

GROUP 6 TRAVEL DEVICE (TYPE 1)

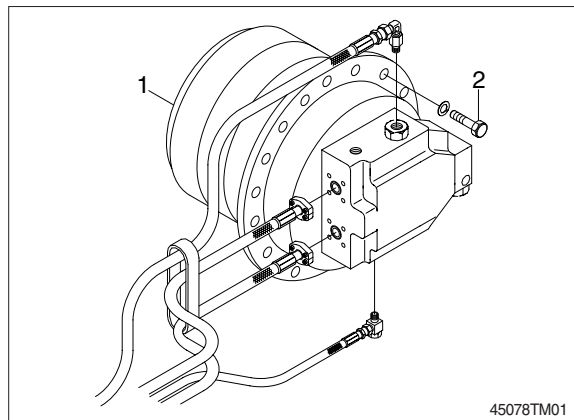
1. REMOVAL AND INSTALL

1) REMOVAL

- (1) Swing the work equipment 90° and lower it completely to the ground.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

- ※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.
- (4) Remove the track shoe assembly.
For details, see removal of track shoe assembly.
 - (5) Remove the cover.
 - (6) Remove the hose.
 - ※ Fit blind plugs to the disconnected hoses.
 - (7) Remove the bolts and the sprocket.
 - (8) Sling travel device assembly (1).
 - (9) Remove the mounting bolts (2), then remove the travel device assembly.
 - Weight : 360 kg (790 lb)

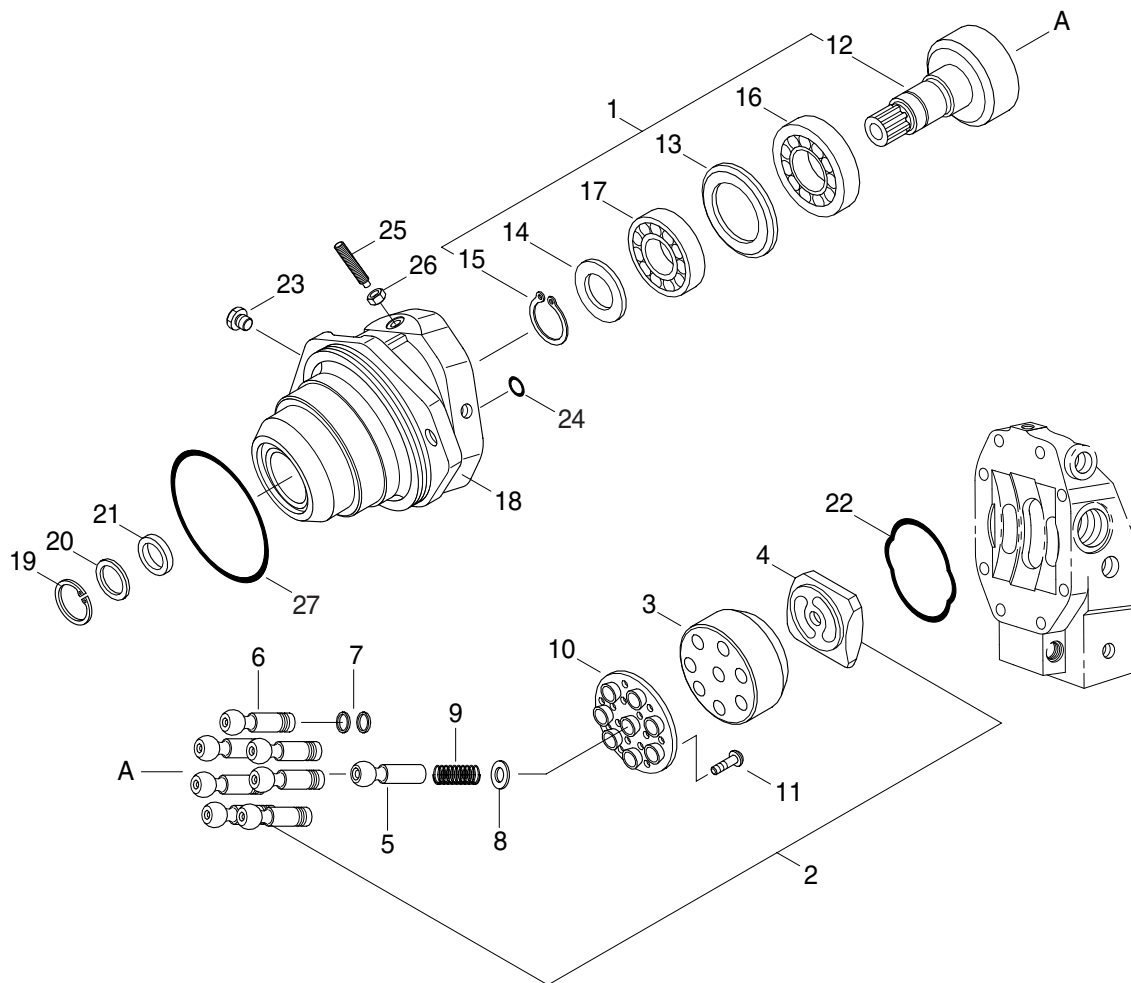


2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Bleed the air from the travel motor.
 - ① Remove the air vent plug.
 - ② Pour in hydraulic oil until it overflows 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) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. TRAVEL MOTOR (1/2)

1) STRUCTURE

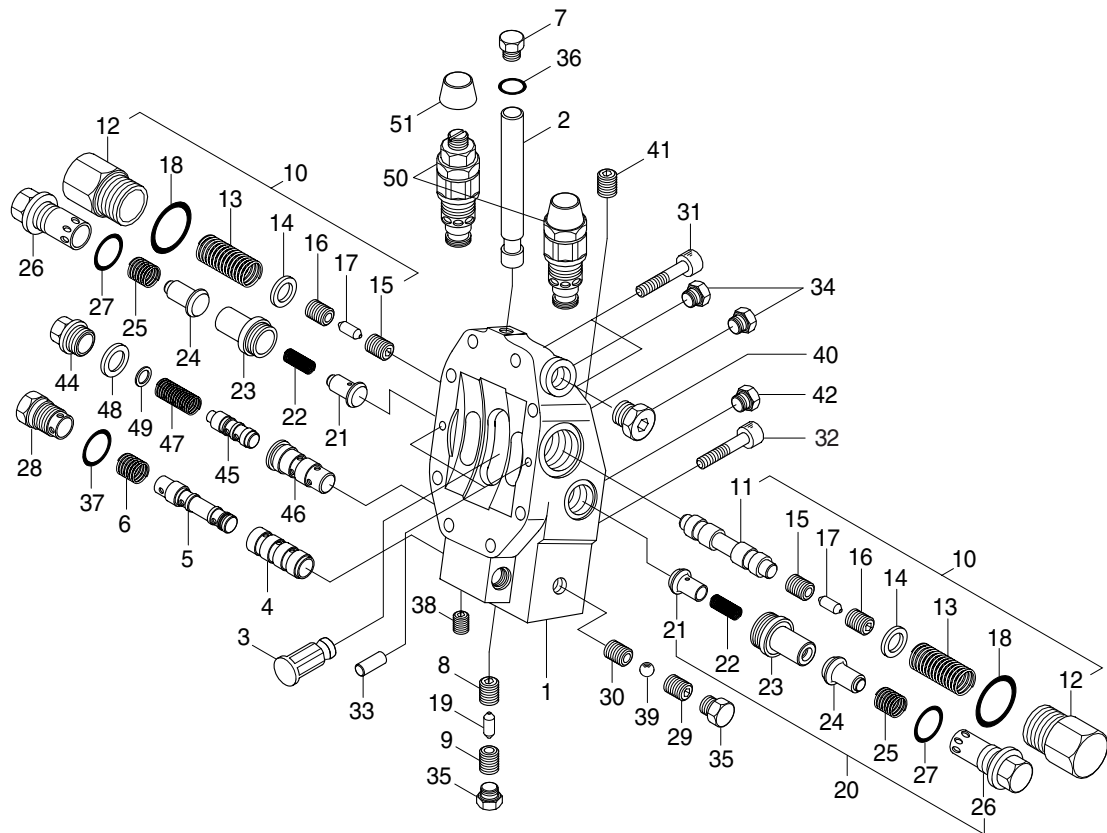


450A8TO02

1	Rotary group	10	Retainer plate	19	Retainer ring
2	Hyd section rotary	11	Screw	20	Shaft seal ring
3	Cylinder	12	Drive shaft	21	Back up plate
4	Control lens	13	Shim	22	O-ring
5	Center pin	14	Back up plate	23	Locking screw
6	Piston	15	Retainer ring	24	O-ring
7	Steel ring	16	Roller bearing	25	Threaded pin
8	Adjustment shim	17	Roller bearing	26	Seal lock nut
9	Pressure spring	18	Housing	27	O-ring

TRAVEL MOTOR (2/2)

· Control part

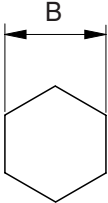


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- | | | | | | |
|----|-------------------|----|-----------------|----|------------------------|
| 1 | Port plate | 18 | O-ring | 35 | Locking screw |
| 2 | Position piston | 19 | Throttle pin | 36 | O-ring |
| 3 | Position turnnion | 20 | Valve | 37 | O-ring |
| 4 | Control bushing | 21 | Poppet valve | 38 | Brake off pin |
| 5 | Control piston | 22 | Pressure spring | 39 | Ball |
| 6 | Pressure spring | 23 | Seat poppet | 40 | Locking screw |
| 7 | Locking screw | 24 | Poppet valve | 41 | Brake off pin |
| 8 | Throttle screw | 25 | Pressure spring | 42 | Locking screw |
| 9 | Throttle screw | 26 | Locking screw | 43 | Pressure control valve |
| 10 | Brake valve | 27 | O-ring | 44 | Locking screw |
| 11 | Brake piston | 28 | Locking screw | 45 | Control piston |
| 12 | Locking screw | 29 | Valve screw | 46 | Control bushing |
| 13 | Pressure spring | 30 | Bushing | 47 | Pressure spring |
| 14 | Washer | 31 | Socket screw | 48 | O-ring |
| 15 | Throttle screw | 32 | Socket screw | 49 | Shim |
| 16 | Throttle screw | 33 | Cylinder pin | 50 | Relief pressure valve |
| 17 | Throttle pin | 34 | Locking screw | 51 | Cap |

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	2.5	
	4	
	6	
	8	
	10	
	14	
Socket for socket wrench, spanner	19	
Torque wrench	Capable of tightening with the specified torques.	
Pliers	-	
(-) Driver	150 mm	
Plastic and iron hammer	Wooden hammer allowed. Nominal 1 or so	
Steel rod approx	7×7×200 mm	
Monkey wrench	-	
Oil seal inserting jig	-	
Bearing pliers	-	
Seal tape	-	
Press (0.5 ton)	-	
Oil stone	-	
Bearing assembling jig	-	
Liquid packing	Loctite #577	
Screw lock	Loctite #243	

(2) Tightening torque

Part name	Item	Size	Torque	
			kgf·m	lbf·ft
Locking screw	11	M 6×20	1.0	7.4
Locking screw	13	M26×1.5	7.0	50.9
Locking nut	18	M12	7.0	50.9
Socket head screw	20, 21	M16×90	-	-
Socket head screw	22	M16×120	-	-
Locking screw	24	M14×1.5	3.0	22
Locking screw	25	M10×1	1.0	7
Locking screw	30	M27×2.0	9.1	66
Locking screw	32	M16×1.5	7.0	50.9

3) DISASSEMBLY

(1) General precautions

- ① Before disassembling the motor, check the items to be inspected and, for remedy against trouble, closely examine the nature of the trouble, so that the motor can be disassembled effectively.
- ② To disassemble the motor, use the disassembling procedures described in section 2) and select a clean place.
- ③ Place a rubber or vinyl sheet or other such protective materials on your working bench to protect the surface of the motor to be serviced.
- ④ During disassembly, give a match mark to the mating surfaces of each part.
- ⑤ Arrange removed parts in order so that they will not become damaged or missing during disassembly.
- ⑥ Once seals have been disassembled, they should be replaced even if damage is not observed. Have replacement seals ready on hand before starting your disassembling job.

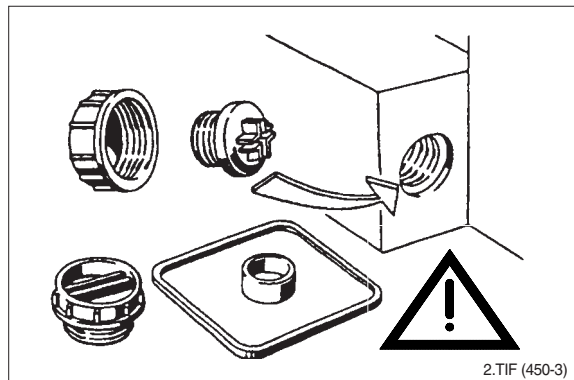
(2) Seal kit and component groups

① Attention

Observe the following notices when carrying out repair work at hydraulic aggregates!

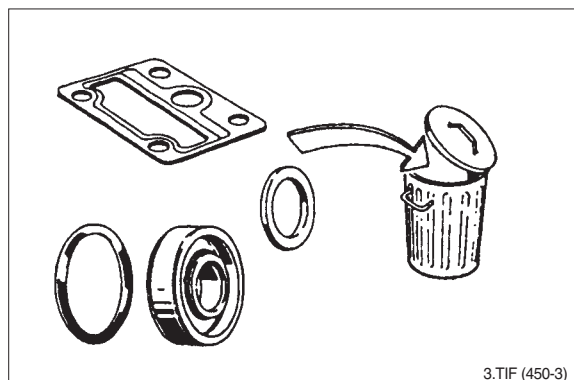


② Close all ports of the hydraulic aggregates.



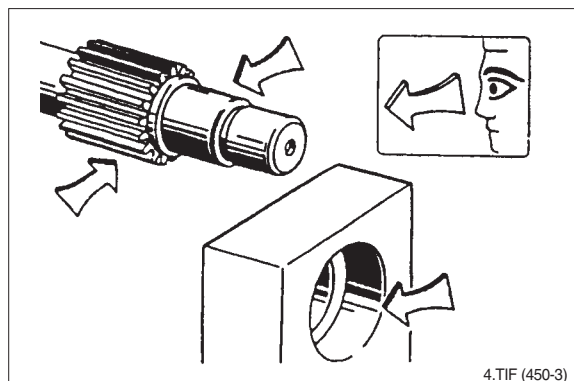
③ Replace all seals.

Use only original spare parts.

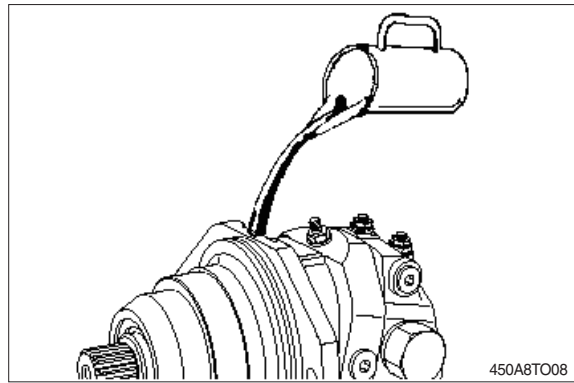


④ Check all seal and sliding surfaces for wear.

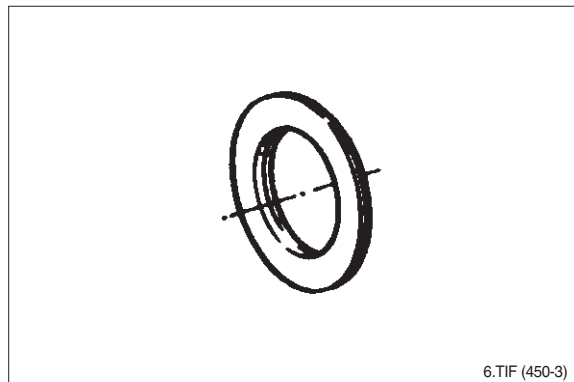
Rework of sealing area for example with abrasive paper can damage surface.



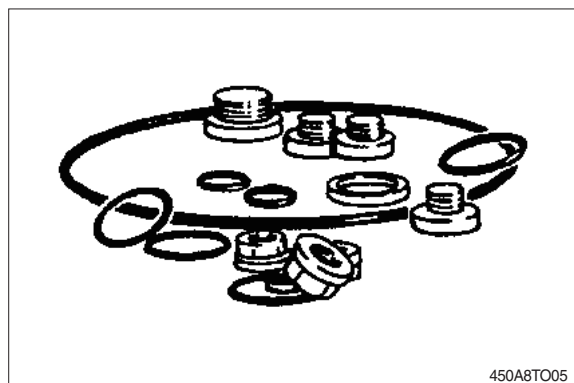
- ⑤ Fill up hydraulic aggregates with hydraulic oil before start-up.



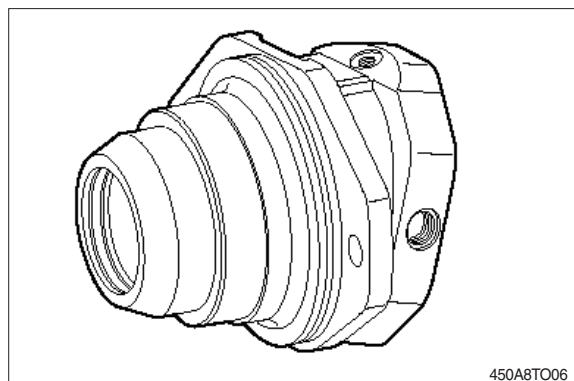
- ⑥ Seal kit for drive shaft.



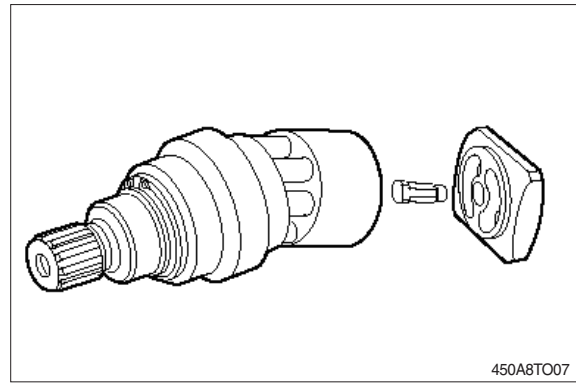
- ⑦ External seal kit.



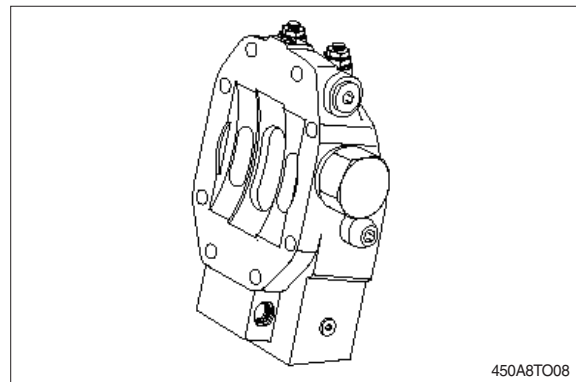
- ⑧ Housing.



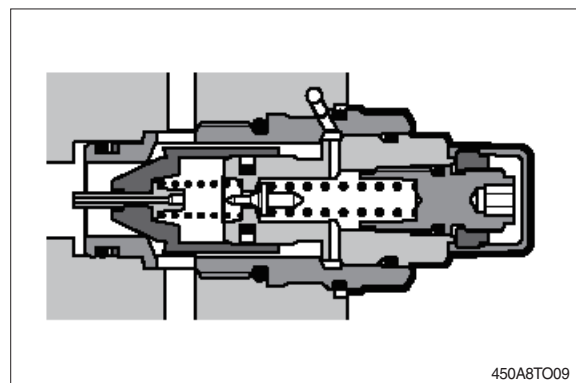
⑨ Complete rotary group.



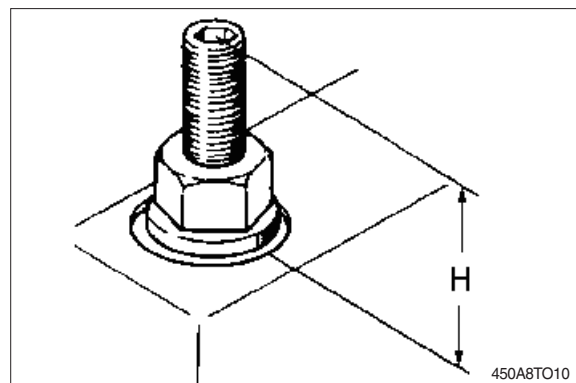
⑩ Port plate with control piston and counter-balance valve.



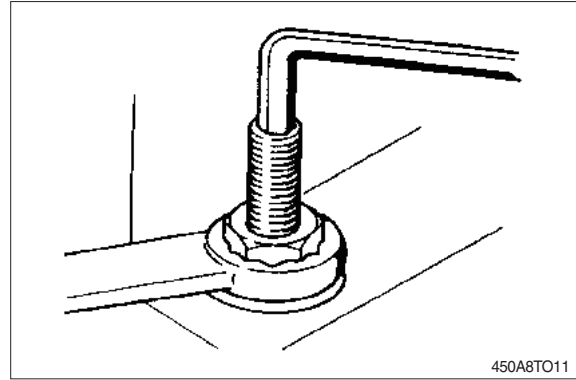
⑪ Relief valve/Make up check valve



⑫ Replace seal nut.
First measure and record setting height.

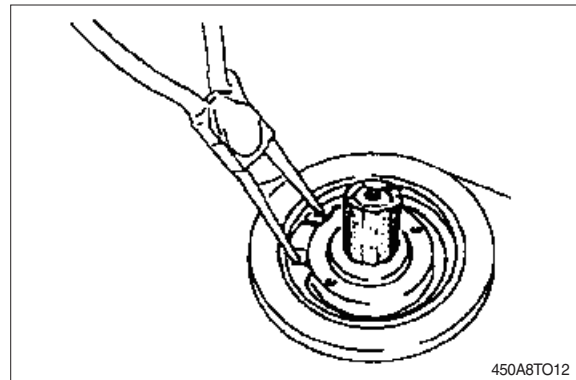


- ⑬ When tightening, counterhold setting screw, then check setting height.

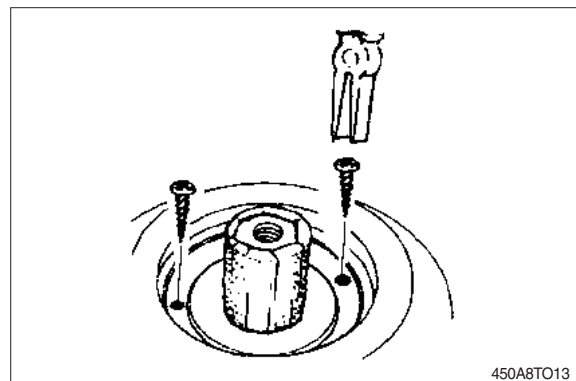


(3) Sealing the drive shaft

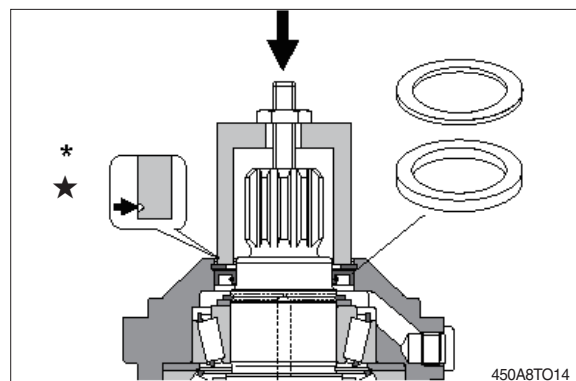
- ① Protecting the drive shaft.
Remove retaining ring and shim.



- ② Screw in sheet metal screw into the holes fitted with rubber.
Pull out seal with pliers.

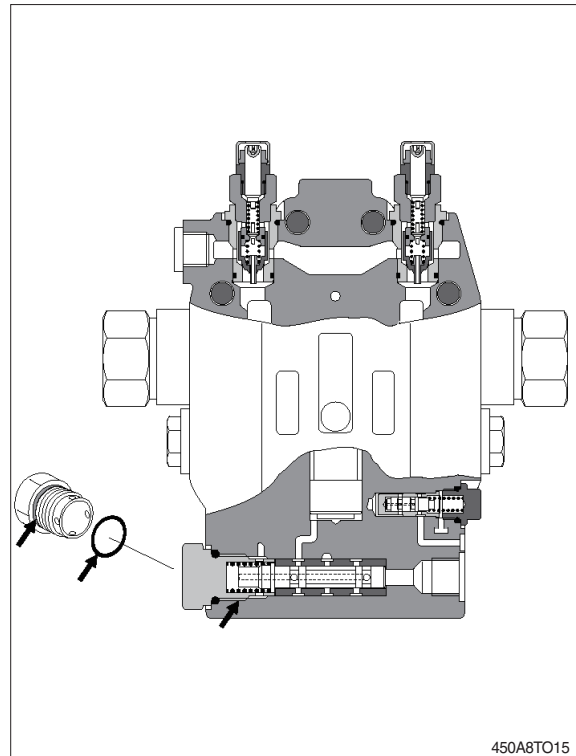


- ③ Press in shaft seal and shim with bush to stop.
※ Pay attention to pressing depth!
★ Mark for pressing depth.
Assemble retaining ring.



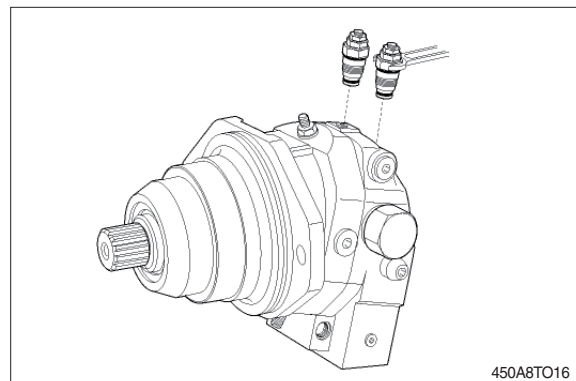
(4) Sealing of the control parts

- ① HZ-Controller
- ※ O-ring, O-ring groove, housing.

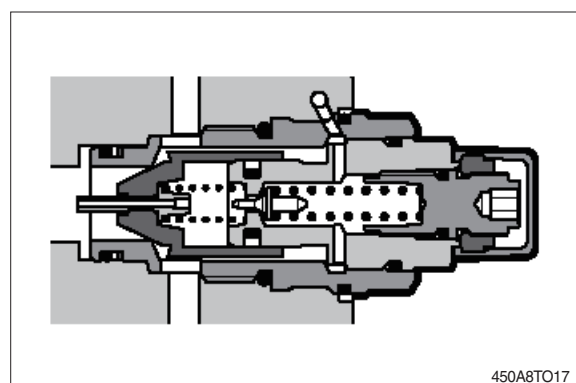


(5) Sealing of the relief valve

- ① Remove relief valve.

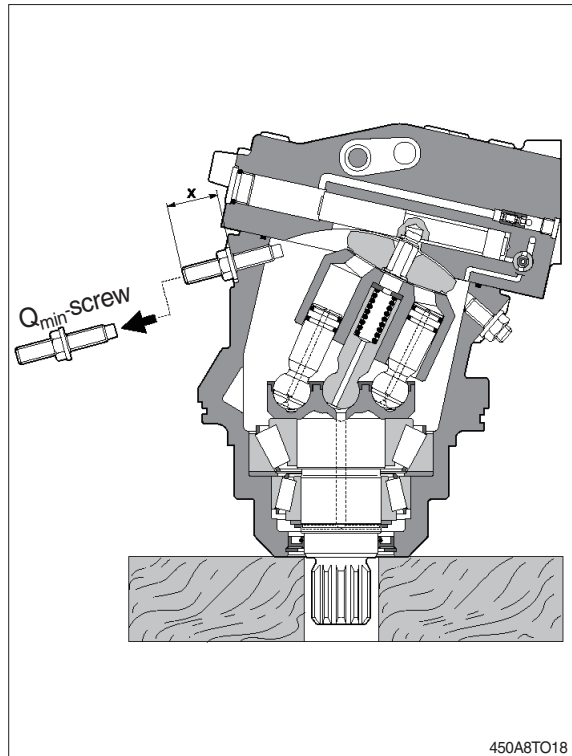


- ② Inspect O-ring.

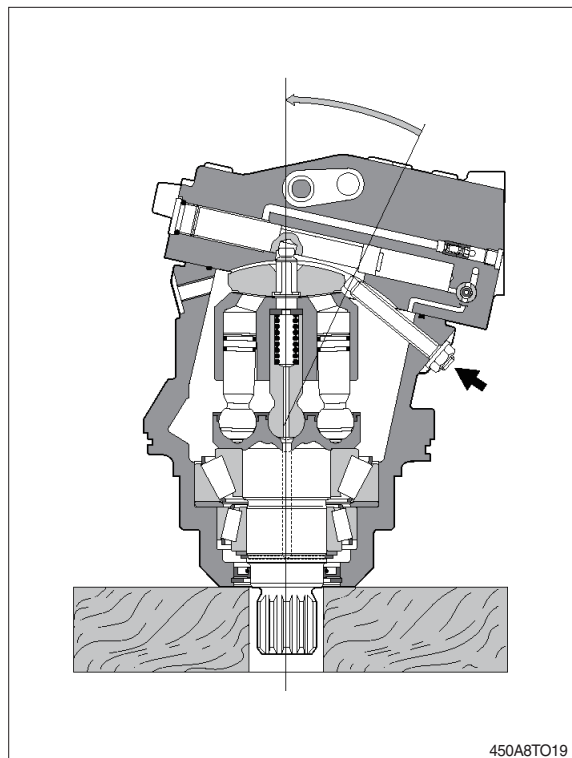


(6) Disassembly of the port plate

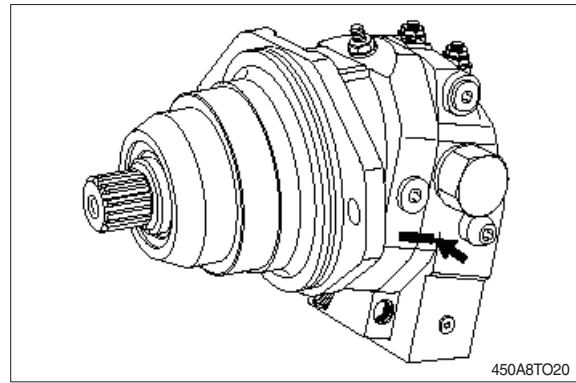
- ① Note dimension x .
Remove Q_{\min} -screw.



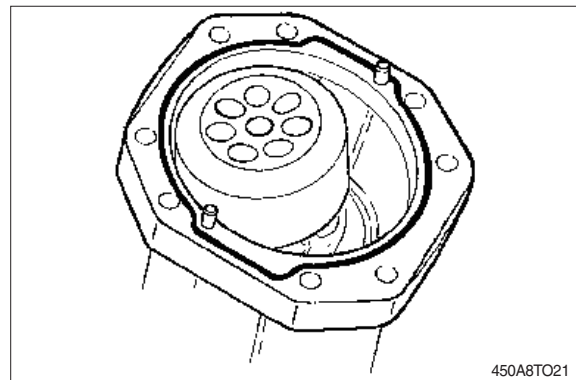
- ② For disassembly of the port plate, swivel always rotary group to zero position. Piston rings to hang out of the cylinder boring. Swivel rotary group to zero position with screw Q_{\max} .



- ③ Port plate
Mark position. Loosen screws.
Removal.

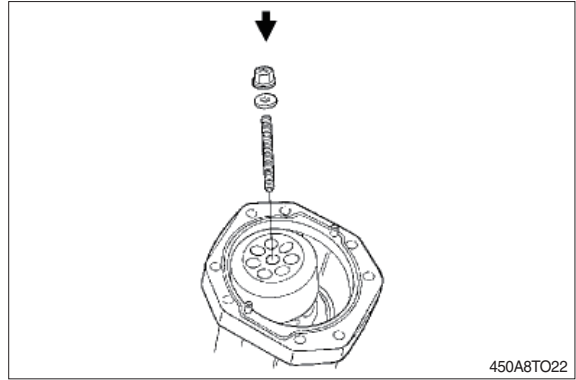


- ④ Check O-ring.
※ Stick new O-ring with some grease. Do
not swivel rotary group. Piston rings to
hang out from the cylinder boring.

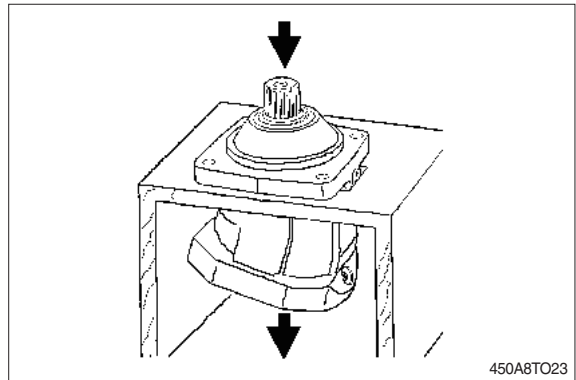


(7) Remove rotary group

- ① Screw in threaded pin into center pin.
Fix the cylinder with disc and lock nut.
Size : M8 × 105 mm

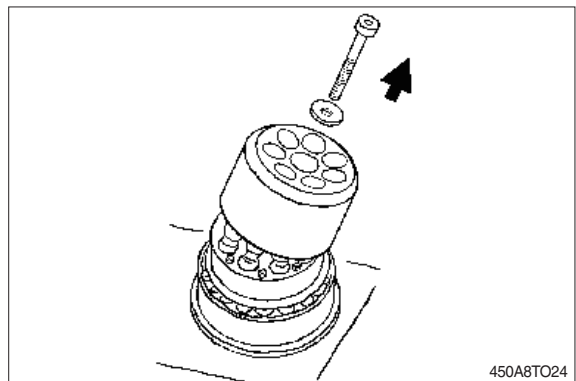


- ② Press out rotary group!
※ If the bearings are used again do not hit on the drive shaft.

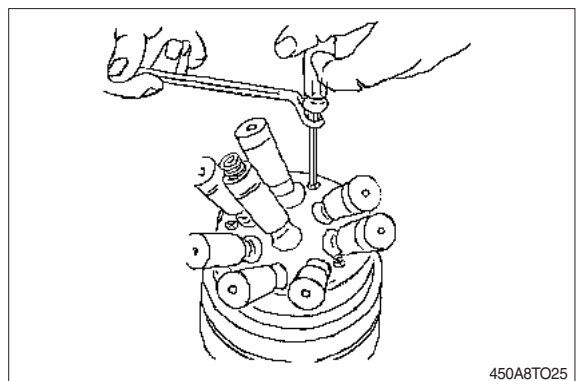


(8) Exchanging of the rotary group

- ① Remove fixing screw (cylinder).
Remove cylinder.



- ② Disassemble retaining plate.
※ Screws are glued. Use Torx-tools.



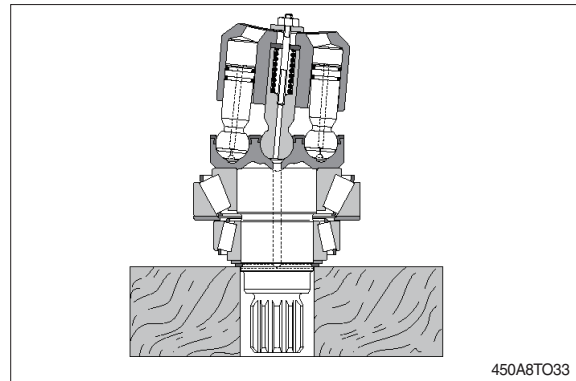
4) ASSEMBLY

(1) General precautions

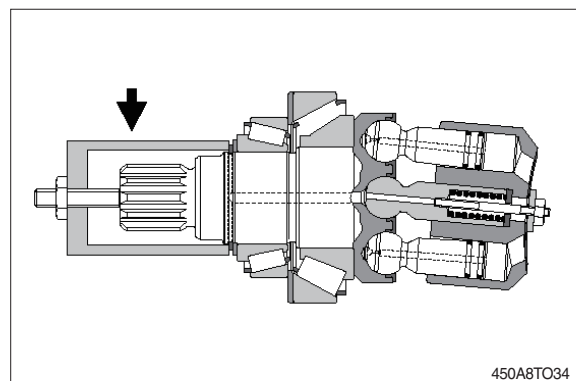
- ① Reassemble in a work area that is clean and free from dust and grit.
- ② Handle parts with bare hands to keep them free of liny contaminates.
- ③ Repair or replace the damaged parts.
Each parts must be free of burrs its corners.
- ④ Do not reuse O-rings, oil seal and floating seal that were removed in disassembly.
Provide the new parts.
- ⑤ Wash all parts thoroughly in a suitable solvent.
Dry thoroughly with compressed air.
Do not use the cloths.
- ⑥ When reassembling oil motor components of motor, be sure to coat the sliding parts of the motor and valve with fresh hydraulic oil. (NAS class 9 or above)
- ⑦ Use a torque wrench to tighten bolts and plugs, to the torque specified as follows.

(2) Rotary group assembly

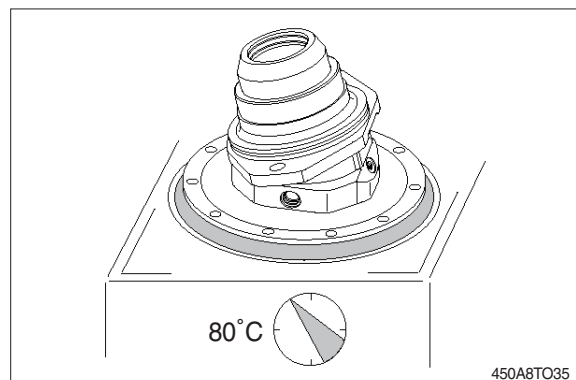
- ① Rotary group completely assembled ready for assembly.



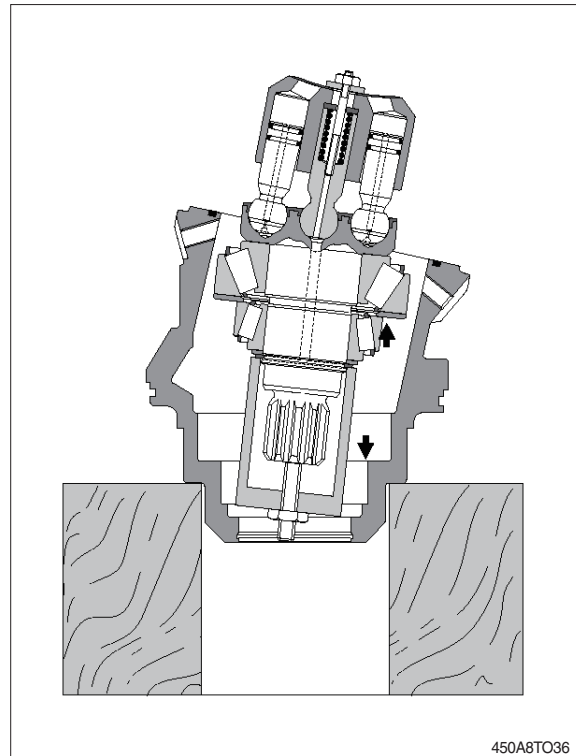
- ② Place assembly sleeve.



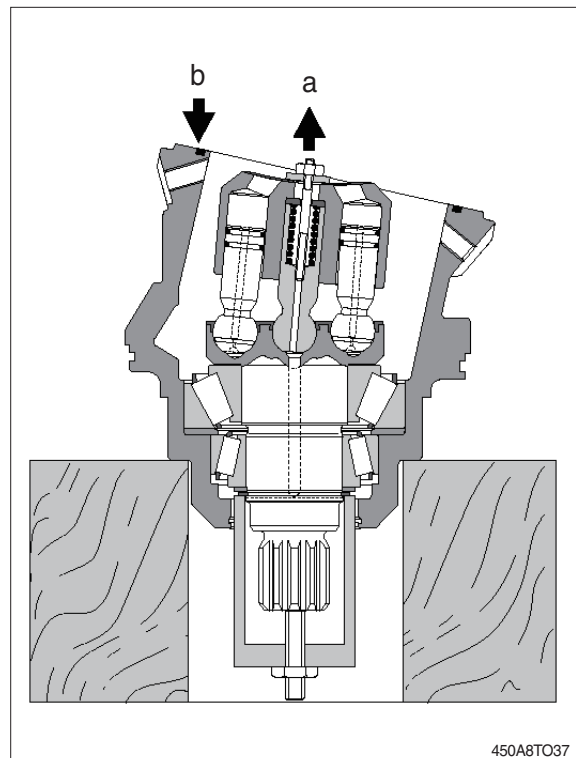
- ③ Warm up housing to 80°C.



- ④ Insert rotary group into housing to seat position.

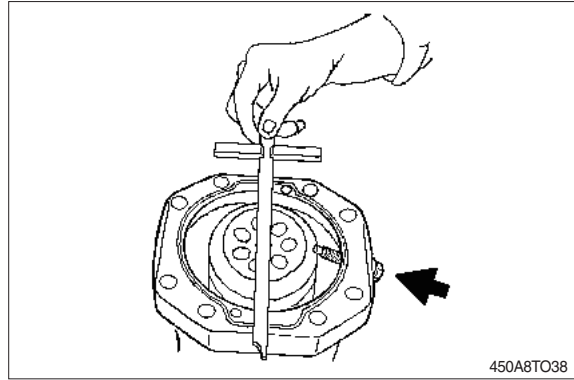


- ⑤ Fix zero position of cylinder with Q_{max} screw.
a. Disassemble cylinder fixing screw.
b. Insert O-ring.

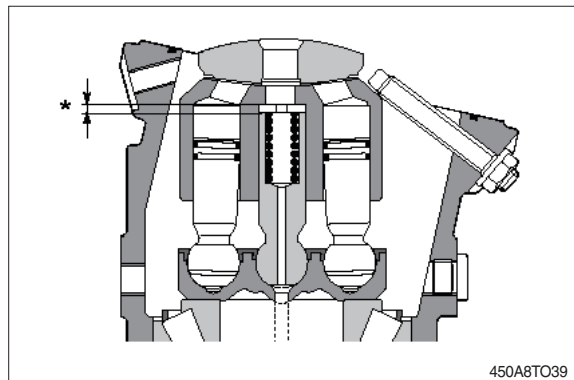


(3) Rotary group adjustment

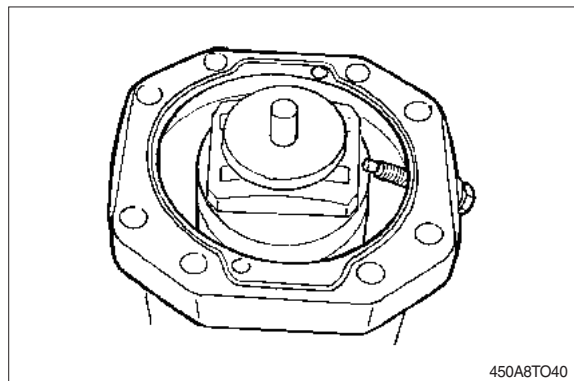
- ① Determine cylinder swivel range to max angle with screw.



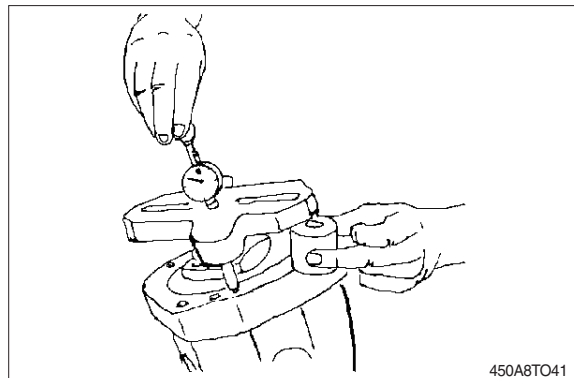
- ② *Disc



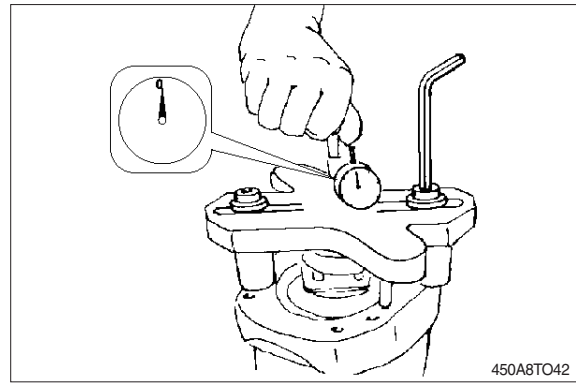
- ③ Place centering disc.



- ④ Mount measuring device.

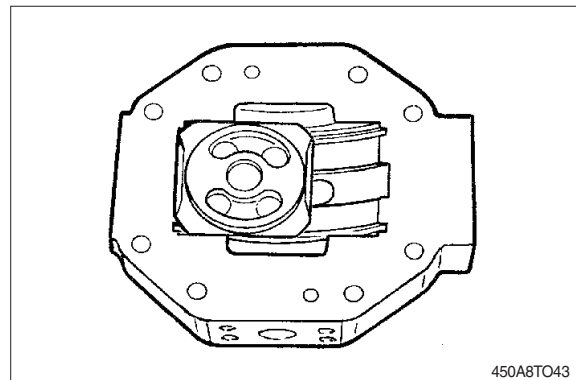


⑤ Check dimension X.



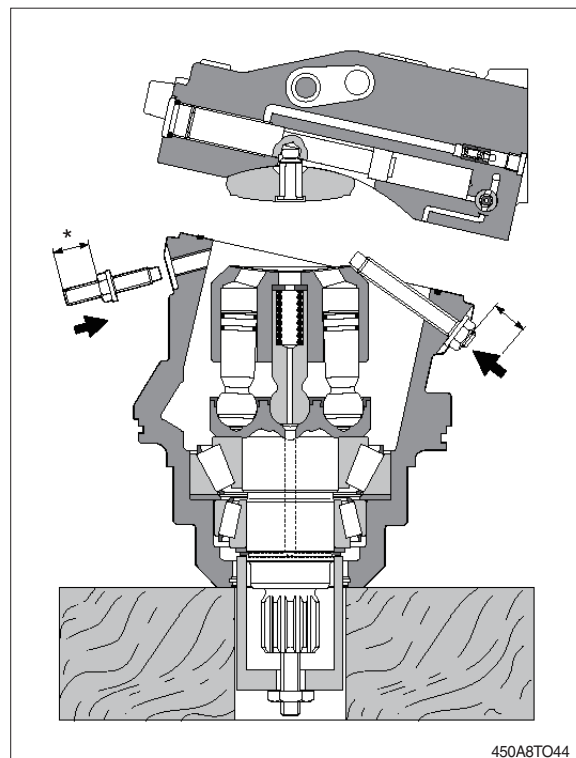
(4) Assembly of the port plate

- ※ Stick control lens in sliding surface with grease. Assembly in reversal order. Mount port plate.

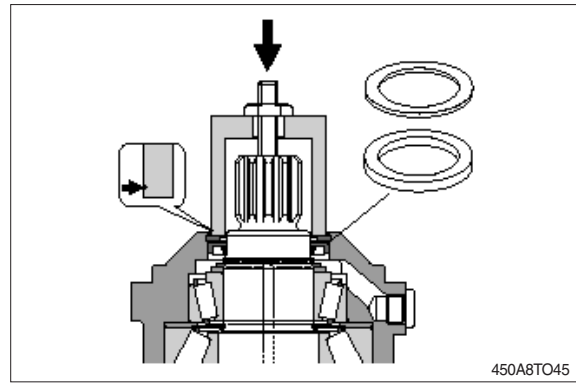


① Assembly port plate.

- ※ Take care of assembly design! Tighten fixing screws with torque.
 - a. Set Q_{min} -screw to dimension*.
 - b. Assemble plug.
 - c. Remove assembly sleeve.

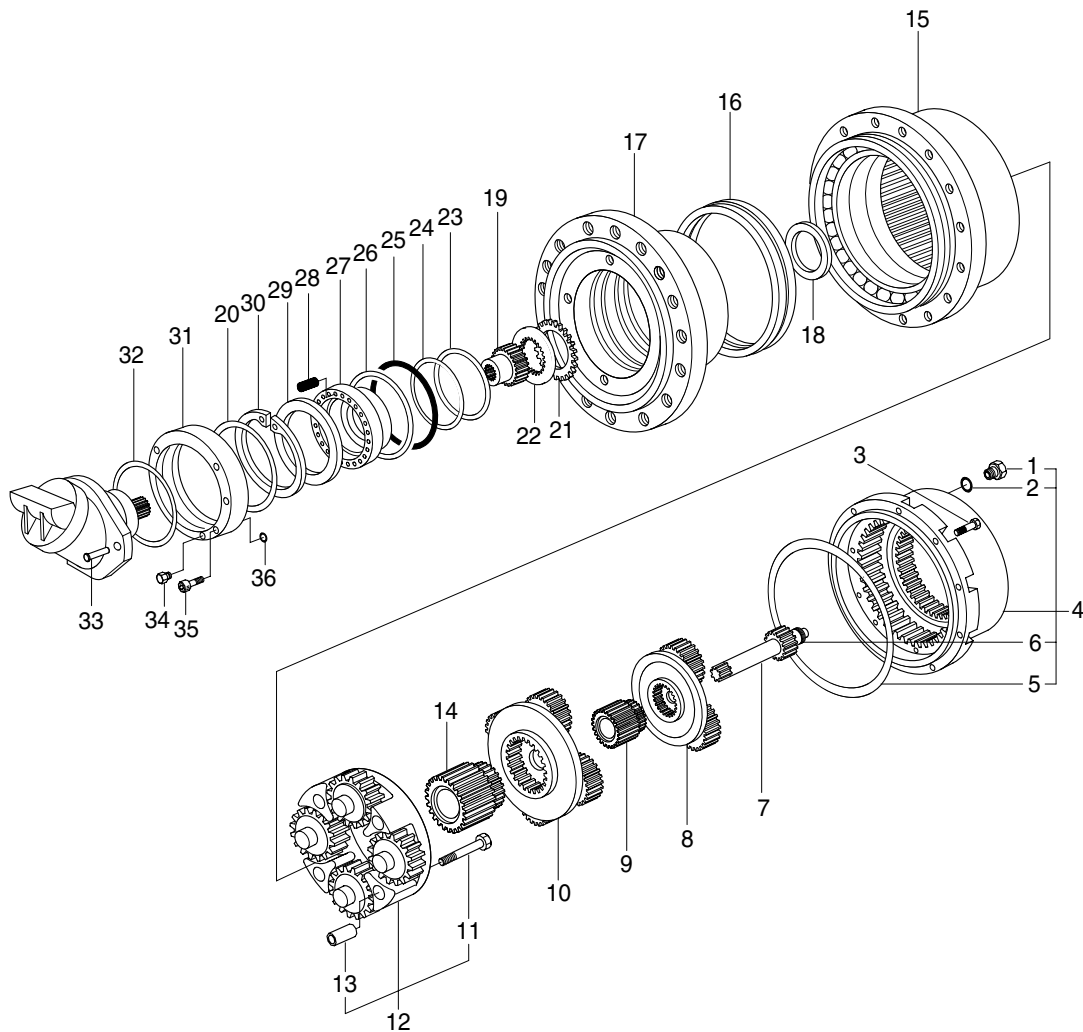


- ② Assemble shaft seal, disc and safety ring. Press-in with assembly sleeve.
※ Take care of press-in depth.



3. REDUCTION GEAR

1) STRUCTURE



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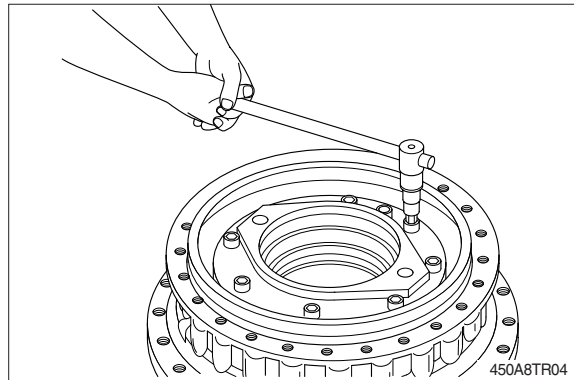
- | | | | | | |
|----|---------------------|----|---------------|----|-------------|
| 1 | Washer | 13 | Bushing | 25 | O-ring |
| 2 | Breather plug | 14 | Sun gear | 26 | Spiral ring |
| 3 | Screw | 15 | Housing | 27 | Piston |
| 4 | Cover set | 16 | Lifetime seal | 28 | Spring |
| 5 | O-ring | 17 | Hub | 29 | Spacer |
| 6 | Pad | 18 | Spacer | 30 | Circlip |
| 7 | Sun gear | 19 | Brake shaft | 31 | Flange |
| 8 | Reduction assy(1st) | 20 | O-ring | 32 | O-ring |
| 9 | Sun gear | 21 | Brake disc | 33 | Screw |
| 10 | Reduction assy(2nd) | 22 | Steel ring | 34 | Plug |
| 11 | Screw | 23 | Back up ring | 35 | Screw |
| 12 | Reduction assy(3rd) | 24 | O-ring | 36 | O-ring |

2) DISASSEMBLING

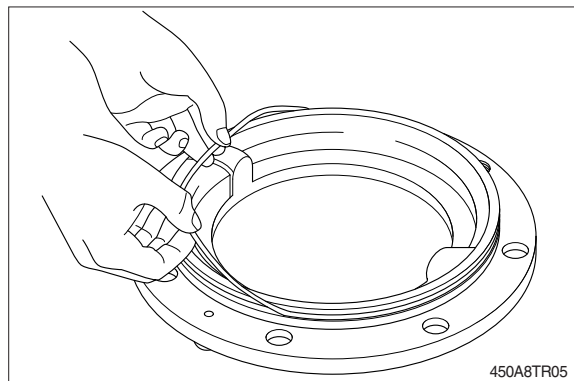
Initial inspection of the gears and the travel motor, can be made without disassembling the track and the gearmotor from the machine.

Prior to disassembling make sure that the oil is discharged, unscrew and remove the 2 screws (33), and remove the travel motor and the O-ring (32).

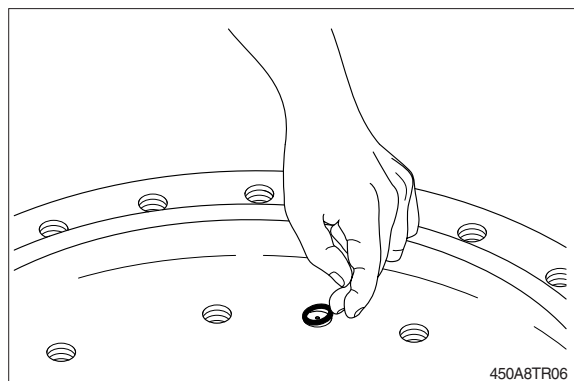
- (1) Unscrew the 8 socket head screws (3) and remove the motor flange from the flanged hub (17).



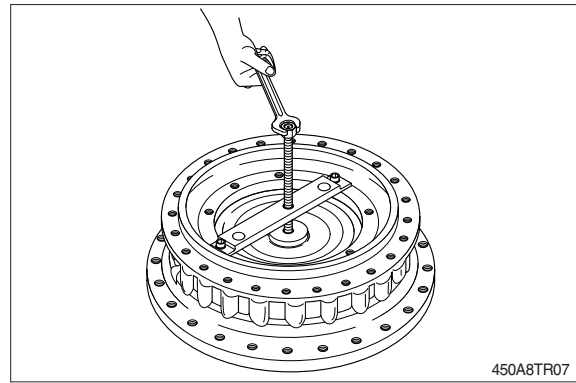
- (2) Remove the O-ring (20) from its groove in the motor flange (31).



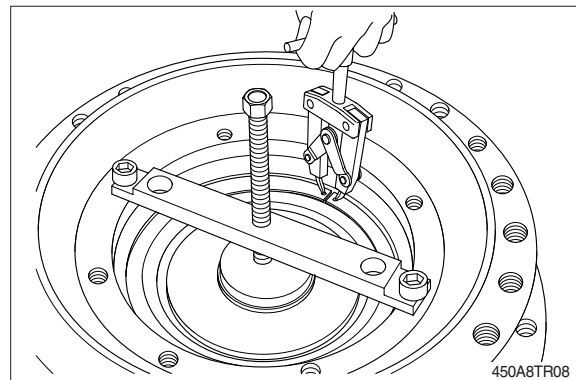
- (3) Remove the O-ring (36) from its groove in the flanged hub (17).



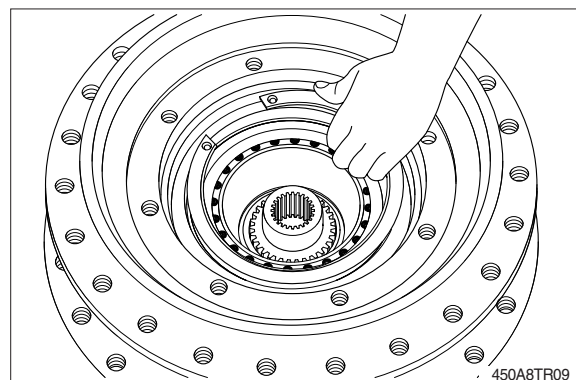
(4) After having placed the disc on the spring retainer (29), fix the pusher on the flanged hub (17) as shown in the scheme by screwing the threaded bar, push the disc on the retainer, thus removing the force of the springs (28) on the circlip (30) and allowing its disassembling.



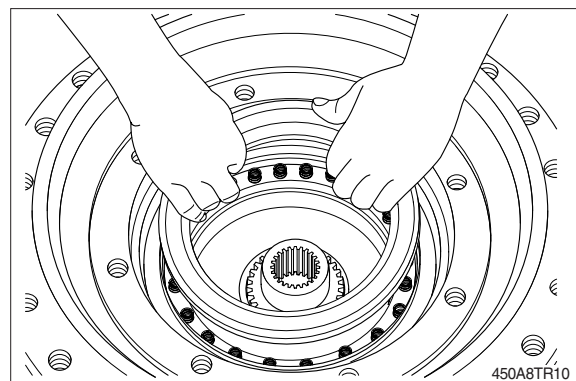
(5) Using pliers remove the circlip (30) from its groove in the flanged hub (17).



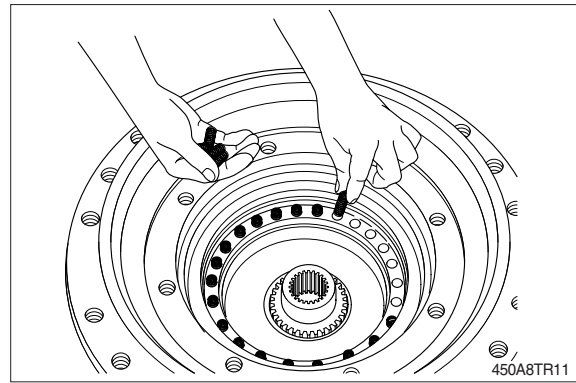
(6) Disassemble the equipment from the flanged hub (17) and remove the circlip (30).



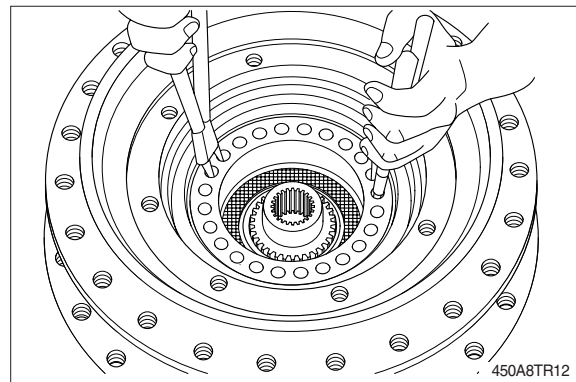
(7) Remove the springs retainer (29).



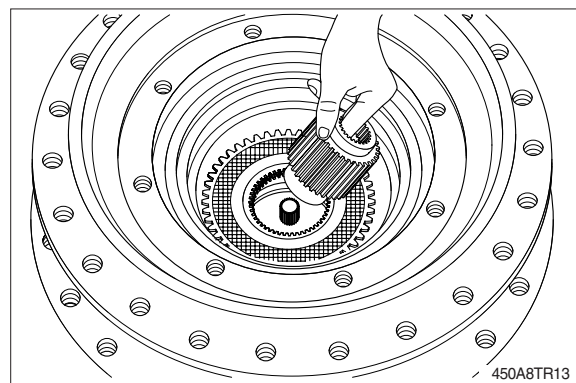
(8) Remove the springs (28) from their grooves.



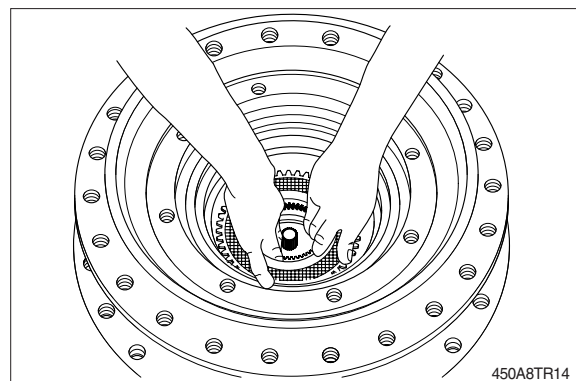
(9) Using pliers remove the brake piston (27).
※ To get it easier, pumping compressed air into the brake port hole.



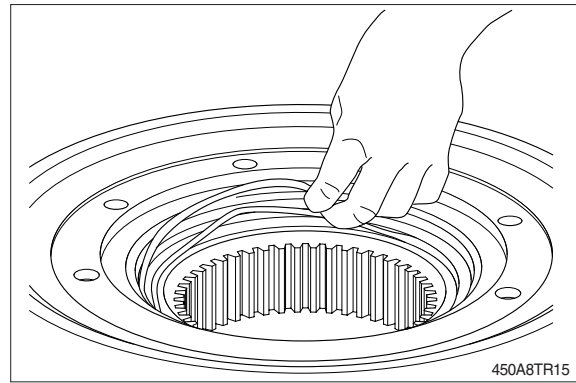
(10) Remove the brake shaft (19).



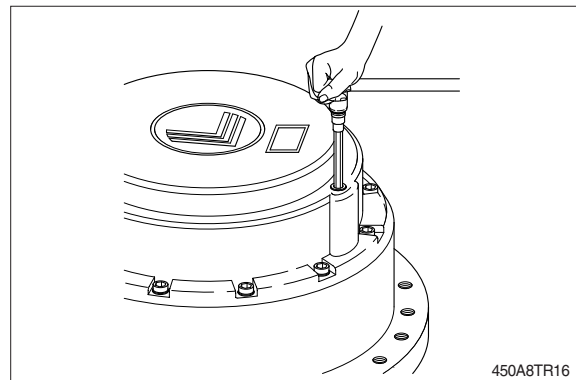
(11) Remove brake discs pack (21, 22).



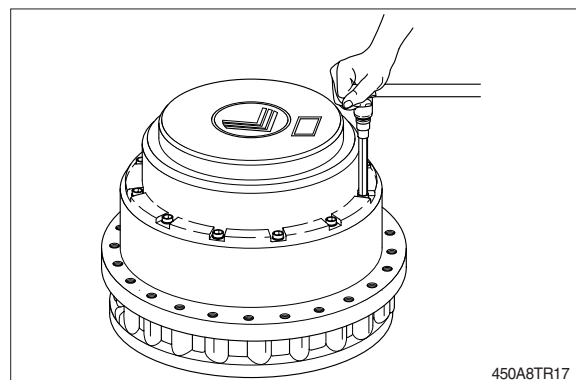
(12) Remove the O-rings (24,25) and the backup rings (23, 26) from their grooves in the flanged hub (17).



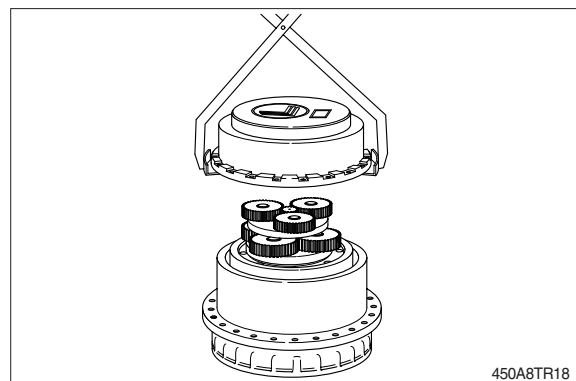
(13) Turn the gearbox around, unscrew and remove the 2 plugs (2) and the 2 washers (1) from the end cover (4).



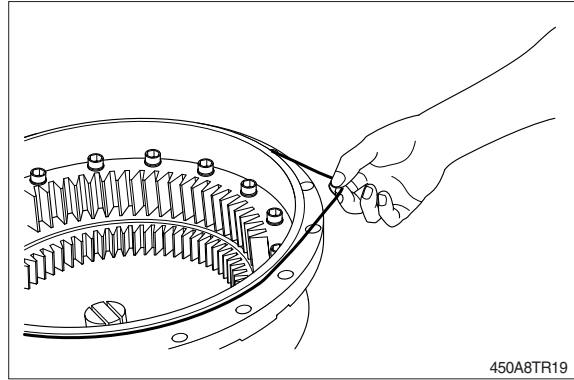
(14) Unscrew and remove the 16 socket head screws (3).



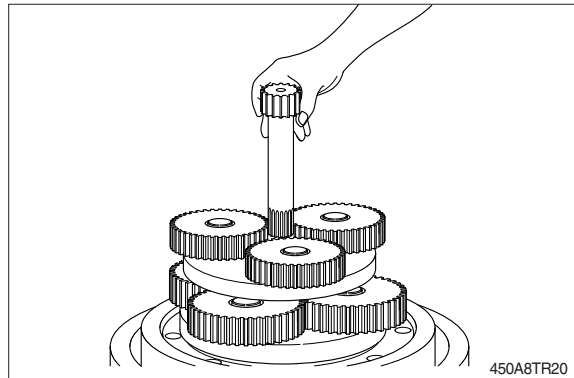
(15) By means of a puller remove the end cover (4).



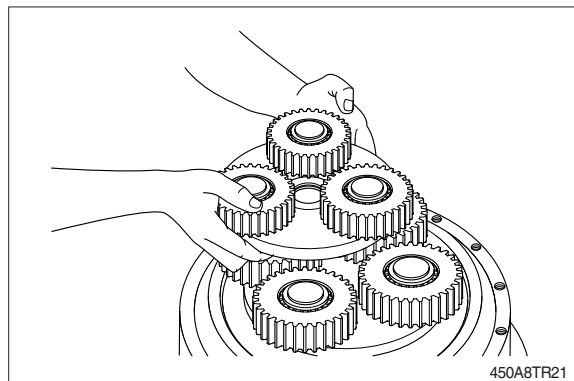
(16) Remove the O-ring (5) from its groove in the end cover (4).



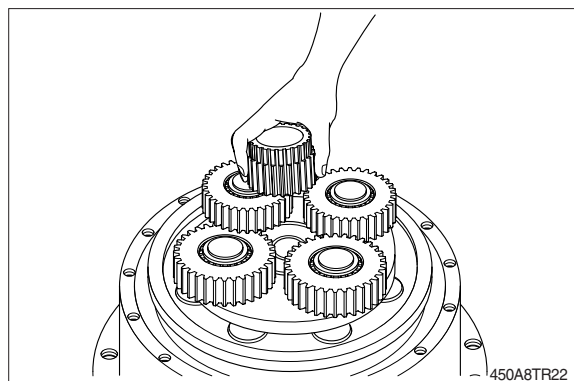
(17) Remove the 1st stage sun gear (7).



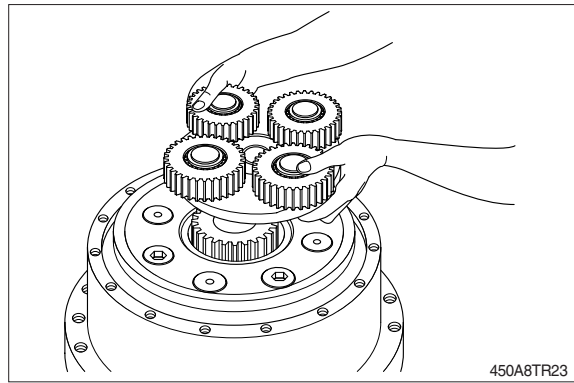
(18) Remove the 1st reduction assembly (8).



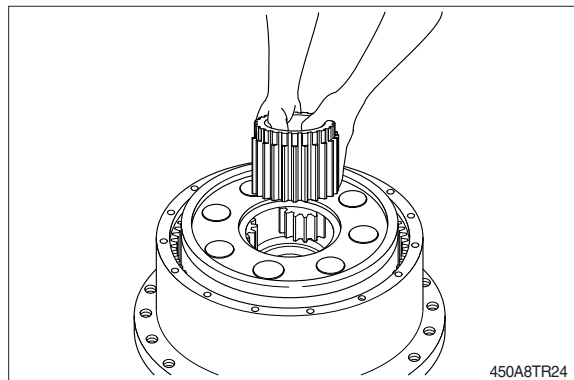
(19) Remove the 2nd stage sun gear (9).



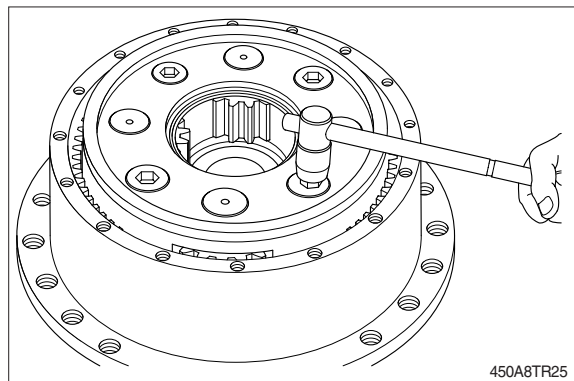
(20) Remove the 2nd reduction assembly (10).



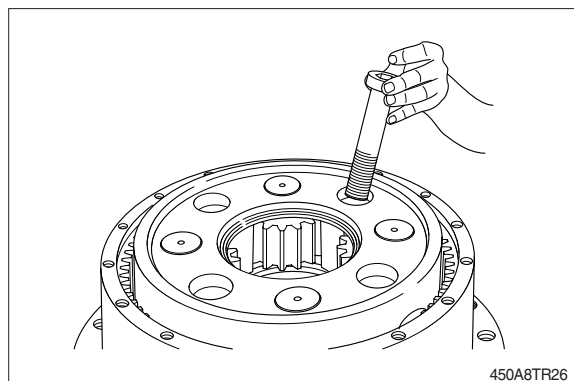
(21) Remove the 3rd stage sun gear (14).



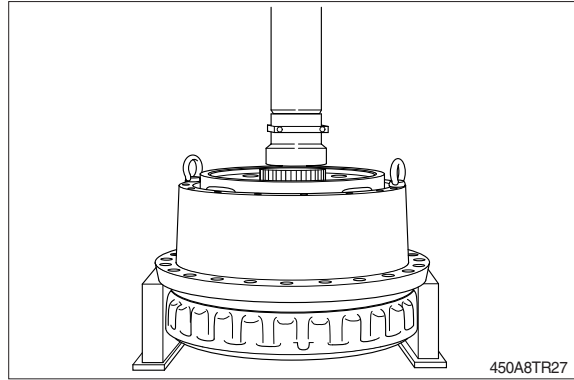
(22) Unscrew the 4 socket head screws (11), fixing the 3rd reduction assembly (12) to the flanged hub (17).



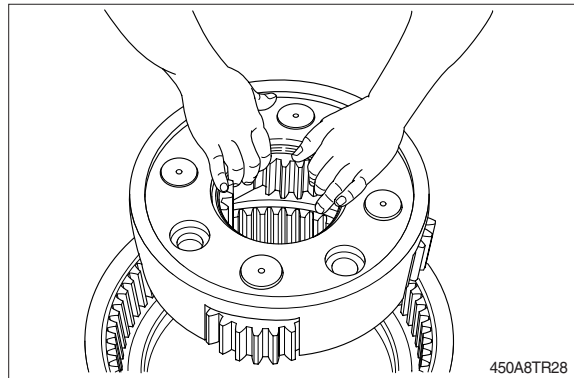
(23) Remove the 4 screws (11).



(24) Using a press and a metal stopper, remove the flanged hub (17) from the gearbox housing (14), paying attention to the eventual falling down of the main bearing's balls.

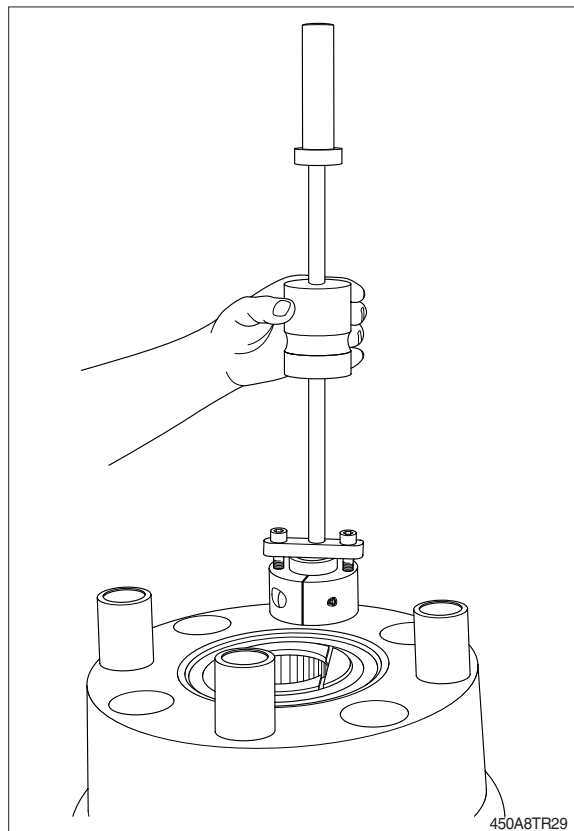


(25) Remove the 3rd reduction assembly (12) from the flanged hub (17).

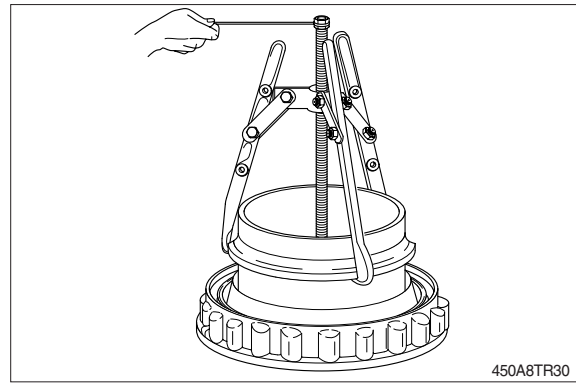


(26) Using the equipment, remove bushes (13) from the flanged hub (17).

- ※ It is possible that the planet assemblies (see reassembly (11)) remain assembled to the planet-carrier. In this case it is sufficient to push on them by means of a rubber pad or a press.
- In case the planet assemblies remain assembled to the flanged hub, it is better to use the fixture (for this operation).



(27) By means of an extractor, remove the inner race of the bearing and spacer kept on the flanged hub (17).

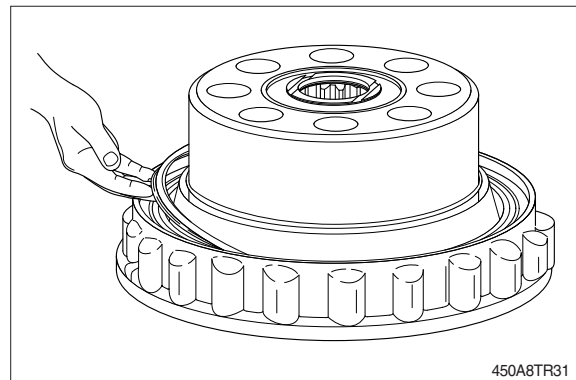


(28) Withdraw both the half-seals (16) from the flanged hub (17) and from the gearbox housing (15).

※ Lifetime seal check

In case of oil leakages, it should be necessary to check and eventually replace the lifetime seal (16), which means both the metal rings parts and the O-rings. In this case it is necessary to disassemble the gearbox from the machine.

※ The gearbox disassembly ends with the above operation: All items are now available for the necessary checks.



3) REASSEMBLY

※ For the correct assemble of gearbox please follow these basic instructions:

In case of damaged gears, for example a planetary, replace all the reduction assembly and not only the damaged gear.

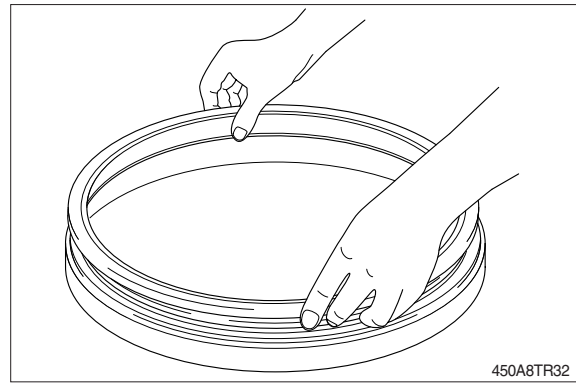
※ Before reassembling the O-ring, gaskets and the oil seals:

Concerned should be removed.

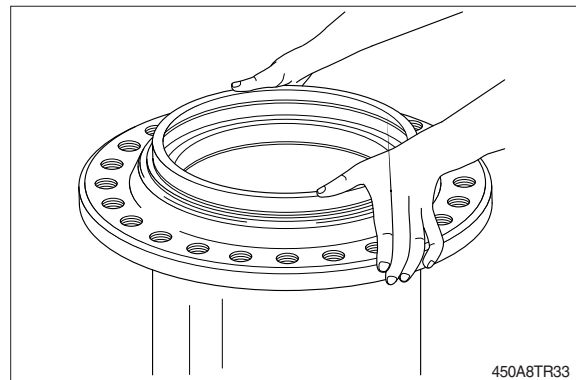
Clean with care all the housing of the seal and put some grease on the gasket before mounting.

※ Never change only one part of the lifetime seal, always the two rings together.

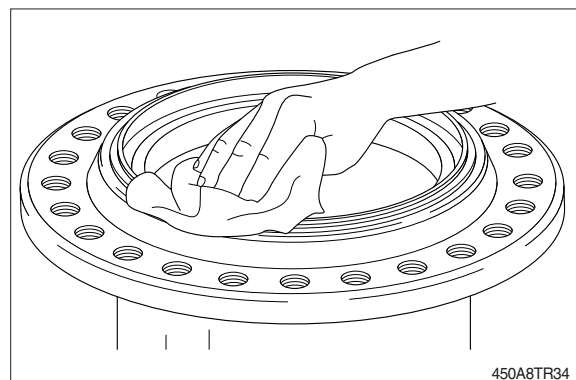
(1) Fit the half seals (16) on the tool.



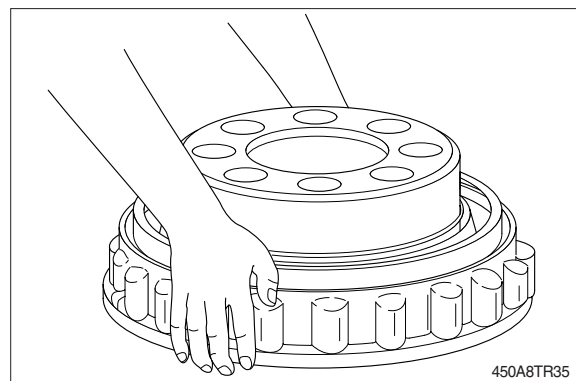
(2) Fit the half seals (16) inside the gearbox housing (15).



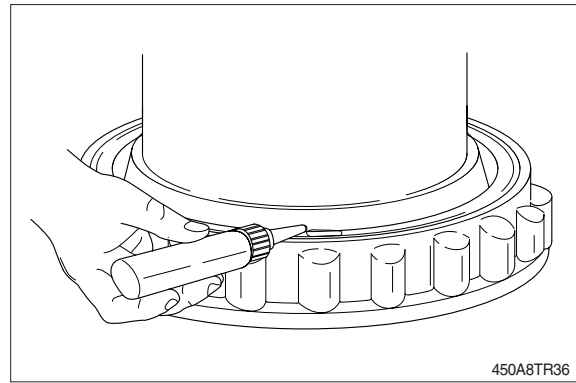
(3) Clean carefully the metallic face of the half-seal.



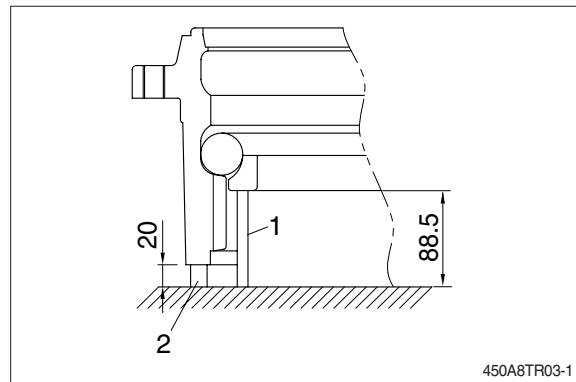
(4) Assemble, by using the same tool, the half seal (16) on the flanged hub (17).



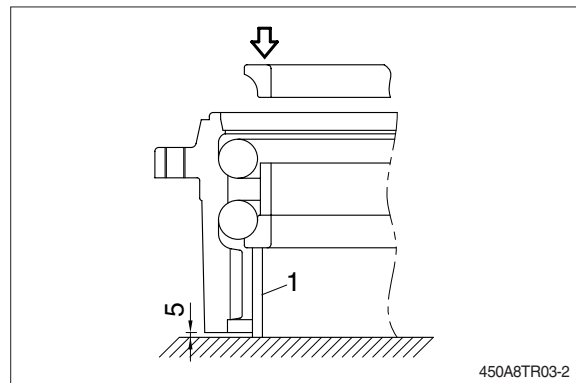
- (5) Lube the metallic face of the half seal with a thin oil film.



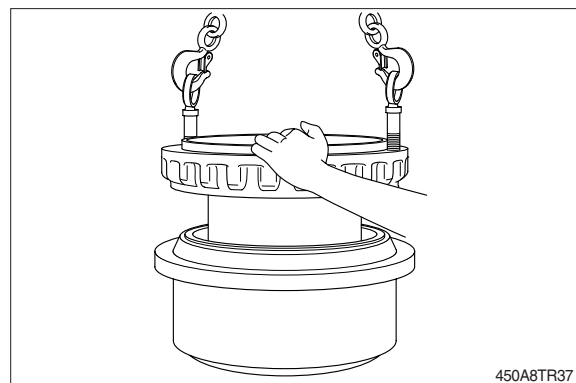
- (6) Fit on the housing the lower ball row, withstanding the ball race through the spacers 1 and 2.
Between the balls, insert the proper spacers.



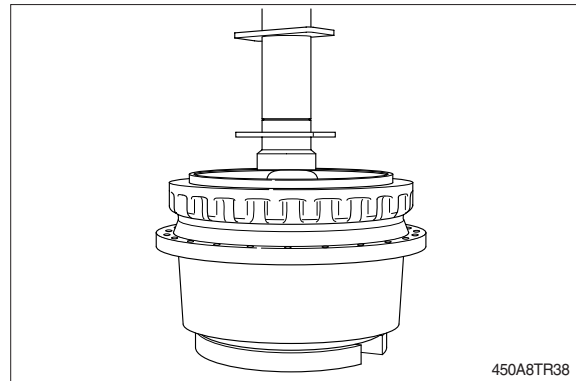
- (7) After having placed the bearing spacer fit the upper ball row.
Then place the upper inner race.



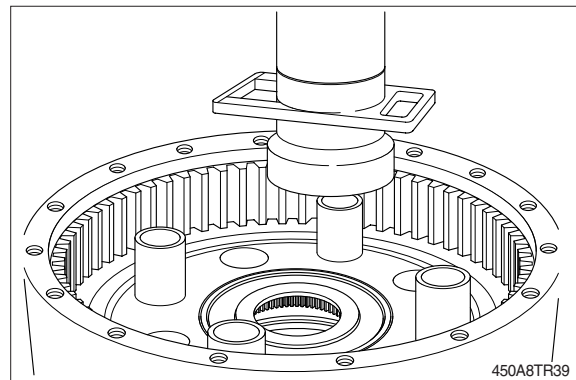
- (8) Lift the flanged hub (17) then lower it inside the gearbox housing (15).



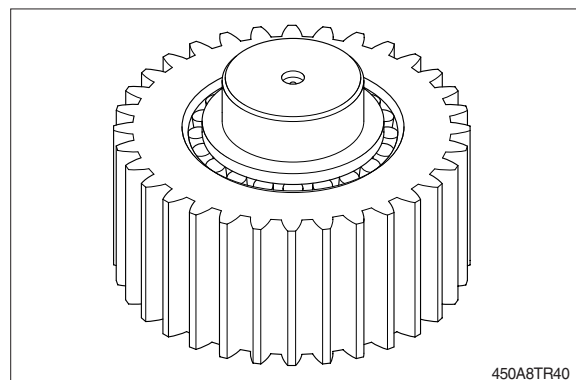
(9) Using a press and a metal stopper, push the flanged hub (17) against the shoulder on the gearbox housing (15) until assembling is complete.



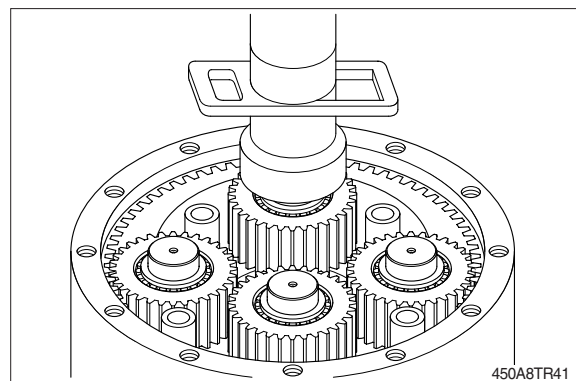
(10) Using a press, place and push the 4 bush, inside their seats on the flanged hub (17).



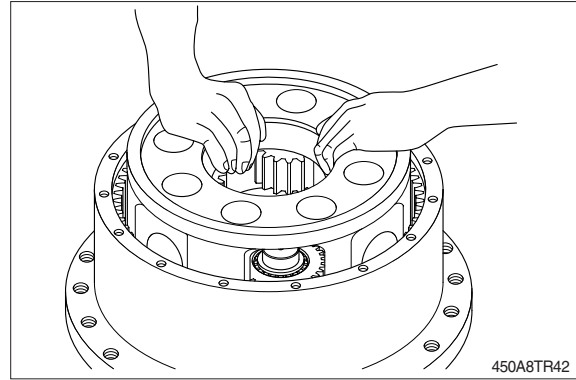
(11) View of the 3rd reduction's planet assembly.



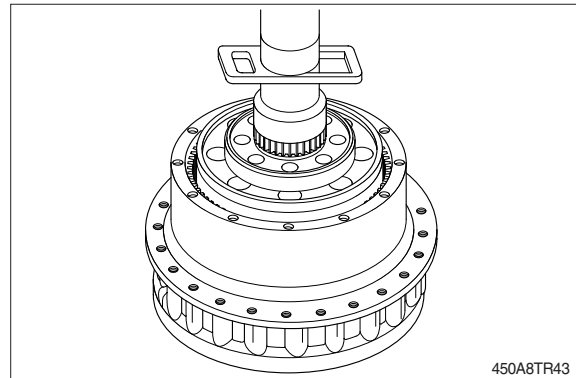
(12) Using a press push the 4 planet assemblies against the shoulder on the flanged hub (17).



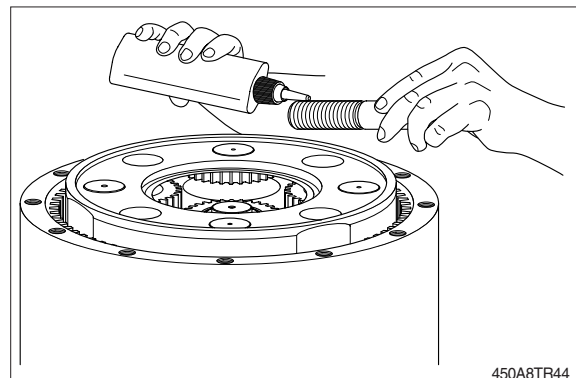
(13) Place the 3rd reduction planet carrier on the hub (17).



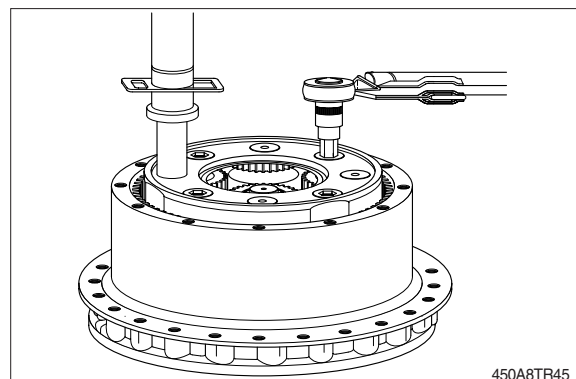
(14) Using a press push the 3rd reduction planet carrier against the shoulder on the flanged hub (17) until complete assembly.



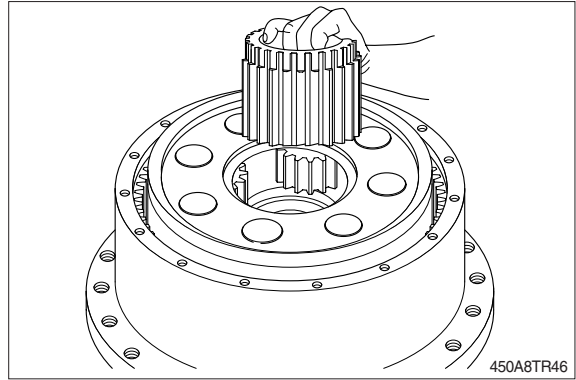
(15) Apply LOCTITE type 243 on the 4 socket head screws (11), and insert them in the thread holes.



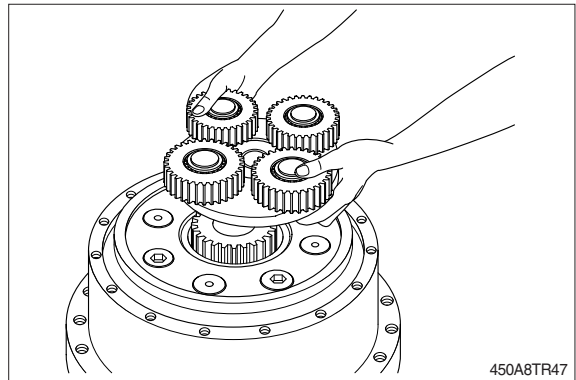
(16) Tighten the screws by a torque wrench at a torque of $153\text{kgf} \cdot \text{m}$ ($1107\text{lb} \cdot \text{ft}$), locking the gearbox acting with the press on a 3rd reduction's planet.



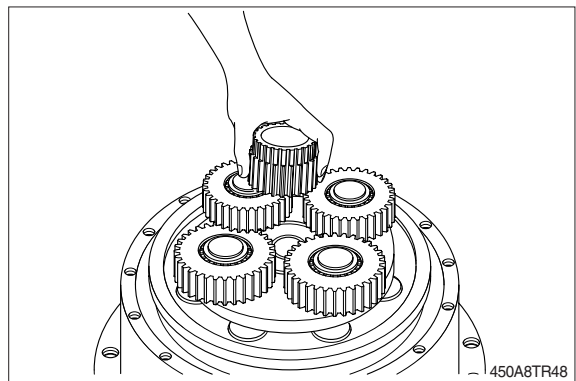
(17) Insert the 3rd stage sun gear (14).



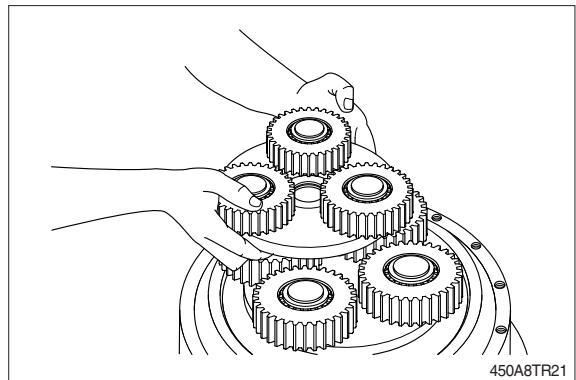
(18) Insert the 2nd reduction assembly (10).



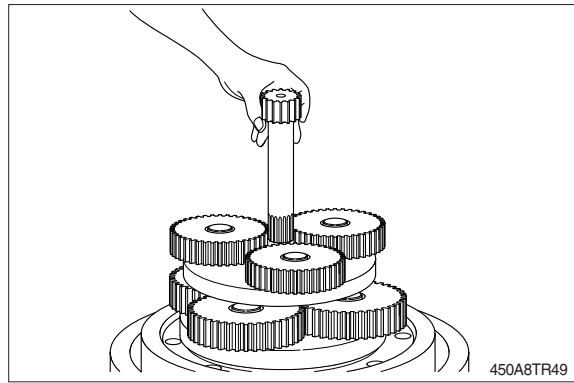
(19) Insert the 2nd stage sun gear (9).



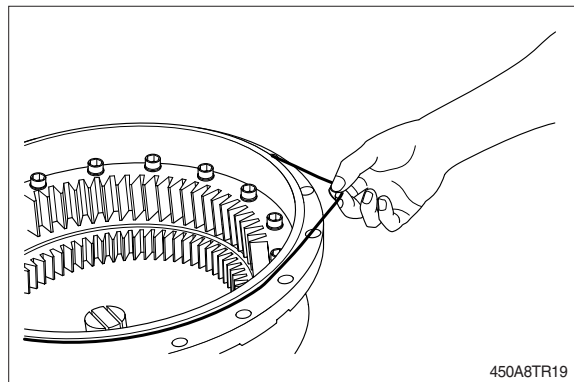
(20) Insert the 1st reduction assembly (8).



(21) Insert the 1st stage sun gear (7).

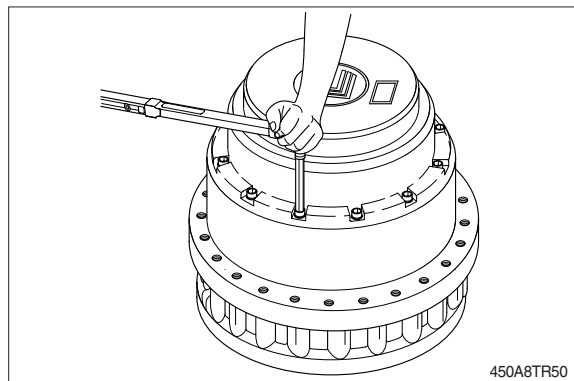


(22) Fit the O-ring (5) into its groove in the end cover (4).

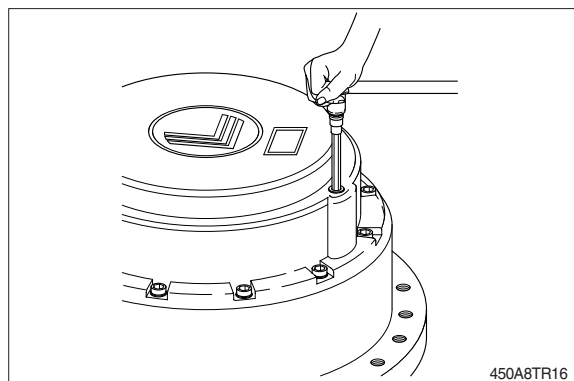


(23) Place the end cover (4) on the gearbox housing (15).

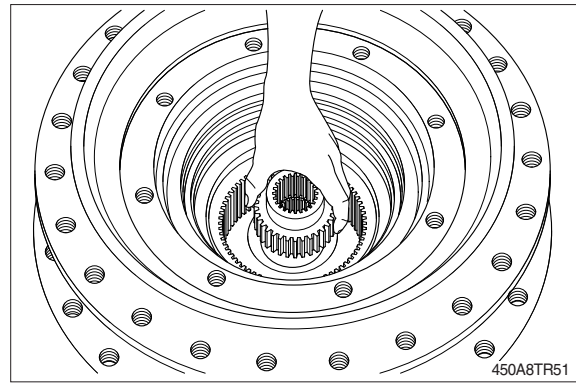
Apply LOCTITE type 243 on the 16 socket head screws (3), and tighten them by a torque wrench at a torque of 19.4 kgf · m (140 lbf · ft).



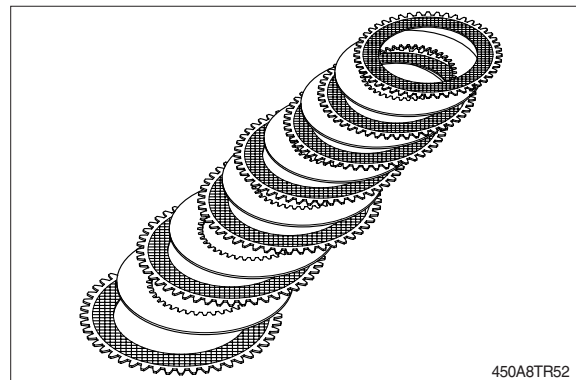
(24) Place the 2 washer (1) in their groves and tighten the 2 plugs at a torque of 6.1~8.2 kgf · m (44.1~59.3 lbf · ft).



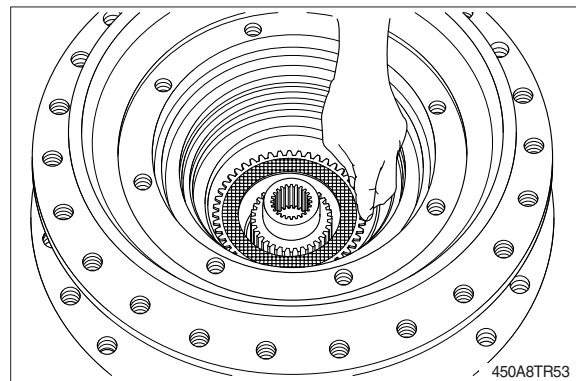
(25) Turn the gearbox around and insert the brake shaft (19).



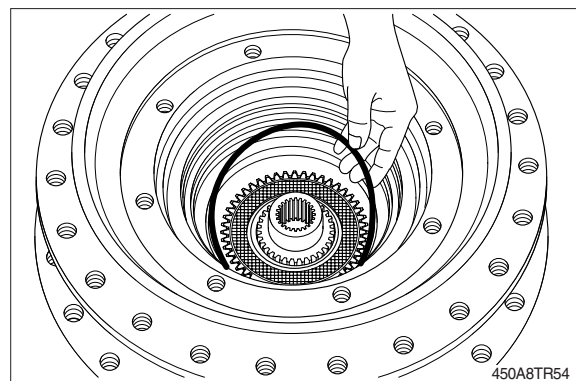
(26) View of the brake discs (21, 22).



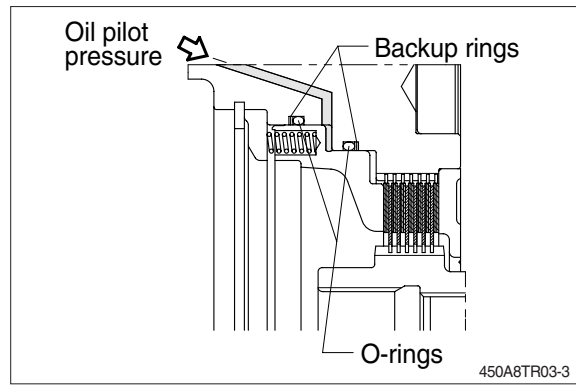
(27) Assemble the brake discs package according to the following order: Firstly insert an external toothed sintered bronze disc (21). Then insert, an internal toothed steel disc (22). Repete the operation until reaching the number of 7 bronze and 6 steel discs.



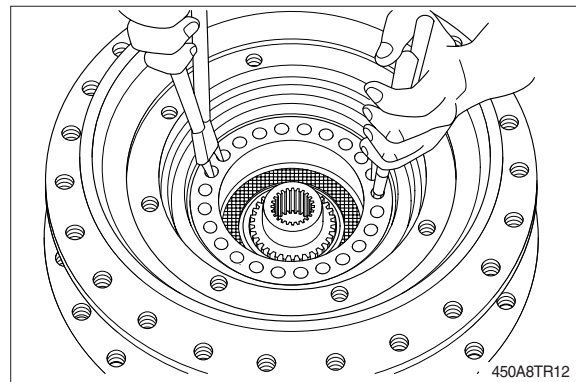
(28) Fit the backup rings (23, 26) and the O-rings (24, 25) inside the two internal grooves of the flanged hub (17, see drawing).



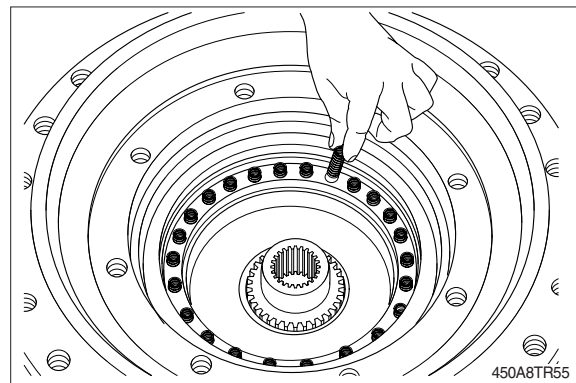
- ※ An O-ring and a backup ring must be fitted in the groove paying attention that the backup ring must always be beyond the O-ring against the oil flow.



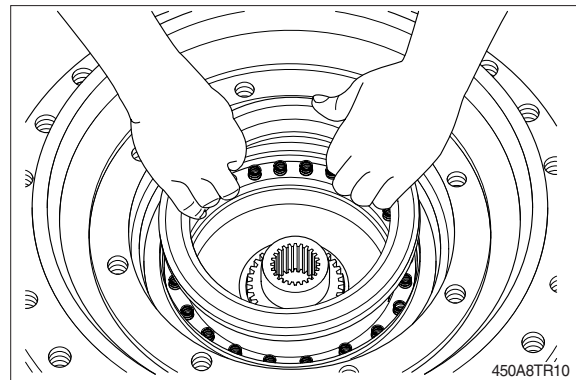
- (29) Insert the brake piston (27) inside the flanged hub (17), paying attention not to damage the seals already fitted.



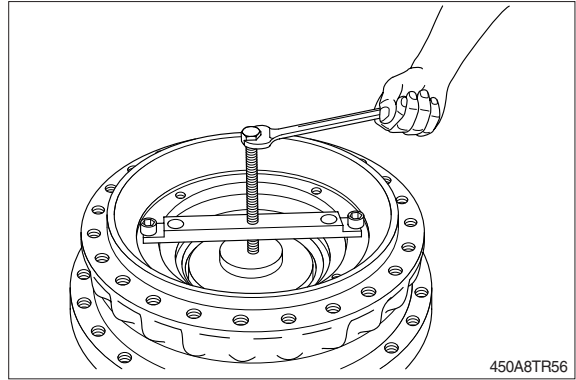
- (30) Insert the springs (28) into the grooves in the brake piston (27).



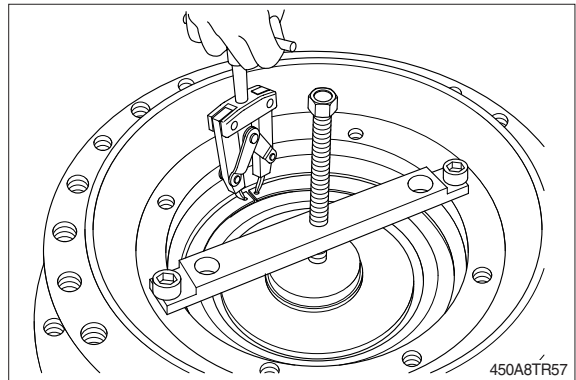
- (31) Insert the retainer disc (29).



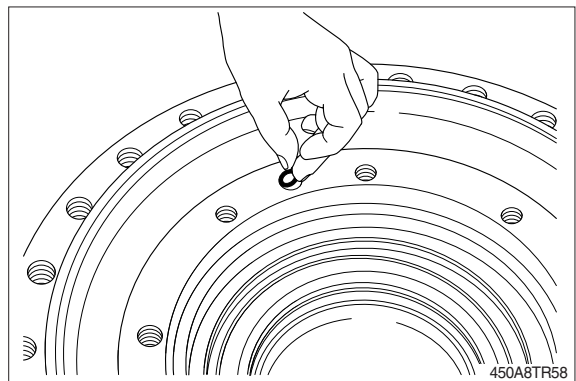
(32) Fixed the equipment to the flanged hub (17) and screw the threaded screw up the springs retainer disc (29) is lowered below the circlip seat (30).



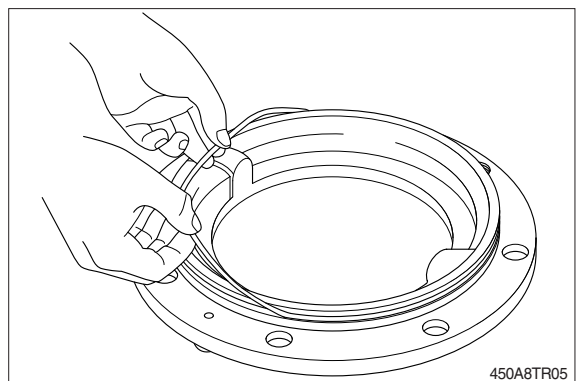
(33) By means of pliers, place the circlip (30) into its groove.



(34) Fit the O-ring (36) into its groove in the flanged hub (17).

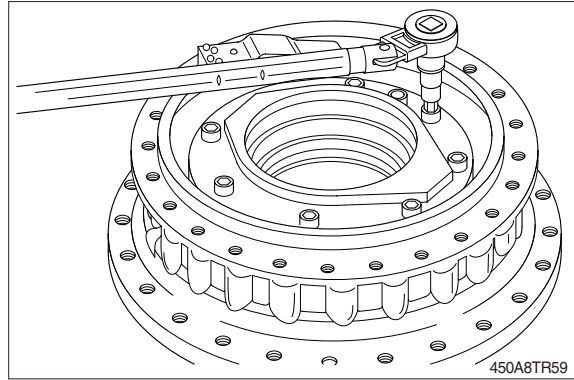


(35) Fit the O-ring (20) into the groove of the motor flange (32).



(36) Place and fix the motor flange (32) to the flanged hub (17) through 8 screws (35) tightened by a torque wrench at a torque of $21.9 \text{ kgf} \cdot \text{m}$ ($158.4 \text{ lbf} \cdot \text{ft}$).

※ After having reassembled the gearbox, fit the travel motor (taking care to include the O-ring(32), by means of 2 fixing screws(33), tightened at $42.3 \text{ kgf} \cdot \text{m}$ ($306.0 \text{ lbf} \cdot \text{ft}$). Fill the gearbox with the lubricant oil.



GROUP 6 TRAVEL DEVICE (TYPE 2)

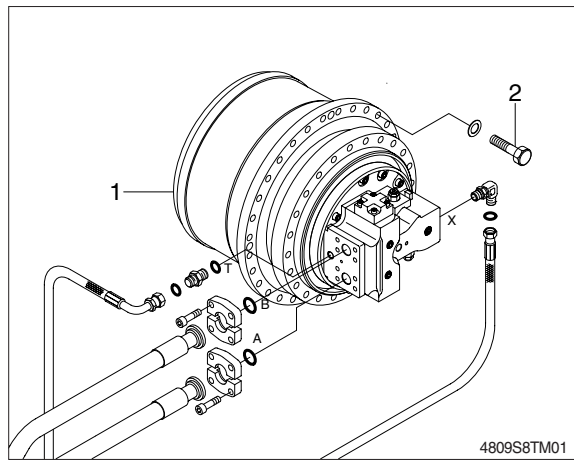
1. REMOVAL AND INSTALL

1) REMOVAL

- (1) Swing the work equipment 90° and lower it completely to the ground.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

- ※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.
- (4) Remove the track shoe assembly.
For details, see removal of track shoe assembly.
 - (5) Remove the cover.
 - (6) Remove the hoses.
 - ※ Fit blind plugs to the disconnected hoses.
 - (7) Remove the bolts and the sprocket.
 - (8) Sling travel device assembly (1).
 - (9) Remove the mounting bolts (2), then remove the travel device assembly.
 - Weight : 440 kg (970 lb)

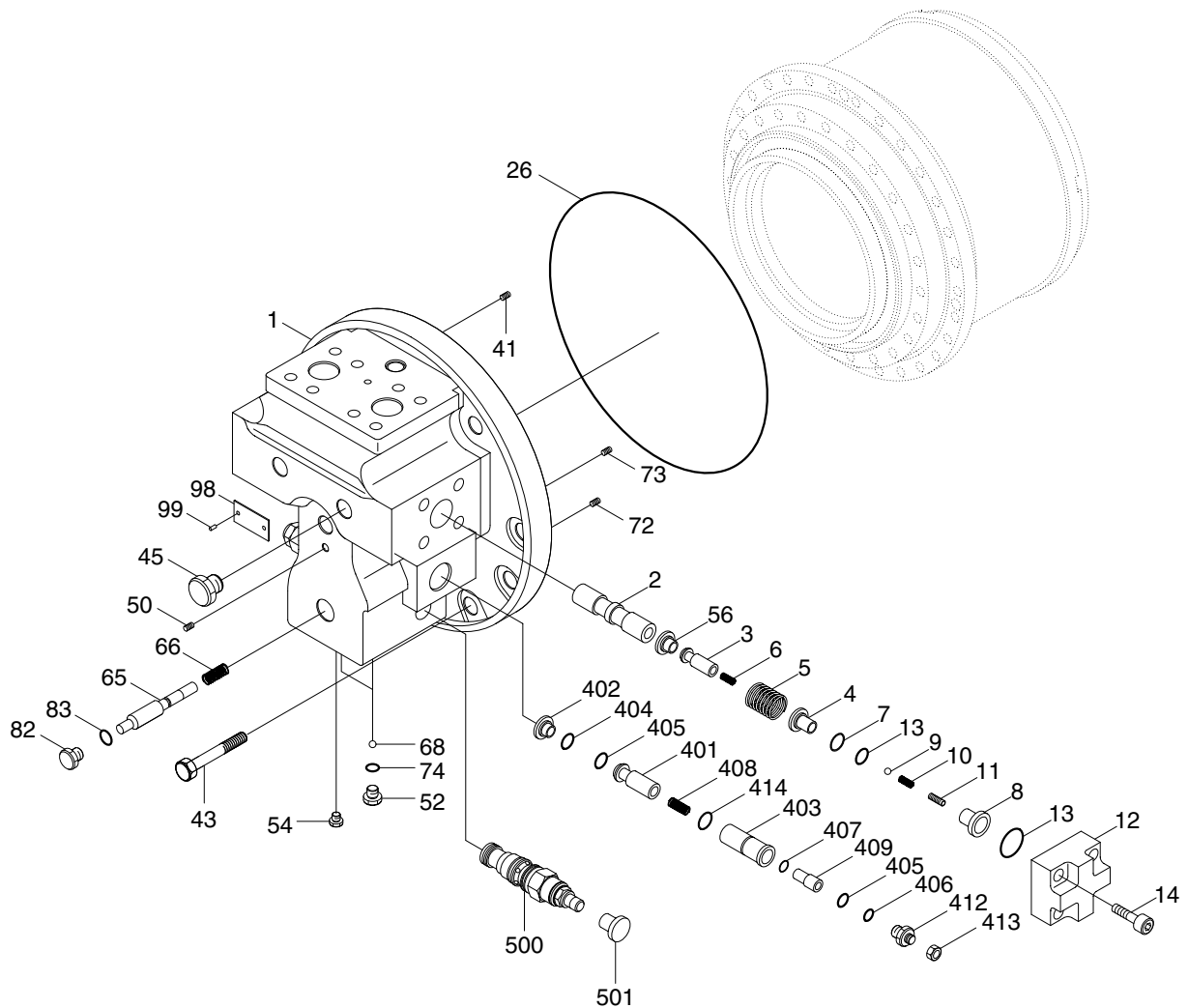


2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Bleed the air from the travel motor.
 - ① Remove the air vent plug.
 - ② Pour in hydraulic oil until it overflows 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) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. TRAVEL MOTOR

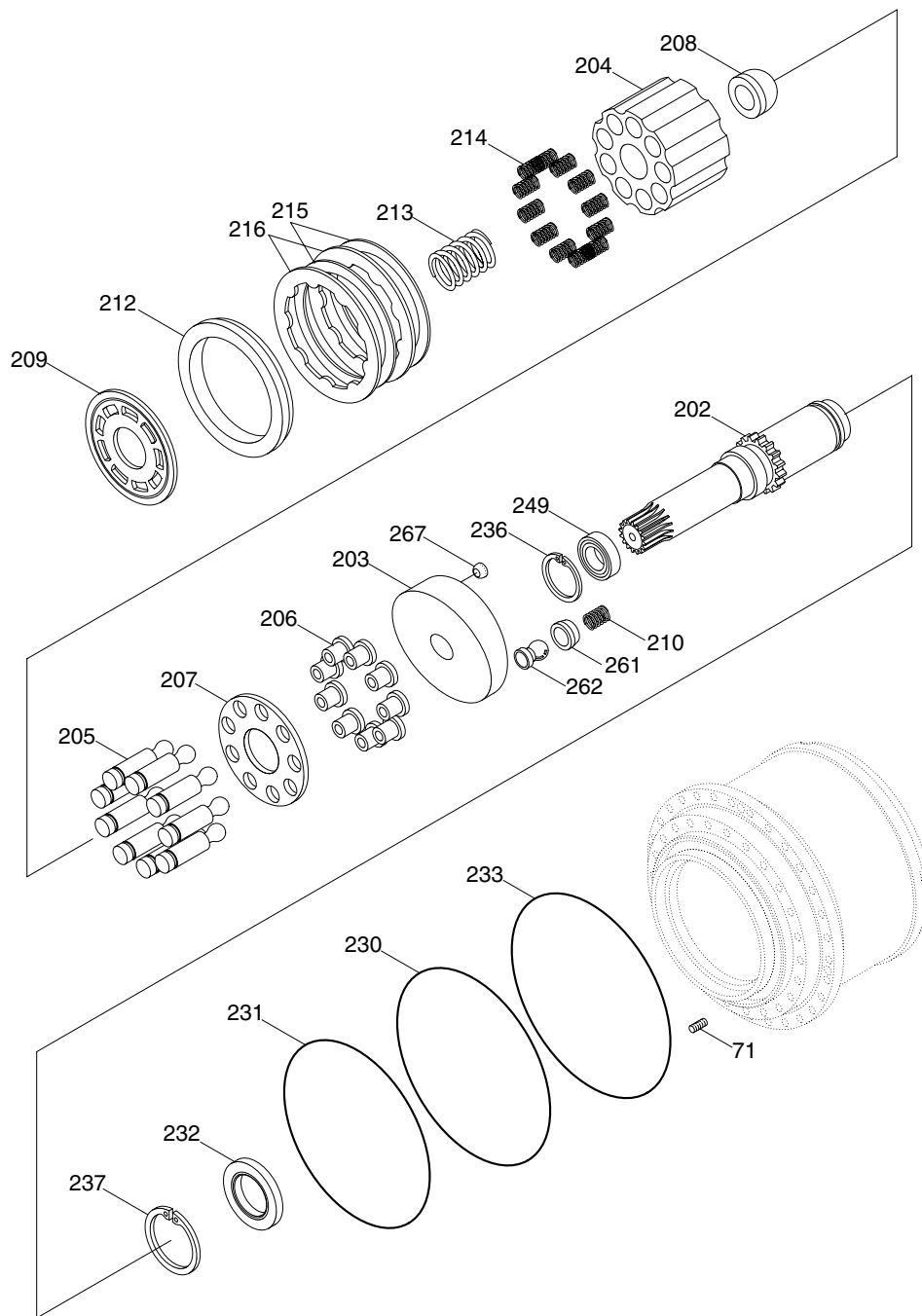
1) STRUCTURE (1/2)



4809S2TM02

1	Rear flange	43	Socket bolt	401	Plunger
2	Spool	45	PT Plug	402	Seat
3	Poppet	50	Needle bearing	403	Body
4	Plug	52	RO Plug	404	Back up ring
5	Check spring	54	Plug	405	O-ring
6	Main spring	56	Plug	406	O-ring
7	Washer	65	Spool	407	Retainer
8	Seat	68	Steel ball	408	Spring
9	Steel ball	72	Orifice	409	Piston
10	Spring	73	Orifice	412	Adjust plug
11	Screw	74	O-ring	413	Lock nut
12	Cover	82	Plug	414	Shim
13	O-ring	83	O-ring	500	Reducing valve
14	Socket bolt	98	Name plate	501	Cover
26	O-ring	99	Rivet screw		
41	Valve plate pin				

STRUCTURE (2/2)

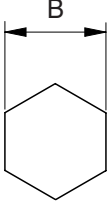


480H2TM03

71	Orifice	209	Timing plate	231	O-ring
202	Drive shaft	210	Spring	232	Oil seal
203	Swash plate	212	Piston	233	O-ring
204	Cylinder block	213	Spring	236	Snap ring
205	Piston	214	Spring	237	Snap ring
206	Shoe	215	Friction plate	249	Roller bearing
207	Retainer plate	216	Mating plate	267	Pivot
208	Thrust ball	230	O-ring		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

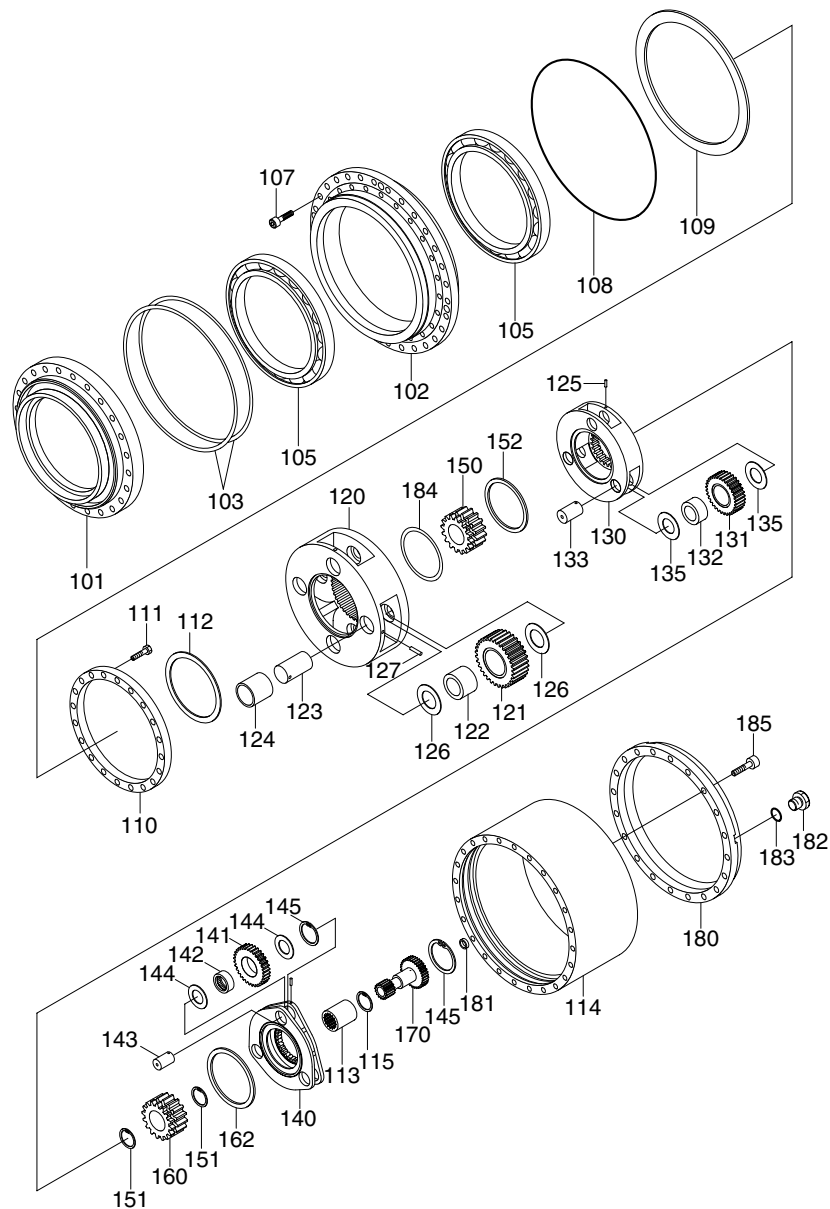
Tool name	Remark	
Allen wrench	2	
	4	
	6	
	10	
	17	
Socket for socket wrench, spanner	19	
	22.4	
	41	
Torque wrench	Capable of tightening with the specified torques.	
Plier (For hole, TPR-90)	For snap ring (236)	
Plier (For shaft)	For snap ring (237)	
(-) Driver	-	
Plastic hammer	Wooden hammer allowed. Nominal 1 or so	
Steel rod approx	7×7×200mm, Bearing (50, 249)	
Monkey wrench	-	
Oil seal inserting jig	-	
Bearing plier	-	
Seal tape	-	

(2) Tightening torque

Part name	Item	Size	Torque		Wrench size	
			kgf · m	lbf · ft	in	mm
Socket bolt	14	M12×45	10	72.3	0.39	10
Socket bolt	43	M20×45	44	318	0.67	17
Plug	54	NPTF 1/16	1.0	72.3	0.16	4
Plug	45	PT 1/2	2.2	15.9	0.24	6
VP Plug	56	PF 1/4	3.7	26.8	0.75	19
Plug	52	PF 1/4	3.7	26.8	0.24	6
Plug	82	PF 1/2	11	79.6	0.39	10
Orifice	71	M4×0.7	0.36	2.6	0.08	2

3. TRAVEL REDUCTION GEAR

1) STRUCTURE

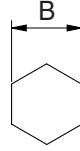


101 Spindle	122 Needle bearing	144 Plate
102 Hub	123 Bushing	145 Snap ring
103 Seat	124 Shaft No. 3	150 Sun gear No.3
105 Angular bearing	125 Spring pin	151 Thrust ring
107 Socket bolt	126 Thrust washer	152 Clip
108 O-ring	127 Spring pin	160 Sun gear No.2
109 Piece	130 Carrier No. 2	162 Clip
110 Coupling	131 Planetary gear No.2	170 Drive gear
111 Socket bolt	132 Needle bearing	180 Cover
112 Thrust plate	133 Shaft No.2	181 Thrust washer
113 Coupling	135 Thrust washer	182 Plug
114 Ring gear	140 Carrier No.1	183 O-ring
115 Snap ring	141 Planetary gear No.1	184 Thrust ring
120 Carrier No. 3	142 Needle bearing	185 Socket bolt
121 Planetary gear No. 3	143 Ring	

480H2TM04

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	10	
	17	
Torque wrench	Capable of tightening with the specified torques.	
Plier (for shaft)	Snap ring (145)	
Plier (for hole)	Snap ring (115)	
(-) Driver	For removing floating seal	
Plastic hammer	Wooden hammer allowed	
Eye bolt	M8, M16, M20, For lifting-up	
Press (1 ton)	Angular bearing (105)	
Tap M16	For removing screw lock in tapped holes	
Oil stone	For finishing mating faces	
Punch	For preventing spring pin from coming out	
Loctite	Socket bolt (107)	

(2) Tightening torque

Part name	Item	Size	Torque		Wrench size	
			kgf · m	lbf · ft	inch	mm
Socket bolt	107	M20 × 90	50.3	364	17	0.67
	111	M16 × 35	25.7	186	14	0.55
Plug	182	PF 1/2	10	72.3	10	0.39
Set screw	185	M12 × 35	10.4	75.2	10	0.39

4. DISASSEMBLING

1) GENERAL PRECAUTIONS

- (1) Pay attention to not damaging contact surfaces for O-rings, oil seals, etc. and contact/sliding surfaces for gears, pins, bearings, etc.
- (2) This motor can be disassembled even in a state on the reduction gear.
However, in that case, pay full attention to preventing mud, dust, etc. from entering in it.
- (3) The numerical in parentheses following each part name indicates its part number shown in the attached **assembly drawings**.
- (4) The piping side of the motor is referred to as the rear side, and the output side as the front side.

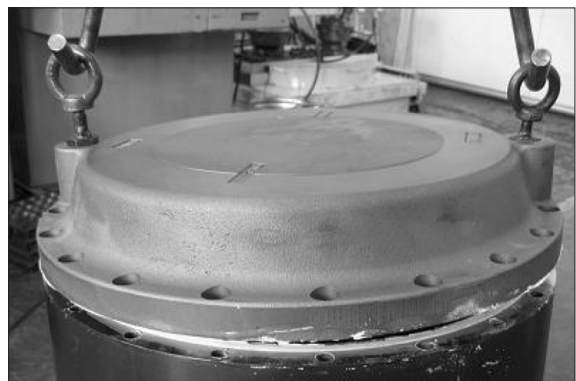
2) DISASSEMBLY OF REDUCTION GEAR

- (1) Select a disassembling place.
 - ※ Select a clean place.
 - ※ Spread rubber sheet or cloth on work bench to prevent parts from being damaged.
- (2) Remove dust, mud, etc. from reduction gear surfaces with washing oil or so.
- (3) Place reduction gear with its gear oil drain port or level gauge at the lowest position, and drain reduction gear oil.
 - ※ Receive gear oil with clean vessel and check it for abnormalities.
Renew gear oil.
- (4) Place reduction gear with its side cover (180) upward, than remove socket bolt (185).
 - ※ Don't reuse thrust washer (181) in cover.



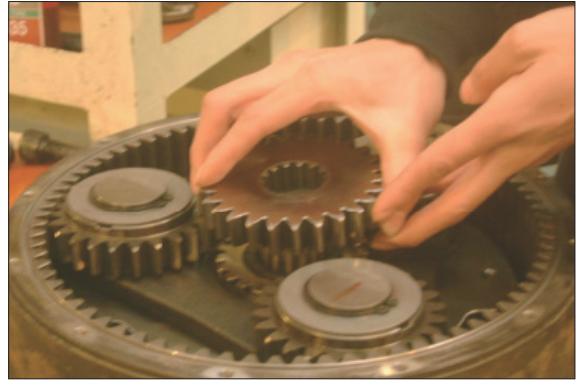
480H8TM01

- (5) Remove cover (180) from ring gear (114).
 - ※ Mount two eyebolt (PF 1/2), then lift it using crane.



480H8TM02

(6) Remove drive gear (170).



370078TM02

(7) Remove carrier 1 (140), together with planetary gears 1 (141), sun gear 2 (160), etc. fitted.



370078TM03

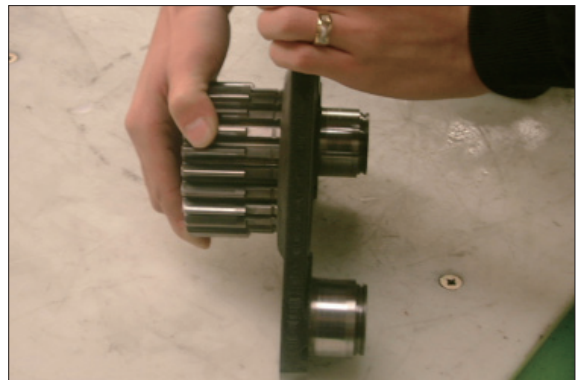
(8) Remove snap ring (145), and then remove side plate (144), planetary gear 1 (141), needle cage (142).

※ If flaking is observed on the inner ring surface replace inner ring. In this case, replace planetary gear 1 and needle cage simultaneously.



370078TM04

(9) Remove clip (162), and then remove carrier 1 (140) from sun gear 2 (160).



370078TM05

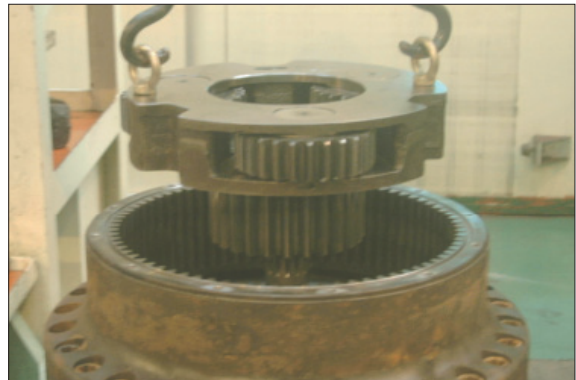
(10) Remove thrust ring (151).



370078TM06

(11) Remove carrier 2 (130).

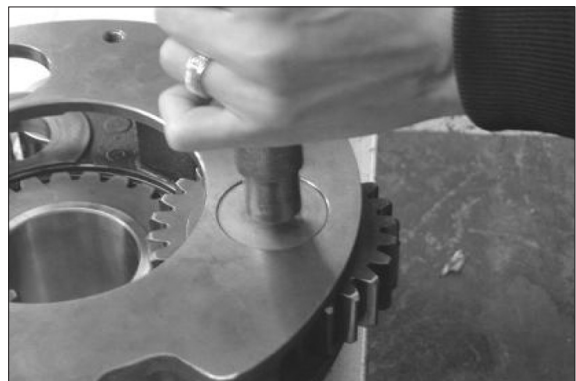
- ※ Mount two eyebolt M16, then lift it using crane.



370078TM07

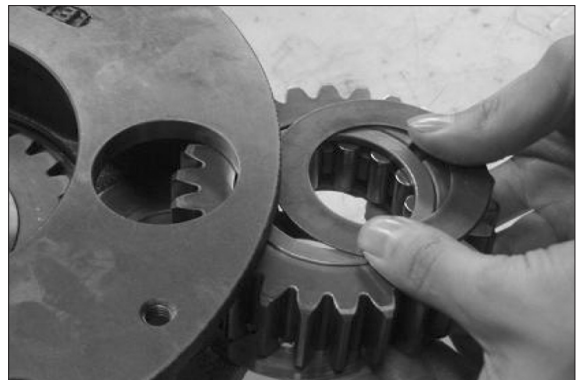
(12) Remove spring pin (125), and shaft bearing 2 (133), from carrier 2 (130).

- ※ Carry out the following check in advance.
If any abnormality should be found, carry out disassembling.
 - Is there any crevice, crack or pitting on tooth surface of planetary gear?
 - When turning planetary gear lightly, is there any abnormal noise or eccentric clearance.



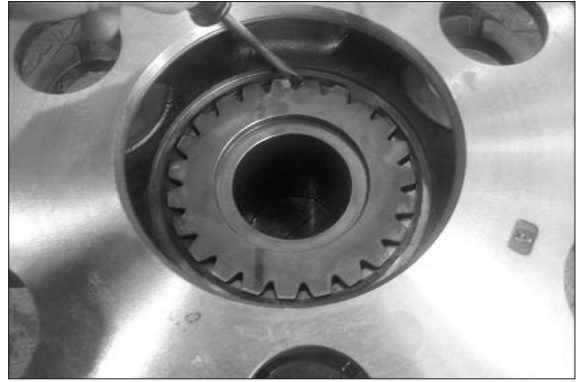
480H8TM12

(13) Remove planetary gear 2 (131), and needle bearing (132) from carrier 2 (130).



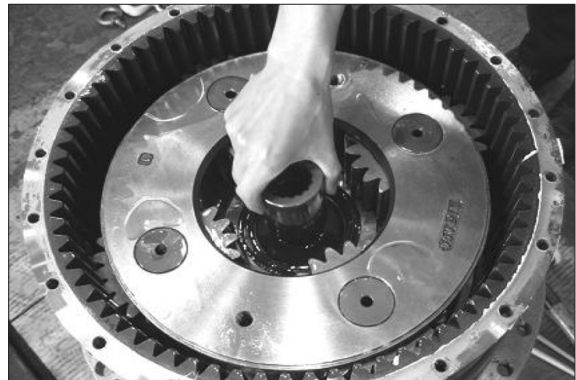
480H8TM13

- (14) Remove thrust ring (151) from sun gear (150), then remove clip (152) and remove carrier 2 (130) from sun gear 3 (150).



480H8TM14

- (15) Remove coupling (113) from drive shaft (202).



480H8TM15

- (16) Remove carrier 3 (120), with planetary gear 3 (121) that they are fitted. Then remove thrust plate (112).

- ※ Mount two eyebolt M16, then lift it using crane.



480H8TM16

- (17) Remove spring pin (127) then remove shaft bearing 3 (124) from carrier 3.

- ※ Remove shaft bearing 3 from carrier 3 rear.



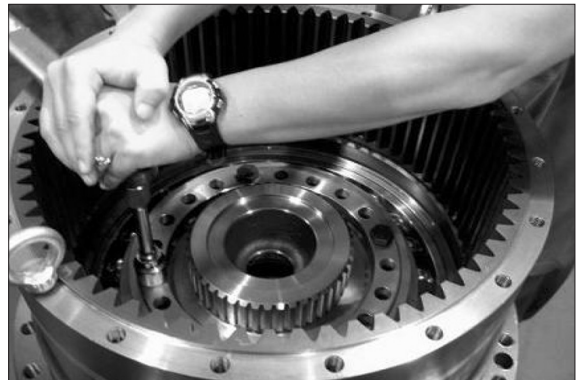
480H8TM17

- (18) Remove planetary gear 4 (121), needle bearing (122), floating bush (123), thrust washer (126) from carrier 3.



480H8TM18

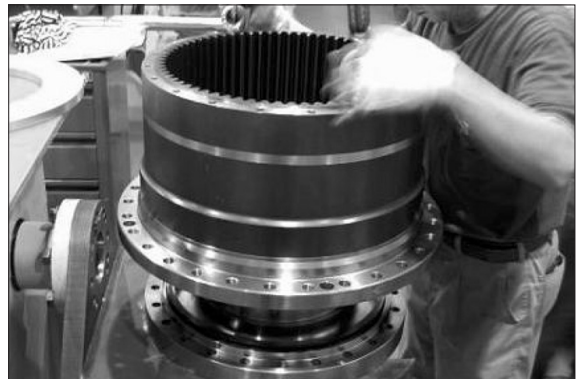
- (19) Remove coupling (110), then distance piece.



480H8TM19

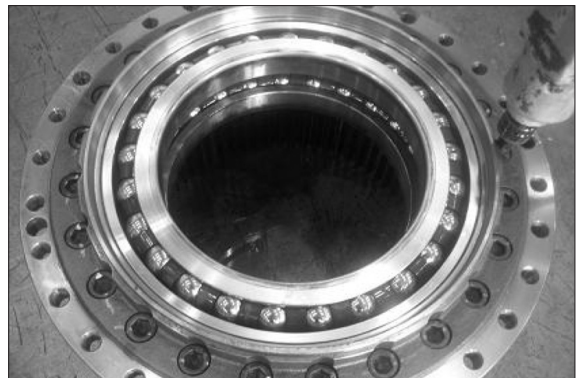
- (20) Remove subassembly with hub (102) and ring gear (114), then remove floating seal (103).

- ※ Mount two eyebolt (M12), then lift it using crane.



480H8TM20

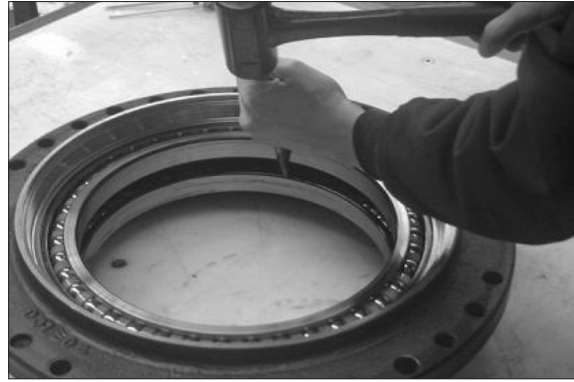
- (21) Remove socket bolt (107) then remove hub (102) and ring gear (114).



480H8TM21

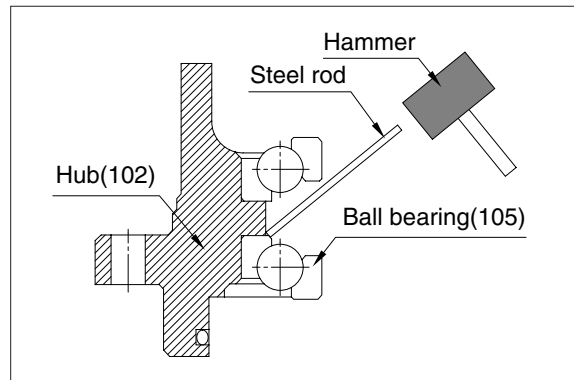
(22) Remove angular bear (105, 2EA) from hub (102).

※ In case of removing bearing, exchange new angular bearing.



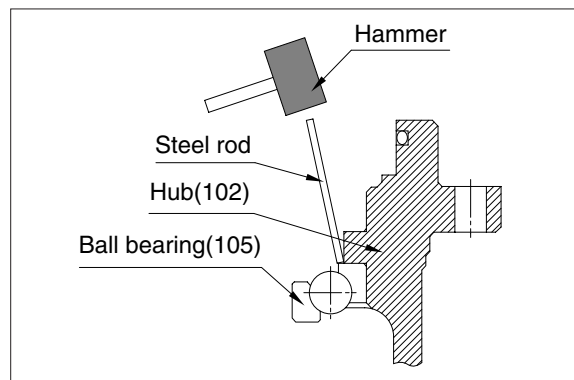
480H8TM22

(23) As show right figure, remove angular bearing (105, 1EA) from hub (102).



480H8TM23

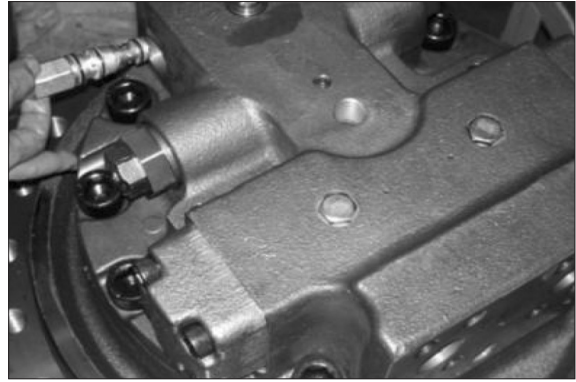
(24) As show right figure, remove remained angular bearing (105) from hub (102).



480H8TM24

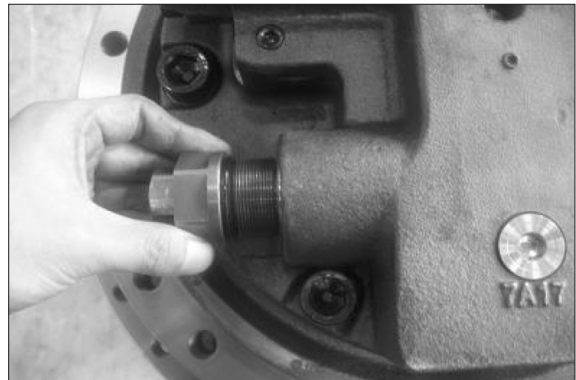
3) DISASSEMBLY OF MOTOR

(1) Loosen reducing valve assy.



480H8TM25

(2) Loosen relief valve (RV1), (2ST).



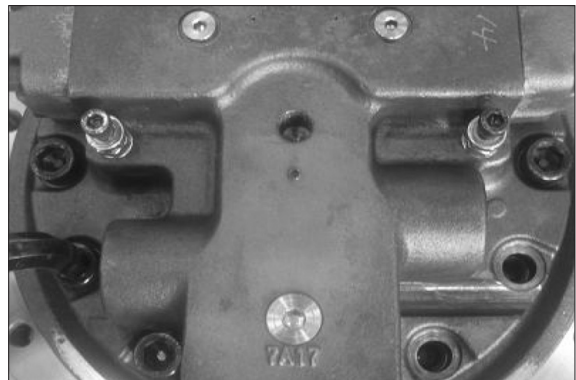
480H8TM26

(3) Remove plug (45, 2EA) then tight two M10×135L bolts with brake piston (212) through holes on rear flange.



480H8TM27

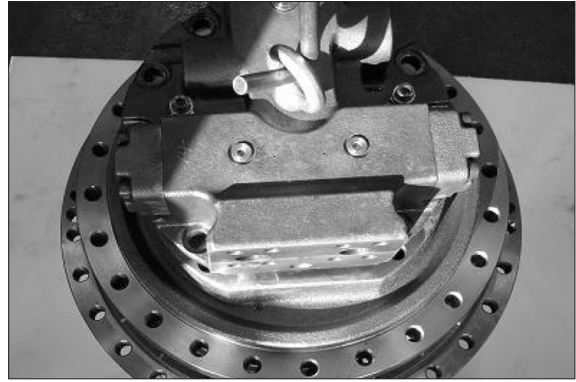
(4) Remove socket bolt (43, 8EA).



480H8TM28

(5) Remove it as lifting rear flange sub.

※ Please tight M20 eye bolt (1EA), lift rear flange sub using crane as a convenience.



480H8TM29

(6) Remove socket bolt (M10×135) then remove parking piston (212) and spring (213).



480H8TM30

(7) Remove spring (213) then remove timing plate (209).



480H8TM31

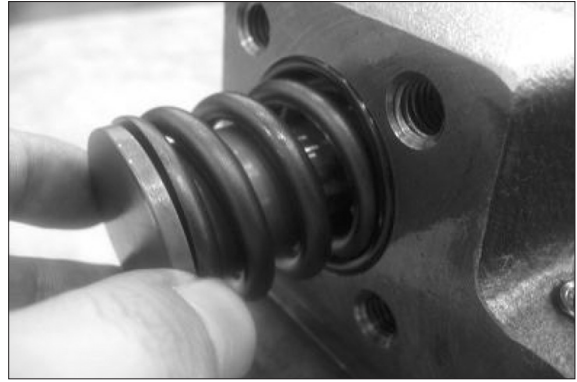
(8) Remove plug (56), then remove spring (66) and spool (65).



480H8TM32

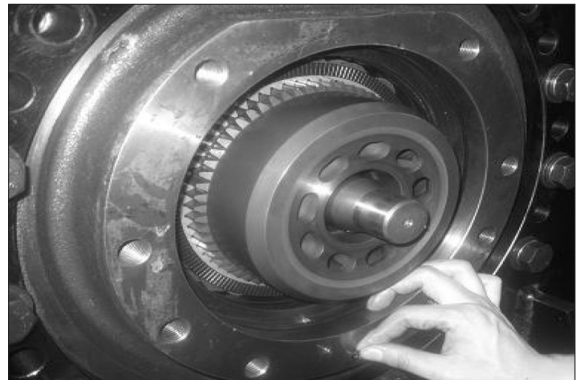
(9) Remove socket bolt (14) and cover (12) then remove counter balance spool assy.

※ If any abnormality should be found, exchange new counter balance spool assy.



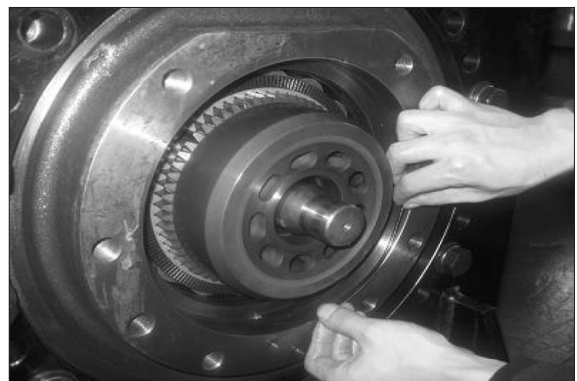
480H8TM33

(10) Remove O-ring (233) (2EA).



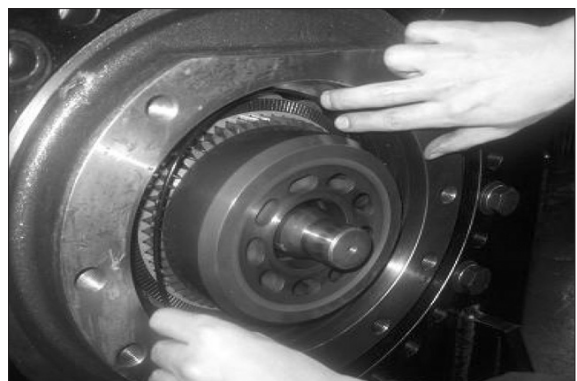
480H8TM34

(11) Remove O-ring (230).



480H8TM35

(12) Remove O-ring (231).



480H8TM36

(13) Remove friction plate (215, 4EA) and mating plate (216, 3EA).

※ In this case, motor should be located in horizontally.



480H8TM37

(14) Remove cylinder block kit.

※ In this case, motor should be located in horizontally.



480H8TM38

(15) Remove retainer (207) assembled piston assy from cylinder block (204).



480H8TM39

(16) Remove piston assy from retainer (207).



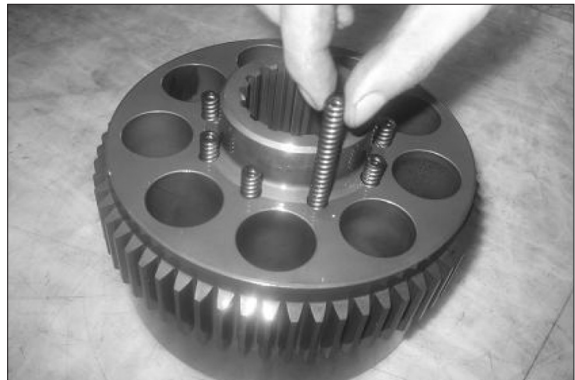
480H8TM40

(17) Remove trust ball (208).



480H8TM41

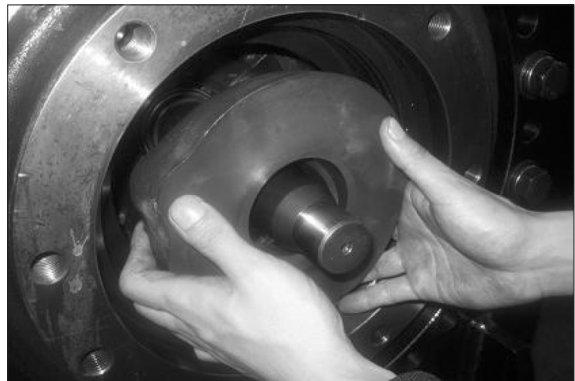
(18) Remove cylinder block spring (214, 9EA).



480H8TM42

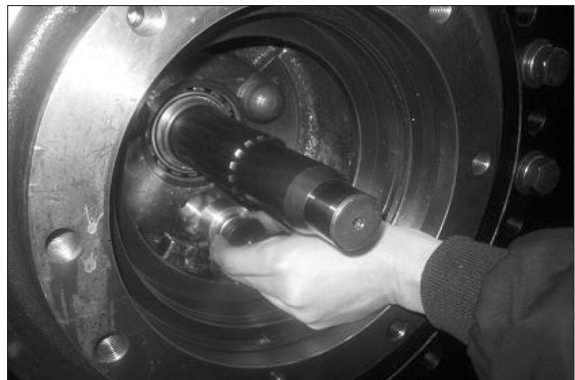
(19) Remove swash plate (203).

※ In this case, motor should be located in horizontally.



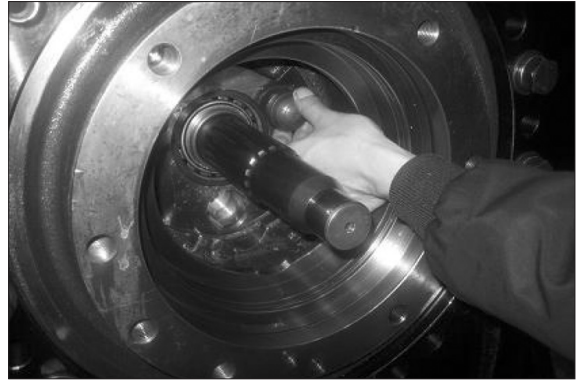
480H8TM43

(20) Remove piston assy (2 speed).



480H8TM44

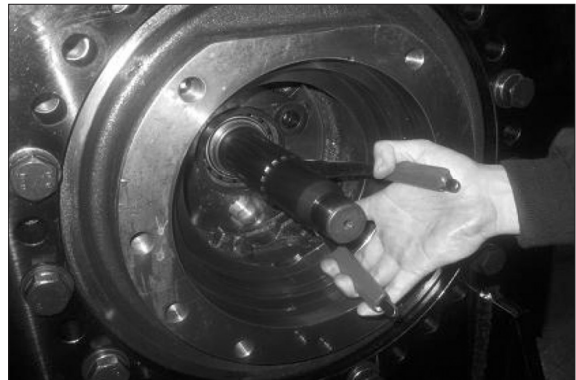
(21) Remove pivot (267, 2EA).



480H8TM45

(22) Remove snap ring (236), and then hit front side end face of shaft (202) lightly with plastic hammer or so to remove from spindle (101).

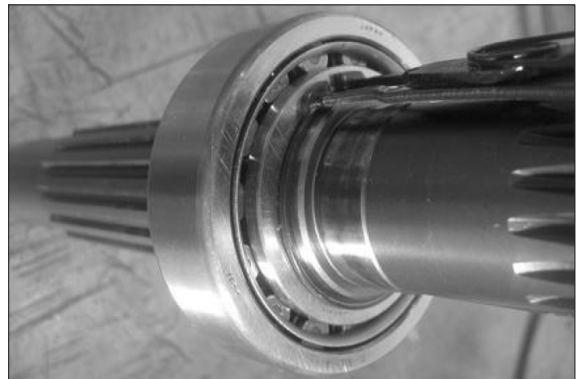
※ As remove snap ring (236), use snap ring plier.



480H8TM46

(23) Remove snap ring (237), then remove roller bearing (249).

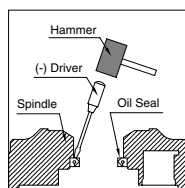
※ Use snap ring plier.



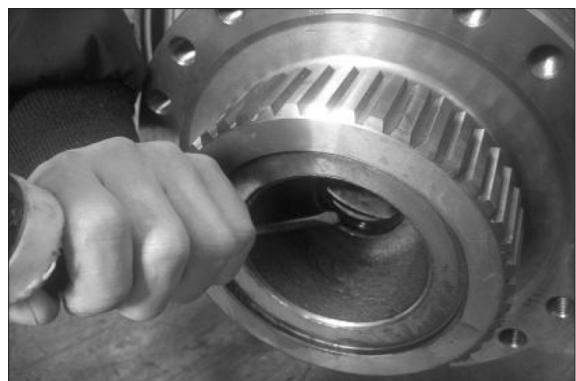
480H8TM47

(24) Remove oil seal (232) from spindle (101).

※ Do not reuse the disassembling oil seal (232). As reassembly, use new oil seal.



Remove the oil seal (232) by hammering from the spindle (101) at the circumference of the oil seal (232) using (-) driver.



480H8TM48

That is all of disassembling work. The pins (41) force-fitted to the valve casing cannot be removed.

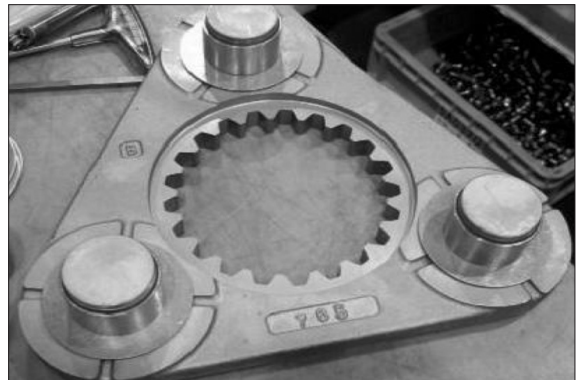
5. ASSEMBLING

1) GENERAL CAUTIONS

- (1) Clean each part fully with washing oil and dry it by blasting compressed air. It is better not to use waste cloths as much as possible.
However, if they are to be used, use clean ones, and pay attention to not leaving lint and so on.
Don't clean the friction plate with washing oil without fail.
- (2) Use the torque wrench in tightening fitting screws and plugs to their respective torque shown in page 8-72, 8-74.
- (3) When hammering is required, use the plastic hammer and try to hit parts lightly.
- (4) Similarly to the disassembling procedures, the numeral in parentheses following each part name indicates its item number shown in the attached assembly drawings.

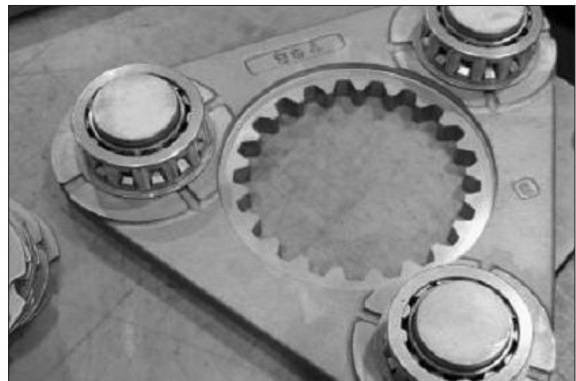
2) ASSEMBLY OF REDUCTION GEAR

- (1) Assemble side plate E (144) and inner race (143) to carrier 1 (140).



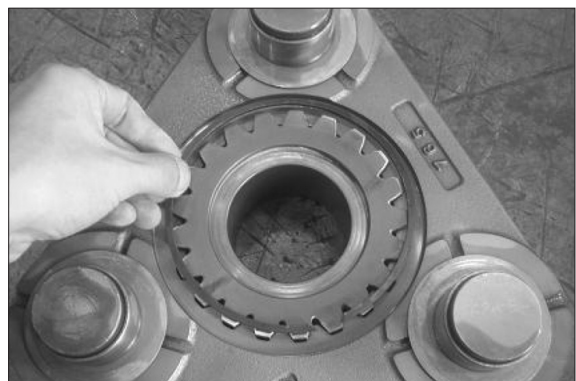
480H8TM50

- (2) Assemble needle bearing (142).



480H8TM51

- (3) Assemble sun gear 2 to carrier 1 and fit clip (162).



480H8TM52

- (4) Assemble planetary gear 1 (141) and side plate (144).



480H8TM53

- (5) Assemble snap ring (145) using snap ring plier.



480H8TM54

- (6) Assemble sun gear 3 (150) to carrier 2 and fit clip (152).



480H8TM55

- (7) Assemble thrust washer (135) and needle bearing (132), thrust washer (136) to planetary gear 2 (131).



480H8TM56

(8) Assemble sub assy assembled in the above process and shaft bearing 2 (133).



480H8TM57

(9) Insert spring pin (125) into pin holes of carrier 2 (130).

※ Mate pin of carrier 2 (130) with center of shaft bearing.



480H8TM58

(10) Assemble needle bearing (122) and floating bush (123) into inside of planetary gear 3 (121) and insert them into carrier 3 (120) holding them between thrust washer (126).



480H8TM59

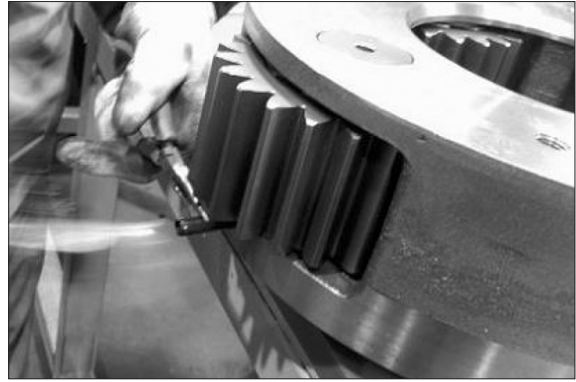
(11) Insert shaft bearing 3 (124).



480H8TM60

(12) Insert spring pin (127) into pin holes of carrier 3 (120).

※ Mate pin of carrier 3 (120) with center of shaft bearing.



480H8TM61

(13) Assemble angular bearing (105) to hub (102).



480H8TM62

(14) Assemble angular bearing (105) in other side of hub (102).



480H8TM63

(15) Assemble hub (102) into ring gear (114) then tighten socket bolt (107) to specified torque to fix hub.

※ Tightening torque
Socket bolt (107) : 50.3 kgf · m
(364 lbf · ft)



480H8TM64

(16) Assemble hub (102) and ring gear (114) assy to spindle (101).



480H8TM65

(17) Steps 1 through 4 of the original assembling procedure must be carried out as directed.

- ① Mount a measure plate on the spindle without inserting a distance piece.
- ② Tighten socket bolt (111) lightly.
- ③ As shown in the diagram at right, measure dimension "A" using depth micrometer.
- ④ As shown in the diagram at right, measure dimension "C" of coupling (B) (110) to be mounted.
- ⑤ Using the clearance measurements calculate the appropriate distance piece (109) thickness as follows.



480H8TM66

- a. Measure the clearance between the edge of the spindle (101) and that of the ball bearing (105).

Take this clearance as "X"

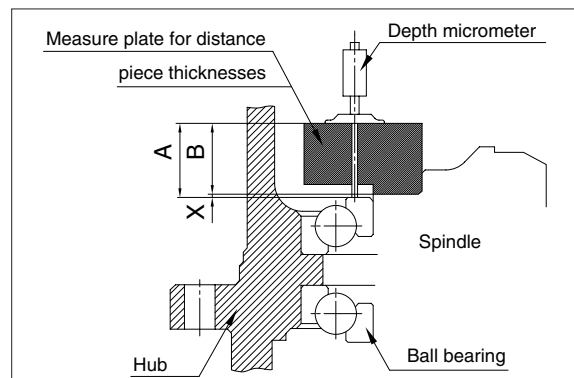
$$"X" = "A" - "B"$$

- b. Next, determine the distance piece (109) of the appropriate thickness.

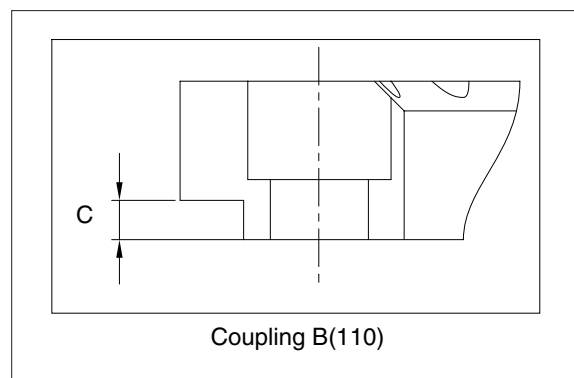
Take this thickness as "T"

$$"T" = ("C" - "X") \pm 0.1$$

- ⑥ Using the results the of step (1) through (5) above, select the appropriate thickness from 9 types.



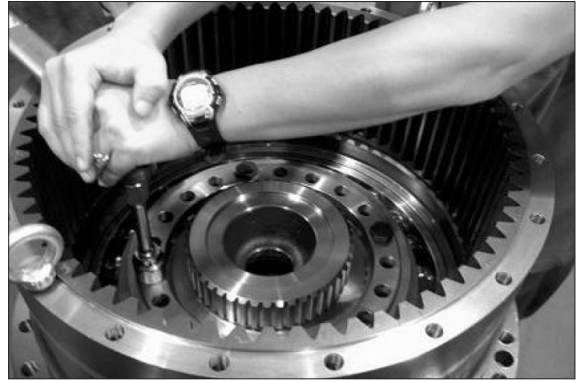
480H8TM67



480H8TM68

(18) Tighten to specified torque socket bolt (111) to coupling B (110).

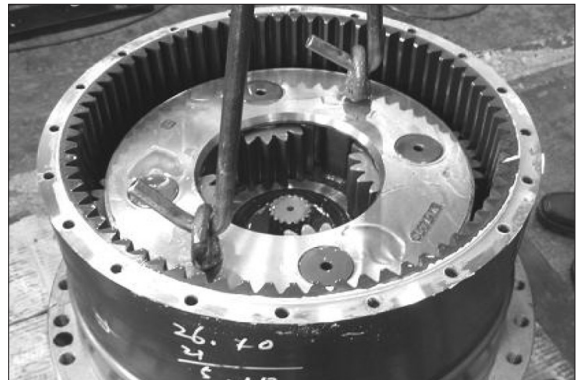
- ※ Tightening torque
socket bolt (111) : 25.7 kgf · m
(186 lbf · ft)



480H8TM69

(19) Mount thrust plate R (112) to spindle (101), and then assemble carrier 3 sub-assembly to ring gear (114).

- ※ Mount two eyebolt (M16), then assemble it using crane.



480H8TM70

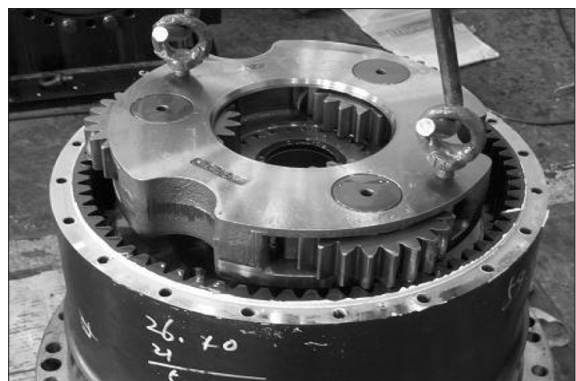
(20) Assemble coupling (113) to drive shaft (202).



480H8TM71

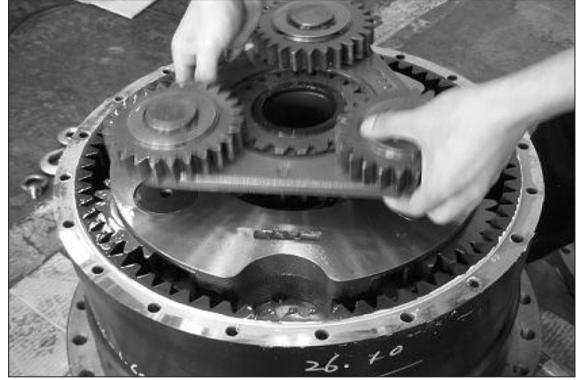
(21) Assemble carrier 2 sub-assembly to ring gear (114).

- ※ Mount two eyebolt (M16), then assemble it using crane.



480H8TM72

- (22) Assemble carrier 1 sub assembly to ring gear (114).
Assemble thrust ring 90 (151).



480H8TM73

- (23) Assemble drive gear (170).



480H8TM74

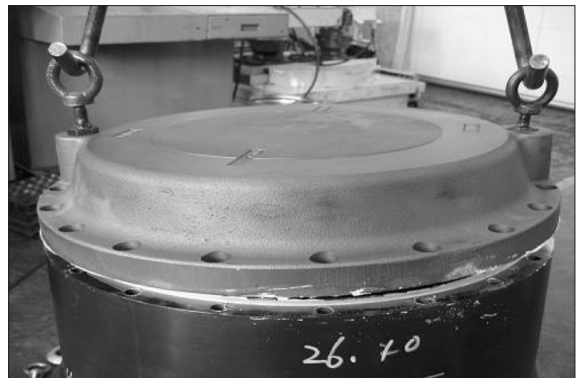
- (24) Assemble thrust washer M (181) to cover (180) using plastic hammer.



480H8TM75

- (25) Apply sealant to the ring gear (114) after installing with the cover.

- ※ Mount two eyebolt (PF 1/2), then assemble it using crane.



480H8TM76

(26) Assemble socket bolt (185) to cover (180).

- ※ Tightening torque
Socket bolt (185) : 10.4 kgf · m
(75.2 lbf · ft)



480H8TM77

(27) Injection reduction gear oil.

- ※ Injected reduction gear oil :
Approximately 10.0 l



480H8TM78

(28) Tighten plug (182) to reduction gear oil inlets.

- ※ Tightening torque
Plug (182) : 10 kgf · m
(72.3 lbf · ft)

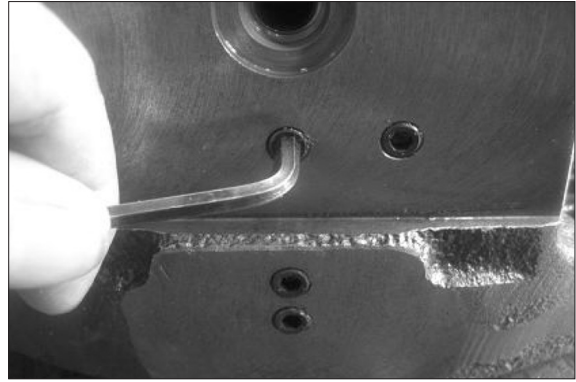


480H8TM79

2) ASSEMBLY OF MOTOR

- (1) Tighten plugs (54, 7EA) into rear flange (1) with specified torque.

※ Tightening torque
Plug (54) : 1 kgf · m (7.2 lbf · ft)



480H8TM80

- (2) Tighten plugs (56, 2EA) into rear flange (1) with specified torque.

※ Tightening torque
Plug (56) : 3.7 kgf · m (26.7 lbf · ft)



480H8TM81

- (3) Assemble two speed spring (66), two speed spool (65) in the order named.



480H8TM82

- (4) Tighten plug (82) into rear flange (1) with specified torque.

※ Tightening torque
Plug (82) : 11 kgf · m (80 lbf · ft)



480H8TM83

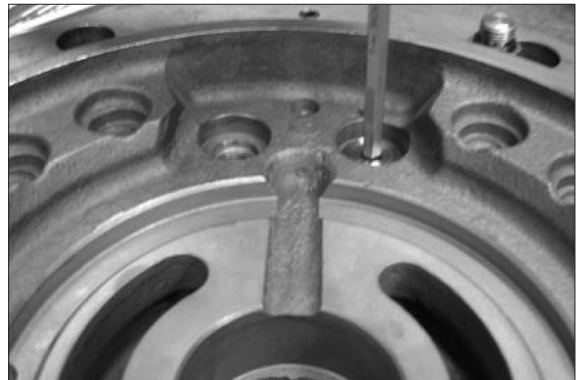
(5) Assemble steel ball (68).



480H8TM84

(6) Tighten plugs (52) into rear flange (1) with specified torque.

※ Tightening torque
Plug (52) : 3.7 kgf · m (27 lbf · ft)



480H8TM85

(7) Tighten orifice (71) into rear flange (1) with specified torque.

※ Tightening torque
Orifice (71) : 0.36 kgf · m (2.6 lbf · ft)



480H8TM86

(8) Assemble counterbalance spool (2).



480H8TM87

(9) Assemble washer (7) into rear flange (1).



480H8TM88

(10) Assemble O-ring (13) (P44).



480H8TM89

(11) Assemble main spring (6).



480H8TM90

(12) Assemble counter balance spool (2), washer (7), main spring (6), seat (8) in the order named.

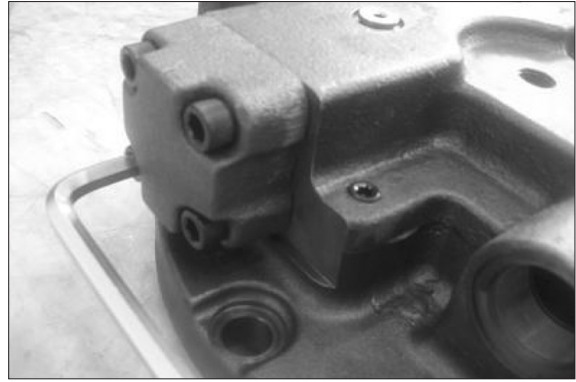


480H8TM91

(13) Fix cover (12) by tightening socket bolt (14).

※ Tightening torque

Socket bolt (14) : 10 kgf · m (72.3 lbf · ft)



480H8TM92

(14) Interference-fit pin (41).



480H8TM93

(15) Interference-fit needle bearing (50).

※ It isn't necessary when needle bearing was disassembled from the rear flange.



480H8TM94

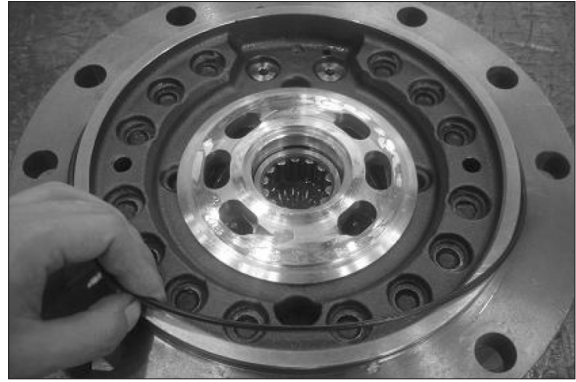
(16) Assemble timing plate (209) to gear flange (1) sub-assembly.

※ Apply grease on timing plate rear flange surface and pay attention to not dropping timing plate.



480H8TM95

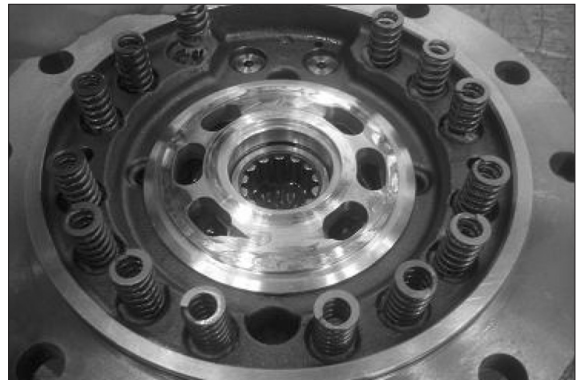
(17) Assemble O-ring (26) (WG51) to rear flange (1) sub-assembly.



480H8TM96

(18) Assemble brake spring (213) (14EA) to rear flange (1) sub-assembly.

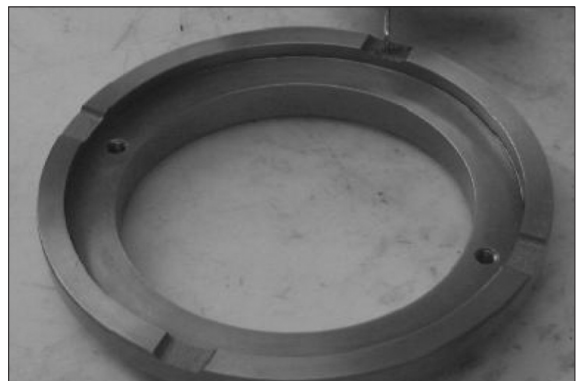
※ Apply grease on spring and pay attention to not dropping spring.



480H8TM97

(19) Assemble orifice (71) to piston (parking) (212).

※ Tightening torque : 0.36 kgf · m (0.3 lbf · ft)



480H8TM98

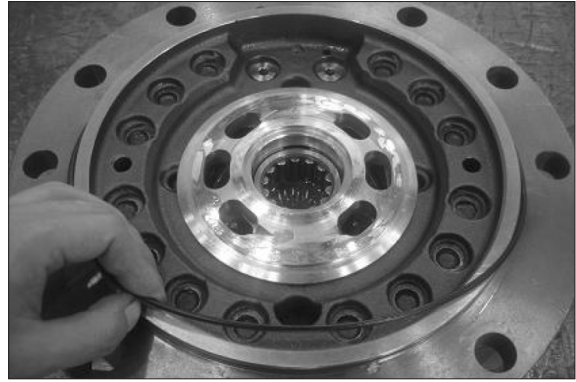
(20) Screw two M10×135 bolts on the holes for compelling brake release.
Sub-assembly (rear flange & piston (parking)).

※ After finishing assembly, two M10×135 (2EA) bolts will be removed.



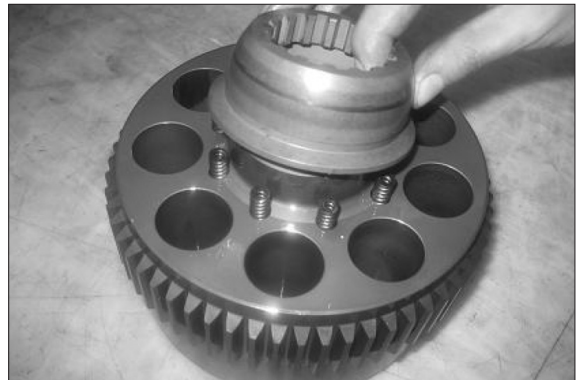
480H8TM99

(21) Assemble cylinder spring (214, 9EA) to cylinder block (204).



480H8TM100

(22) Assemble thrust ball (208) to cylinder block (204).



480H8TM101

(23) Put piston (261), shoe (262) sub-assembly (9EA) to retainer plate (207).



480H8TM102

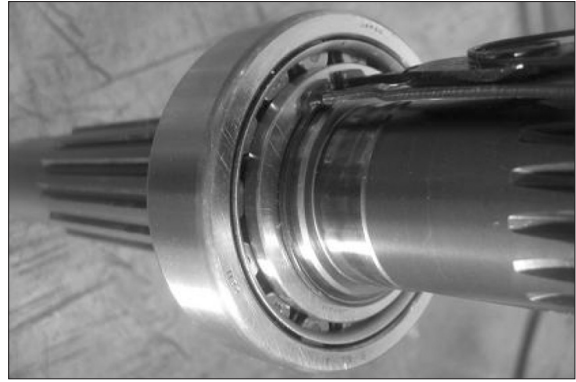
(24) Assemble retainer plate assembly to cylinder block (204).



480H8TM103

(25) Put roller bearing (249) on drive shaft (202), and assemble snap ring (236) by using the plier.

- ※ Pay attention to not damaging oil seal sliding area of driving shaft.
- ※ Pay attention to not fitting snap ring the other way around.



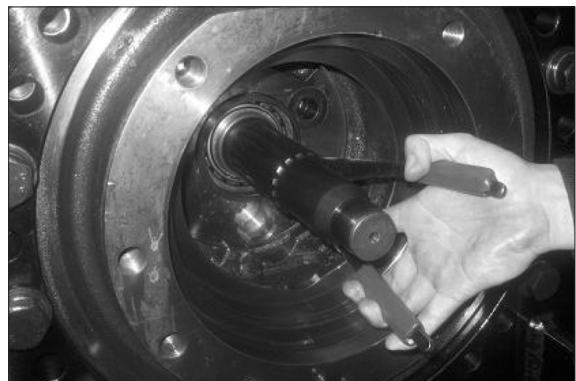
480H8TM104

(26) Interference-fit oil seal (232) into spindle (101) by special tool.



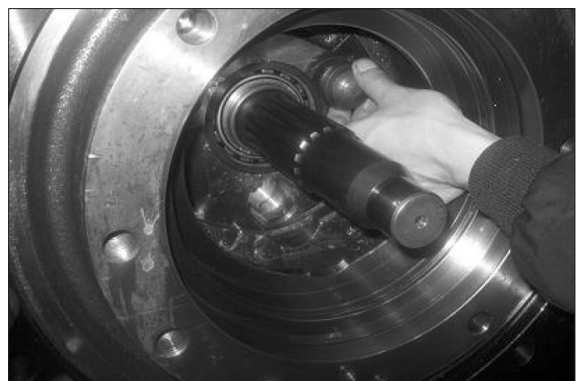
480H8TM105

(27) Assemble drive shaft (202) to spindle (101), and assemble snap ring (236) by using the plier.



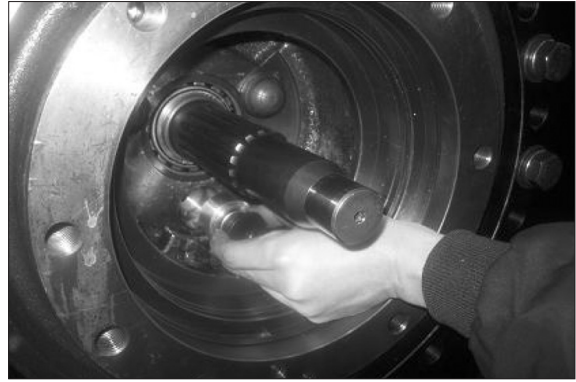
480H8TM106

(28) Assemble pivot (267).



480H8TM107

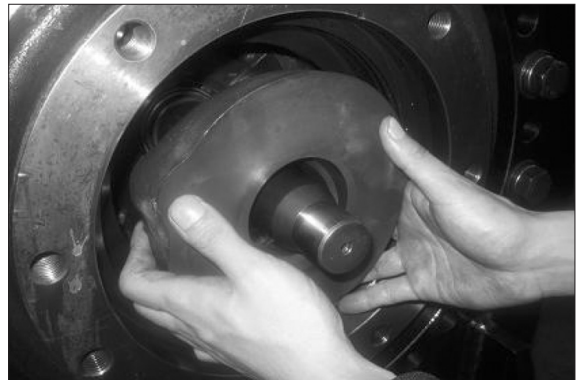
(29) Assemble two speed piston (261), shoe (262) assy.



480H8TM108

(30) Apply grease on sliding area of swash plate (203) rear surface and then assemble swash plate (203) to spindle (101).

※ Confirm with finger tips of both hands whether swash plate moves smoothly.



480H8TM109

(31) Assemble cylinder block sub-assembly (CB1) to spindle (101).

※ Apply working fluid to the swash plate (203) thinly.



480H8TM110

(32) Assemble mating plate (216, 3EA) and friction plate (215, 4EA) into cylinder block (204).

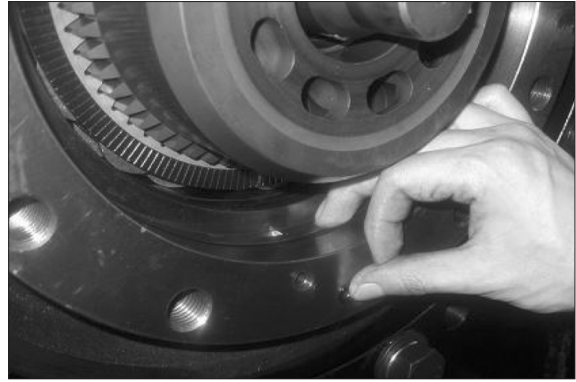
※ Ortehr :
Friction plate → Mating plate → Friction plate
→ Mating plate → Friction plate →
Mating plate → Friction plate



480H8TM111

(33) Assemble O-ring (233) (P8) into spindle (101).

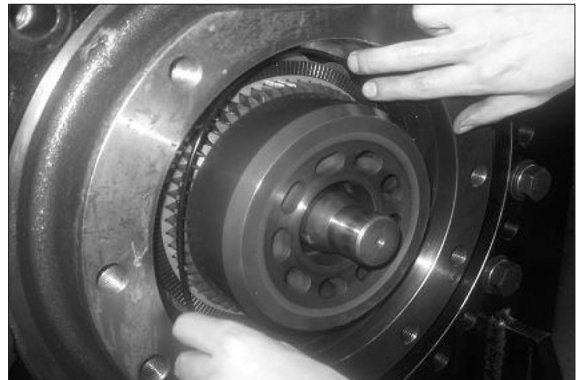
- ※ Do not reuse the disassembling O-ring (233).



480H8TM112

(34) Assemble O-ring (231) (WG48) into spindle (101).

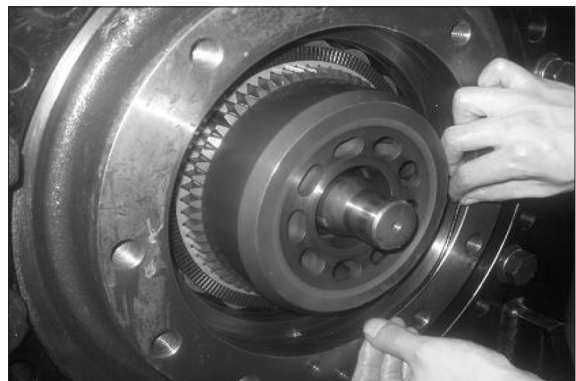
- ※ Do not reuse the disassembling O-ring (231).



480H8TM113

(35) Assemble O-ring (230) (WG52) into spindle (101).

- ※ Do not reuse the disassembling O-ring (230).



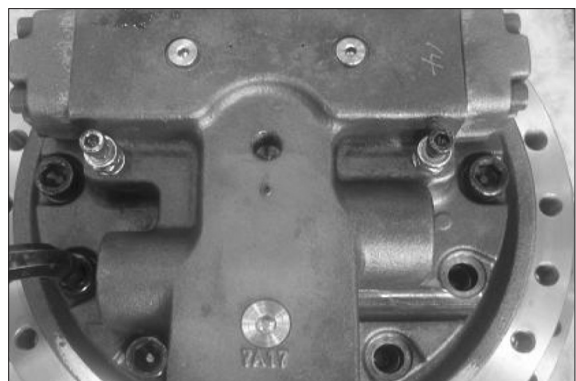
480H8TM114

(36) Tighten socket bolt (43) (8EA) to rear flange (1).

- ※ Apply grease on roller of needle bearing (50) in rear flange (1).

Tightening torque :

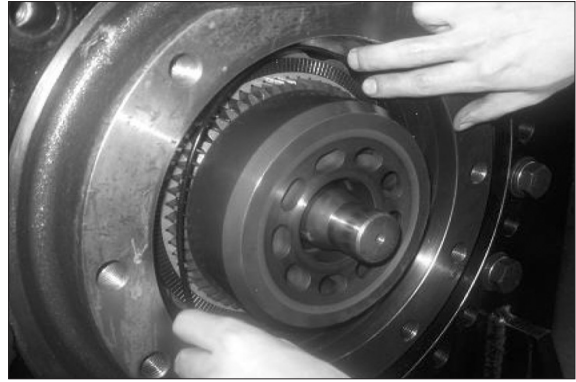
Socket bolt (43) : 44 kgf · m (318 lbf · ft)



480H8TM115

(37) Disassemble socket bolt (M10×135) on the holes for compelling brake release. And then assemble plug (45, 2EA).

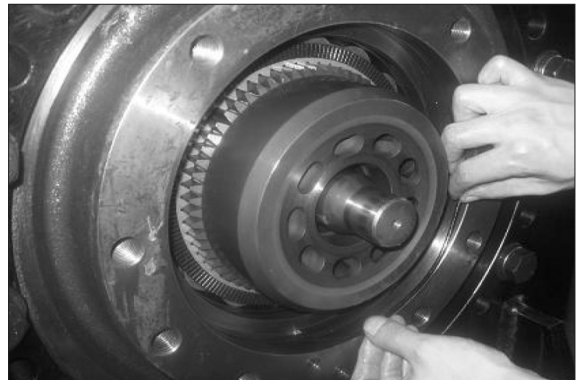
- ※ Tightening torque :
Plug (45) : 2.2 kgf · m (15.9 lbf · ft)



480H8TM116

(38) Tighten to specified torque relief valve (RV1) (2 set) to rear flange sub-assembly.

- ※ Tightening torque :
Relief valve (RV1) : 25 kgf · m (181 lbf · ft)



480H8TM117

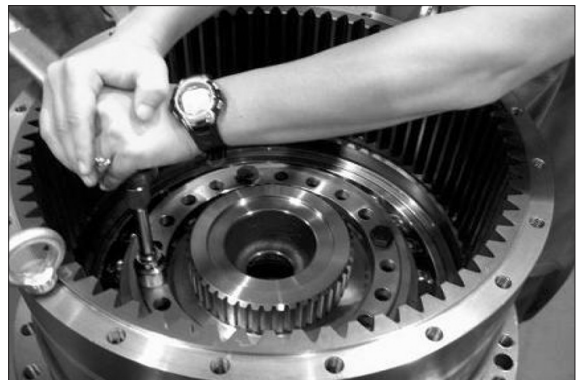
(39) Tighten to specified torque reducing valve (500) (1 set) to rear flange sub-assembly.

- ※ Tightening torque
Reducing valve (500) :
4.5 kgf · m (32.5 lbf · ft)



480H8TM25

(40) Assemble reducing valve cover (501) to rear flange sub-assembly.



480H8TM19