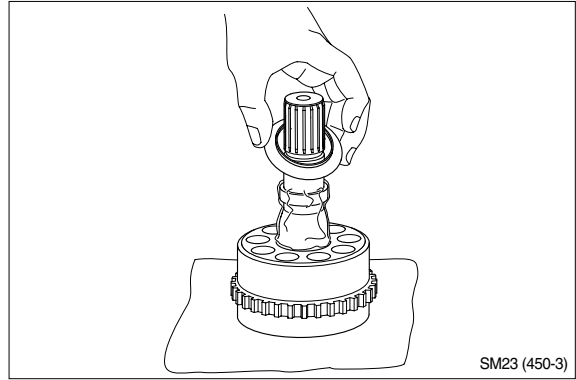
- ④ When assembling, lubricate with specified clean hydraulic oil.

- ⑤ When assembling piston assembly(8) to piston hole of cylinder(25), check matching mark between them.

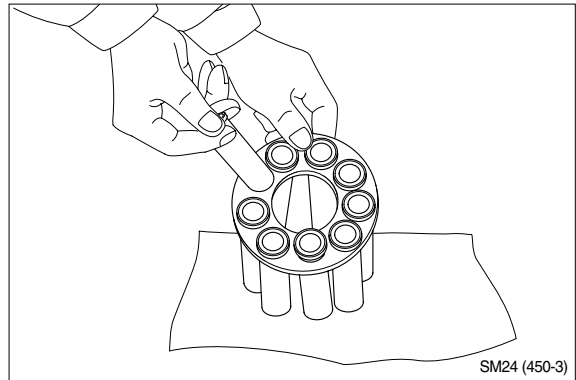


(2) Assembly of cylinder assembly

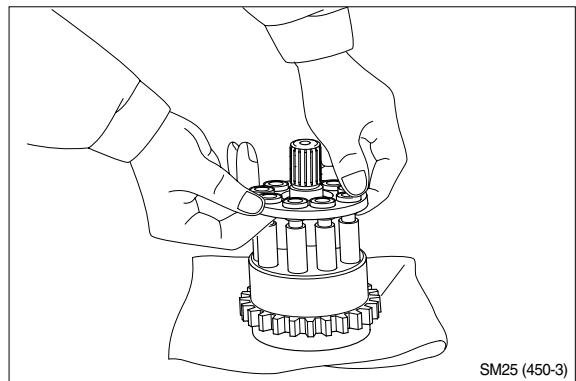
- ① Lubricate grease on round area (contacting area with spring(5)) of cylinder(25) and assemble spring(5).



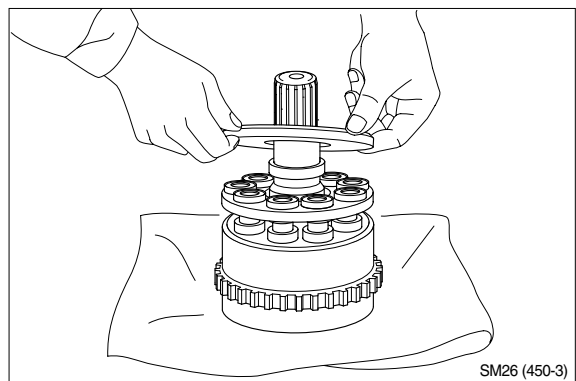
- ② Insert piston assembly(8) in hole of return plate(7).



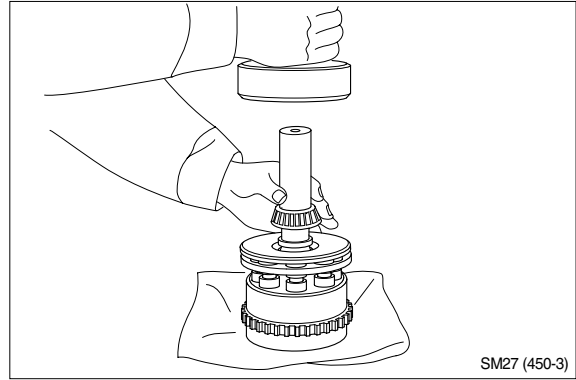
- ③ Assemble piston assembly(8) and return plate(7) to cylinder(25). When assembling, check matching mark between them. Before assembling, lubricate specified hydraulic oil in piston hole of cylinder(25).



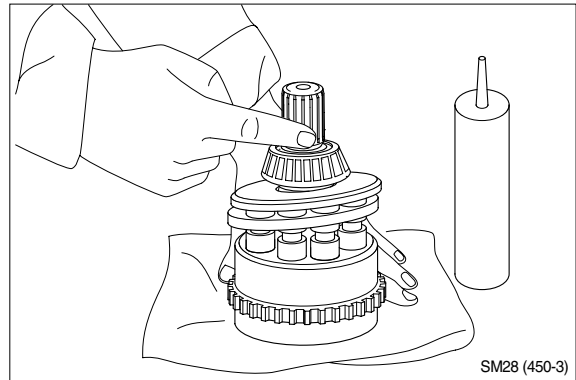
- ④ Lubricate specified hydraulic oil on shoe sliding face of piston assembly(8) and assemble cam plate(6).



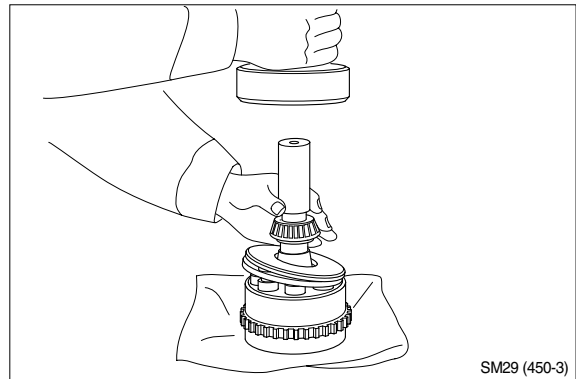
- ⑤ Assemble inner race of taper roller bearing(3) to cylinder(25).



- ⑥ Apply loctite to bearing mounting area of inner race of cylinder(25) lightly.



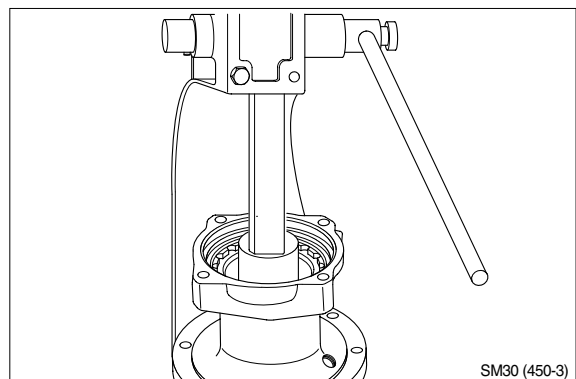
- ⑦ Assemble inner race(1) to cylinder(25).



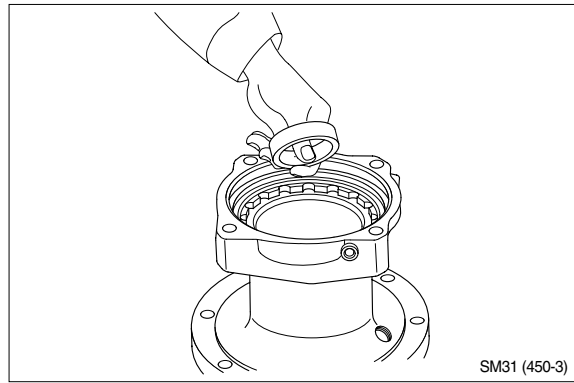
(3) Assembly of oil seal

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.



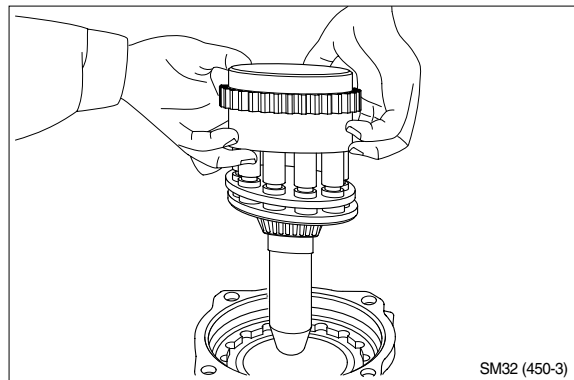
- (4) Assemble outer race of taper roller bearing(3) to motor housing(26).



(5) Assembly of cylinder assembly

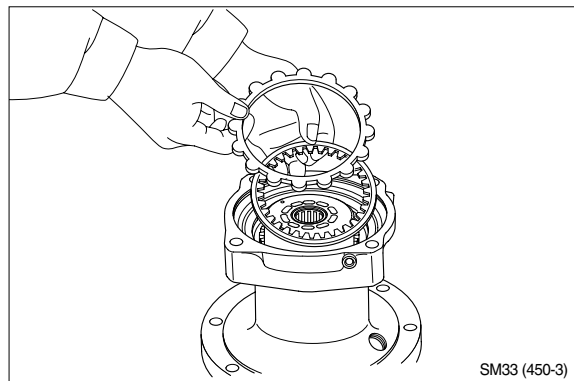
Hold end of cylinder assembly(25) with hands and assemble cylinder assembly to housing(26). Be careful to prevent damage of seal by spline of shaft.

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



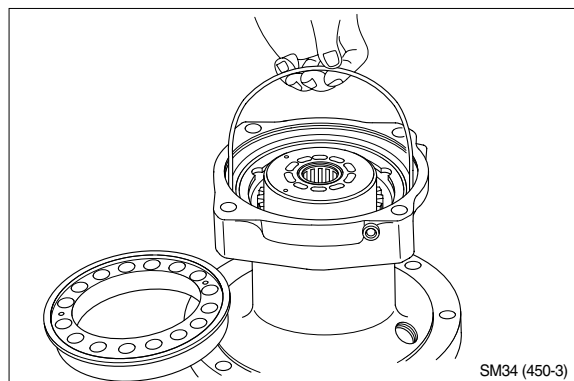
- (6) Assemble plate(9) and lining plate(10).

- ※ Lubricate specified hydraulic oil on each side.



- (7) Insert O-rings(11,13) into housing(26) and piston(12).

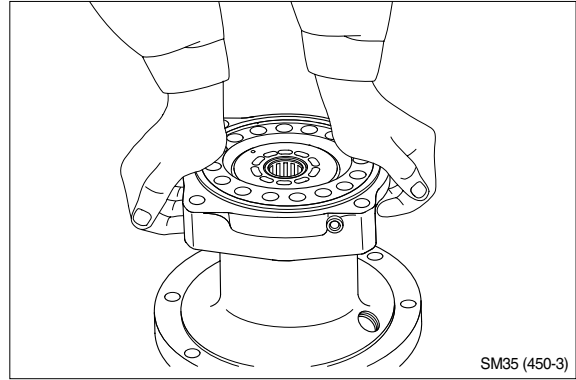
- ※ Lubricate O-ring with grease.



(8) Assembly of brake piston

Lubricate specified hydraulic oil on outer sliding face of piston(12) and assemble brake piston to housing(26).

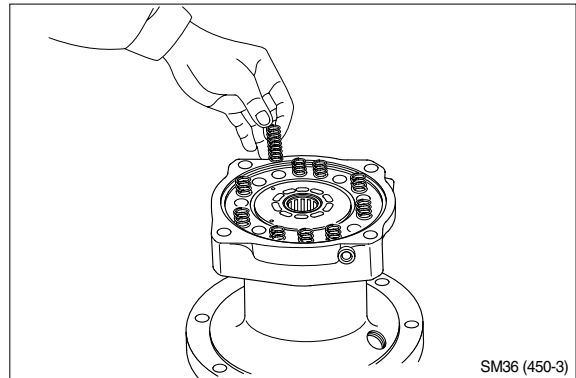
- ※ It is too tight to assemble piston(11) because O-rings(11,13) are fitted, therefore it is recommended to push piston(12) horizontally by hands at once.



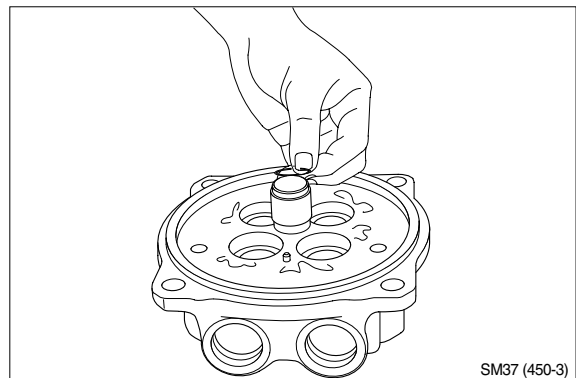
(9) Assembly of spring(14, brake unit)

Assemble spring(14) to piston(12) of brake unit.

- ※ Insert spring(14) into original position.

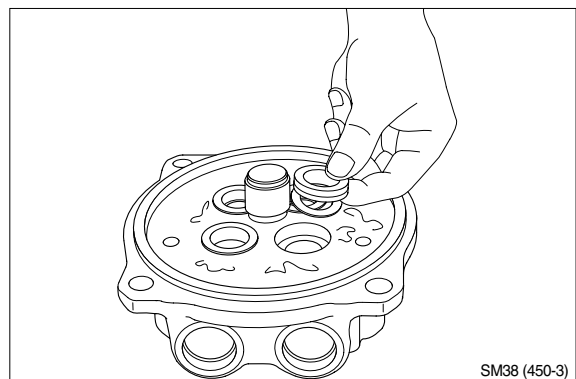


(10) Assemble inner race of needle bearing (23) and snap ring(24) to cover(34).

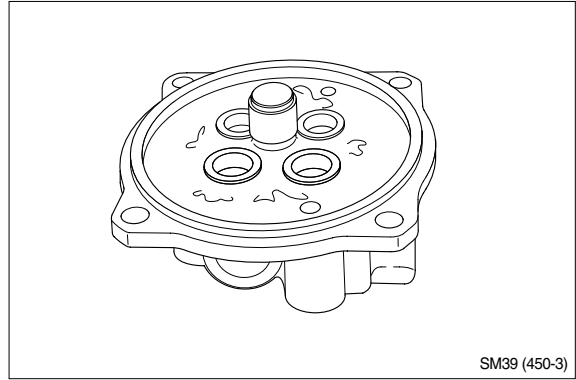


(11) Assemble bushing(21) with teflon ring(20) and coned scrowave(19) to bushing hole of cover(34).

Lubricate on both end surfaces of bushing(21) and outer face of teflon ring(20) with grease and assemble cover to housing, and parts are adhered on cover by grease viscosity which makes assembling easy.



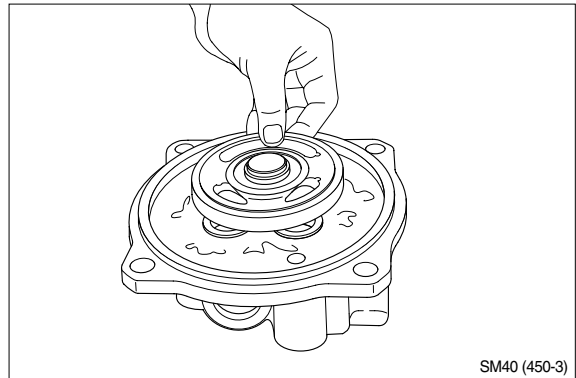
- (12) Lubricate locating pin for antirotation of balance plate(22) of cover(34) with grease sufficiently and install locating pin to housing.



(13) Assembly of balance plate

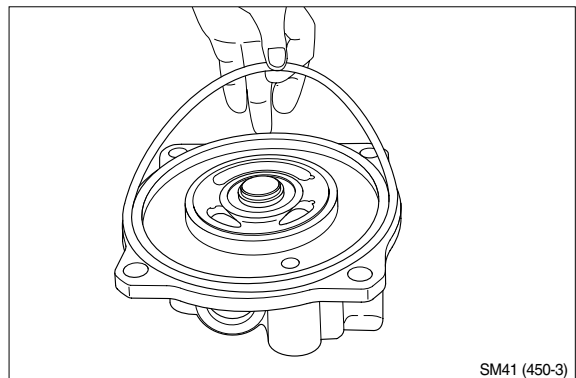
Assemble balance plate(22) to cover(34).

- ※ Be cautious of assembling direction.

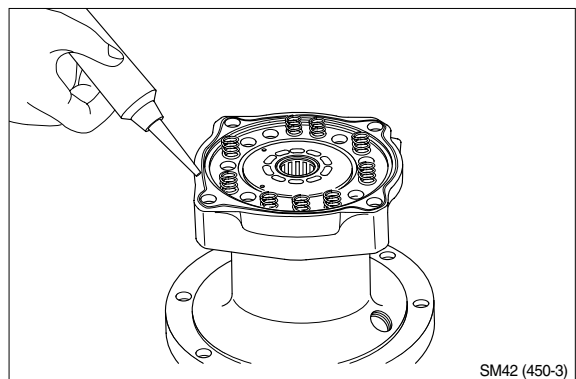


- (14) Assemble O-ring(13) to cover(34).

- ※ Lubricate O-ring with grease.



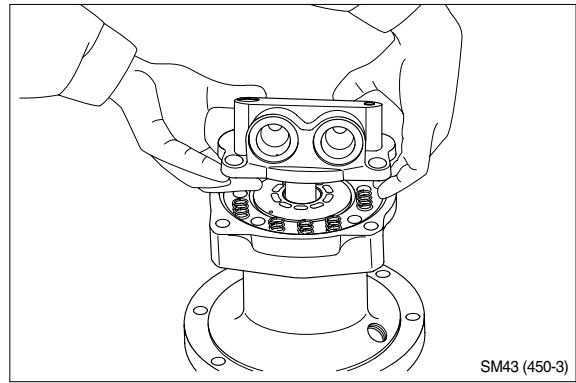
- (15) Apply three bond of white color to distinguish oil leakage from remaining oil in bolt hole(M16) of cover(34).



(16) Assembly of cover

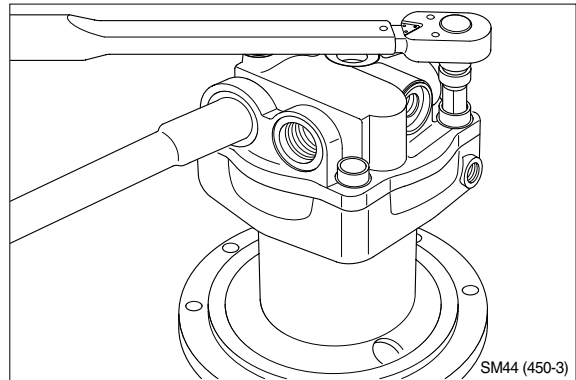
Assemble cover(34) and balance plate (22) to housing(26) lightly, holding them up with hands.

- ※ When assembling, be careful not to detach balance plate(22) and bushing (21) from cover(34).
- ※ Fit matching marks on housing(26) and cover(34) made before disassembling.



(17) Tighten cover(34) and housing(26) with 16mm hexagonal socket bolt(41).

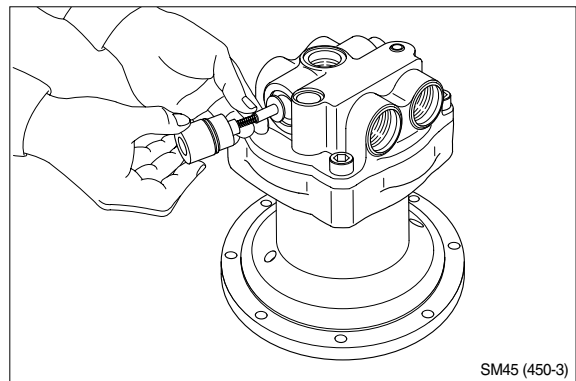
- Tightening torque : 29kgf · m
(210 lbf · ft)



(18) Assembly of make up valve

Assemble check(42) and spring(43) to cover(34) and tighten cap(44) with 14mm hexagonal socket bolt.

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

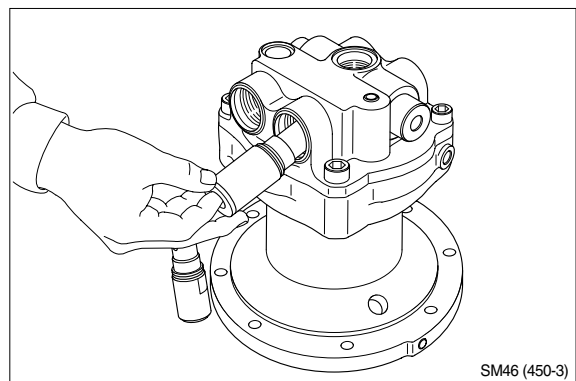


(19) Assembly of relief assembly

Assemble relief valve assembly(39) to cover(34) with 14mm hexagonal socket bolt.

- Tightening torque : 8kgf · m
(58 lbf · ft)

Be cautious of assembling method.



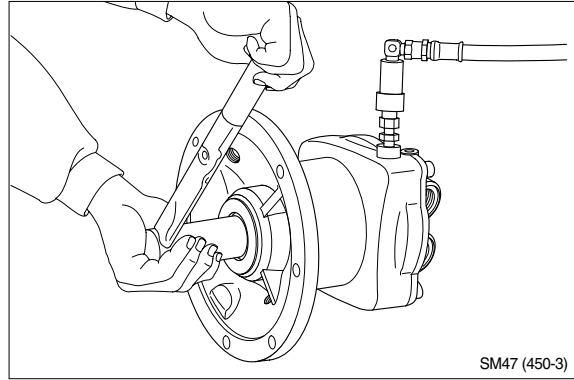
(20) Check of assembly

Load pilot pressure of 30kgf/cm^2 to brake release port after opening inlet and outlet port.

Check if output shaft is rotated smoothly around torque of $2\sim 3\text{kgf} \cdot \text{m}$.

If not rotated, disassemble and check.

This completes assembly.



3. REMOVAL AND INSTALL OF REDUCTION GEAR

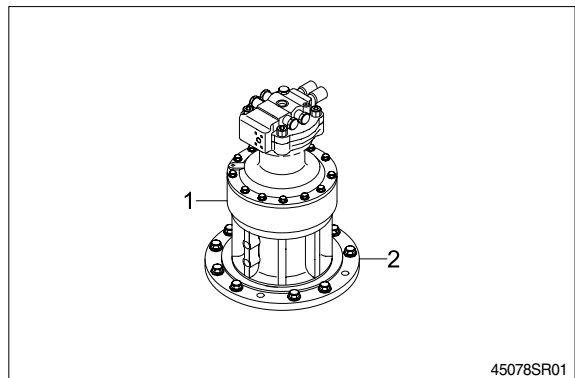
1) REMOVAL

- (1) Remove the swing motor assembly.
For details, see **removal of swing motor assembly**.
- (2) Sling reduction gear assembly(1) and remove mounting bolts(2).
- (3) Remove the reduction gear assembly.
 - Reduction gear device weight : 180kg (397lb)



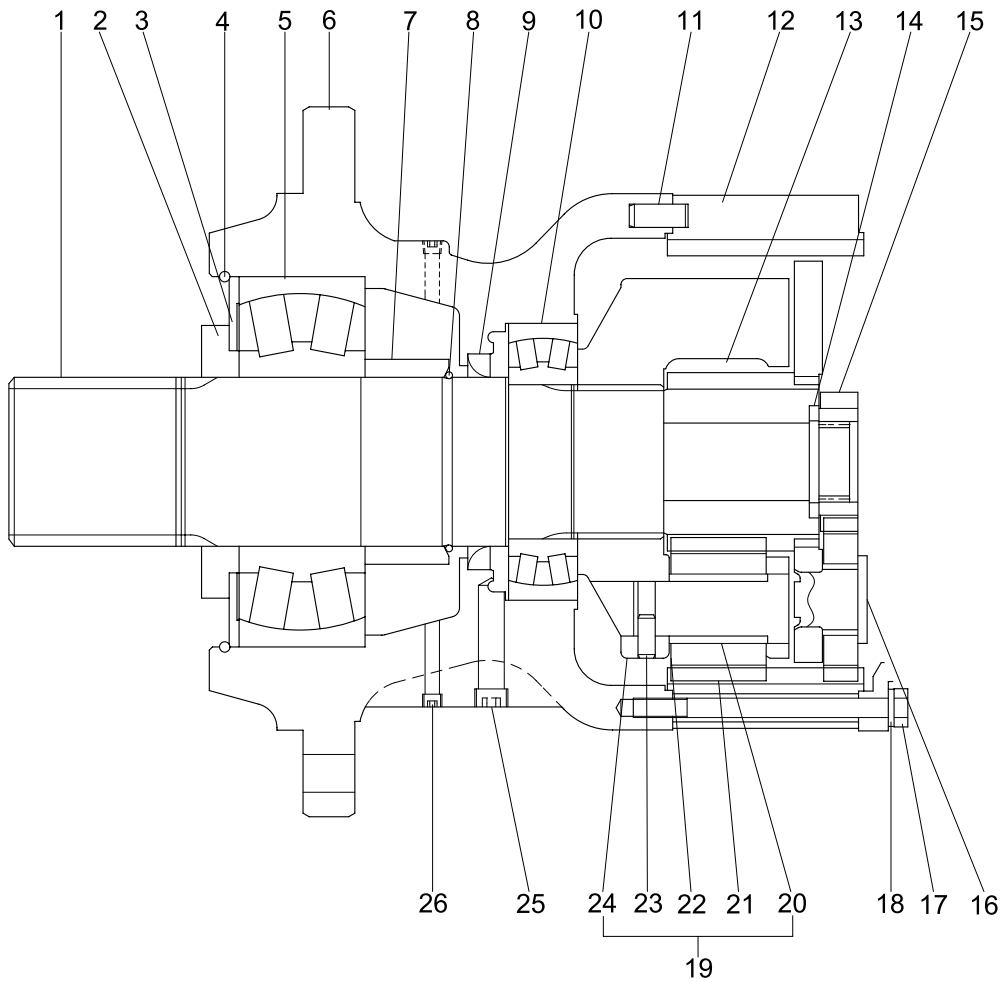
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
 - Mounting bolt : 49.2~66.6kgf · m (356~481lbf · ft)



4. REDUCTION GEAR

1) STRUCTURE



45070SR01

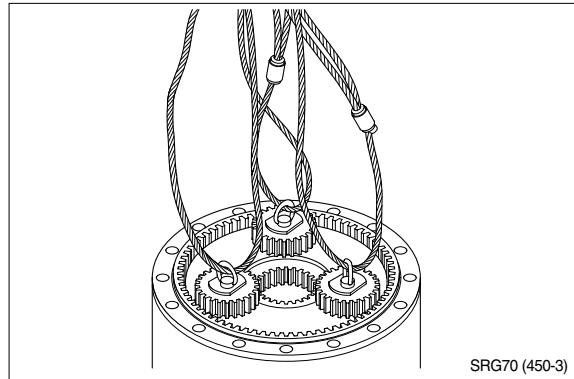
1	Pinion shaft	10	Roller bearing	19	Holder assy 2
2	Collar	11	Parallel pin	20	Shaft 2
3	Plate	12	Ring gear	21	Spur gear 5
4	Snap ring	13	Spur gear4	22	Thrust plate 2
5	Roller bearing	14	Thrust plate	23	Spring pin
6	Gear casing	15	Sun gear	24	Holder 2
7	Collar	16	Holder assy 1	25	Plug
8	Snap ring	17	Bolt	26	Plug
9	Oil seal	18	Lock washer		

2) DISASSEMBLY

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

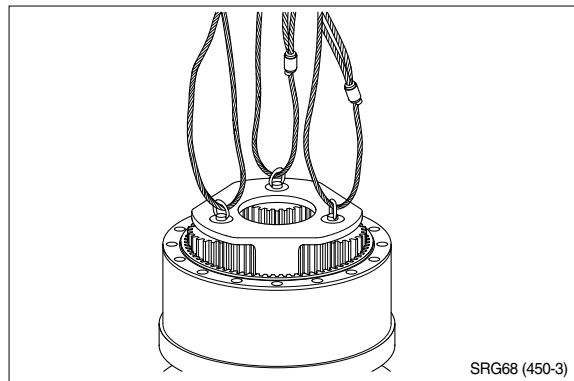
Remove sun gear(15) and holder assembly1(16) itself.

- ※ Shaft 1(16) is pressed into holder(13) and tighten by press. Therefore, it is impossible to disassemble any more. Please replace assembly(16) if they have defect.



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

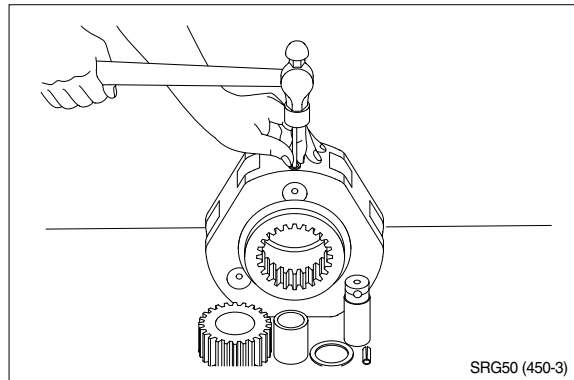
Remove spur gear 4(13) and holder assembly 2(19) itself.



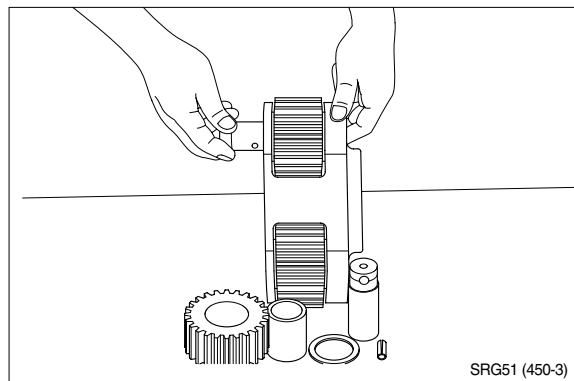
(3) Disassembly of 2nd holder assembly

- ① Insert spring pin(23) into shaft 2(20) by hammering.

- ※ Do not reuse spring pin after removal.

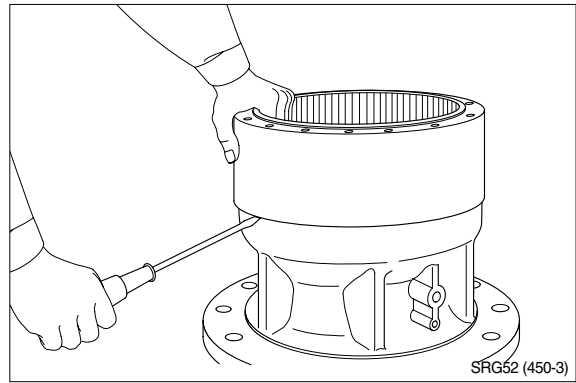


- ② Remove shaft 2(20) from holder 2(19), spur gear 5(21) with hands.



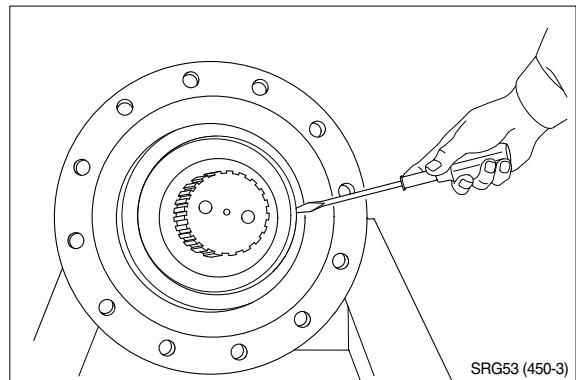
(4) Removal of ring gear

- ① Remove ring gear(12) from casing(6).
- ※ Fluid packing is applied on contacting face of ring gear and gear casing. Therefore, remove ring gear through tap hole of gear casing with (-) driver.

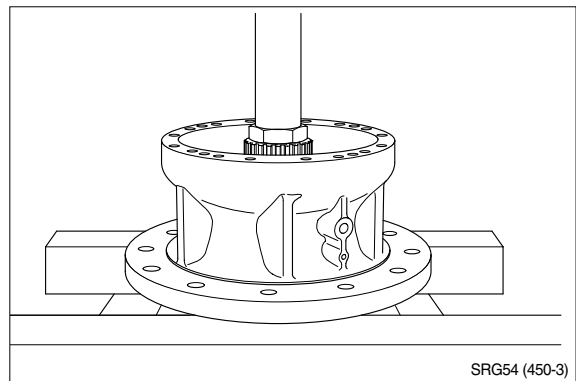


(5) Removal of pinion shaft assembly

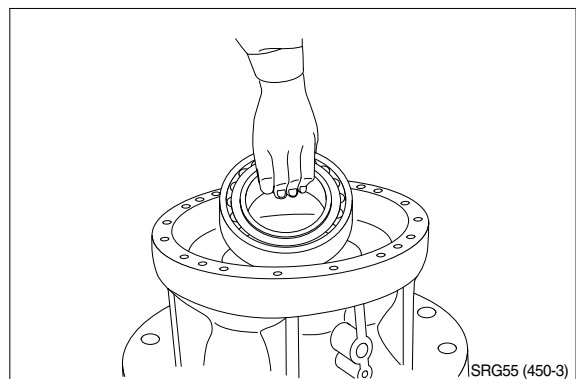
- ① Remove snap ring(4) through hole of gear casing with (-)driver.



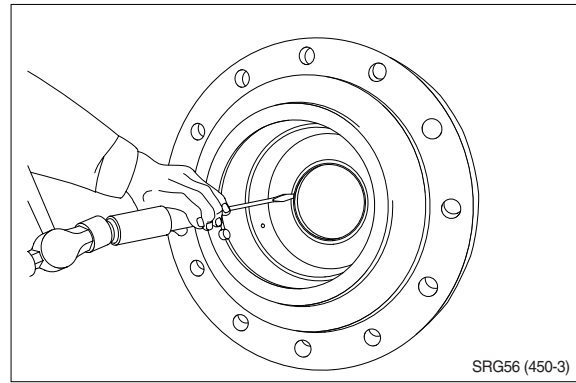
- ② Press end face of pinion shaft(1) with hydraulic press to gain space(approx. 300mm) needed for removing pinion shaft at flange part of gear casing, and remove pinion shaft(1), collar(2), plate(3), roller bearing(5) as assembly. Do not reuse oil seal(9) after removal.



- ③ Remove roller bearing(10) from gear casing(6).



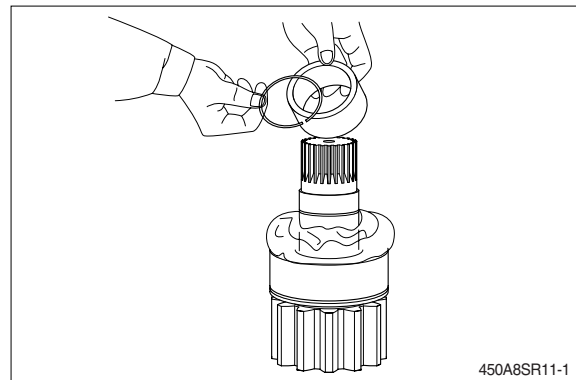
④ Remove oil seal(9) from gear casing(6).



(6) Disassembly of pinion shaft assembly

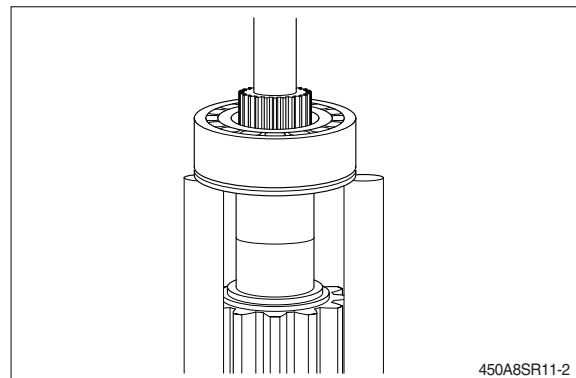
① Remove snap ring(8) from pinion shaft(1) with scribe and then remove collar(7).

※ Be cautions not to damage on sliding face of oil seal lip of pinion shaft.



② Remove roller bearing(5), plate(3) and collar(2) by pressing output pinion shaft and end face of the other side.

※ Replace pinion shaft assy if they have defeat.

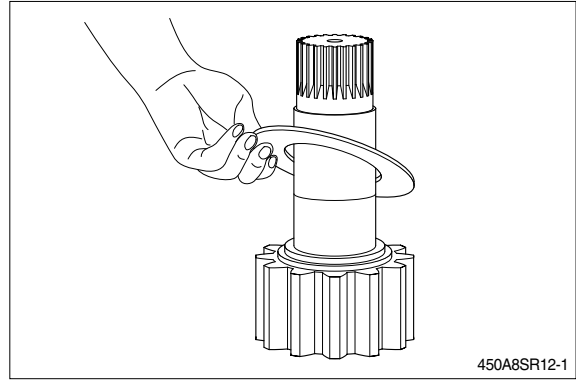


This completes disassembly.

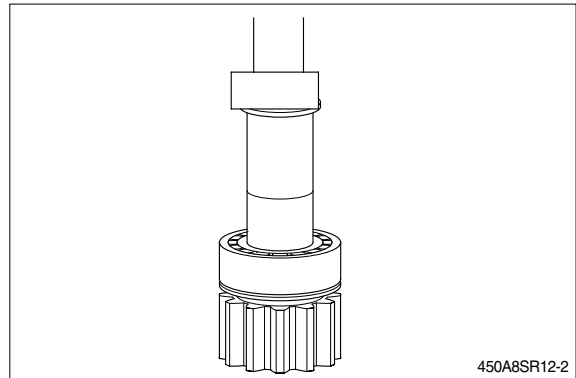
3) ASSEMBLY

(1) Assembly of pinion shaft assembly

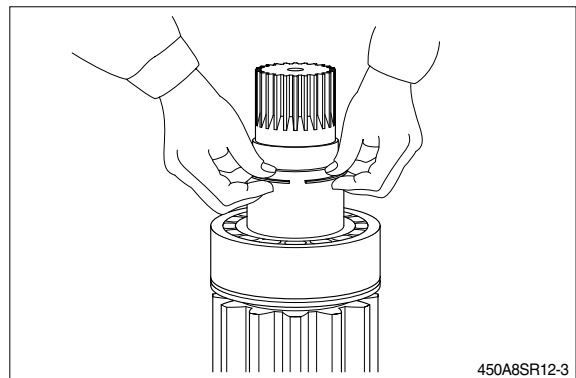
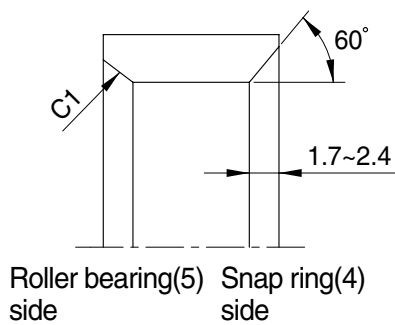
- ① Insert collar(2) into pinion shaft(1) and assemble plate(3).
Be cautious of assembling direction.



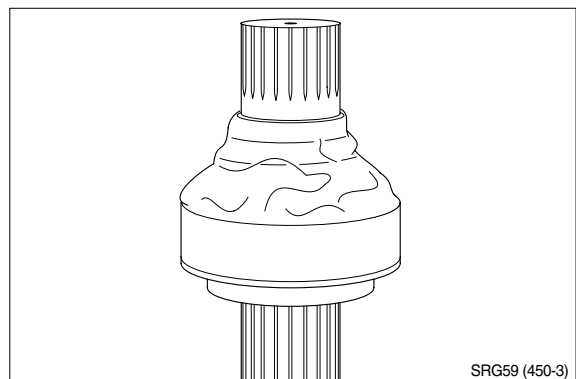
- ② Heat roller bearing(5) up to 50°C plus surrounding temperature and assemble it to pinion shaft(1).
※ Heat roller bearing up more than 100°C.



- ③ Assemble collar(7) and snap ring(8).
※ Be cautions of assembling direction.

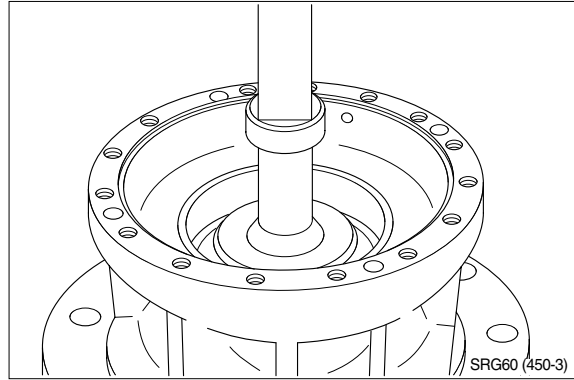


- ④ Lubricate on outer face of roller bearing(5) with grease.
Capacity : 400cc



(2) Installation of oil seal

Remove oil from assembled face of oil seal of gear casing(6) and oil seal(9). 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 on oil seal lip with grease.



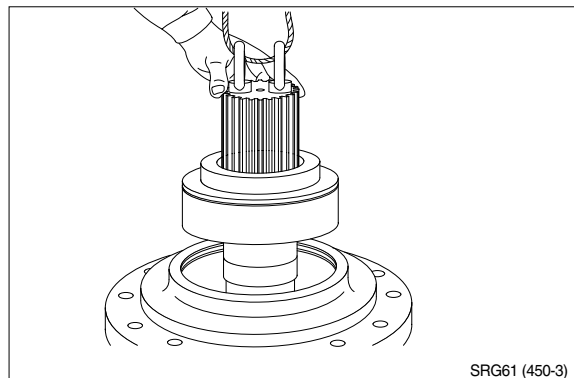
(3) Assembly of pinion shaft assembly

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

Assemble pinion shaft assembly by using seal guide.

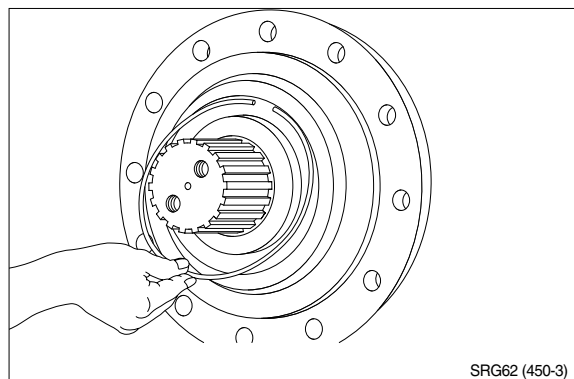
- ② Put pinion shaft of gear casing(6) upward.

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



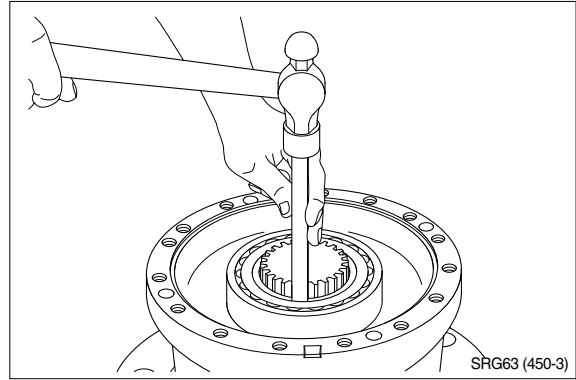
- ③ Assemble snap ring(4).

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



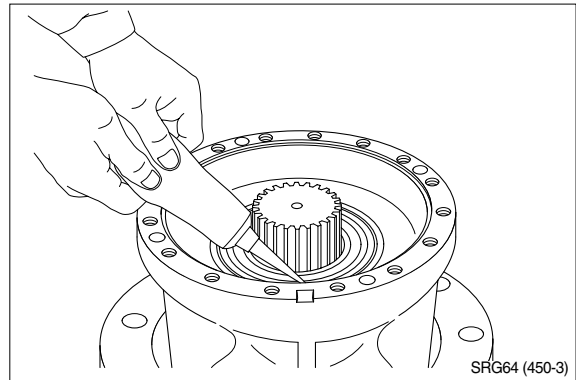
(4) Assembly of roller bearing

Put gear casing under pinion shaft. Heat inner race of roller bearing(10) up to 50°C plus surrounding temperature and assemble to center of pinion shaft. Assemble roller bearing by putting between gear casing and pinion shaft.

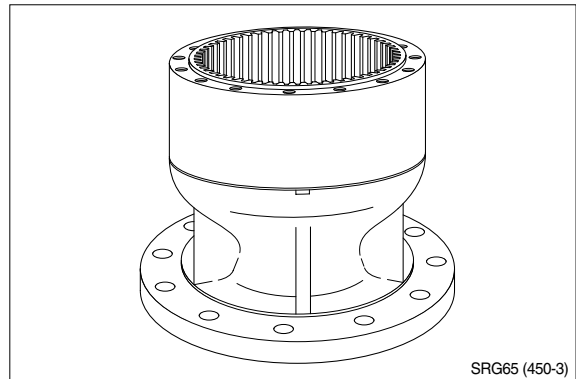


(5) Assembly of ring gear

- ① Remove oil from mating faces between gear casing(6) and ring gear(12), and from pin(11). Assemble collar to gear casing and apply fluid packing(three bond of grey color).

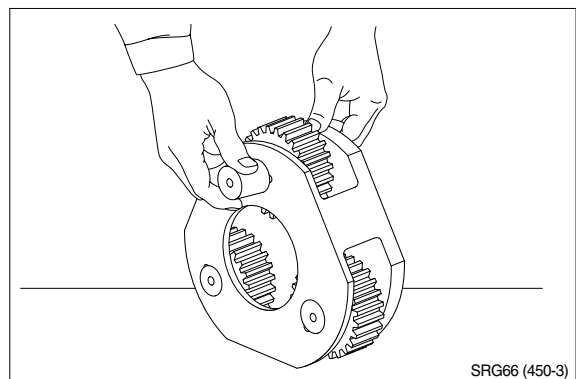


- ② Assemble ring gear(12).

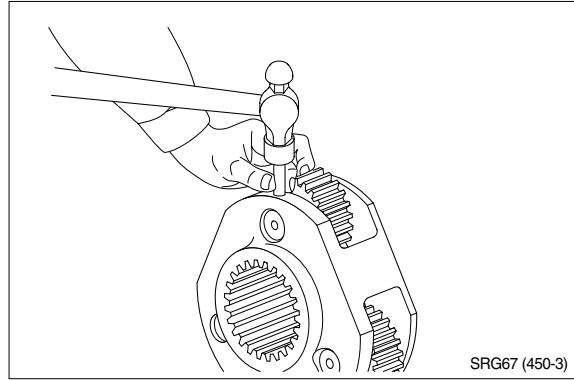


(6) Assembly of holder assembly

- ① Insert shaft 2(20) after putting plate(22) and holder(24).
- ※ Lubricate gear oil to inside of gear and outside of shaft.

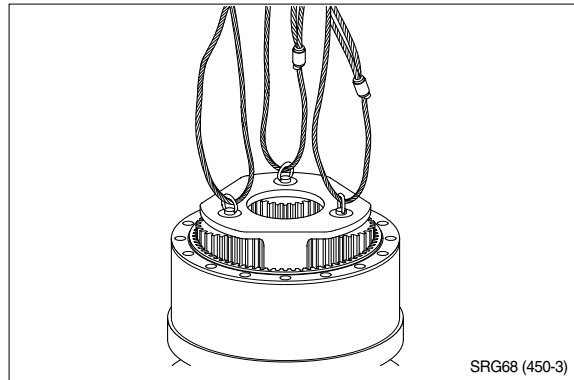


- ② Insert spring pin(23) by hammering.
- ※ Insert as the clearance between spring pins toward gear(21).

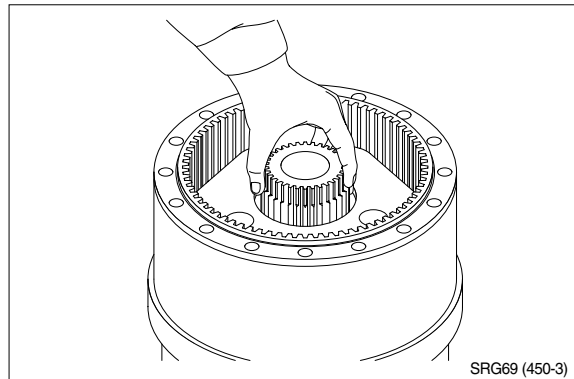


(7) Assembly of 2nd holder assembly and planetary gear 4

- ① Insert holder assembly being engaged with internal teeth of ring gear(12). Rotate holder assembly lightly so that splines of pinion shaft(1) are engaged.

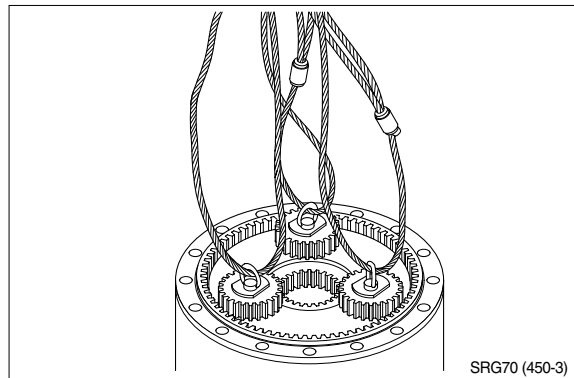


- ② Insert spur gear 4(13) thrust plate to gear 5(21).

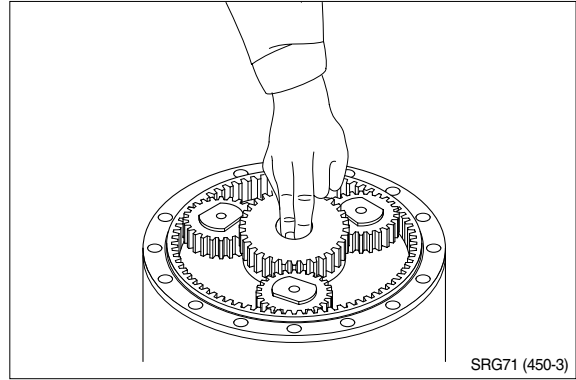


(8) Assembly of sun gear and 1st holder assembly

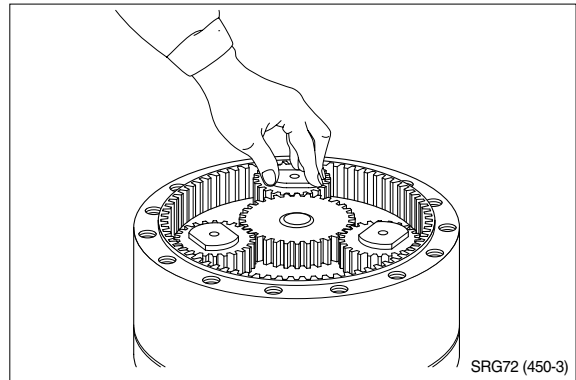
- ① Insert holder assembly being engaged with internal teeth of ring gear(12). Rotate holder assembly lightly so that spur gear 4(13) is engaged with teeth of holder 1(16).



- ② Insert sun gear(15) to planetary gear 2(15).



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



This completes assembly.

GROUP 5 SWING DEVICE(#0409~)

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 pipe assy(4, 5, 6, 7).
- (4) Disconnect pilot line hoses(2, 3, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17).
- (5) Sling the swing motor assembly(1) and remove the swing motor mounting bolts(18).

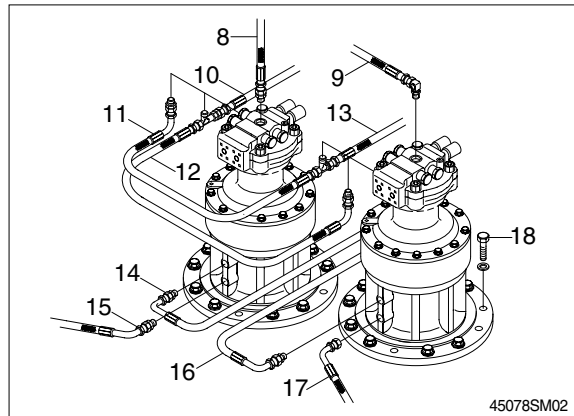
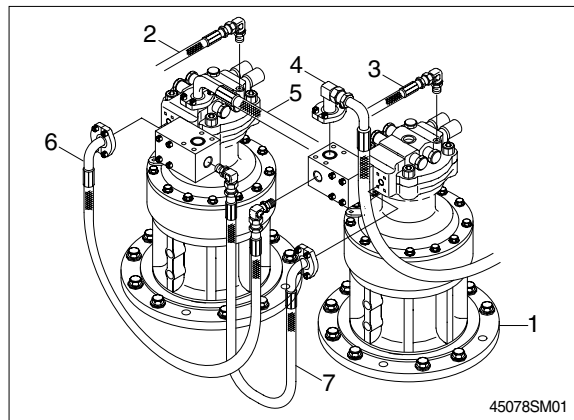
- Motor device weight : 63kg(139lb)
- Tightening torque : 58.4kgf · m
(422.4lbf · ft)

- (6) Remove the swing motor assembly.

※ When removing the swing motor assembly, check that all the piping have been disconnected.

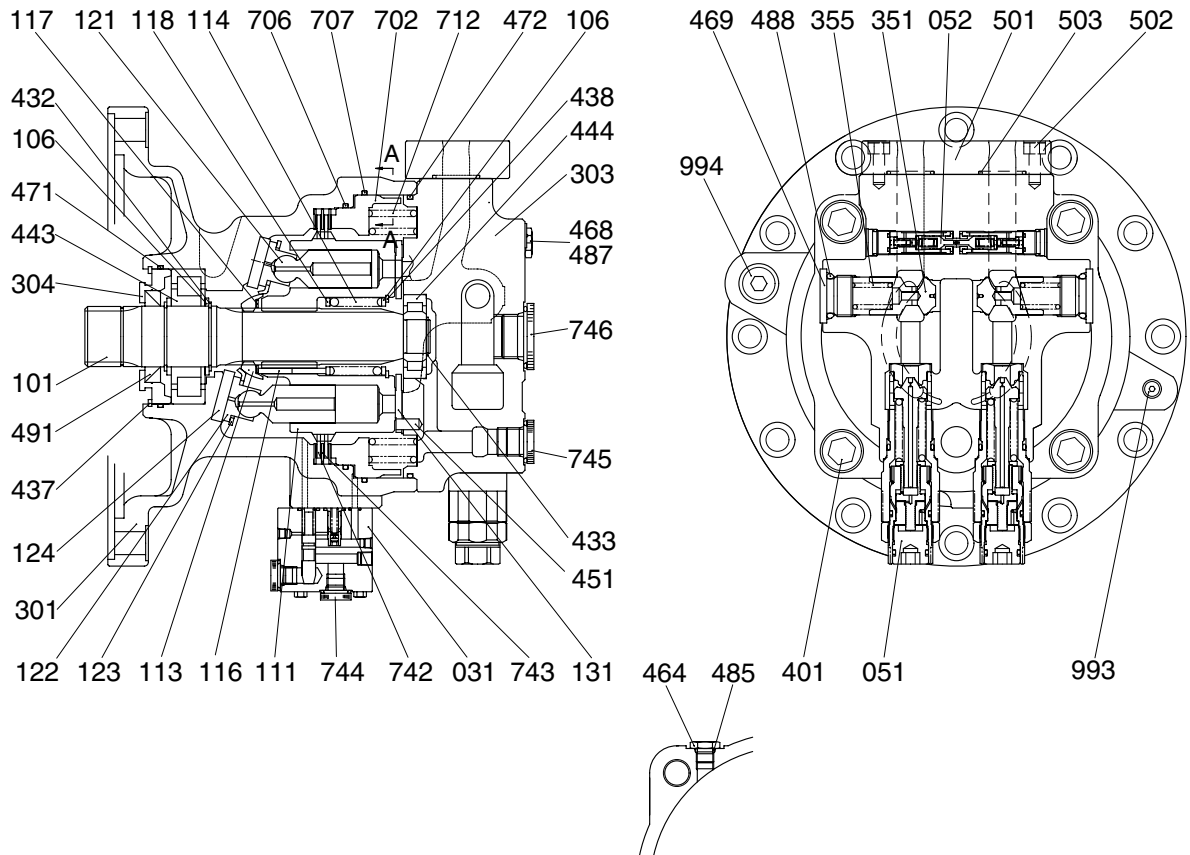
2) INSTALL

- (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



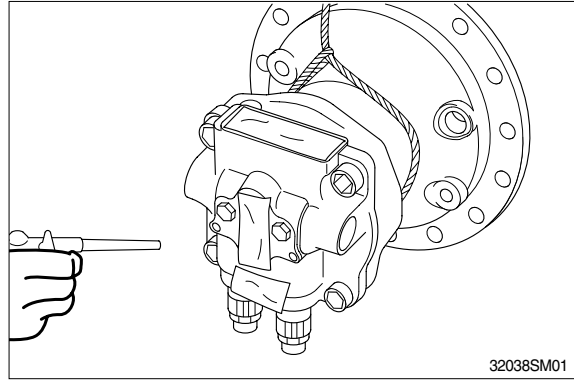
SECTION A - A

50072SM02

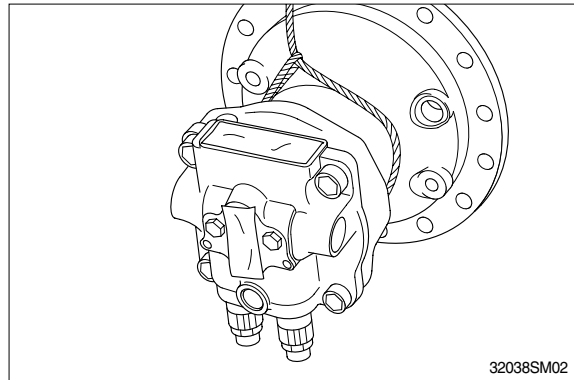
031	Brake valve	303	Valve casing(K)	485	O-ring
051	Relief valve	304	Front cover	487	O-ring
052	Reactionless valve assy	351	Plunger(K)	488	O-ring
101	Drive shaft	355	Spring	491	Oil seal
106	Spacer	401	Socket bolt	501	Adapter
111	Cylinder block	432	Snap ring	502	Socket bolt
113	Spherical busing	433	Snap ring	503	O-ring
114	Cylinder spring	437	Snap ring	702	Brake piston
116	Push rod	438	Snap ring	706	O-ring
117	Spacer(F)	443	Roller bearing	707	O-ring
118	Spacer(R)	444	Roller bearing	712	Brake spring
121	Piston	451	Spring pin	742	Friction plate
122	Shoe plate	464	VP Plug	744	Dust plug
123	Retainer	468	VP Plug	745	Dust plug
124	Shoe	469	RO Plug	746	Dust plug
131	Valve plate	471	O-ring	993	PT Plug
301	Casing(F)	472	O-ring	994	PT Plug

2) DISASSEMBLY

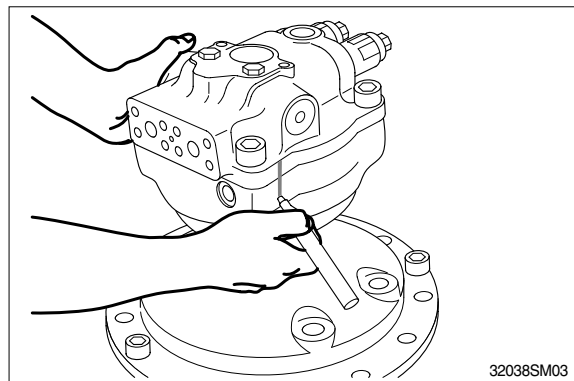
- (1) Lift the motor out. Clean the motor in kerosene and dry with compressed air.
 - ※ To avoid dust inside the motor, mask all the ports of the motor with tapes.



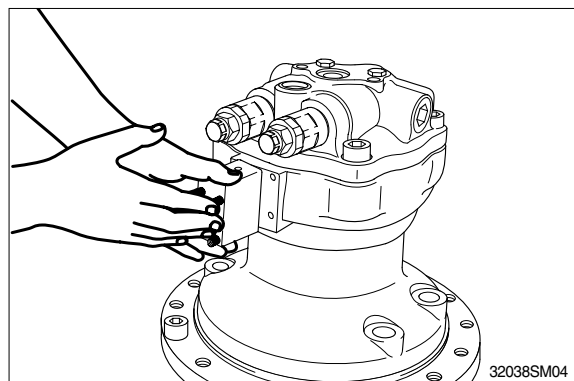
- (2) Loosen the drain plug to discharge oil in the casing(301).



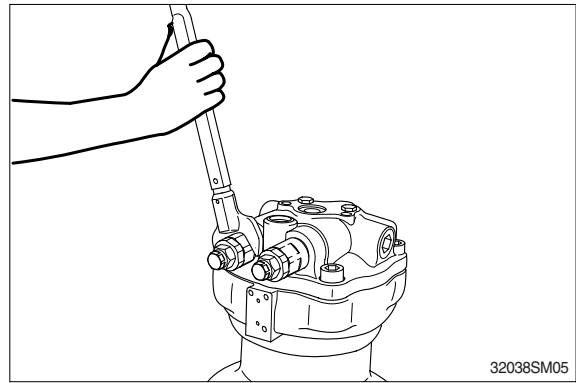
- (3) Fix the drive shaft(101) on the workbench with the end of output shaft down. Put matching marks on casing (301) and valve casing(303) for easy reassembly.



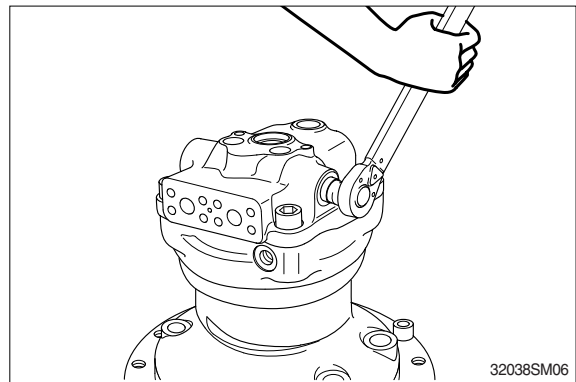
- (4) Remove the valve(052).



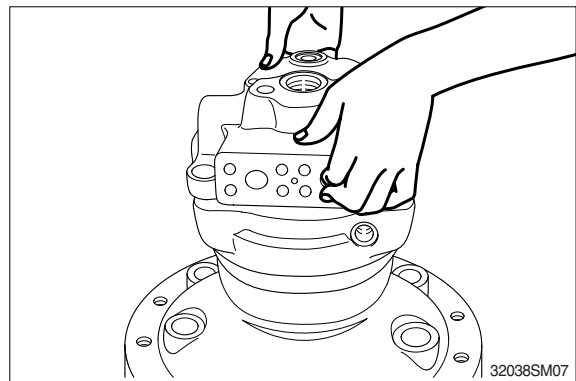
- (5) Remove the relief valve(051) from valve casing(303).



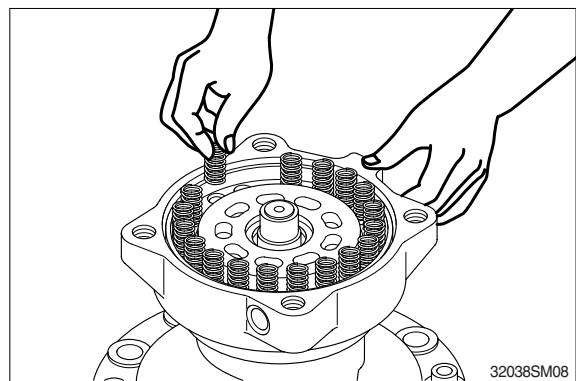
- (6) Remove plug(469) from valve casing (303) and spring(355), plunger(351).
※ Be careful not to damage the plunger seat assembly.



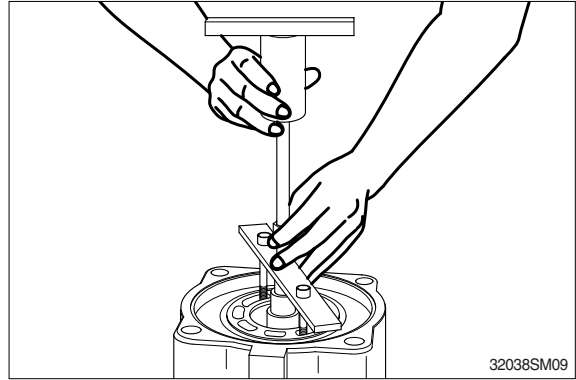
- (7) Remove valve casing(303) from casing (301). Then, remove the valve plate(131) from valve casing(303) with care.



- (8) Remove the brake spring(712) from brake piston(702).

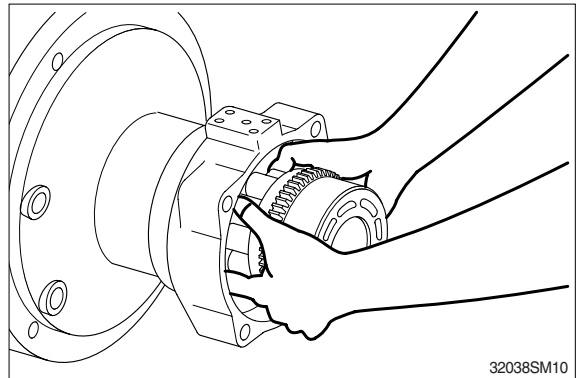


- (9) Remove brake piston(702) from casing (301).

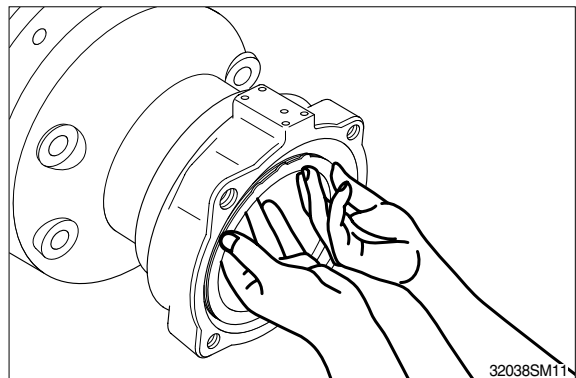


- (10) Remove the cylinder(111) from the output shaft (101) with the motor positioned horizontally. Remove piston(121), retainer(123), spherical bushing(113), spacer (117) and shoe plate(124).

※ If shoe plate would not removed easily, try again after procedure(14).

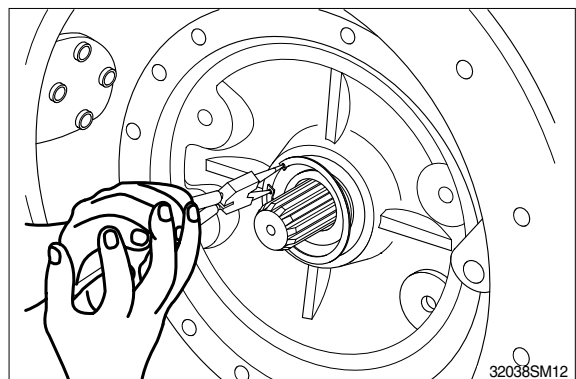


- (11) Remove friction plate(742) and separate plate(743) from casing(301).

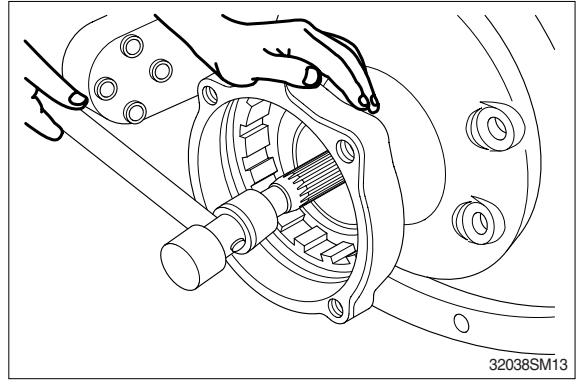


- (12) Remove snap ring(437) with plier and remove the front cover(304) from casing(301).

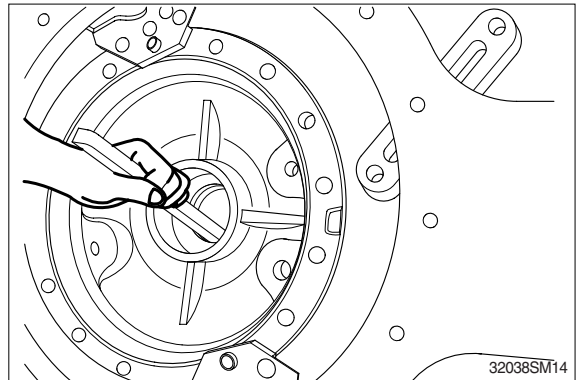
※ Front cover could be removed with sliding shaft if necessary.



(13) Remove drive shaft(101) from casing (301).



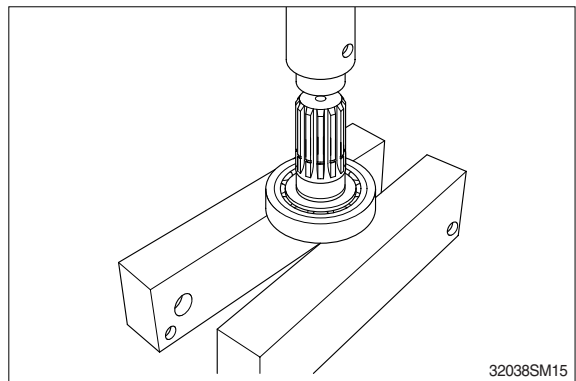
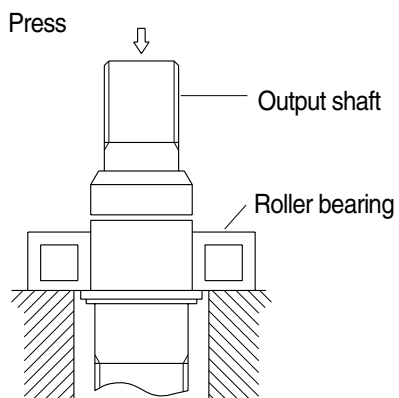
(14) Remove the shoe plate(124) from casing (301).



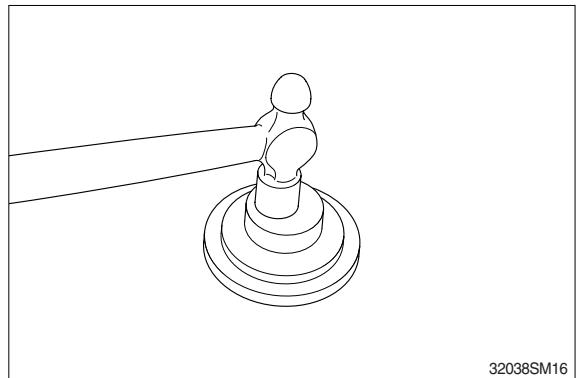
(15) Proceed with following job only when necessary.

- ① Remove the snap ring(432), spacer(106) from drive shaft(101) and remove the cone of roller bearing(443) by press.

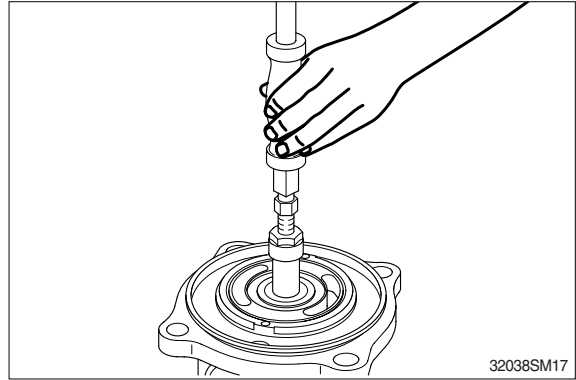
※ Do not reuse bearings.



- ② Remove oil seal(491) from front cover (304).

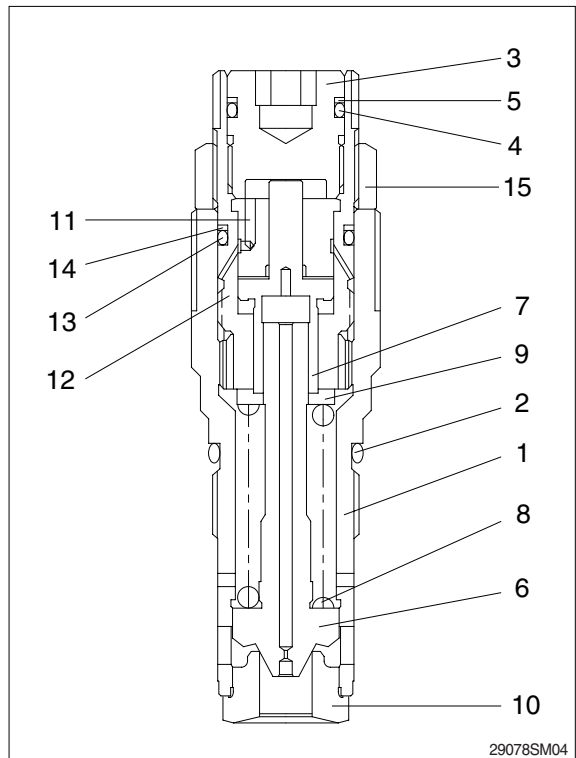


- ③ Remove the roller bearing(444) from the valve casing(303) by using slide hammer bearing puller.



- ④ When disassembling the relief valve, release the plug(3).
Remove the piston(7), spring seat(9), spring(8) and plunger(6) with the body(1) downwards.

※ Do not release the lock nut(15).

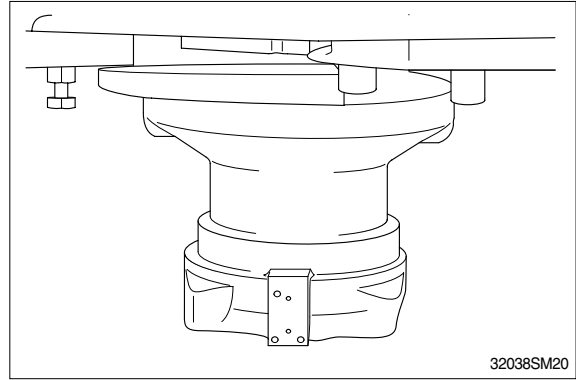


This completes disassembly.

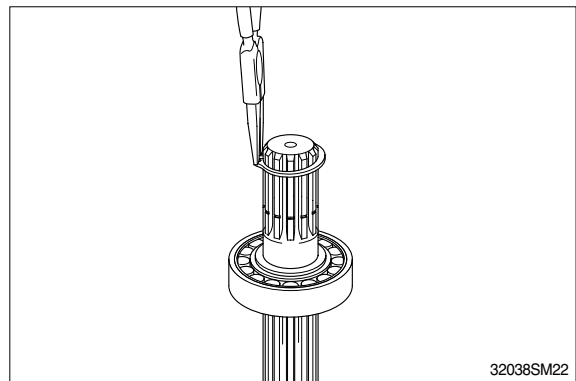
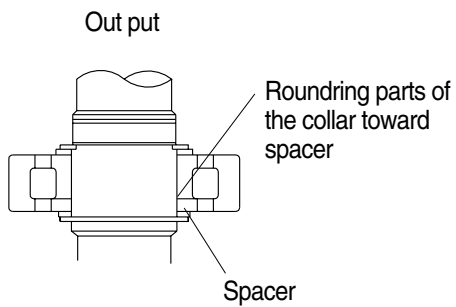
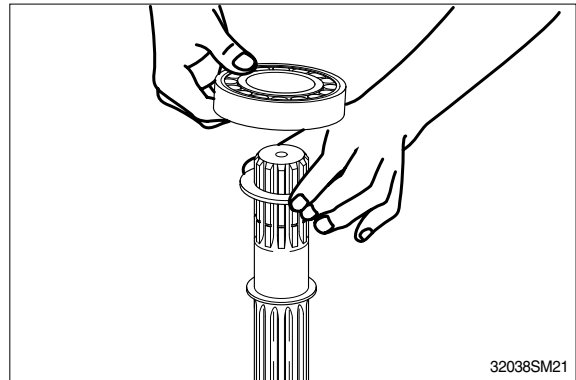
3) ASSEMBLY

Do the reassembly in the reverse procedure of the disassembly.

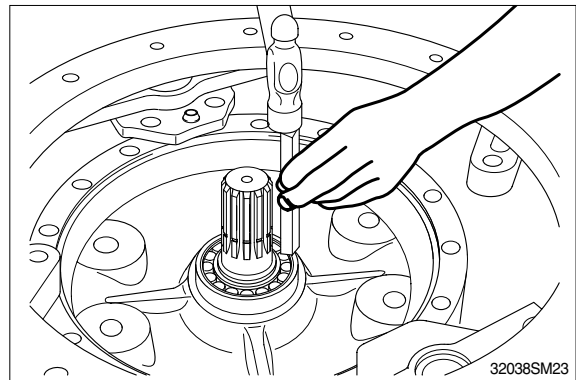
- (1) Place the casing(301) on the workbench with the valve casing(303) downward.



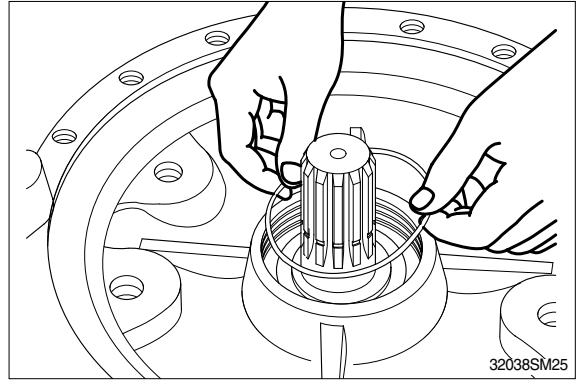
- (2) When reassembling the roller bearing, install the snap ring(432), and spacer(106) to the drive shaft(101). Insert the collar and cone of the roller bearing(443). Install the spacer(106) and snap ring(432). Install snap ring(433) to the output shaft (101) by heating the cone of the roller bearing(444).



- (3) Insert the drive shaft(101) into the casing (301) with the end of output shaft upward and tap the outer race of roller bearing with the hammer.

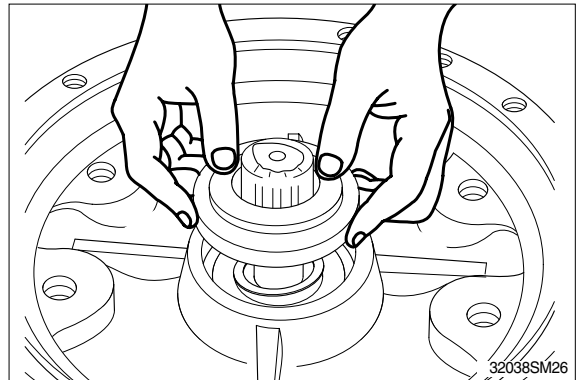


(4) Tack O-ring(471) to the casing(301).

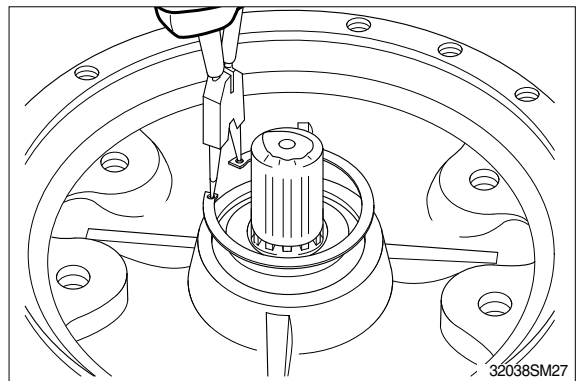


(5) Reassemble the front cover(304) to the casing(301).

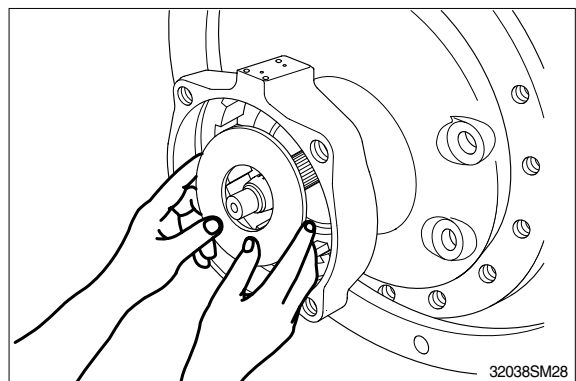
※ Apply grease to the rib of oil seal to avoid damage to the rib.



(6) Install the snap ring(437) to the casing (301).

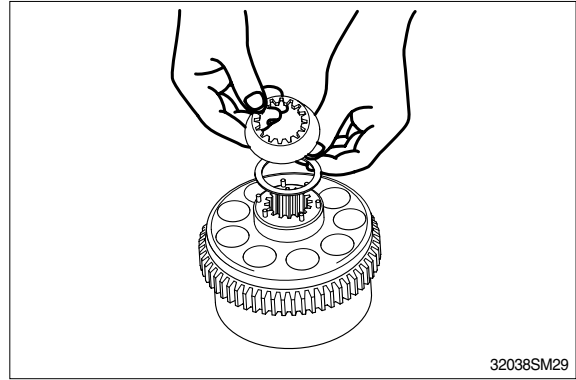


(7) Insert the shoe plate(124) with the casing (301) position horizontally.



(8) Insert the push rod(116) into the cylinder (111). Place the spherical bushing(113) assembled with spacer(117) onto the cylinder.

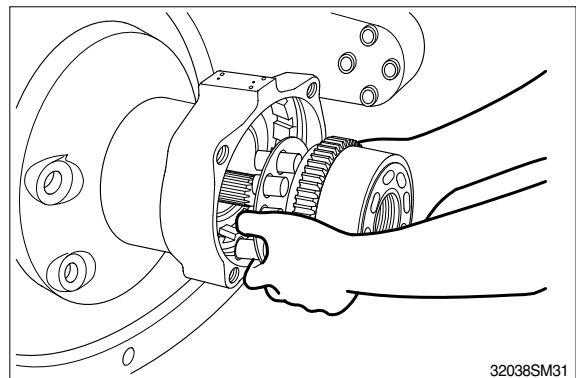
※ Insert two push rods in each hole.



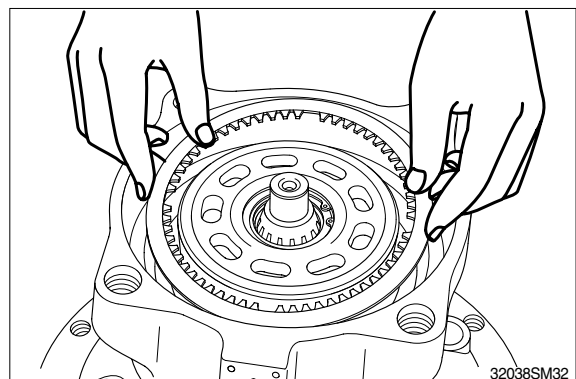
(9) Install the piston sub-assembly(121, 122) to the retainer(123).



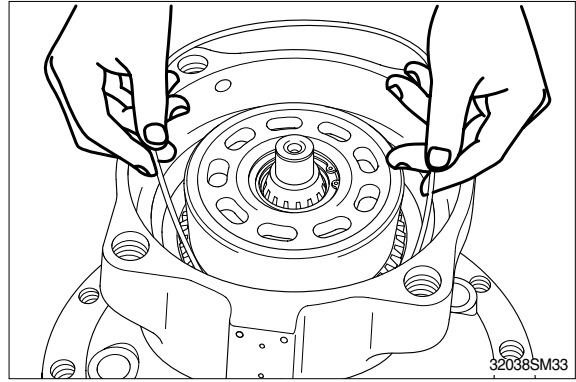
(10) Reassemble the piston assembly(121, 122) to the cylinder(111).



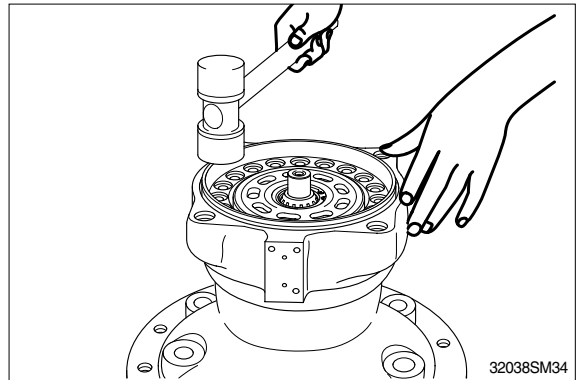
(11) Place the casing(301) under the front cover(304) and reassemble 3 sheets of separate plate(743) and then 2 sheets of friction plate(742) to the casing(301).



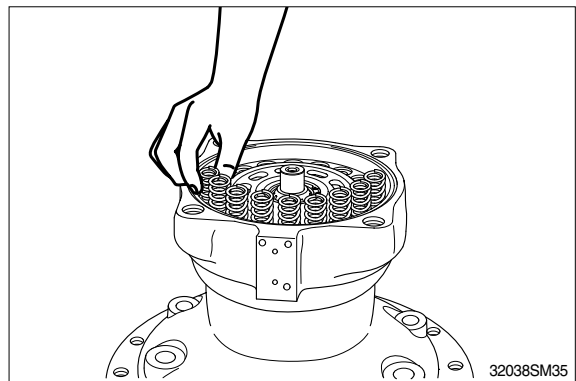
(12) Insert O-ring(706, 707) inside the casing (301).



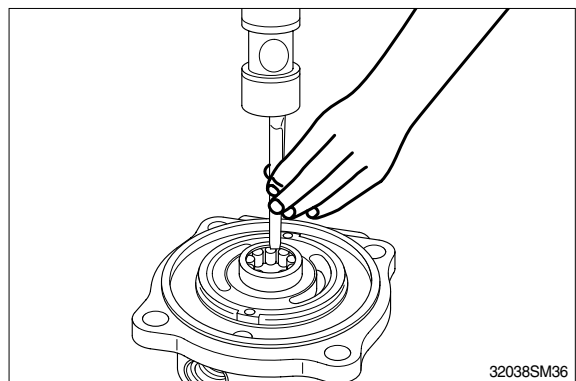
(13) Reassemble brake piston(702) to the casing(301).



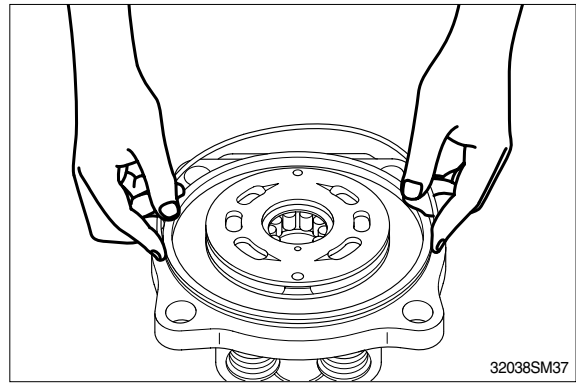
(14) Reassemble brake spring(712) to the brake piston(702).



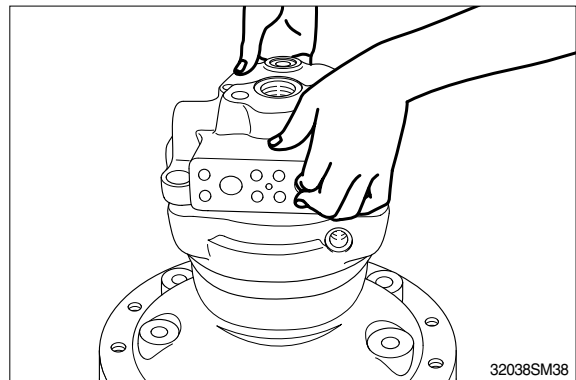
(15) When assembling the roller bearing(444), insert the roller bearing(444) into valve casing(303) by hammering.



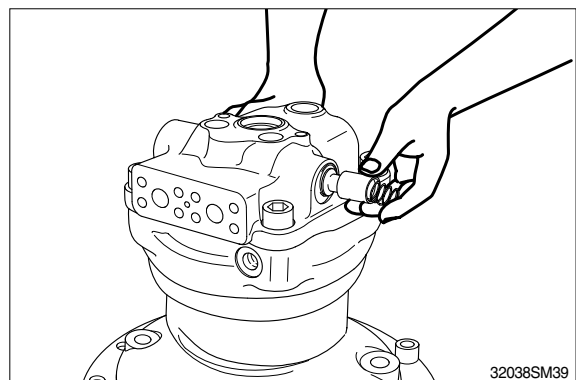
(16) Reassemble valve plate(131) to the valve casing(303) and reassemble O-ring(472).



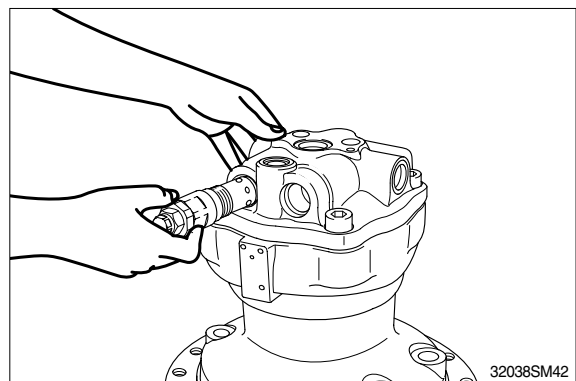
(17) Connect the valve casing(303) with the casing(301) and tighten the hexagon socket bolt(401).



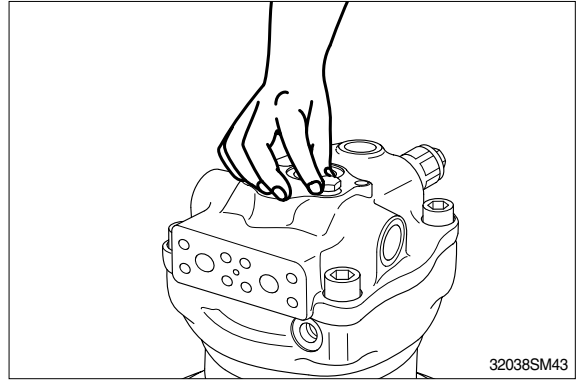
(18) Insert plunger(351) and spring(355) in the valve casing and install O-ring(488). Tighten plug(469) to the valve casing.



(19) Insert O-rings(051-1) to the relief valve (051) and reassemble them to valve casing(303).



(20) Tighten the plug(468) to valve casing(303) with O-ring(487) and tighten the plug(464) to casing(301) with O-ring(485).



(21) Connect the valve casing(303) with the casing(301).

This completes assembly.

3. REMOVAL AND INSTALL OF REDUCTION GEAR

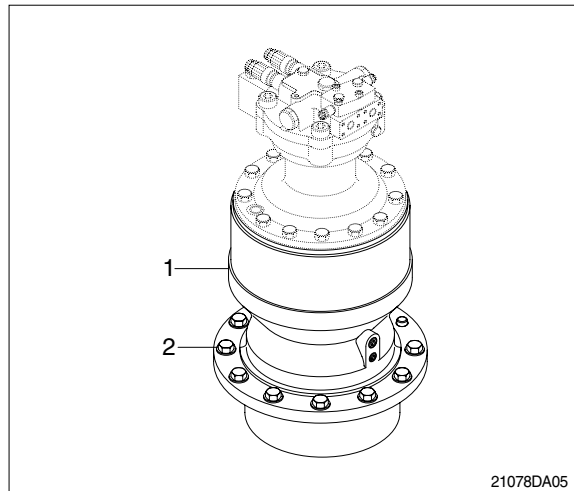
1) REMOVAL

- (1) Remove the swing motor assembly.
For details, see **removal of swing motor assembly**.
- (2) Sling reduction gear assembly(1) and remove mounting bolts(2).
- (3) Remove the reduction gear assembly.
 - Reduction gear device weight : 180kg
(396lb)



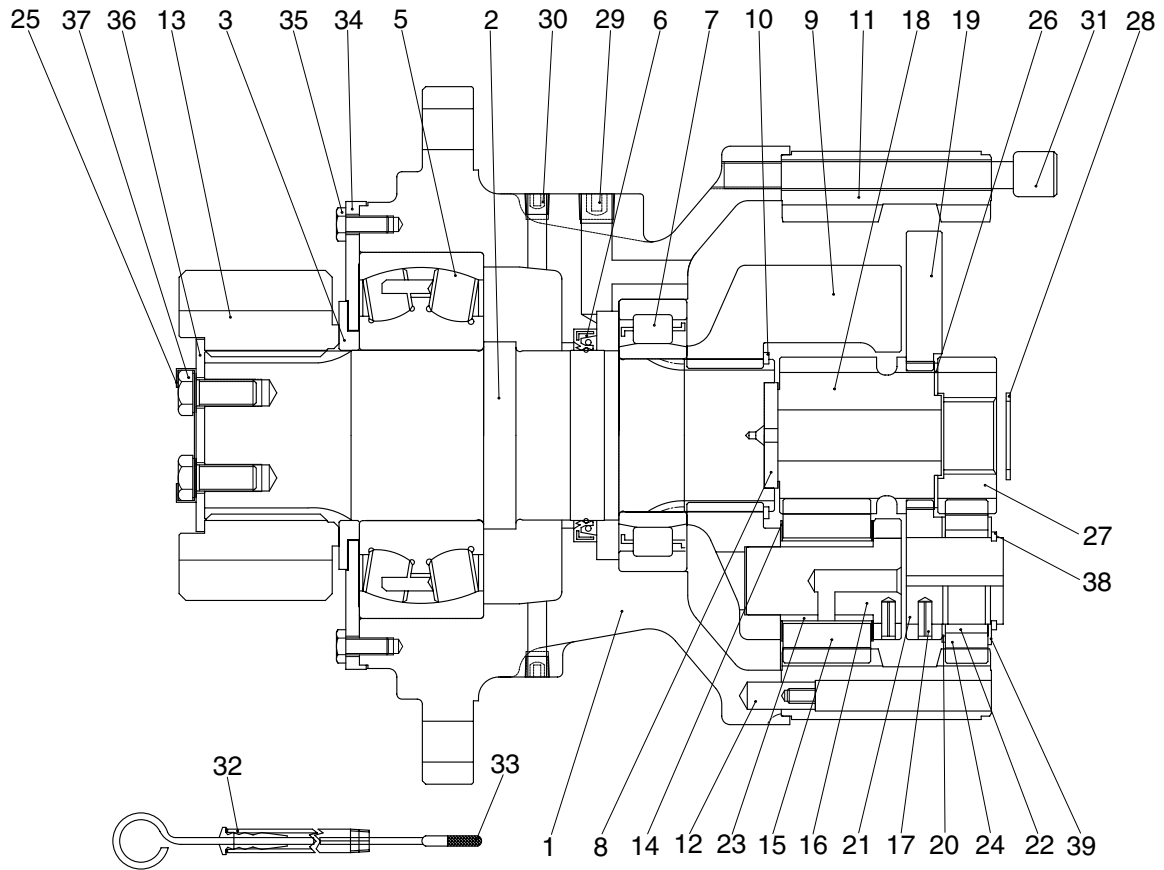
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
 - Tightening torque : 49.2~66.6kgf · m
(356~481lbf · ft)



4. REDUCTION GEAR

1) STRUCTURE



50072SM03

1	Casing	15	Planet gear 2	28	Stop ring
2	Drive shaft	16	Pin 2	29	Plug
3	Spacer	17	Spring pin	30	Plug
5	Roller bearing	18	Sun gear 2	31	Socket bolt
6	Oil seal	19	Carrier 1	32	Gage pipe 39
7	Roller bearing	20	Side plate 1	33	Gage bar side plate2
8	Thrust plate	21	Pin 1	34	Cover plate
9	Carrier 2	22	Needle cage	35	Hex bolt
10	Stop ring	23	Bushing	36	Lock plate
11	Ring gear	24	Planet gear 1	37	Hex bolt
12	Knock pin	25	Lock washer	38	Stop ring
13	Pinion gear	26	Side plate 3	39	Side plate 2
14	Thrust washer	27	Sun gear 1	40	Air breather assy

2) DISASSEMBLY

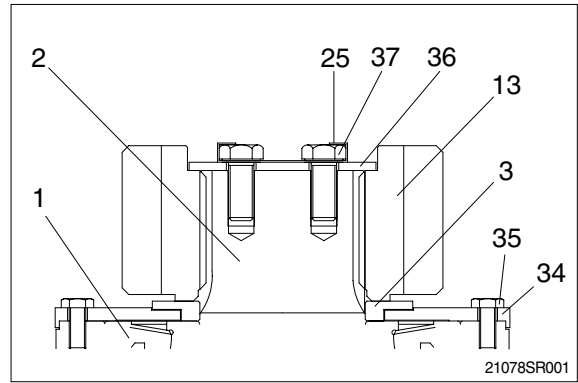
(1) Spread off the 4 corners of lock washer (25) with a tool.

※ Do not reuse lock washer(25).

Loosen the hexagon bolts(37) and then remove lock washer(25) and lock plate (36) from the pinion gear(13).

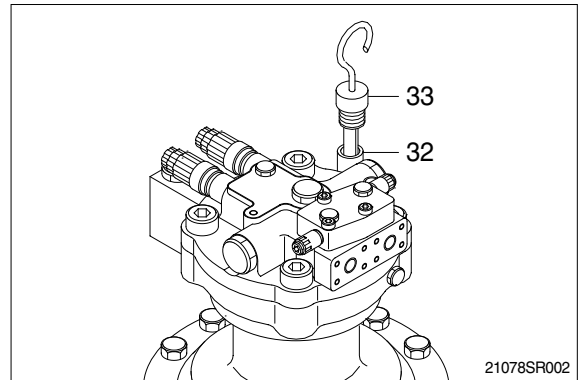
Remove pinion gear(13) and spacer(3) from the drive shaft(2).

Remove cover plate(34) from the casing (1) by loosening the hexagon socket bolts (35).

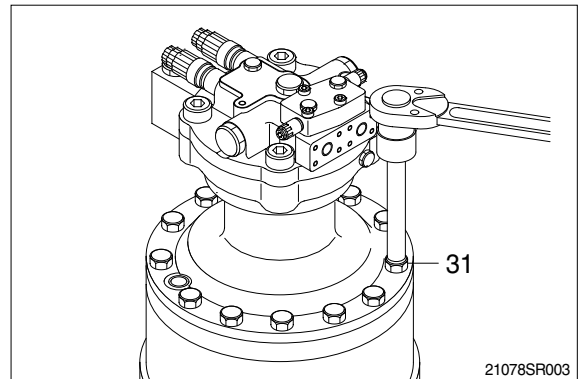


(2) Remove gauge bar(33) and gauge pipe (32) from the swing motor casing.

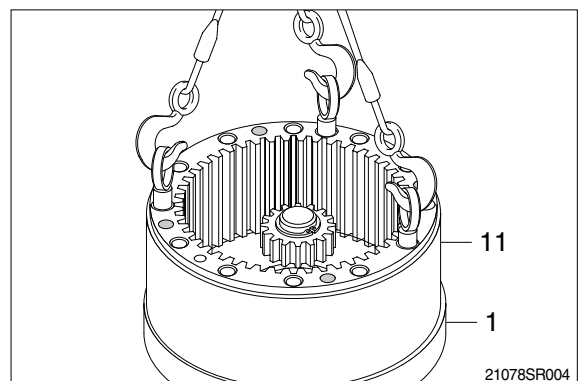
※ Pour the gear oil out of reduction gear into the clean bowl to check out the friction decrease.



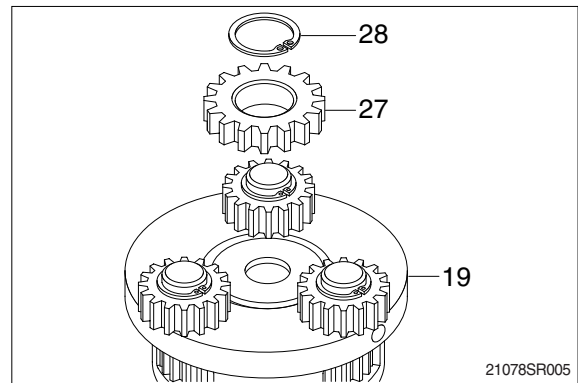
(3) Loosen the socket bolts(31) to separate swing motor from reduction gear.



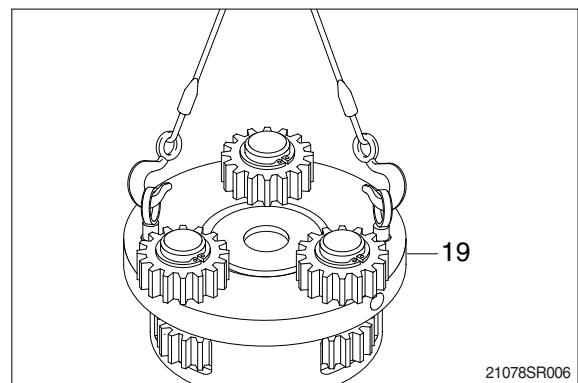
(4) Tighten 3 M16 eye bolts to the ring gear (11) and then lift the ring gear(11) out of the casing(1).



- (5) Remove stop ring(28) and then sun gear1 (27).

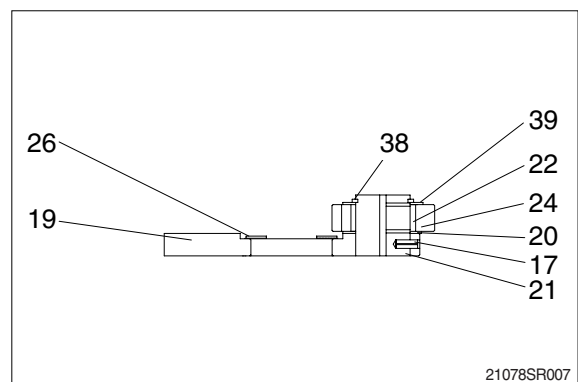


- (6) Tighten two M10 eye bolts to carrier1(19) and lift up and remove carrier1(19) as subassembly.

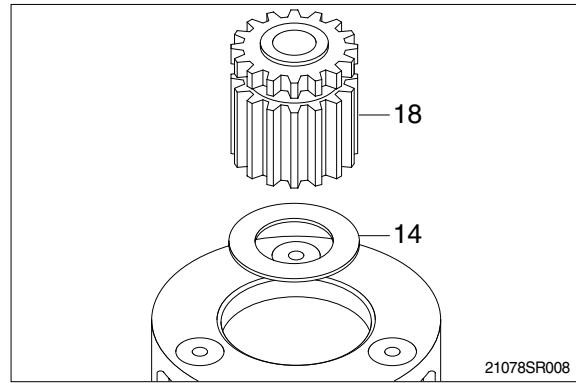


- (7) Disassembling carrier1(19) assembly.

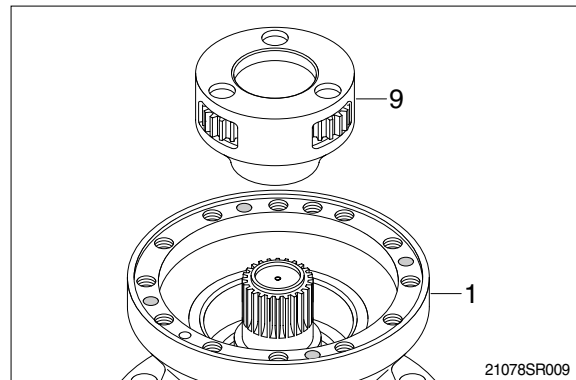
- ① Remove stop ring(38).
- ② Remove side plate2(39), planet gear1 (24), needle cage(22), side plate1(20) and side plate3(26) from the carrier.
- ③ Using M8 solid drill, crush spring pin(17) so that the pin1(21) can be removed by hammering.
- ④ Remove side plate3(26) from carrier1(19).
 - ※ Do not reuse spring pin(17).
 - ※ Do not remove pin1(21), carrier1(19) and spring pin(17) but in case of replacement.
 - ※ Put matching marks on the planet gear1 (24) and the pin1(21) for easy reassembly.



(8) Remove sun gear2(18) and thrust gear (14).

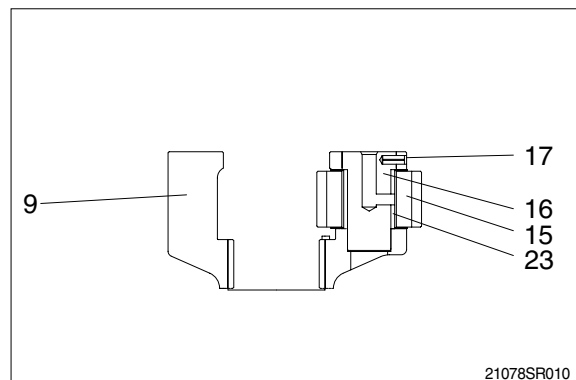


(9) Remove carrier2(9) assembly from casing (1).

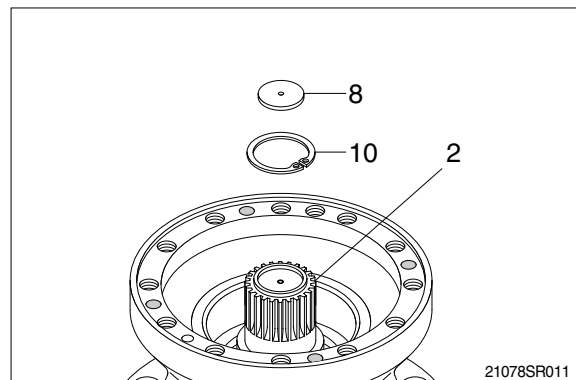


(10) Disassembling carrier2(9) assembly

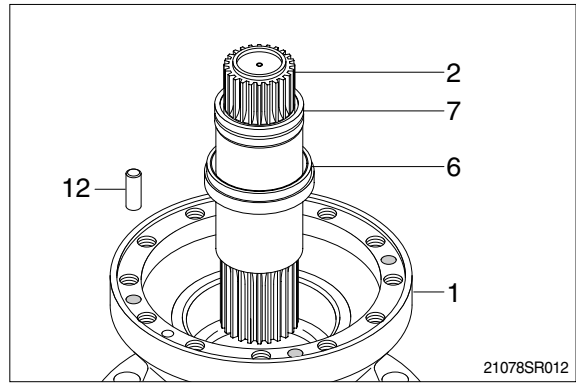
- ① Using M8 solid drill, crush spring pin(17) so that the pin2(16) can be removed.
※ Do not reuse spring pin(17).
- ② Remove pin2(16), planet gear2(15) and bush2(23) from the carrier2(9).
※ Put matching marks on the planet gear2 (15) and the pin2(16) for easy reassembly.
※ Do not disassemble pin2(16), carrier2(9) and spring pin(17) but in case of replacement.



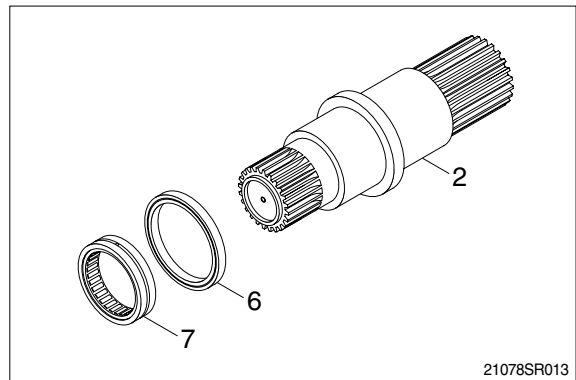
(11) Remove thrust plate3(8) and stop ring (10) from the drive shaft(2).



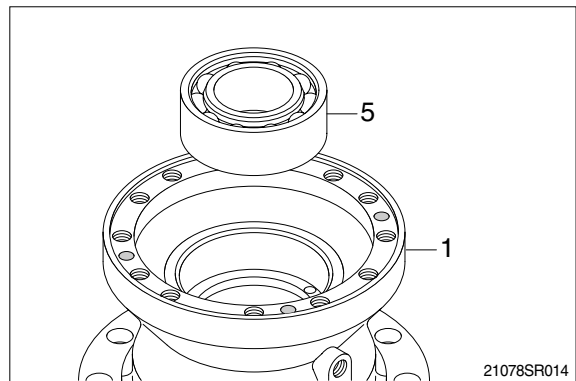
- (12) Remove drive shaft(2) with roller bearing(7) and oil seal(6) assembled.
Remove knock pin(12) from the casing(1).



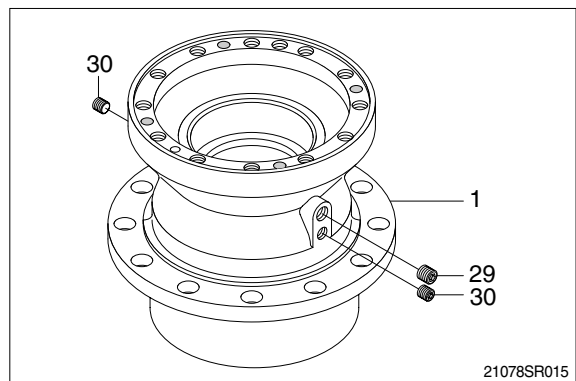
- (13) Remove roller bearing(7) and oil seal(6)
from the drive shaft(2).
※ Do not reuse oil seal(6) once removed.



- (14) Using the bearing disassembly tool,
remove roller bearing(5).

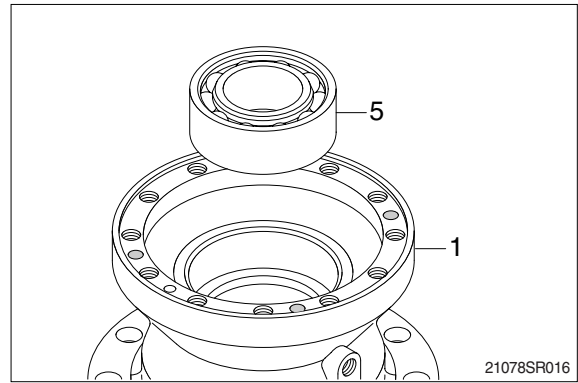


- (15) Remove plugs(29, 30) from the casing(1).

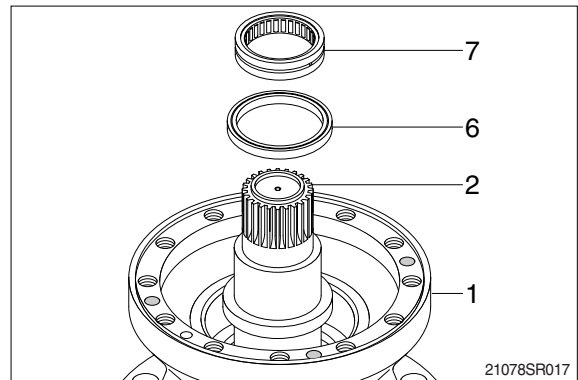


3) ASSEMBLY

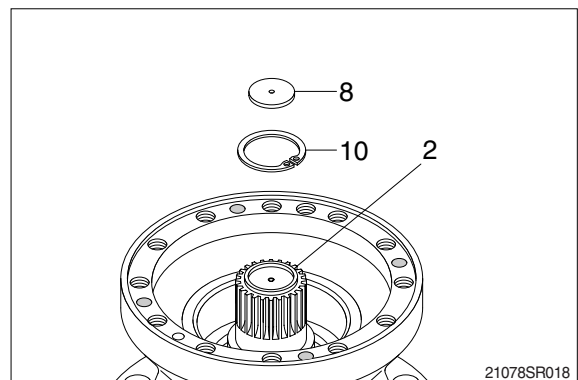
- (1) Assemble roller bearing(5) inside the casing(1).



- (2) Assemble the drive shaft(2) into the casing(1) and then install oil seal(6) and roller bearing(7).

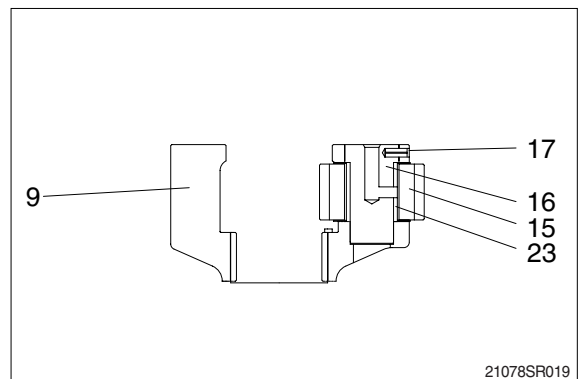


- (3) Install stop ring(10) and thrust plate 3(8) on top of drive shaft(2).

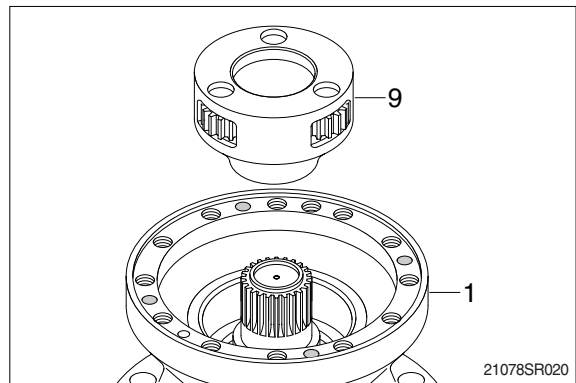


- (4) Assembling carrier2(9) assembly.

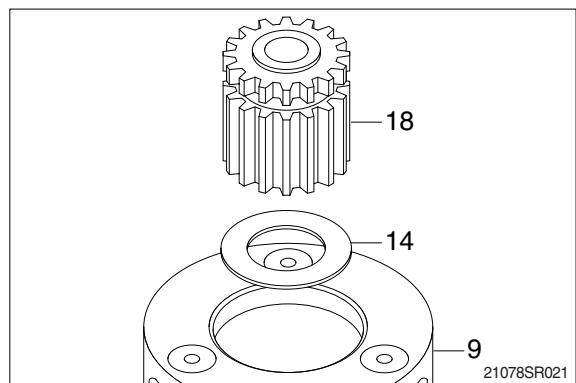
- ① Install thrust washer(14) inside the carrier2 (9).
 - ② Install bush2(23) inside the planet gear2 (15) and then assemble them to the carrier2(9).
 - ③ Assemble the pin2(16) to the carrier2(9) and then press the spring pin(17) by hammering.
 - ④ Punch 2 points of the spring pin(17) lip.
- ※ Take care not to mistake the matching marks of each part.



- (5) Assemble carrier2(9) assembly correctly to the drive shaft(2).

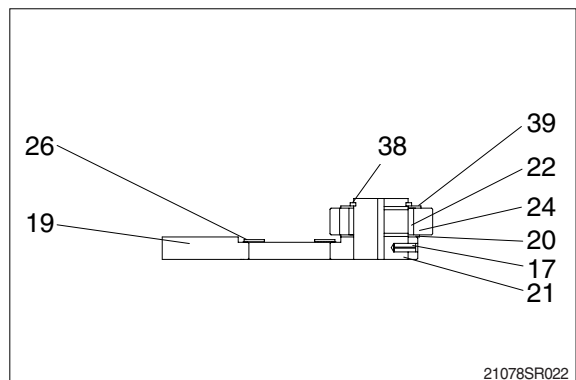


- (6) Assemble sun gear2(18) and thrust washer(14) to the center of the carrier2(9) assembly.

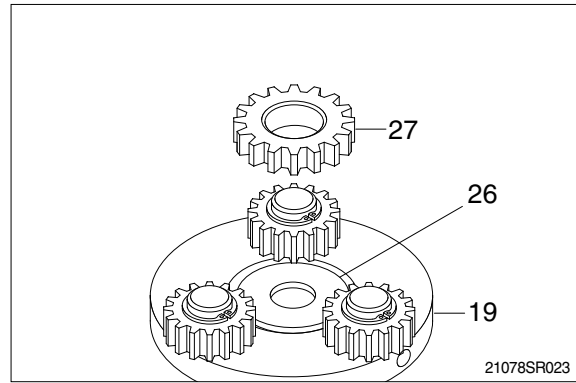


- (7) Assembling carrier1(19) assembly.

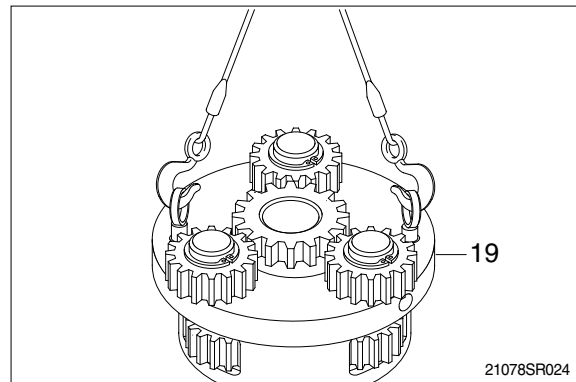
- ① Assemble the pin1(21) to the carrier1(19) and then press the spring pin(17) by hammering.
 - ② Punch 2 points of the spring pin's(17) lip.
 - ③ Install side plate3(26) onto the center of carrier1(19).
 - ④ Install needle cage(22) into the planet gear1(24).
 - ⑤ Assemble side plate(20), planet gear1(24), side plate2(39) and then stop ring(38) to the pin1(21).
- ※ Take care not to mistake the matching marks of each part.



(8) Install sun gear(27) onto the side plate3 (26).



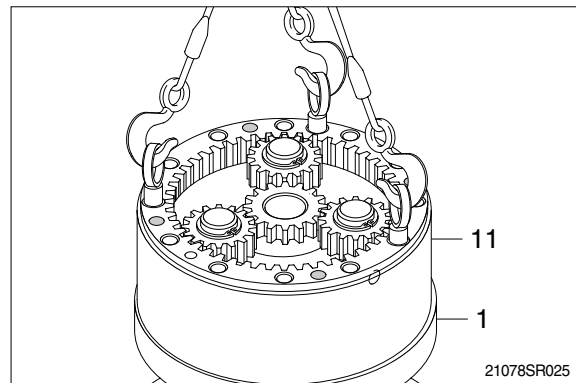
(9) Assemble carrier1(19) assembly onto the carrier2(9) assembly.



(10) Apply loctite to the tapped holes of casing (1).

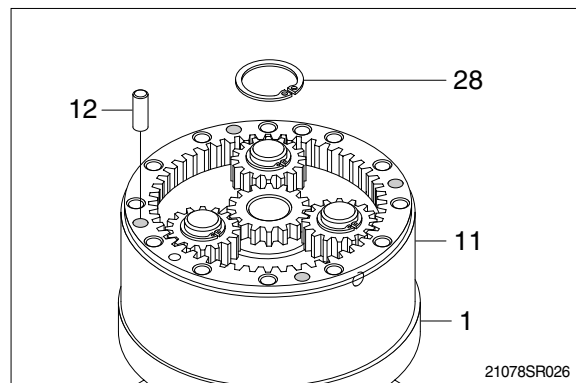
(11) Tighten 3 M16 eye bolts to the ring gear(11) and lift up and then assemble it onto the casing(1).

※ Don't fail to coincide the knock pin(12) holes.



(12) Hammer 4 knock pins(12) around the ring gear(11).

(13) Assemble stop ring(28) to the drive shaft of the swing motor.

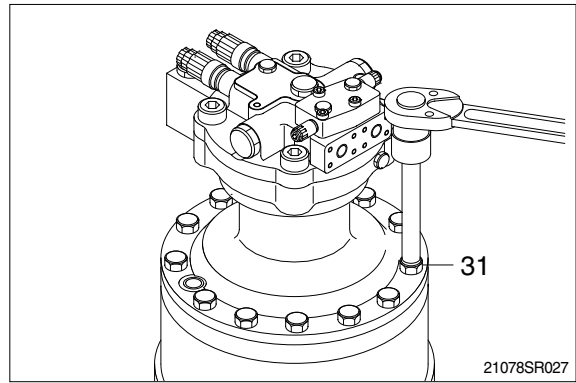


(14) Apply loctite to the tapped holes of the ring gear(11) and then mount swing motor onto the ring gear(11).

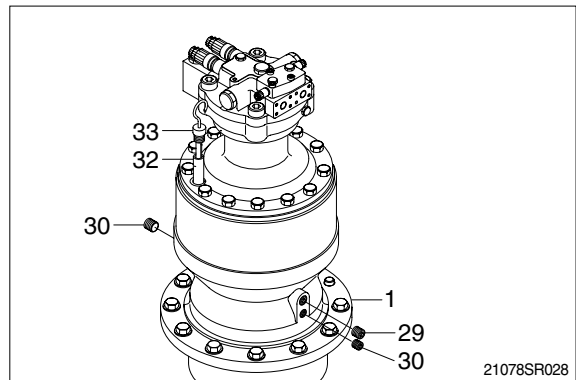
※ Don't fail to coincide the gauge bar(33) hole.

(15) Tighten socket bolts(31) around the swing motor assembly.

· Tightening torque : $25 \pm 2.5 \text{kgf} \cdot \text{m}$
($181 \pm 18 \text{lb} \cdot \text{ft}$)



(16) Assemble plugs(29, 30), gauge bar(33) and gauge pipe(32).



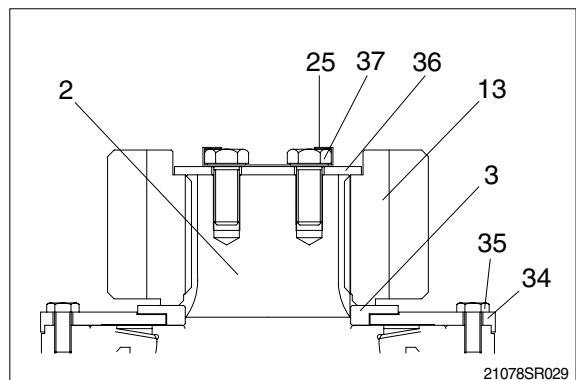
(17) Turn the swing motor assembly upside down and assemble cover plate(34) by tightening the hexagon socket bolts(35). Install spacer(3) and pinion gear(13) to the drive shaft(2).

Assemble lock plate(36) on the pinion gear(13).

Assemble 2 lock washers(25) on the lock plate(36) with their 2 hole coincided individually to the tapped holes of drive shaft(2).

Tighten hexagon socket bolts(37) to the drive shaft(2) and then fold all the lock washer(25) corners over the hexagon bolts(37).

· Tightening torque : $25 \pm 2.5 \text{kgf} \cdot \text{m}$
($181 \pm 18 \text{lb} \cdot \text{ft}$)



(18) Inject oil into the reduction gear.