

## SECTION 7 DISASSEMBLY AND ASSEMBLY

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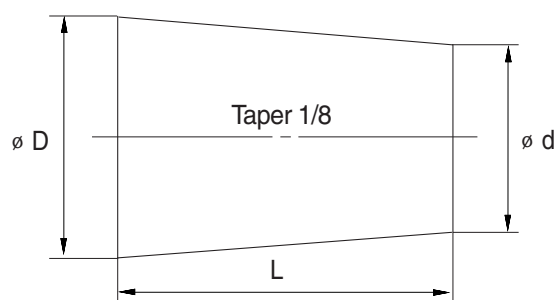
# SECTION 7 DISASSEMBLY AND ASSEMBLY

## GROUP 1 PRECAUTIONS

### 1. REMOVAL WORK

- 1) Lower the work equipment completely to the ground.  
If the coolant contains antifreeze, dispose of it correctly.
- 2) After disconnecting hoses or tubes, cover them or fit blind plugs to prevent dirt or dust from entering.
- 3) When draining oil, prepare a container of adequate size to catch the oil.
- 4) Confirm the match marks showing the installation position, and make match marks in the necessary places before removal to prevent any mistake when assembling.
- 5) To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors.
- 6) Fit wires and hoses with tags to show their installation position to prevent any mistake when installing.
- 7) Check the number and thickness of the shims, and keep in a safe place.
- 8) When raising components, be sure to use lifting equipment of ample strength.
- 9) When using forcing screws to remove any components, tighten the forcing screws alternately.
- 10) Before removing any unit, clean the surrounding area and fit a cover to prevent any dust or dirt from entering after removal.
- 11) When removing hydraulic equipment, first release the remaining pressure inside the hydraulic tank and the hydraulic piping.
- 12) If the part is not under hydraulic pressure, the following corks can be used.

Nominal number	Dimensions		
	D	d	L
06	6	5	8
08	8	6.5	11
10	10	8.5	12
12	12	10	15
14	14	11.5	18
16	16	13.5	20
18	18	15	22
20	20	17	25
22	22	18.5	28
24	24	20	30
27	27	22.5	34



## 2. INSTALL WORK

- 1) Tighten all bolts and nuts (sleeve nuts) to the specified torque.
- 2) Install the hoses without twisting or interference.
- 3) Replace all gaskets, O-rings, cotter pins, and lock plates with new parts.
- 4) Bend the cotter pin or lock plate securely.
- 5) When coating with adhesive, clean the part and remove all oil and grease, then coat the threaded portion with 2-3 drops of adhesive.
- 6) When coating with gasket sealant, clean the surface and remove all oil and grease, check that there is no dirt or damage, then coat uniformly with gasket sealant.
- 7) Clean all parts, and correct any damage, dents, burrs, or rust.
- 8) Coat rotating parts and sliding parts with engine oil.
- 9) When press fitting parts, coat the surface with antifriction compound (LM-P).
- 10) After installing snap rings, check that the snap ring is fitted securely in the ring groove (check that the snap ring moves in the direction of rotation).
- 11) When connecting wiring connectors, clean the connector to remove all oil, dirt, or water, then connect securely.
- 12) When using eyebolts, check that there is no deformation or deterioration, and screw them in fully.
- 13) When tightening split flanges, tighten uniformly in turn to prevent excessive tightening on one side.
- 14) When operating the hydraulic cylinders for the first time after repairing and reassembling the hydraulic cylinders, pumps, or other hydraulic equipment or piping, always bleed the air from the hydraulic cylinders as follows:
  - (1) Start the engine and run at low idling.
  - (2) Operate the control lever and actuate the hydraulic cylinder 4-5 times, stopping 100 mm before the end of the stroke.
  - (3) Next, operate the piston rod to the end of its stroke to relieve the circuit. (the air bleed valve is actuated to bleed the air.)
  - (4) After completing this operation, raise the engine speed to the normal operating condition.
    - ※ If the hydraulic cylinder has been replaced, carry out this procedure before assembling the rod to the work equipment.
    - ※ the work equipment.Carry out the same operation on machines that have been in storage for a long time after completion of repairs.

### **3. COMPLETING WORK**

- 1) If the coolant has been drained, tighten the drain valve, and add water to the specified level. Run the engine to circulate the water through the system. Then check the water level again.
- 2) If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
- 3) If the piping or hydraulic equipment, such as hydraulic cylinders, pumps, or motors, have been removed for repair, always bleed the air from the system after reassembling the parts.
- 4) Add the specified amount of grease (molybdenum disulphide grease) to the work equipment related parts.

## GROUP 2 TIGHTENING TORQUE

### 1. MAJOR COMPONENTS

No.	Descriptions	Bolt size	Torque		
			kgf · m	lbf · ft	
1	Engine	Engine mounting bolt (engine-Bracket)	M10 × 1.5	6.0±1.4	43±10.0
2		Engine mounting bolt (bracket-Frame)	M12 × 1.75	12.3±1.5	89±10.9
3		Radiator mounting bolt, nut	M10 × 1.5	6.9±1.4	50±10.0
4		Coupling mounting bolt	M12 × 1.75	9.25±0.25	67±1.8
5	Hydraulic system	Main pump mounting bolt	M12 × 1.75	9.5±1.9	69±14.0
6		Main control valve mounting bolt	M10 × 1.5	6.9±1.4	50±10.0
7		Fuel tank mounting bolt	M12 × 1.75	12.8±3.0	93±22.0
8		Hydraulic oil tank mounting bolt	M12 × 1.75	12.8±3.0	93±22.0
9		Turning joint mounting bolt, nut	M10 × 1.5	6.9±1.4	50±10.0
10	Power train system	Swing motor mounting bolt	M14 × 2.0	19.6±2.9	142±21.0
11		Swing bearing upper mounting bolt	M12 × 1.75	13.3±2.0	96.2±14.5
12		Swing bearing lower mounting bolt	M12 × 1.75	12.8±2.0	93±14.5
13		Travel motor mounting bolt	M12 × 1.75	13.8±2.0	100±14.0
14		Sprocket mounting bolt	M12 × 1.75	12.3±1.2	89±8.7
15	Under carriage	Carrier roller mounting bolt, nut	M12 × 1.75	12.3±1.2	89±8.7
16		Track roller mounting bolt	M18 × 2.0	41.3±3.0	299±22.0
17	Others	Counter weight mounting bolt	M20 × 2.5	57.9±8.7	419±62.9
18		Cab mounting bolt, nut	M12 × 1.75	12.8±3.0	92±22.0
19		Operator's seat mounting bolt	M 8 × 1.25	2.5±0.5	18.1±3.6

※ For tightening torque of engine and hydraulic components, see each component disassembly and assembly.

## 2. TORQUE CHART

Use following table for unspecified torque.

### 1) BOLT AND NUT

#### (1) Coarse thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 6 × 1.0	0.85 ~ 1.25	6.15 ~ 9.04	1.14 ~ 1.74	8.2 ~ 12.6
M 8 × 1.25	2.0 ~ 3.0	14.5 ~ 21.7	2.7 ~ 4.1	19.5 ~ 29.7
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 81.0	9.8 ~ 15.8	70.9 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 163
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.5	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 344
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	349 ~ 458	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.0	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1656
M36 × 4.0	174 ~ 236	1261 ~ 1704	250 ~ 310	1808 ~ 2242

#### (2) Fine thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 8 × 1.0	2.2 ~ 3.4	15.9 ~ 24.6	3.0 ~ 4.4	21.7 ~ 31.8
M10 × 1.2	4.5 ~ 6.7	32.5 ~ 48.5	5.9 ~ 8.9	42.7 ~ 64.4
M12 × 1.25	7.8 ~ 11.6	56.4 ~ 83.9	10.6 ~ 16.0	76.7 ~ 116
M14 × 1.5	13.3 ~ 18.1	96.2 ~ 131	17.9 ~ 24.1	130 ~ 174
M16 × 1.5	19.9 ~ 26.9	144 ~ 195	26.6 ~ 36.0	192 ~ 260
M18 × 1.5	28.6 ~ 43.6	207 ~ 315	38.4 ~ 52.0	278 ~ 376
M20 × 1.5	40.0 ~ 54.0	289 ~ 391	53.4 ~ 72.2	386 ~ 522
M22 × 1.5	52.7 ~ 71.3	381 ~ 516	70.7 ~ 95.7	511 ~ 692
M24 × 2.0	67.9 ~ 91.9	491 ~ 665	90.9 ~ 123	658 ~ 890
M30 × 2.0	137 ~ 185	990 ~ 1339	182 ~ 248	1314 ~ 1796
M36 × 3.0	192 ~ 260	1390 ~ 1880	262 ~ 354	1894 ~ 2562

**2) PIPE AND HOSE (FLARE type)**

Thread size (PF)	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

**3) PIPE AND HOSE (ORFS type)**

Thread size (UNF)	Width across flat (mm)	kgf · m	lbf · ft
9/16-18	19	4	28.9
11/16-16	22	5	36.2
13/16-16	27	9.5	68.7
1-3/16-12	36	18	130
1-7/16-12	41	21	152
1-11/16-12	50	35	253

**4) FITTING**

Thread size	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

## GROUP 3 PUMP DEVICE

### 1. REMOVAL AND INSTALL

#### 1) REMOVAL

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

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

- (4) Loosen the drain plug under the hydraulic tank and drain the oil from the hydraulic tank.

- Hydraulic tank quantity : 37 l  
(9.8 U.S.gal)

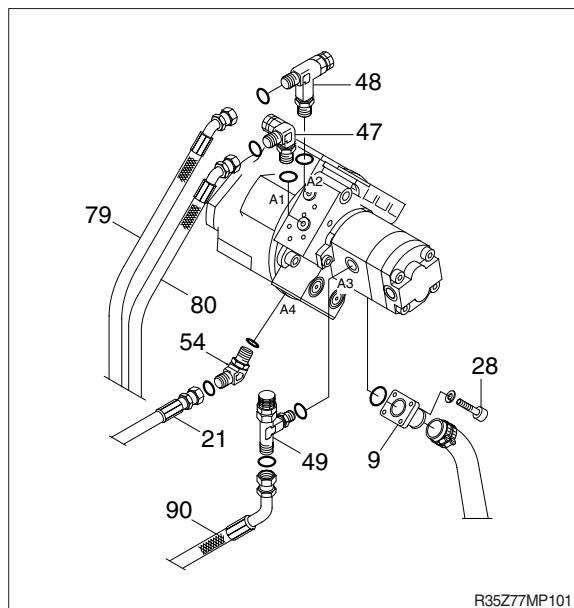
- (5) Disconnect hoses (79, 80) and remove connectors (47, 48).
- (6) Disconnect pilot line hoses (21, 90) and remove connectors (49, 50).
- (7) Remove socket bolts (28) and disconnect pump suction tube (9).

※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.

- (8) Sling the pump assembly and remove the pump mounting bolts.

- Weight : 25 kg (55 lb)

※ Pull out the pump assembly from housing. When removing the pump assembly, check that all the hoses have been disconnected.



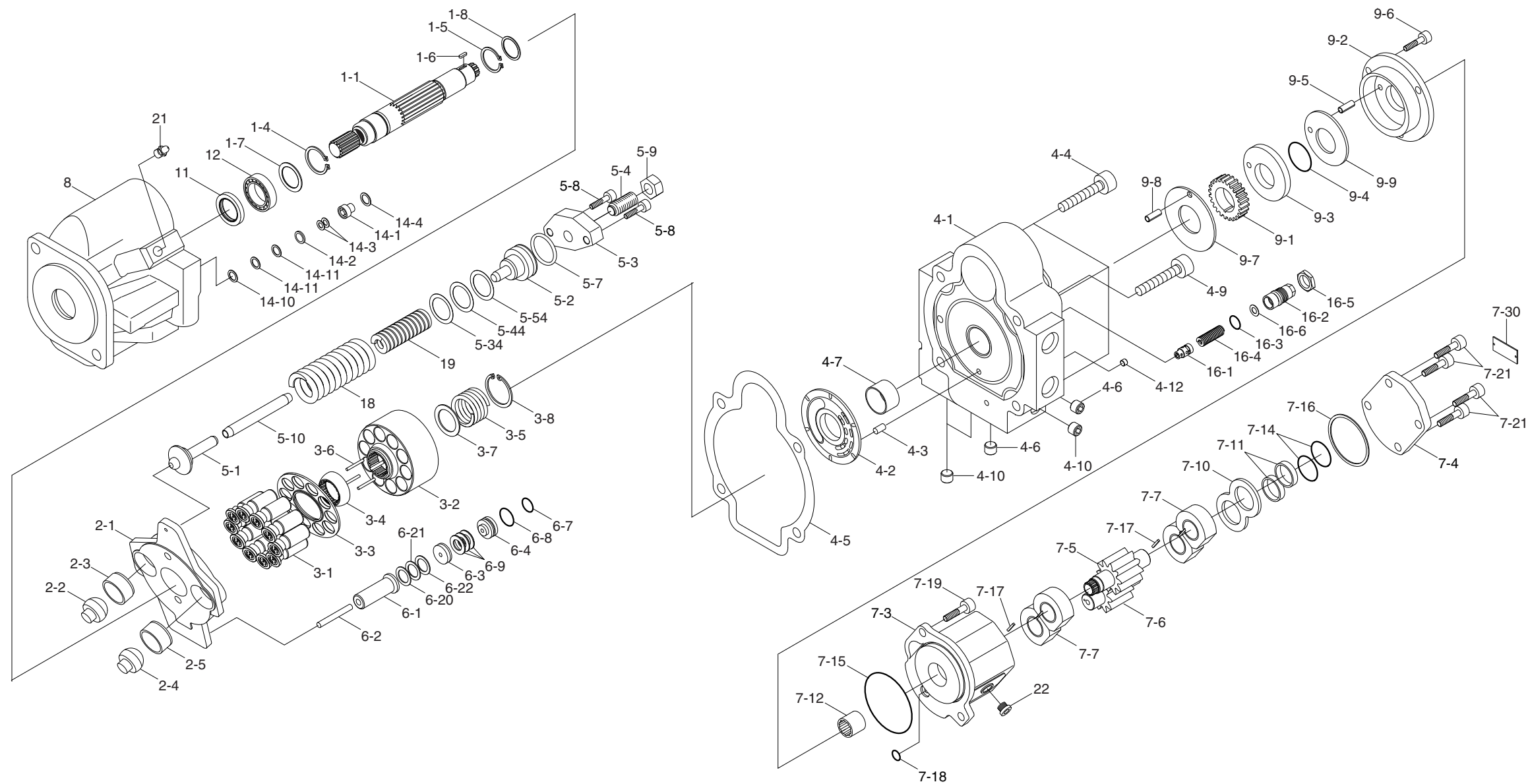


## 2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Remove the suction strainer and clean it.
- (3) Replace return filter with new one.
- (4) Remove breather and clean it.
- (5) After adding oil to the hydraulic tank to the specified level.
- (6) Bleed the air from the hydraulic pump.
  - ① Remove the air vent plug (1EA).
  - ② Tighten plug lightly.
  - ③ Start the engine, run at low idling, and check oil come out from plug.
  - ④ Tighten plug.
- (7) Start the engine, run at low idling (3~5 minutes) to circulate the oil through the system.
- (8) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

## 2. MAIN PUMP

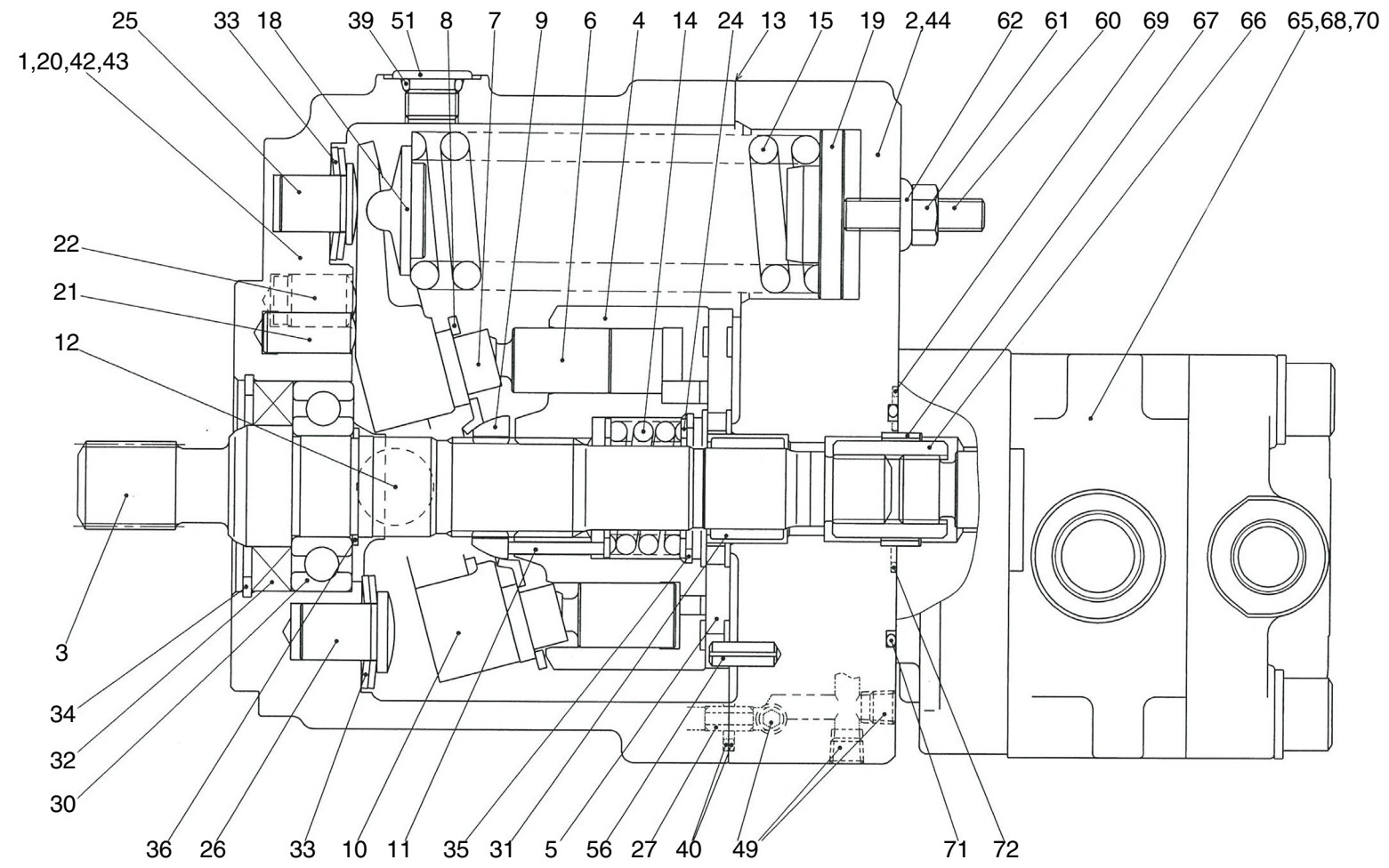
### 1) STRUCTURE (TYPE 1)



1 Shaft assy	3 Rotary group	4-4 Socket head screw	5-8 Socket head screw	6-9 Coned disc spring	7-14 O-ring	14-2 Distance piece	9-7 Thrust plate
1-1 Shaft	3-1 Piston assy	4-5 Packing	5-9 Hex nut	6-20 Shim	7-15 O-ring	14-3 Coned disc spring	9-8 Spring pin
1-4 Ring	3-2 Cylinder block	4-6 Plug	5-10 Guide	6-21 Shim	7-16 Square ring	14-4 Retaining ring	9-9 Plate
1-5 Ring retaining	3-3 Retainer	4-7 Bearing	5-34 Shim	6-22 Shim	7-17 Square ring	14-5 Shim	16 Relief valve assy
1-6 Key	3-4 Guide	4-9 Socket head screw	5-44 Shim	7 Gear pump	7-18 O-ring	14-6 Shim	16-1 Spool
1-7 Shim	3-5 Spring	4-10 plug	5-54 Shim	7-3 Housing	7-19 Bolt	14-7 Shim	16-2 Adjust screw
1-8 Shim	3-6 Pressure pin	4-12 Orifice	6 Control piston assy	7-4 Cover	7-21 Socket head screw	9 Trochoid pump assy	16-3 O-ring
2 Swash plate assy	3-7 Spring seat	5 Spring seat assy	6-1 Sleeve	7-5 Gear	7-30 Name plate	9-1 Gear	16-4 Spring
2-1 Swash plate	3-8 Retaining ring	5-1 Spring seat	6-2 Parallel pin	7-6 Gear	8 Housing assy	9-2 Case	16-5 Nut
2-2 Suction side guide	4 Port plate assy	5-2 Spring seat	6-3 Distance piece	7-7 Thrust plate assy	11 Oil seal	9-3 Thrust plate	16-6 Spring seat
2-3 Suction side bushing	4-1 Port plate	5-3 Cover	6-4 Piston	7-10 Plate	12 Bearing	9-4 O-ring	18 Spring
2-4 Delivery side guide	4-2 Control plate	5-4 Adjusting screw	6-7 O-ring	7-11 Guide	14 Stopper assy	9-5 Spring pin	19 Spring
2-5 Delivery side bushing	4-3 Parallel pin	5-7 O-ring	6-8 O-ring	7-12 Coupling	14-1 Guide	9-6 Socket head screw	21 Air vent valve
							22 Plug

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STRUCTURE (TYPE 2)



- |   |                 |    |               |    |                |    |             |    |             |    |        |
|---|-----------------|----|---------------|----|----------------|----|-------------|----|-------------|----|--------|
| 1 | Body S          | 10 | Swash plate   | 21 | Rod G          | 33 | Dish spring | 49 | Plug        | 68 | Screw  |
| 2 | Body H          | 11 | Needle        | 22 | Rod C          | 34 | Snap ring   | 51 | Plug        | 69 | O-ring |
| 3 | Shaft           | 12 | Ball          | 24 | Retainer       | 35 | Snap ring   | 56 | Spring pin  | 70 | Washer |
| 4 | Cylinder barrel | 13 | Packing       | 25 | Stopper pin A  | 36 | Snap ring   | 60 | Screw       | 71 | O-ring |
| 5 | Valve plate     | 14 | Spring C      | 26 | Stopper pin B  | 39 | O-ring      | 61 | Nut         | 72 | O-ring |
| 6 | Piston          | 15 | Spring T1     | 27 | Pin            | 40 | O-ring      | 62 | Seal washer |    |        |
| 7 | Shoe            | 18 | Spring holder | 30 | Ball bearing   | 42 | Plug        | 65 | Gear pump   |    |        |
| 8 | Shoe holder     | 19 | Spring guide  | 31 | Needle bearing | 43 | O-ring      | 66 | Coupling    |    |        |
| 9 | Barrel holder   | 20 | Pin           | 32 | Oil seal       | 44 | Screw       | 67 | Collar      |    |        |

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- DISASSEMBLY AND ASSEMBLY (TYPE 1) : Refer to page 7-10~7-32.

2) NECESSARY TOOLS AND JIGS

The following tools and jigs are necessary to disassemble and reassemble the pump.

(1) Tools

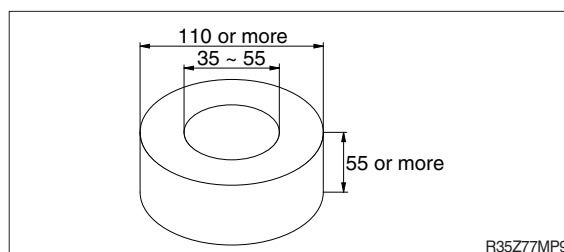
Tool name	Size	Quantity
Hexagon socket screw key	One each	4, 6, 8, 10
Spanner	One each	14, 24
Plastic hammer	1	Medium size
Pliers for retaining ring	1	For hole (retaining ring for 22)
Pliers for retaining ring	1	For shaft (retaining ring for 20)
Torque wrench	-	Wrench which can tighten at the specified torque
Grease	Small amount	-
Adhesives	Small amount	Loctite (high tack sealant #98)

(2) Jigs

① Disassemble table

This is a plate to stand the pump facing downward.

A square block may be used instead of the shaft and does not contact.



② Jigs for disassemble the port plate

Jigs are necessary to protect the shaft, when disassembly and assembly the port plate.

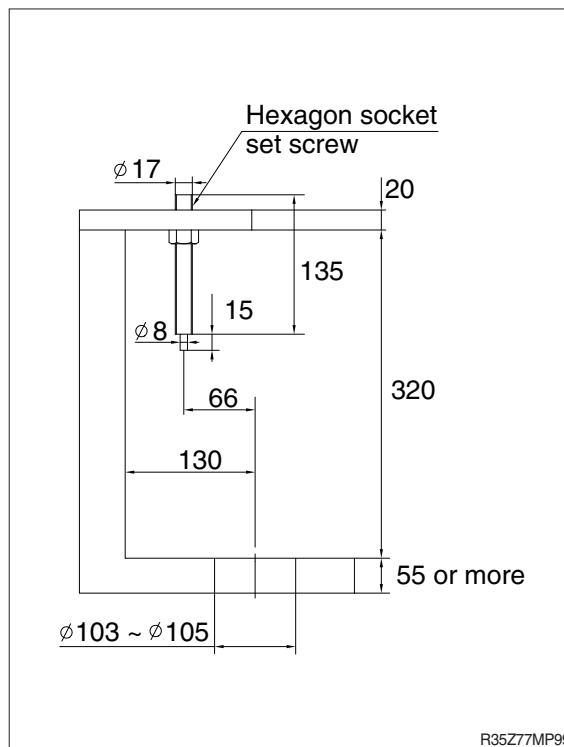
**Disassembly**

When hexagon socket head cap screws (4 pieces of size M12) are removed, the jig is necessary to prevent the port plate from lifting up diagonally due to the control spring.

**Assembly**

The jig is necessary to install the port plate parallel to the housing mounting surface.

The structure of the jig is shown as right. It can hold the port plate by means of applying the machined edge\* of the hexagon socket set screw (M16 × 150) to the adjusting screw.



\* When the hex socket set screw is used, apply the machining work on the edge to shape it in size the dia of 8 mm from the top edge to 15 mm position.

### **3) CAUTIONS DURING DISASSEMBLING AND ASSEMBLING**

#### **(1) Cautions for disassembling**

- ① Never attempt operating the adjusting screw unless absolutely necessary.
- ② Take utmost care during disassembly not to knock or drop each part.

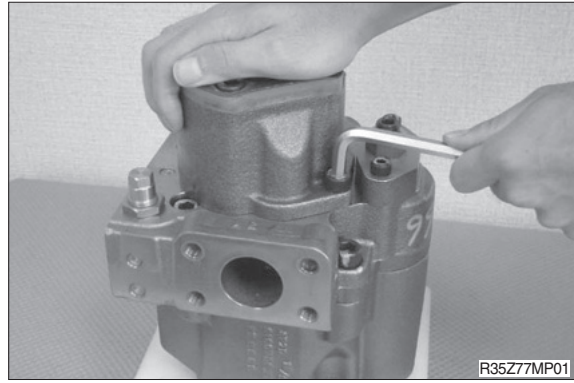
#### **(2) Cautions for assembling**

- ① Wash each part thoroughly.
- ② During assembling, take utmost care not to damage the part or allow foreign materials to enter.
- ③ As a rule, the O-ring and oil seal should not be reused.
- ④ In our assembly work, the torque wrench is used to control the torque.  
Be sure to use torque wrench.

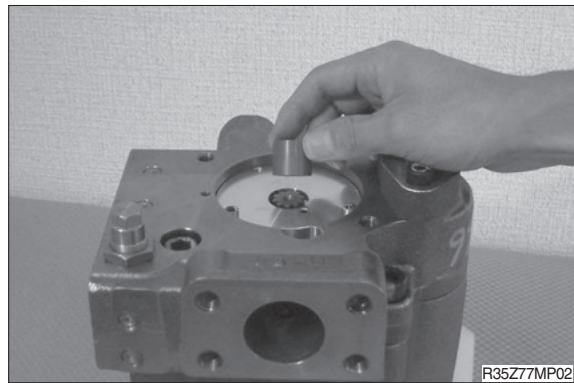
### 3. DISASSEMBLING PROCEDURE

#### 1) DISASSEMBLING THE GEAR PUMP

- (1) Remove the hexagon socket head cap screw. (M10 × 25, 2 pieces)  
Hexagon socket screw key (8 mm)  
※ Be careful because the O-ring (at 2 pieces) are provided to the housing.

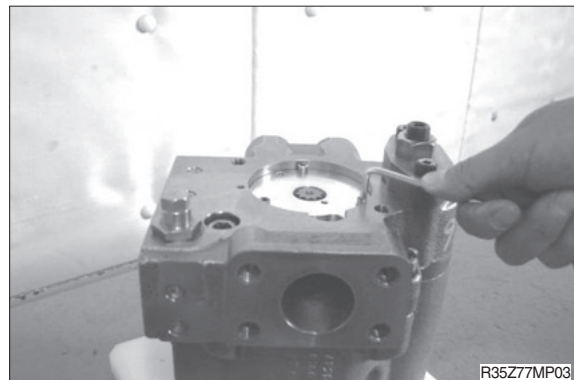


- (2) Remove the coupling.



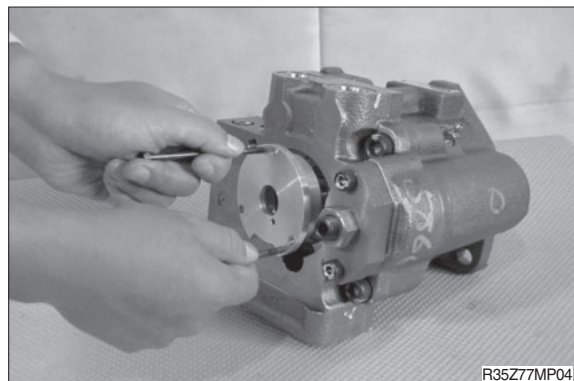
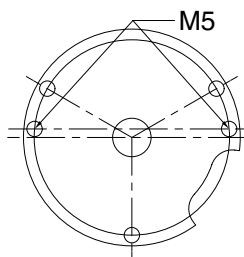
#### 2) DISASSEMBLING THE TROCHOID PUMP

- (1) Remove the hexagon socket head cap screw. (M5 × 12, 3 pieces)  
Hexagon socket screw key (4 mm)

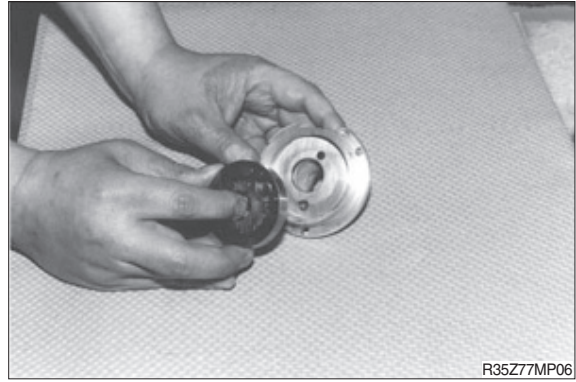


- (2) Remove the case, the side plate (A), and the gear.  
Use the hexagon socket head cap screws.

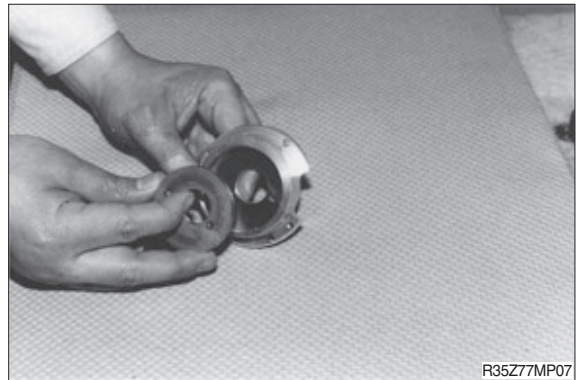
For example : M5 × 90, 2 pieces



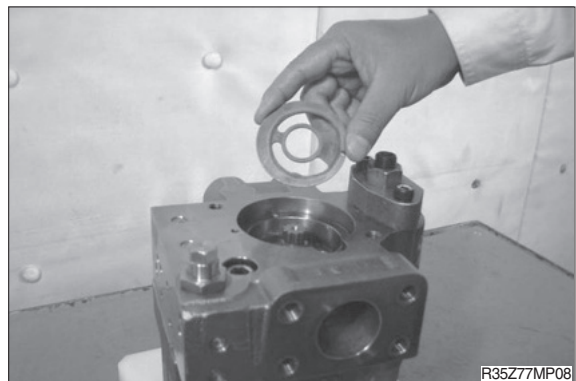
(3) Remove the gear from the case.



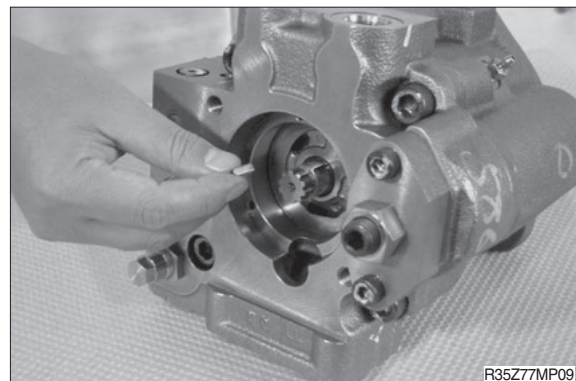
(4) Remove the side plate (A) from the case.



(5) Remove the side plate (B) from the port plate.

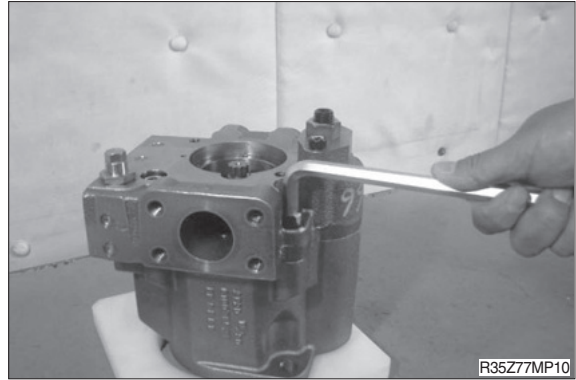
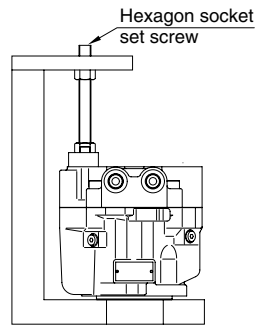


(6) Remove the key of the shaft.

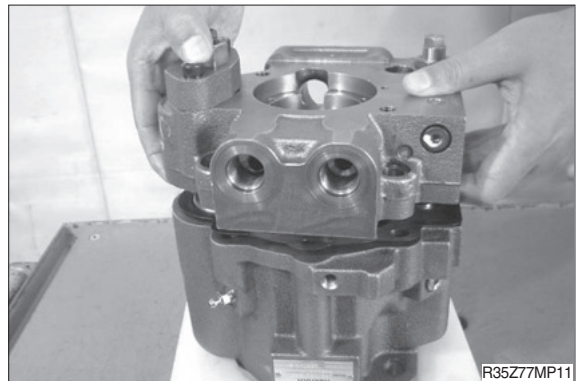
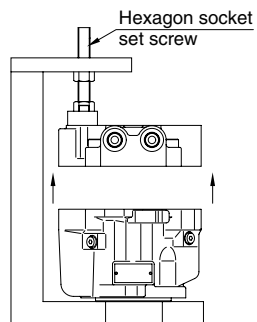


### 3) DISASSEMBLING THE MAIN PUMP

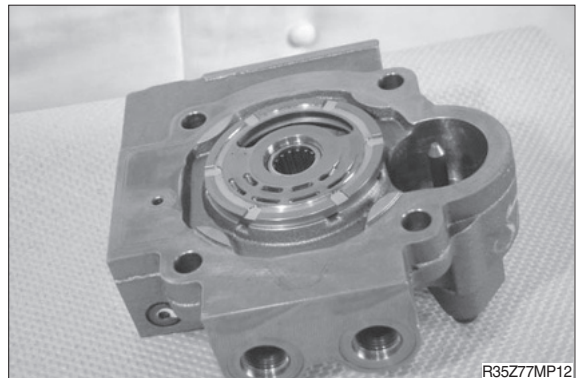
- (1) Remove the port plate since the force of the control spring is strong, remove the hexagon socket head cap screws holding the port plate by means of the jigs.  
(M12 × 40, 3 pieces), (M12 × 55, 1 piece)  
Hexagon socket screw key (10 mm)



- (2) Remove the cover.  
Use the jig to hold the port in a horizontal condition, and loosen the hexagon socket set screw of the jig slowly, to remove the port plate.  
※ Be careful because the control plate is provided to the backside.

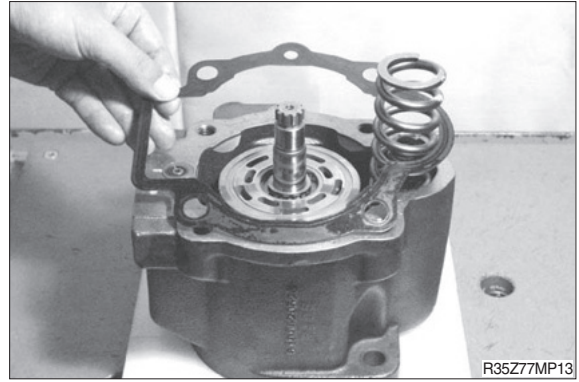


- (3) This photo shows the state with the port plate removed.

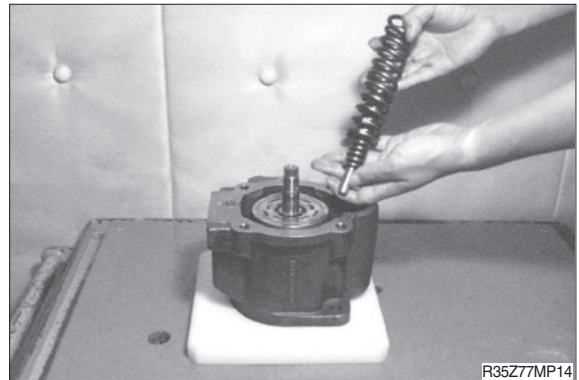




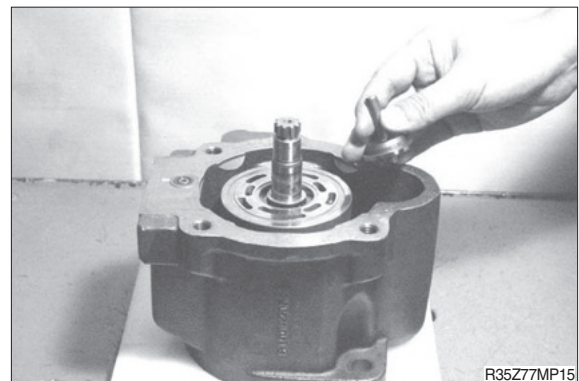
(4) Remove the packing.



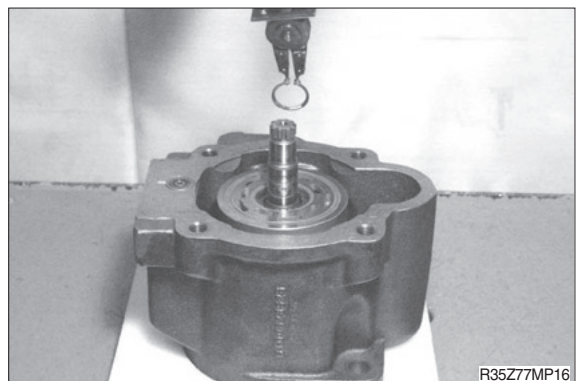
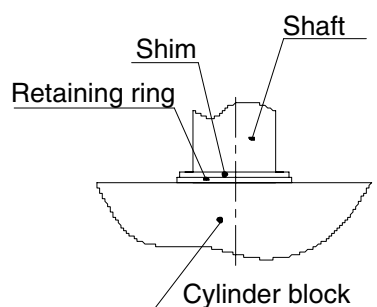
(5) Remove the control spring and the spring seat.  
Remove the two springs (inner and outer),  
and the guide.



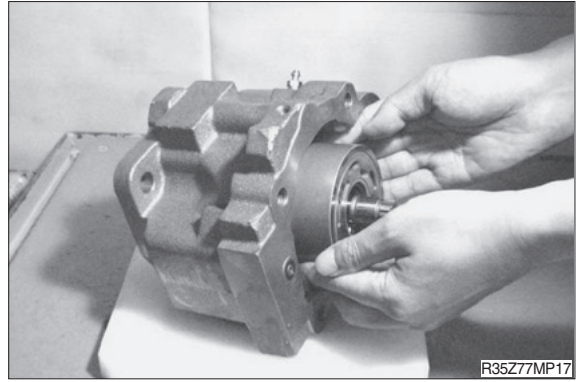
(6) Remove the spring seat.



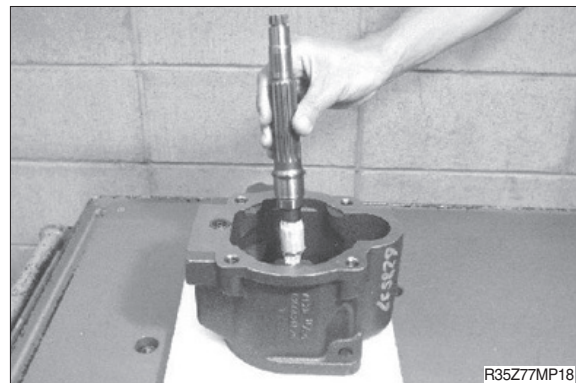
(7) Remove the rotary group.  
Remove the shim and the retaining ring.  
(for shafts ; 20)  
Pliers for retaining rings.  
(for shafts ; retaining ring for 20)



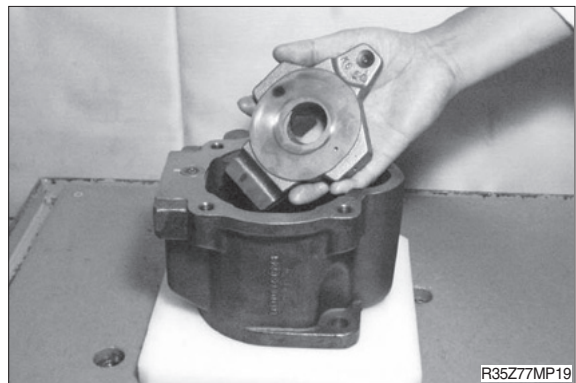
- (8) Push down sideways the pump. And takes out the rotary group from the shaft.



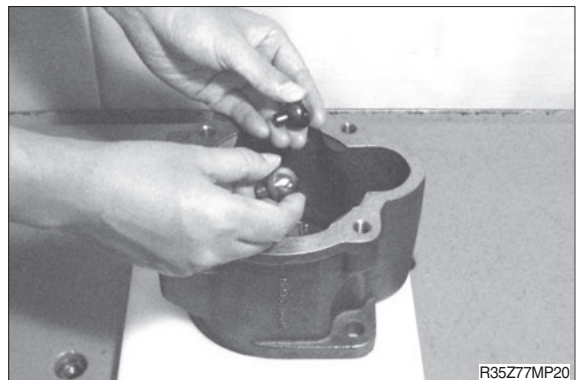
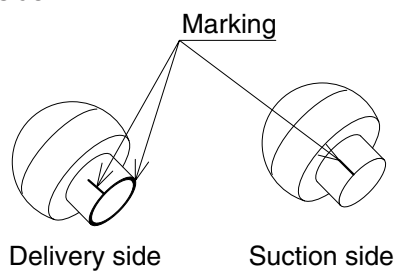
- (9) Remove the shaft.  
The protective taping around the spline part, and pull out straight the shaft, taking care not to damage the oil seal.



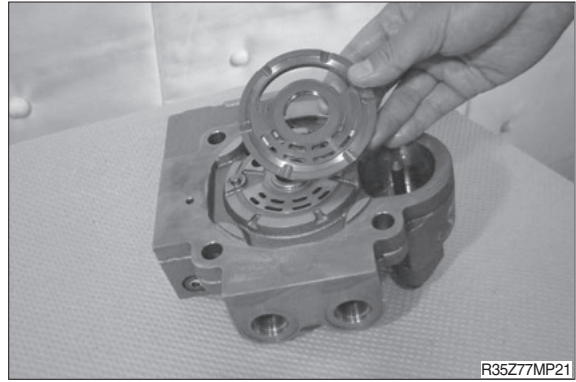
- (10) Remove the swash plate assembly.  
Remove the swash plate.



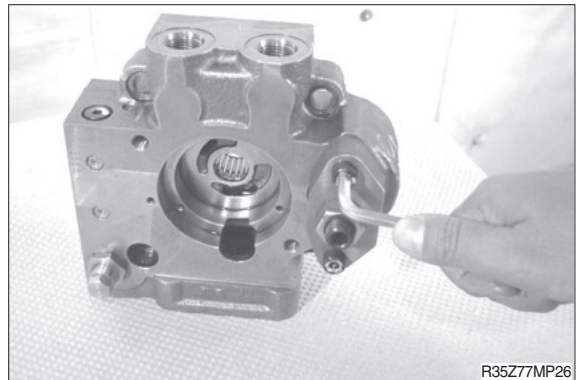
- (11) Remove the guide.  
※ Put the mark on the guides, to know the correct direction, and between right and left side.



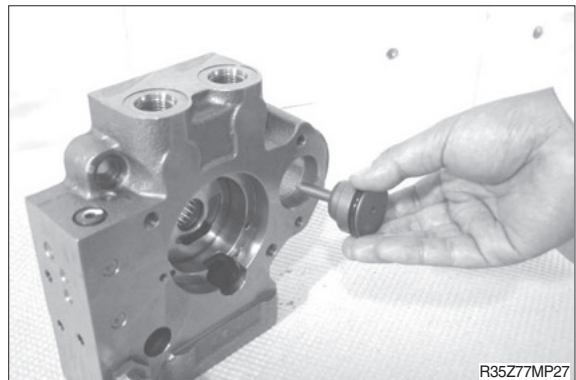
- (12) Disassemble the port plate assembly.  
Remove the control plate.



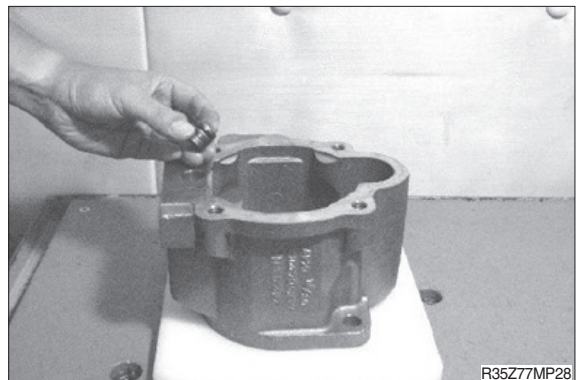
- (13) Remove the hexagon socket head cap screws (M8×30, 2 pieces), in order to remove the cover of the spring seat assembly.  
Hexagon socket screw key (6 mm)



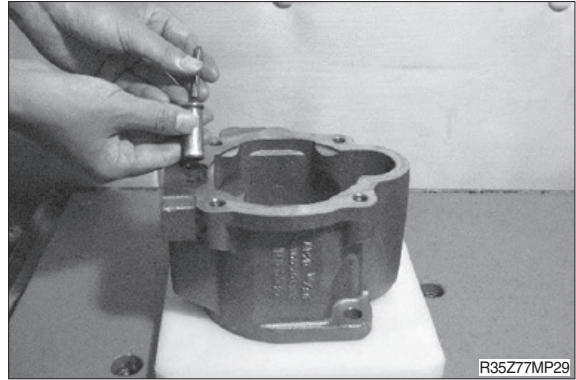
- (14) Remove the spring seat.



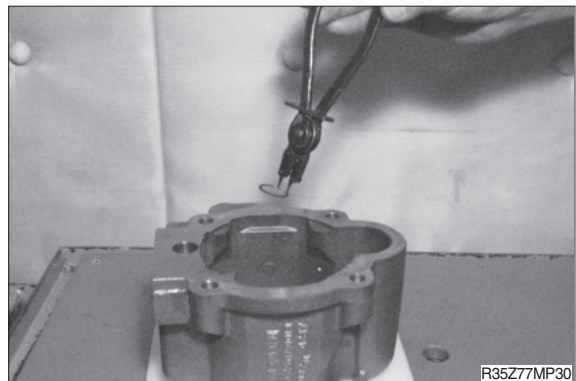
- (15) Disassemble the control piston assembly.  
Remove the piston, the coned disk springs, the distance piece and the shim.



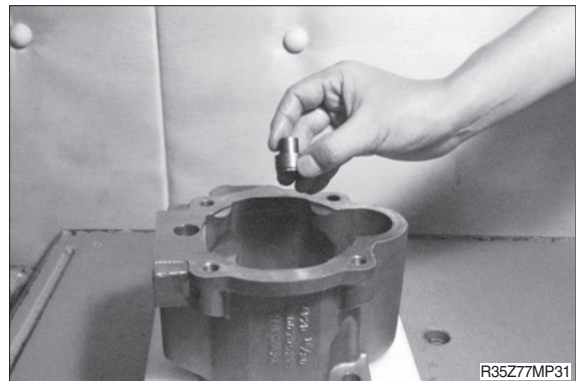
(16) Remove the parallel pin and the sleeve.



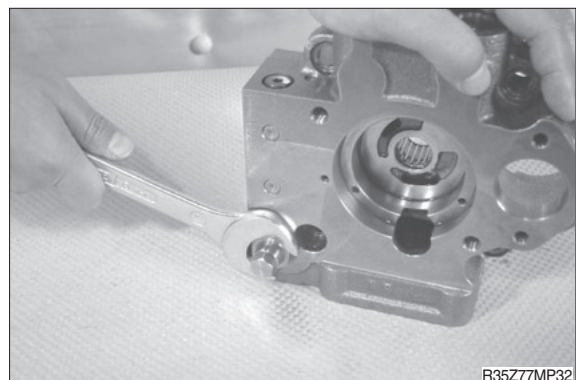
(17) Remove the minimum flow stopper.  
Remove the retaining ring. (for holes ; 22)  
Pliers for retaining rings.  
(for holes ; retaining ring for 22)



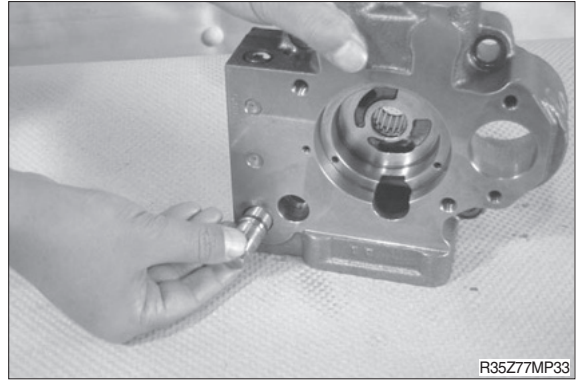
(18) Remove the guide, the coned disk springs, the distance piece, and shim.



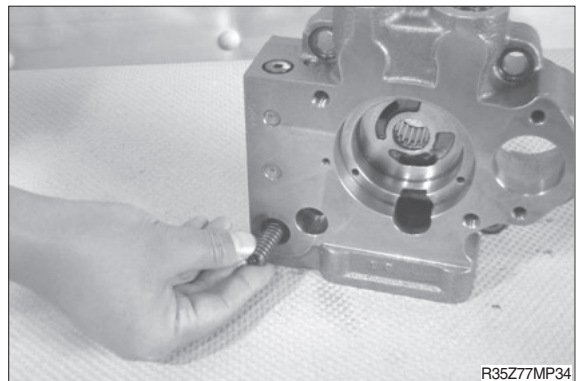
(19) Remove the relief valve.  
Remove the hexagon nut.  
Spanner (24 mm)  
※ Since the pressure has set, you may remove this assembly, only when necessary.



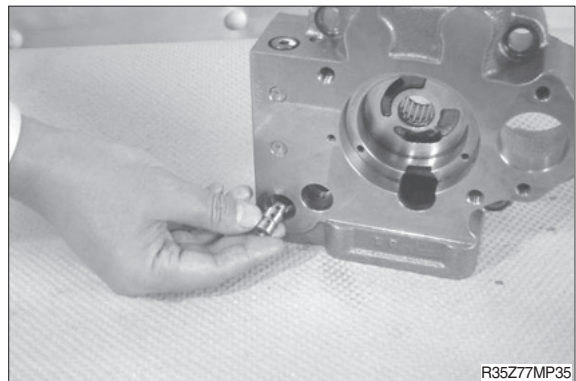
- (20) Remove the adjustment screw.  
Spanner (14 mm)  
※ Be careful because the shim is inserted.



- (21) Remove the spring.



- (22) Remove the spool.

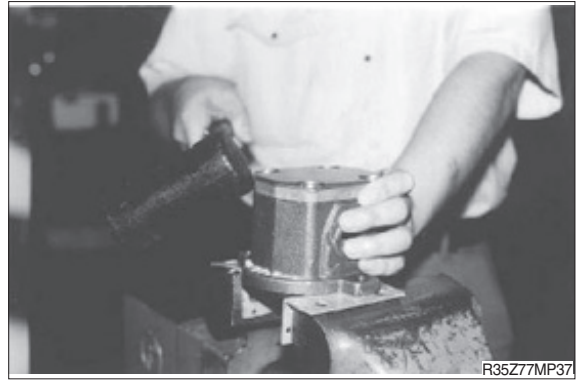


#### 4) DISASSEMBLING THE GEAR PUMP (GSP2)

- (1) Remove the hexagon socket head cap screws.  
(M10 × 20, 4 pieces)  
Hexagon socket screw key (8 mm)



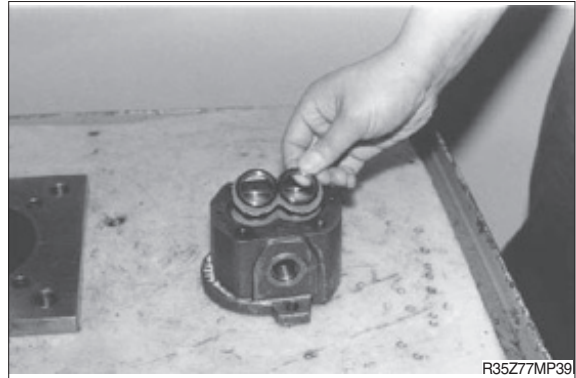
(2) Remove the cover.



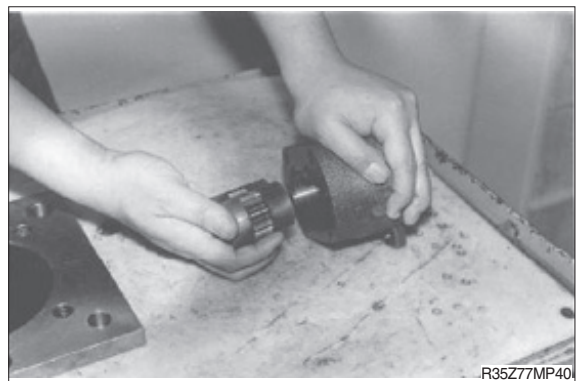
(3) Remove the square ring.



(4) Remove the plate, the guides, and the O-rings.



(5) Remove the drive gear, the idle gear, and the side plates.



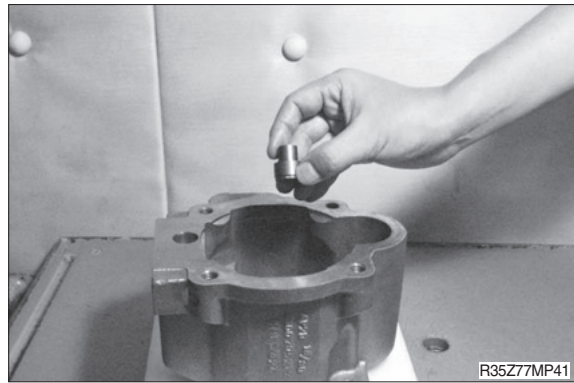
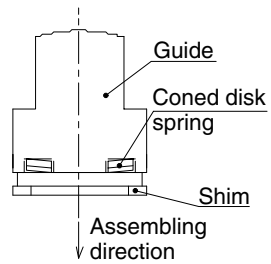
## 5. ASSEMBLING PROCEDURE

### 1) ASSEMBLE THE MAIN PUMP

- (1) Assemble the minimum flow stopper.

Install the guide, the coned disk springs, the distance piece, and the shim into the housing.

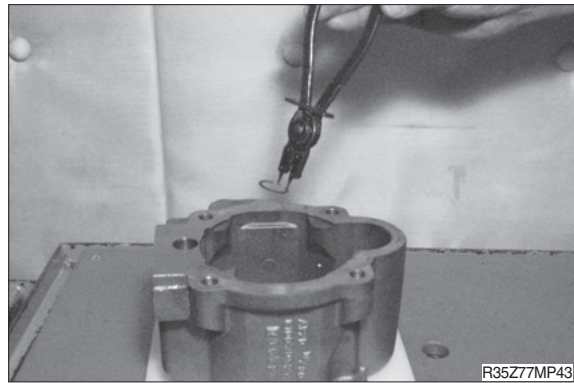
\* Pay attention to the direction of the coned disk spring.



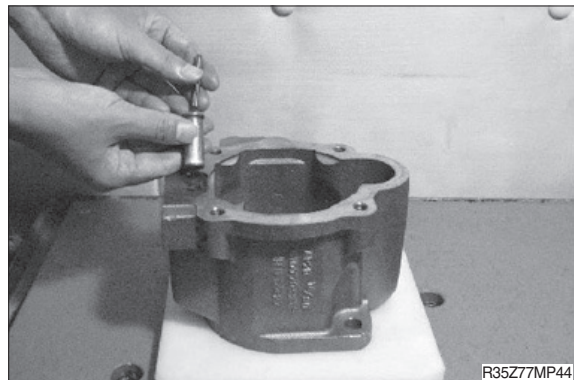
- (2) Install the retaining ring. (for holes ; 22)

Pliers for retaining rings.

(for holes; retaining ring for 22)

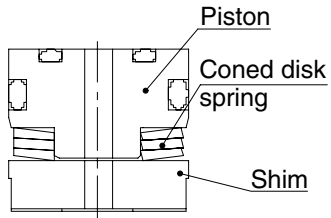


- (3) Install the parallel pin and the sleeve into the housing.

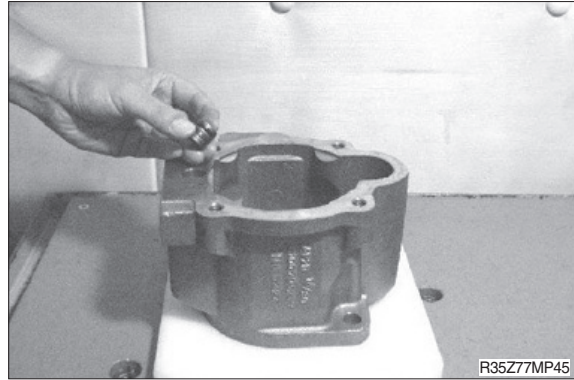


(4) Install the piston, the coned disk springs, the distance piece, and the shim into the housing.

※ Pay attention to the direction of the coned disk springs.

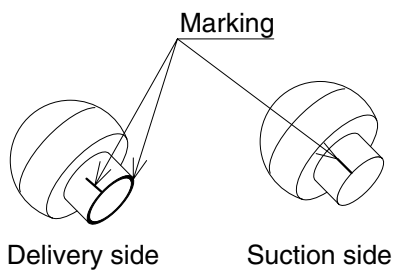


↓  
Assembling  
direction

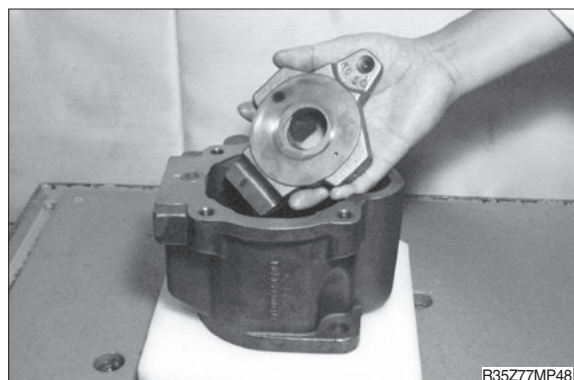


(5) Assemble the swash plate.  
Install the guides into the housing.

※ Assemble the guides into the housing, taking care on the marking, which was put on during disassembling work.



(6) Install the swash plate.

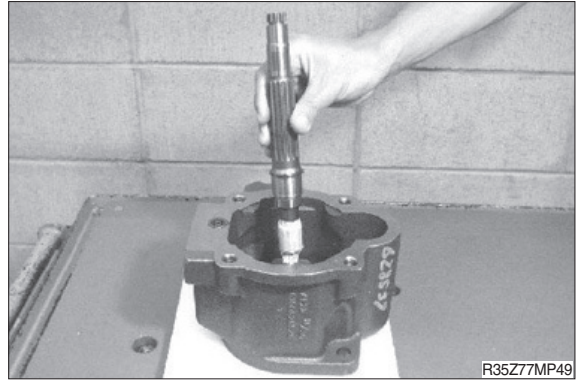
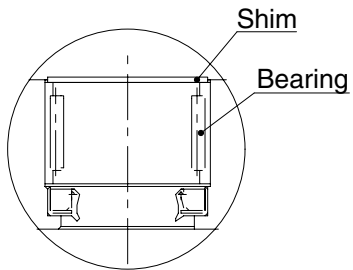




(7) Assemble the shaft.

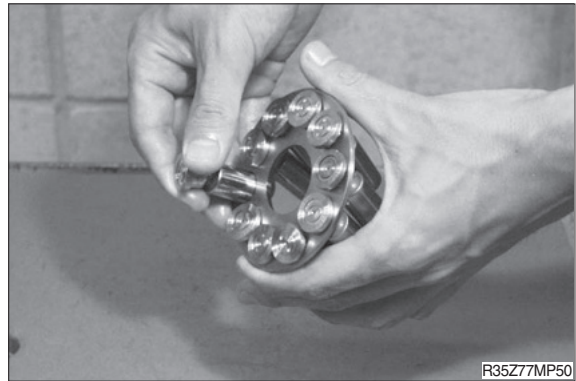
The protective taping around the spline part, and install the shaft vertically, taking care not to damage the oil seal.

- ※ Confirm that the shim is installed above the bearing.



(8) Assemble the rotary group.

Install the pistons (10 pistons) into the retainer.

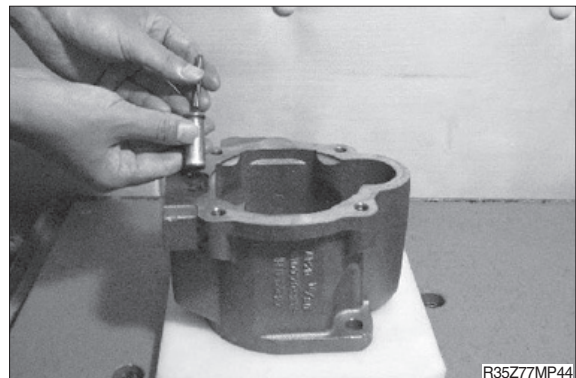


(9) Apply the grease to the spherical portion of the guide.

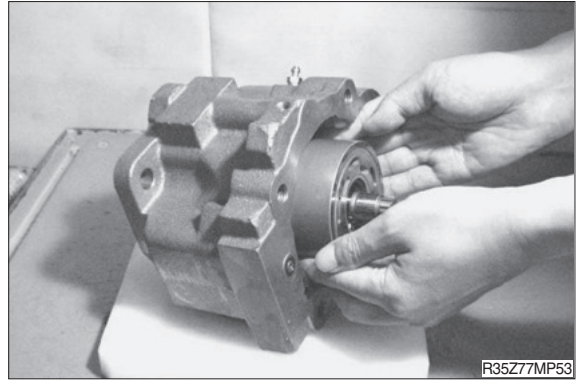


(10) Insert the guide between the retainer and the cylinder block and assemble the piston into the hole of the cylinder block.

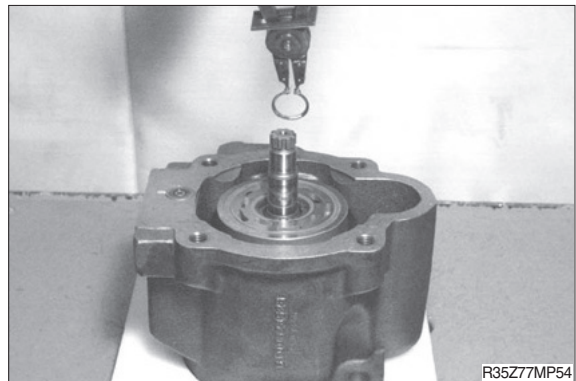
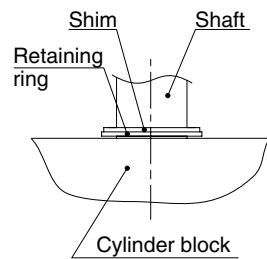
- ※ Apply grease to the end of the shoes.



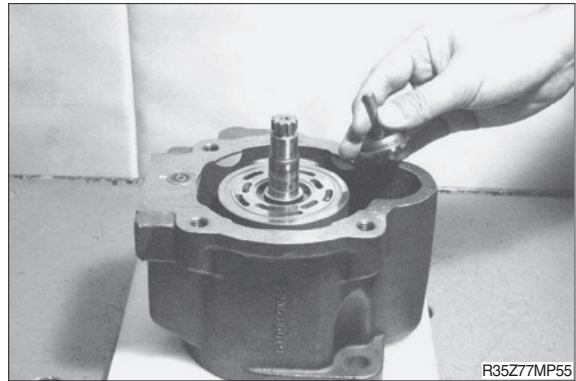
- (11) Install the rotary group.  
Assemble the rotary group along the shaft spline.



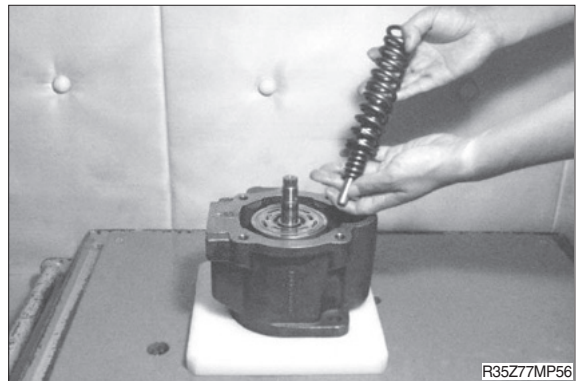
- (12) Install the retaining ring (for shafts ; 20),  
and install the shim.  
Pliers for retaining rings.  
(for shafts ; retaining ring for 20)



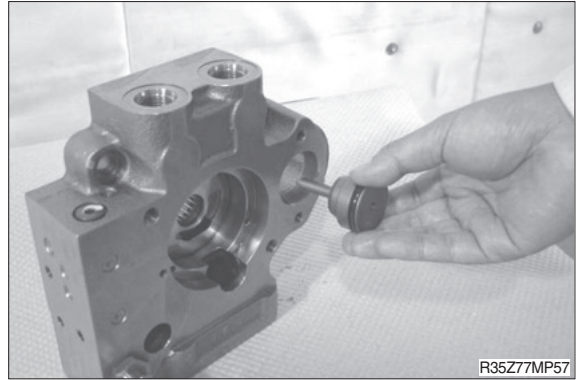
- (13) Assemble the control spring.  
Apply grease to the spherical portion of  
the spring seat before assembling.



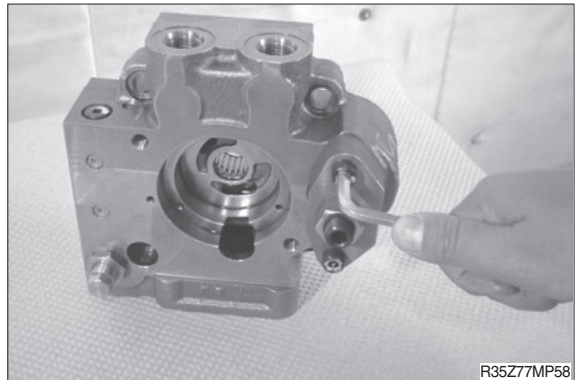
- (14) Assemble the two springs (inner and  
outer) and the guide.



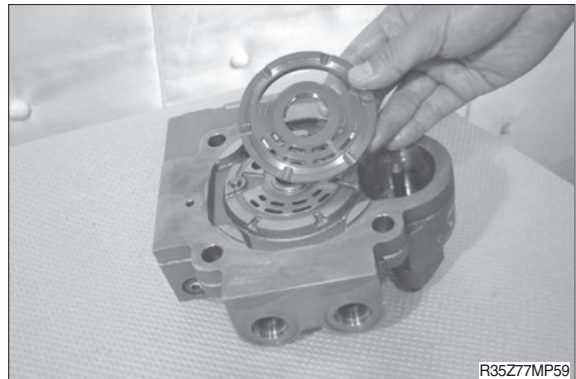
- (15) Assemble the port plate.  
Assemble the spring seat into the port plate.



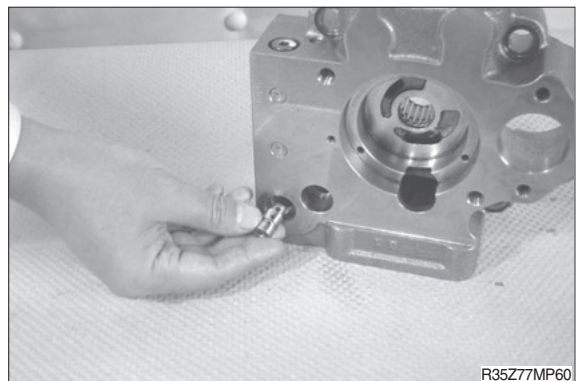
- (16) Assemble the cover of the spring seat assembly, and fix it with hexagon socket head cap screws. (M8 × 30, 2 pieces)  
Hexagon socket screw key (6 mm)  
· Tightening torque : 3.6 kgf · m  
(21~26 lbf · ft)



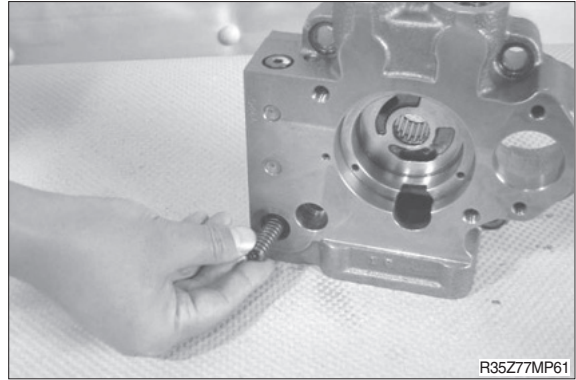
- (17) Apply grease to the backside of the control plate (to prevent dislodgement), and assembly it to the port plate while matching the knock hole.



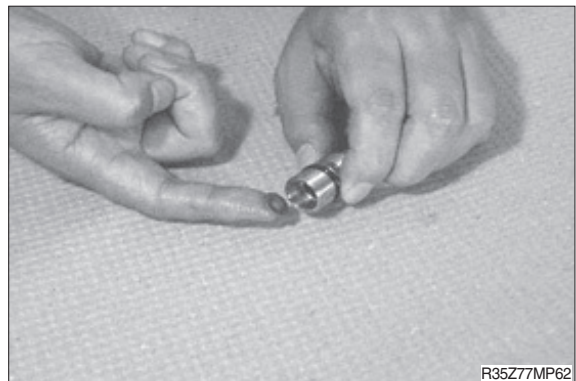
- (18) Assemble the relief valve.  
Install the spool into the port plate.



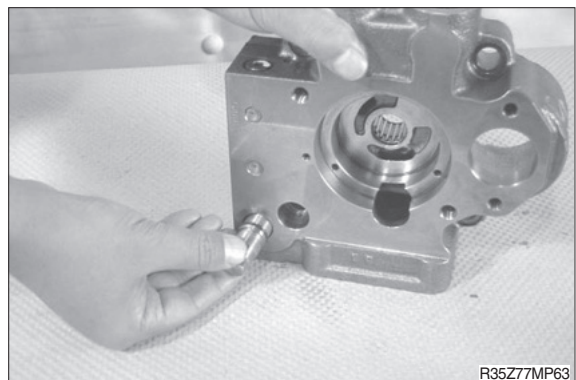
(19) Assemble the spring.



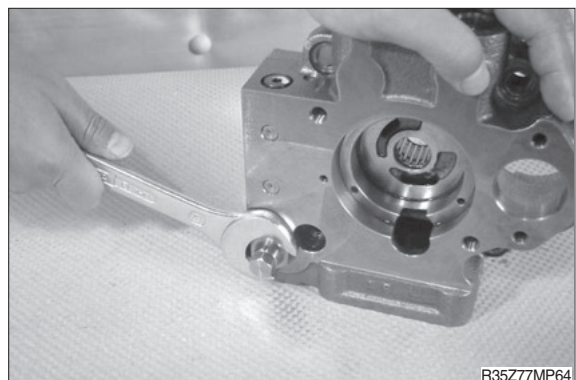
(20) Install the shim into the adjustment screw.



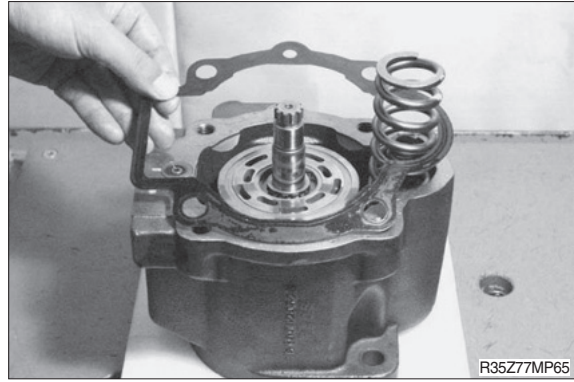
(21) Assemble the adjustment screw.  
Spanner (14 mm)



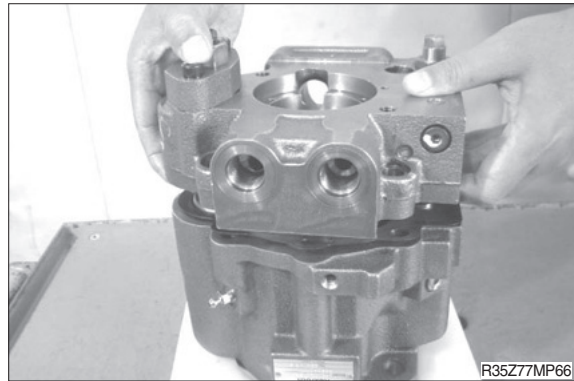
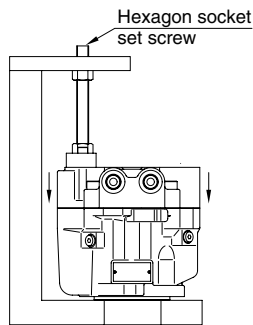
(22) Tighten the hexagon nut.  
※ After assembling, set the pressure and  
tighten the nut.  
Spanner (24 mm)  
· Tightening torque : 1.0 kgf · m  
(7.2 lbf · ft)



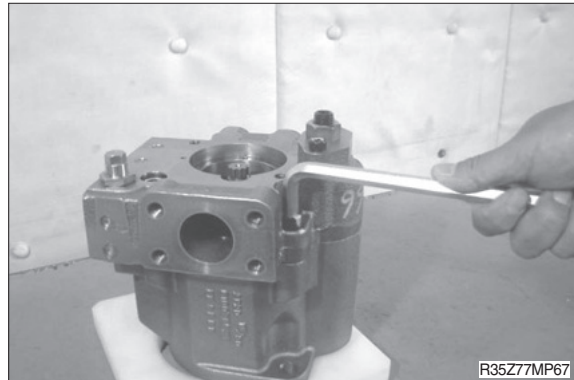
- (23) Assemble the port plate.  
Install the packing.



- (24) Holding the cover in parallel condition, by using the jig, tightens slowly the hexagon socket set screw of the jigs, in order to install the port plate.

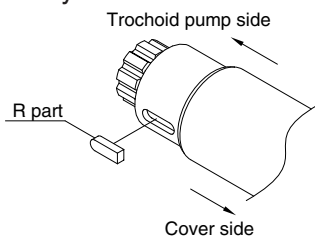


- (25) Fix the port plate with the hexagon socket head cap screws.  
(M12 × 40, 3 pieces)  
(M12 × 55, 1 pieces)  
Hexagon socket screw key (10 mm)  
· Tightening torque : 10~12.5 kgf · m  
(72.3~91 lbf · ft)

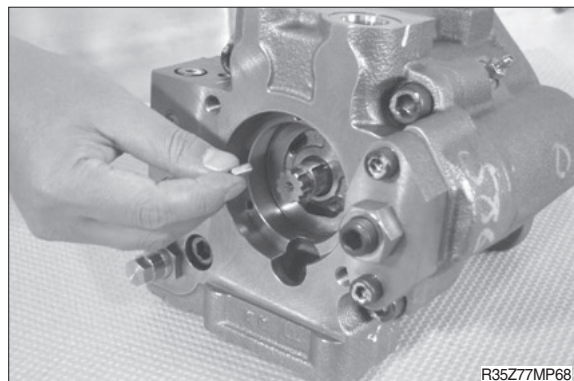


## 2) ASSEMBLE THE TROCHOID PUMP

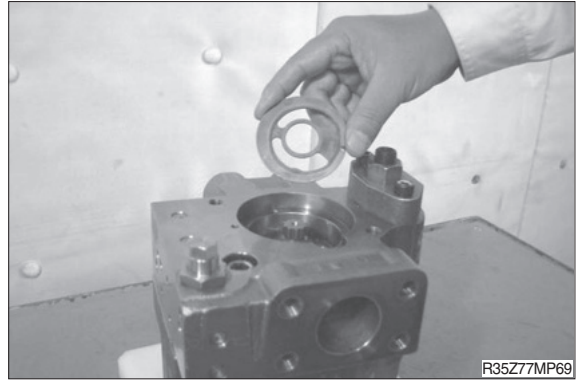
- (1) Install the key into the shaft.



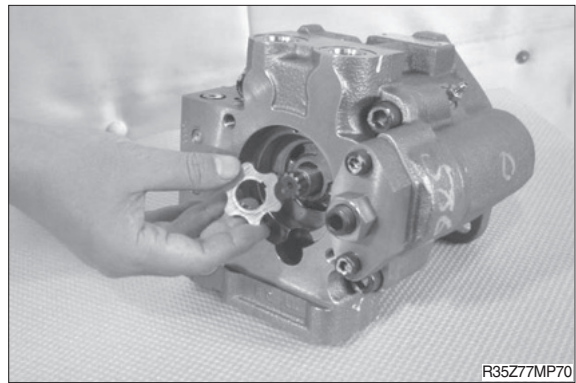
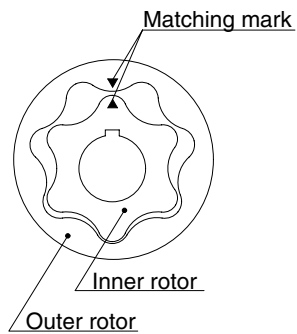
Install the key so that R side position in the trochoid pump side.



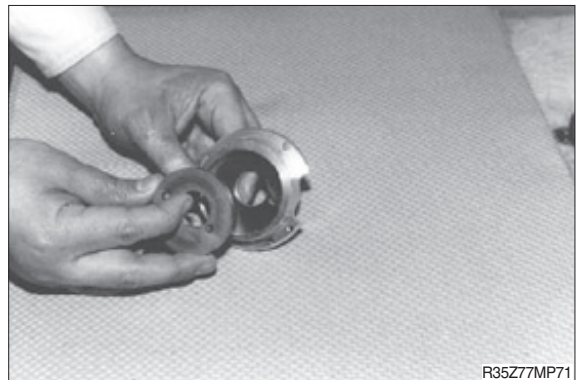
(2) Install the side plate (B) into the port plate.



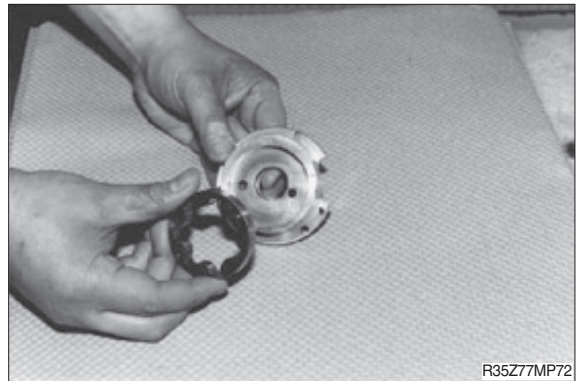
(3) Install the gear (inner rotor) into the shaft.  
※ The surface of matching mark should be positioned in the side plate (B) side.



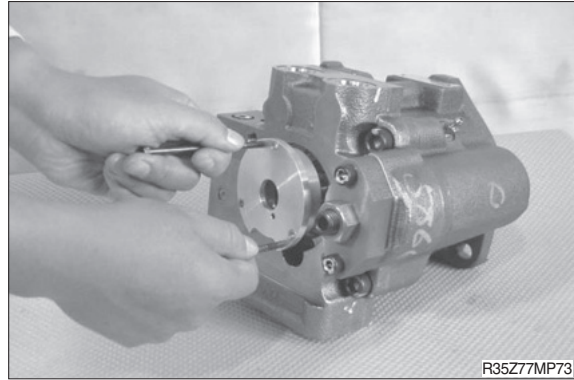
(4) Install the side plate (A) into the case.



(5) Install the gear (outer rotor) into the case.  
※ The surface of matching mark should be positioned in the side plate (B) side.



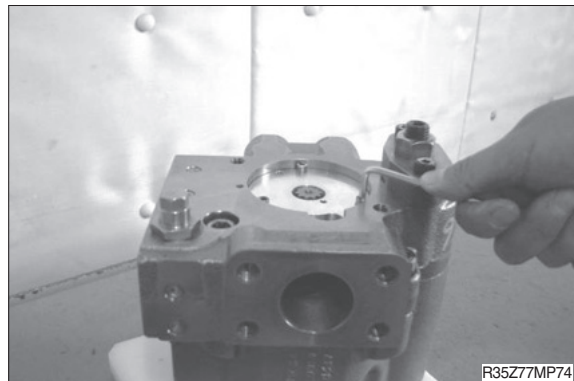
(6) Install the case into the port plate.



(7) Tighten the hexagon socket head cap screw. (M5 × 12, 3 pieces)

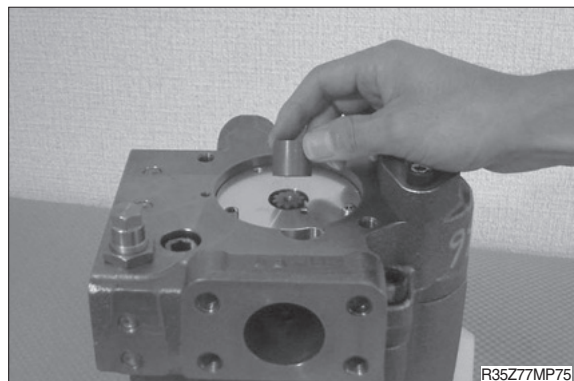
Hexagon socket screw key (4 mm)

- Tightening torque : 0.7~0.8 kgf · m  
(5.1~6.1 lbf · ft)



### 3) ATTACH THE GEAR PUMP

(1) Install the coupling to the shaft end on the main pump.



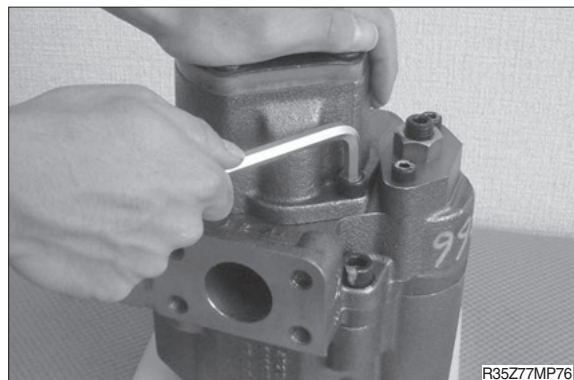
(2) Connect the main pump and the gear pump.

And fix the gear pump with the hexagon socket head cap screws.

(M10 × 25, 2 pieces)

Hexagon socket screw key (8 mm)

- Tightening torque : 5.6~7.0 kgf · m  
(41~51 lbf · ft)

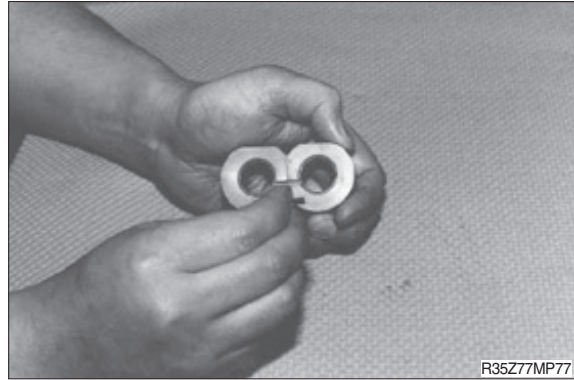
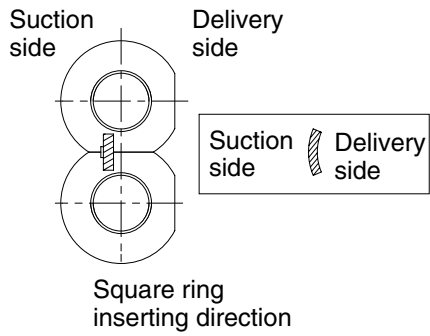


#### 4) ASSEMBLE THE GEAR PUMP

(1) Assemble the gear pump (GSP2)

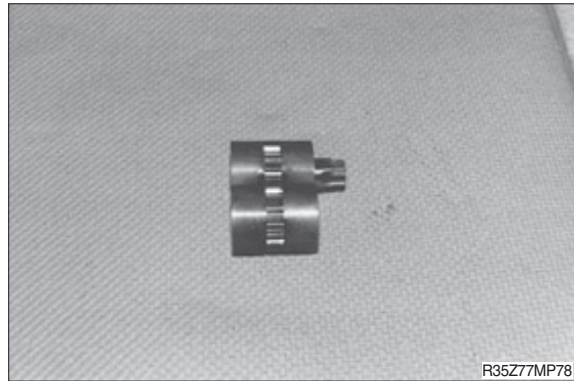
Assemble the square ring into the side plate.

Pay attention to the suction and delivery directions.



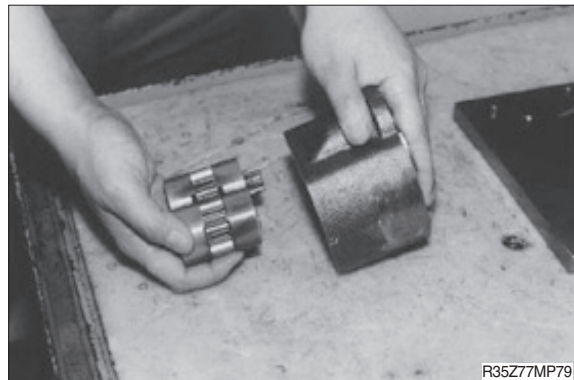
R35Z77MP77

(2) Assemble the drive gear and the idle gear to the side plates.



R35Z77MP78

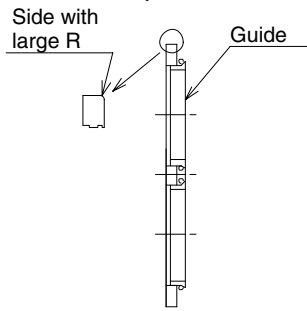
(3) Assemble the drive gear, the idle gear and the side plates in the housing.



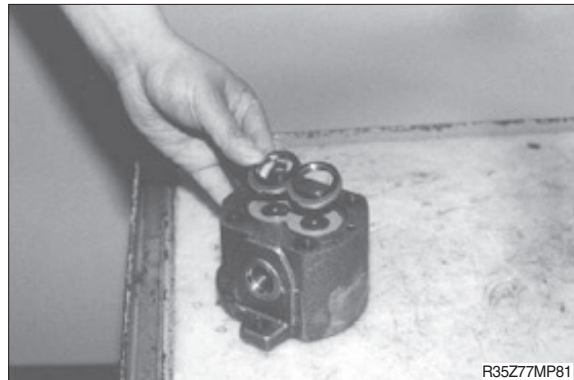
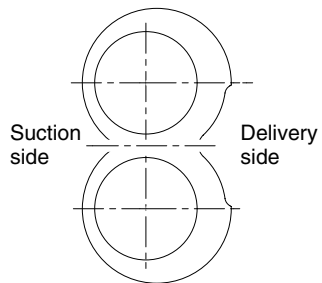
R35Z77MP79



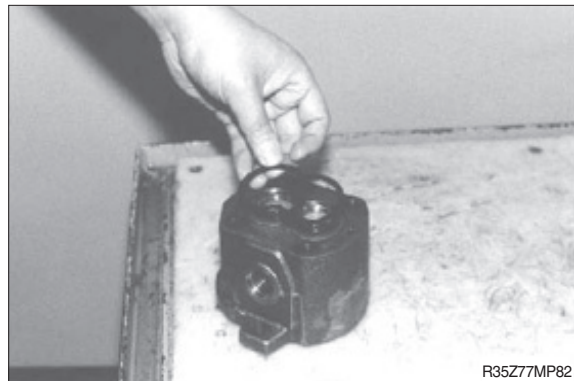
- (4) Insert the O-rings into the guides, then insert them into the plate.



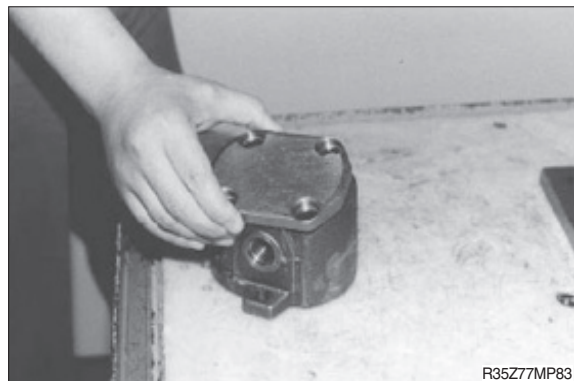
- (5) Assemble the plate, guides and O-rings. Pay attention to the suction and delivery directions.



- (6) Install the square ring.



- (7) Assemble the housing and the cover.



(8) Fix the housing and the cover with the hexagon socket head cap screws.

(M10 × 20, 4 pieces)

Hexagon socket screw key (8 mm)

- Tightening torque : 5.6~7.0 kgf · m  
(41~51 lbf · ft)



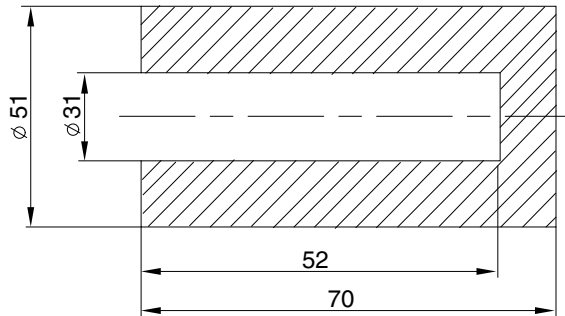
**- DISASSEMBLY AND ASSEMBLY (TYPE 2) : Refer to page 7-32-1~7-32-11.**

**1) General precautions**

- (1) Before disassembling, it is important to have fully understood the internal structure of the pump.
- ※ The gasket (13), oil seal (32) and O-rings will be probably damaged when you disassemble it, so be sure to have prepared spares.
- (2) After having drained oil inside the pump, wash the pump and put it on a working bench covered with clean paper, cloth, or rubber mat for disassembling and assembling. Then, disassemble and assemble the pump slowly and carefully with necessary tools. Use care not to scratch even slightly, and take proper measures to prevent foreign matters from entering the assembly.

**2) Tools**

Tool name	Size	Quantity
Hexagon wrench	4, 6, 8 mm	1 each
Circlip player	For hole	1
Spanner wrench	13 mm	1
Torque wrench	45N (JIS B 4650) 90N (JIS B 4650)	1 1
Resin hammer	-	1
Special tooling for oil seal	See below	1
Seal kit	-	1 set
Grease	-	Small amount



Special tooling for oil seal

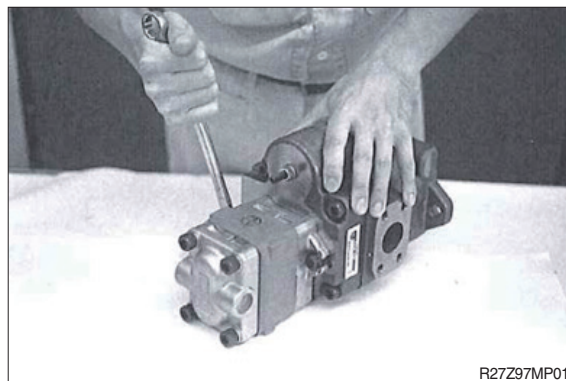
R27Z97MP98

### 3) DISASSEMBLING

#### (1) Disassembling of gear pump

Remove two screws (68) with spanner wrench 13 mm, and after that remove gear pump (65), collar (67) and coupling (66).

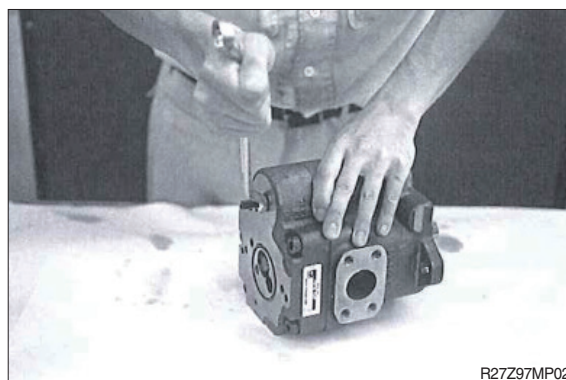
- ※ Coupling (66) and collar (67) may be attached with gear pump kit (65).



#### (2) Remove the adjustment screw

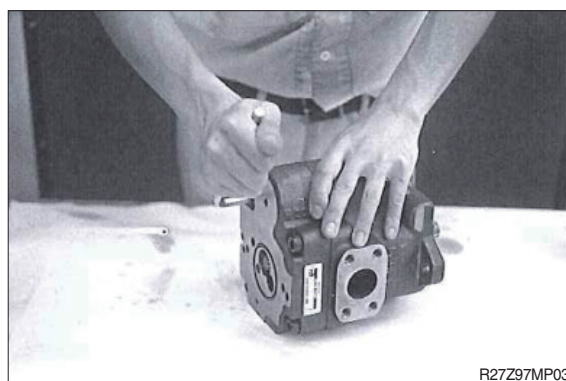
Loose hexagon nut (61) with spanner wrench 13 mm, then remove the adjustment screw (60) with hexagon wrench 4 mm.

- ※ Suggest you to measure the outside length of the adjustment screw. Because it is a good help when you readjust it after reassembling.



#### (3) Separation of body S and body H

Remove five screws (44) with hexagon wrench 8 mm.

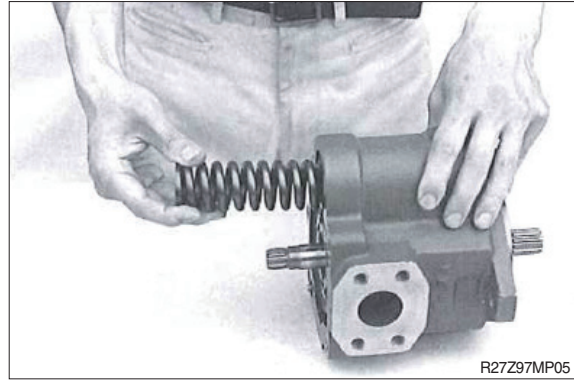


- ※ If you tap the part of inserted spring of body H with hummer softly, it is easy for separation.



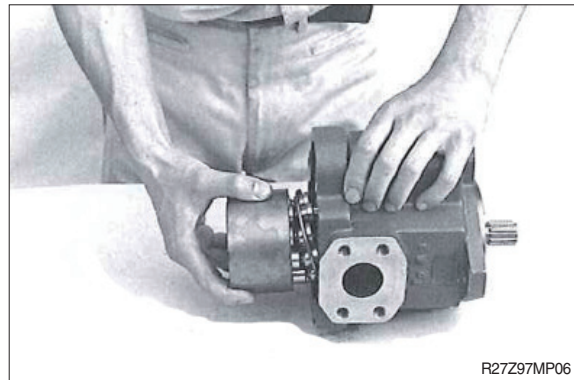
**(4) Disassembling of body S kit**

Remove spring T1 (15) from body S kit, then take off spring holder (18).



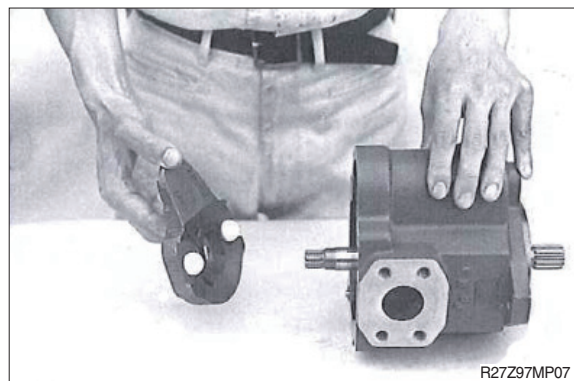
**(5) Disassembling of body S kit**

Remove cylinder barrel kit.



**(6) Disassembling of body S kit**

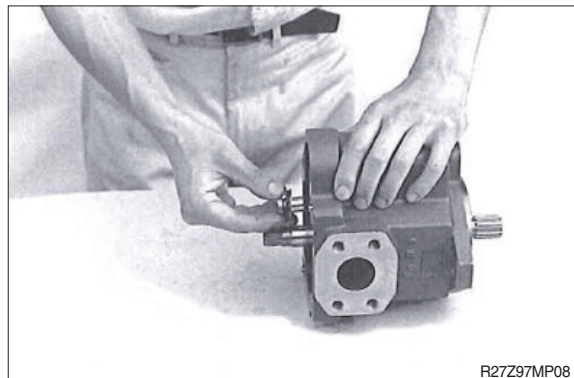
Remove swash plate (10) and two balls (12).



**(7) Disassembling of body S kit**

Remove stopper pin A (25), stopper pin B (26), dish springs (33), rod G (21) and rod C (22).

- ※ The length of the stopper pin A and B is different. Pay attention not to swap when reassembling.



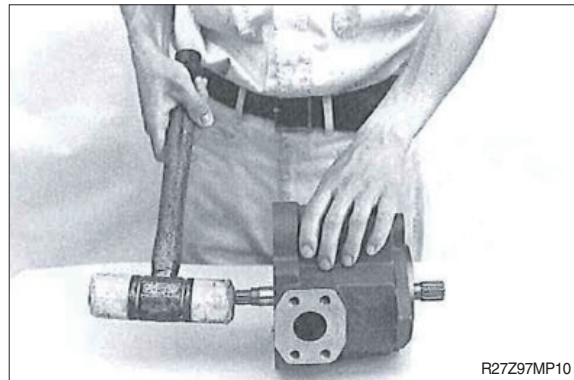
**(8) Disassembling of body S kit**

Remove snap ring (34) from body S (1).



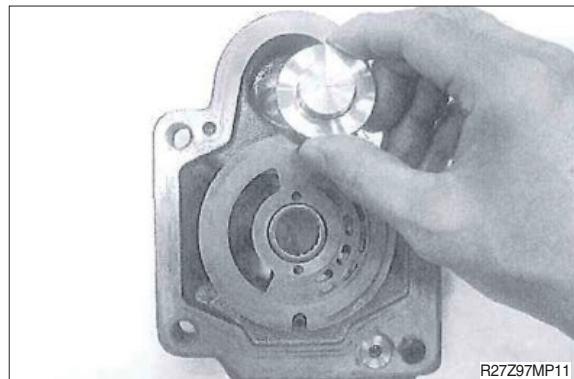
**(9) Disassembling of body S kit**

Tap the end of shaft (3) with hammer, then oil seal (32) and shaft with bearing (30) come off.



**(10) Disassembling of body H kit**

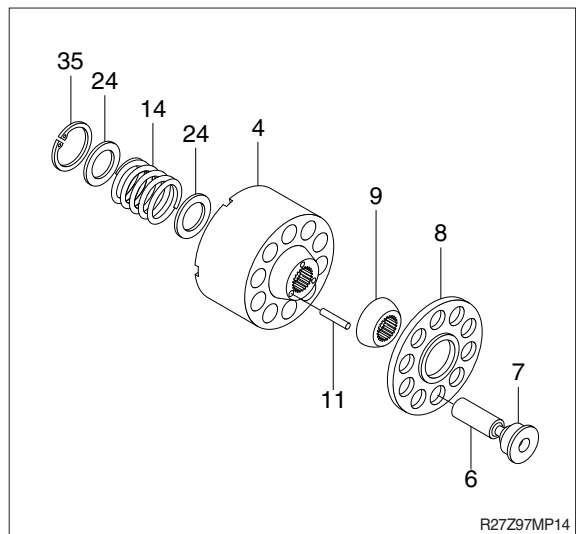
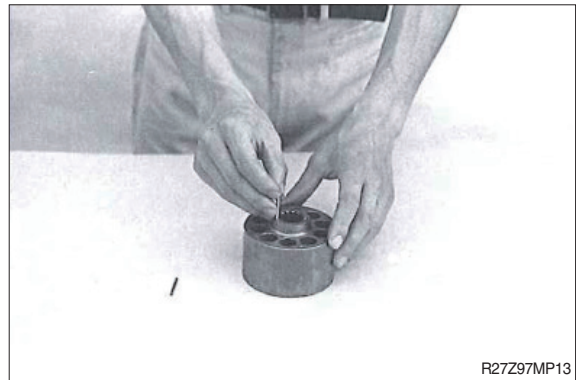
Remove spring guide (19) and valve plate (5) from body H.



### (11) Disassembling of cylinder barrel kit

Remove shoe holder (8) on which piston shoe assemblies (6) and (7) are set and disassemble it in the order of barrel holder (9) and needle (11).

Also, take off snap ring (35), retainer (24), spring C (14) and retainer (24), which are set in the cylinder barrel (4) in this order.



## 4) ASSEMBLING

### (1) Precautions during assembling

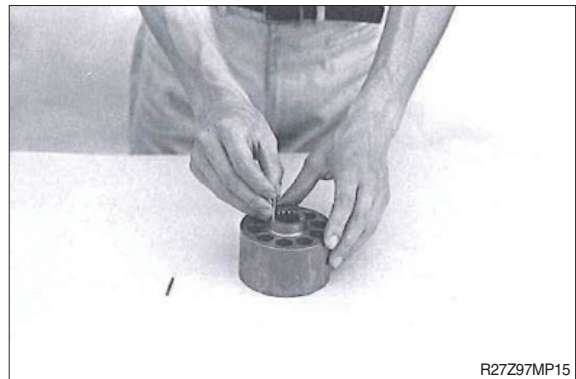
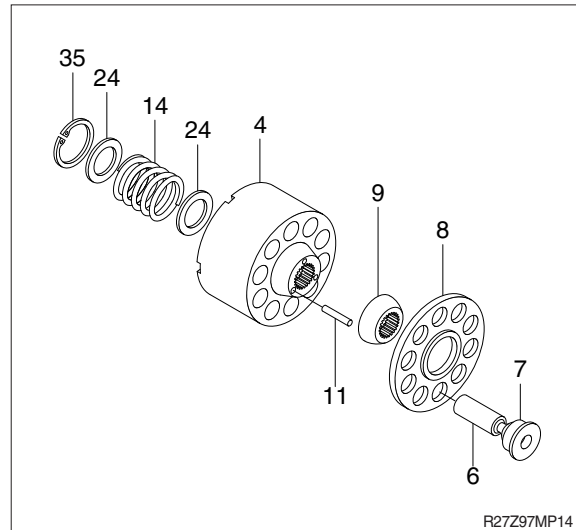
Reverse the above procedures for assembling.

When assembling, be very careful to wash parts in clean oil, to prevent dusts and water from adhering to parts entering assemblies and not to scratch on the sliding surfaces of all parts.

- ※ Apply small quantity of grease to the periphery of O-rings to be set in socket and spigot joints to prevent the O-rings from being damaged.

### (2) Assembling of cylinder barrel kit

Set retainer (24), spring C (14), retainer (24) and snap ring (35) in the shaft center hole of cylinder barrel (4) in this order, and carefully set shoe holder (8), on which needle (11), barrel holder (9) and ten piston shoe assemblies have already been set, in cylinder barrel from the opposite side.



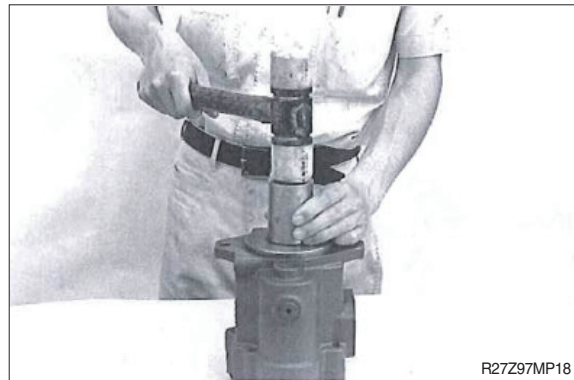
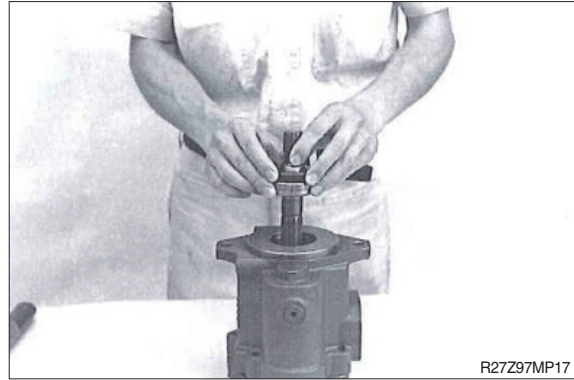


### (3) Assembling of body S kit

Set shaft (3) with bearing (30), oil seal (32) and snap ring (34) in this order into body S (1).

- ※ Use new oil seal for assembling. Before assembling, apply a small quantity of grease to the periphery of oil seal lip and tap it together with the special tooling with hammer.

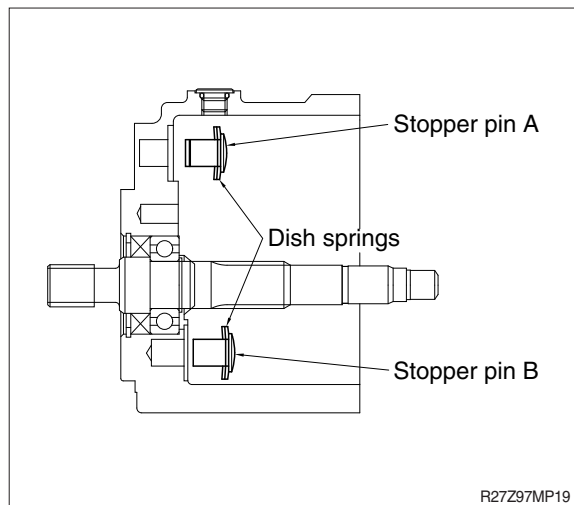
When assembling, put body S (1) onto body H (2) tentatively for easy work.



### (4) Assembling of body S kit

Set each four dish springs (33) to stopper pin A (25) and stopper pin B (26), then set them into body S (1).

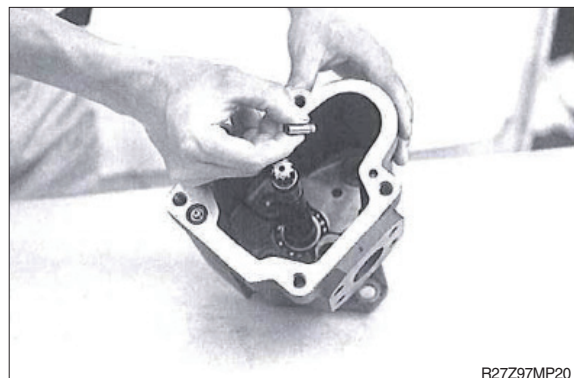
- ※ Pay attention to the direction of the dish washer.
- ※ Pin A and pin B have different length. Set them to the original position. Otherwise, pump displacement changes, and engine stall or insufficient speed can occur.



### (5) Assembling of body S kit

Set rod G (21) and rod C (22) into body S (1).

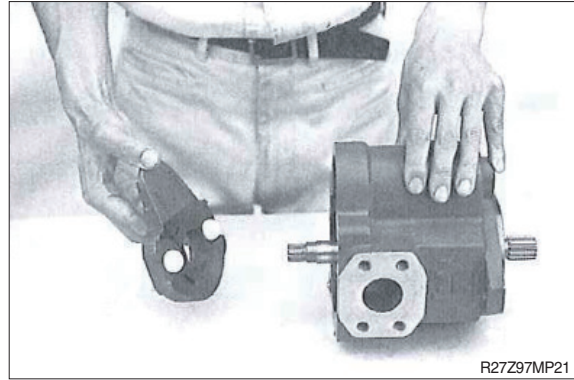
- ※ Pay attention to the direction of the rod G and rod C. (See cross section drawing for the direction.)



**(6) Assembling of body S kit**

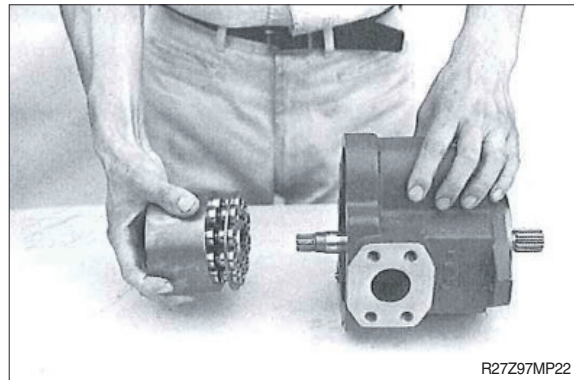
Put two balls (12) in the hole of swash plate (10) and install it in body S.

※ Apply grease on the balls if they drop out.



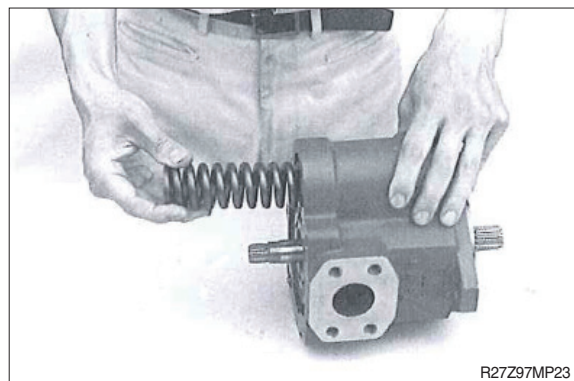
**(7) Assembling of body S kit**

Assemble cylinder barrel kit into the body S (1).



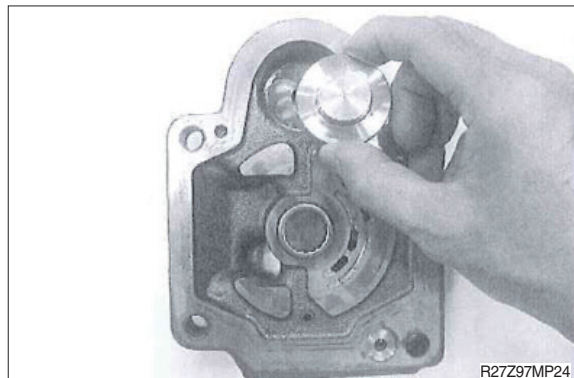
**(8) Assembling of body S kit**

Set spring T1 (15) to spring holder (18), then set them together into the hole on swash plate (10).



**(9) Assembling of body H kit**

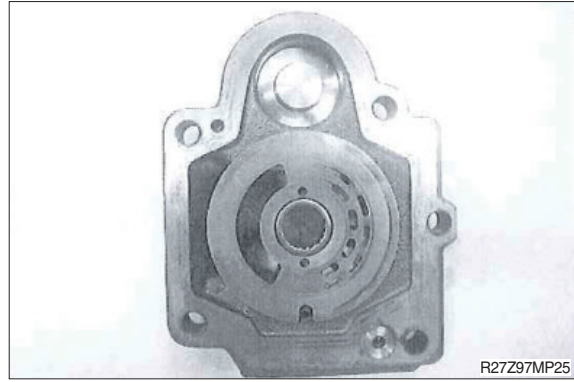
Set spring guide (19) in body H (2).



**(10) Assembling of body H kit**

Place valve plate (5) slowly on body H (2) by positioning it with spring pin (56).

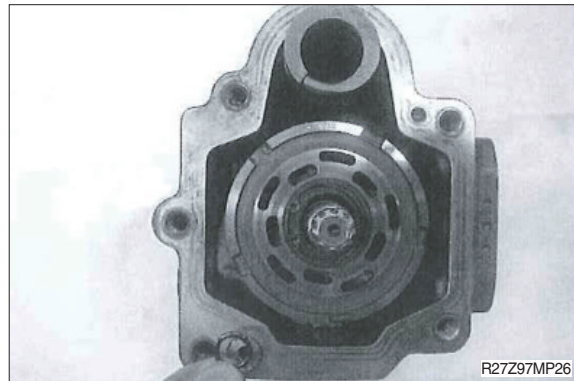
- ※ V notch copper alloy side of valve plate slides with cylinder barrel (4) and be careful not to set the valve plate to a wrong direction.



**(11) Assembling of body S kit with body H kit**

Place O-ring (40) on body S.

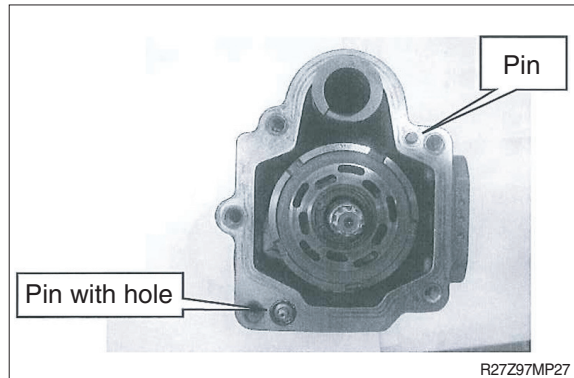
- ※ Use new O-ring for assembling.



**(12) Assembling of body S kit with body H kit**

Set pin (20) and pin (27) on body S.

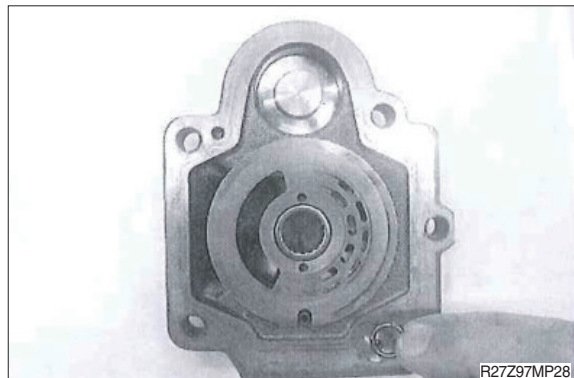
- ※ Pay attention to the position of each pin. Pin (27) has a hole.



**(13) Assembling of body S kit with body H kit**

Place O-ring (40) on body H.

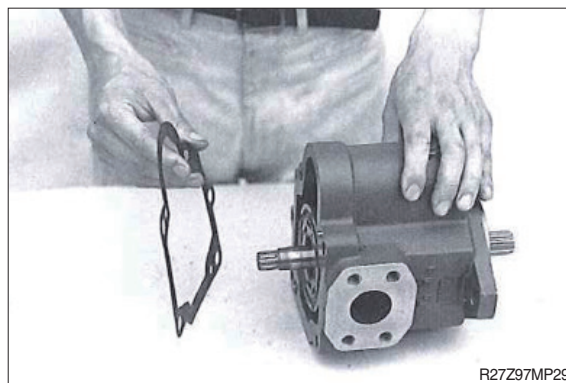
- ※ Use new O-ring for assembling.



#### (14) Assembling of body S kit with body H kit

Place packing (13), position it with locating pin (27) on body S.

- ※ Use new packing for assembling.

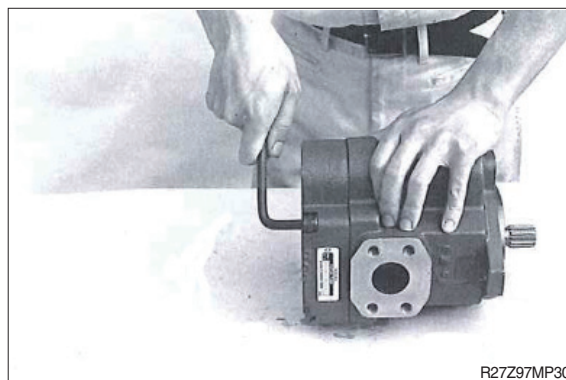


#### (15) Assembling of body S kit with body H kit

Set two screws (M10×65) into the upper side two screw holes, and tighten them until the distance between body S and body H comes to 5 to 10 mm.

Then set three screws (44) into the three screw holes, after that, replace the upper side two screws (M10×65) to the regular size screws (44) and fix them.

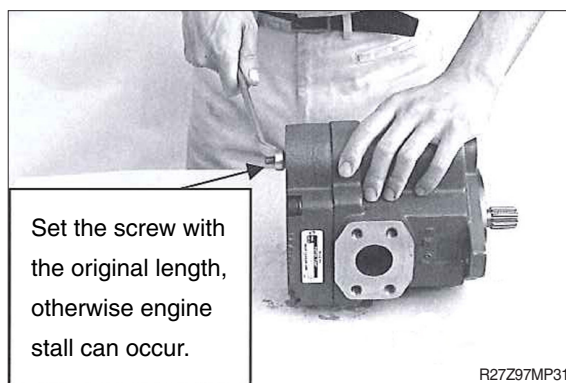
- Tightening torque : 5.2~6.6 kgf · m  
(37.6~47.7 lbf · ft)



#### (16) Installation of the adjusting screw

Fasten the adjusting screw (60) with hexagon wrench 4 mm, then adjust the outside length of adjusting screw and fix locknut (61) with spanner wrench 13 mm. At that time, change the seal washer (62) to new one.

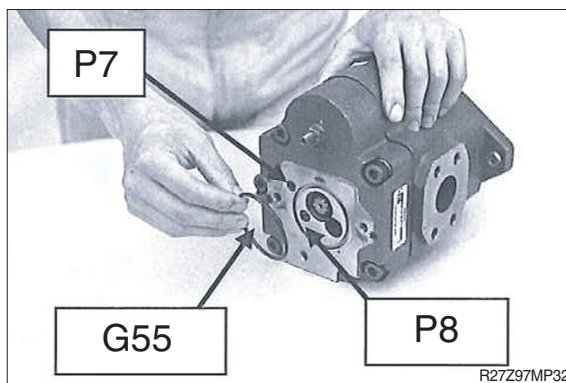
- Tightening torque : 1.5~2.0 kgf · m  
(10.8~14.5 lbf · ft)



#### (17) Installation of gear pump kit

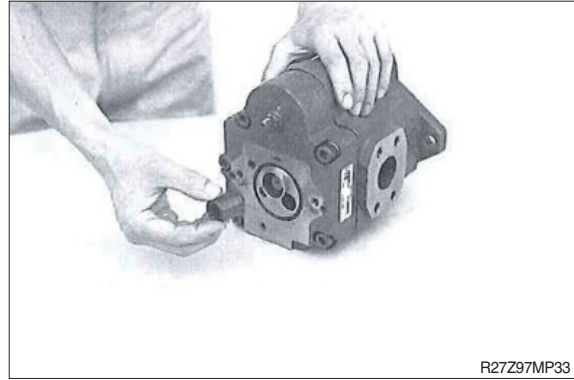
Place O-ring (69, 71, 72) on the installation side of body H.

- ※ Use new O-ring for assembling.



### (18) Installation of gear pump kit

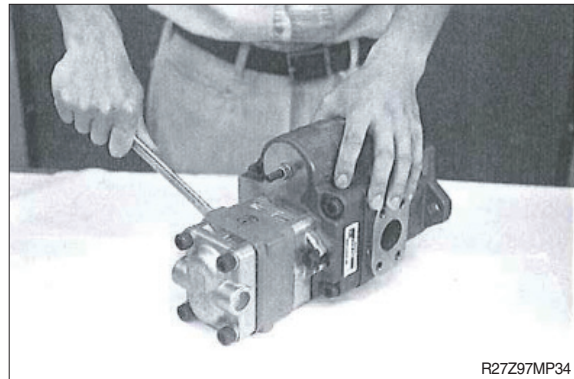
Set collar (67) and coupling (66).



### (19) Installation of gear pump kit

Install gear pump kit (65) and fix it by two screws (68) and washers (70) with spanner wrench 13 mm.

- Tightening torque : 2.0~2.4 kgf · m  
(14.5~17.3 lbf · ft)



### (20) Inspection of assembling

After completed the assembling of pump, make sure that pump shaft rotates smoothly by hand.

## GROUP 4 MAIN CONTROL VALVE

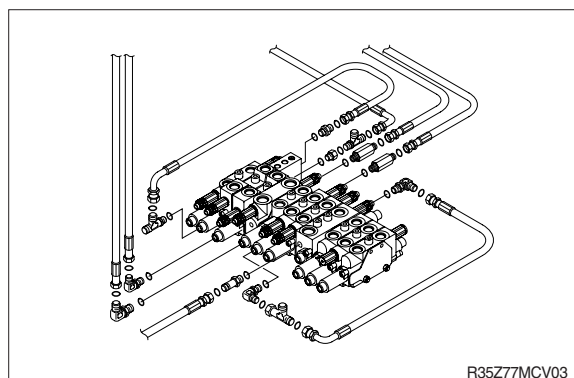
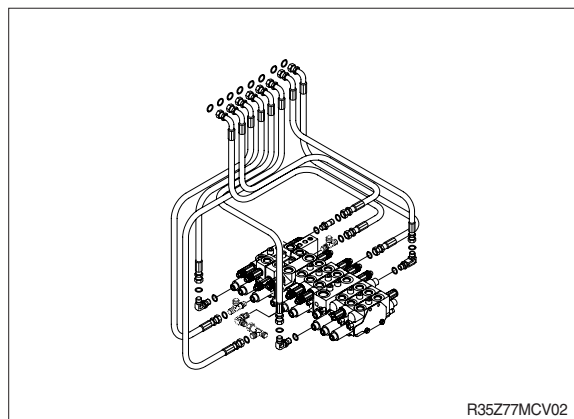
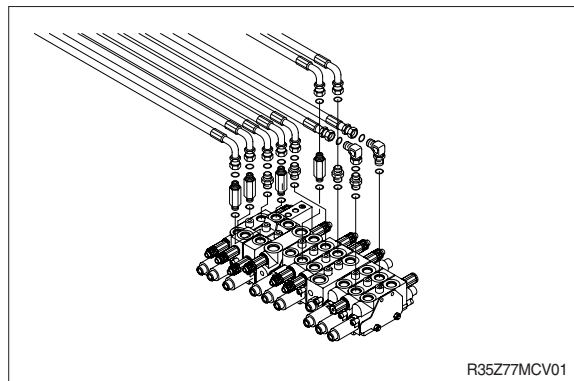
### 1. REMOVAL AND INSTALL OF MOTOR

#### 1) REMOVAL

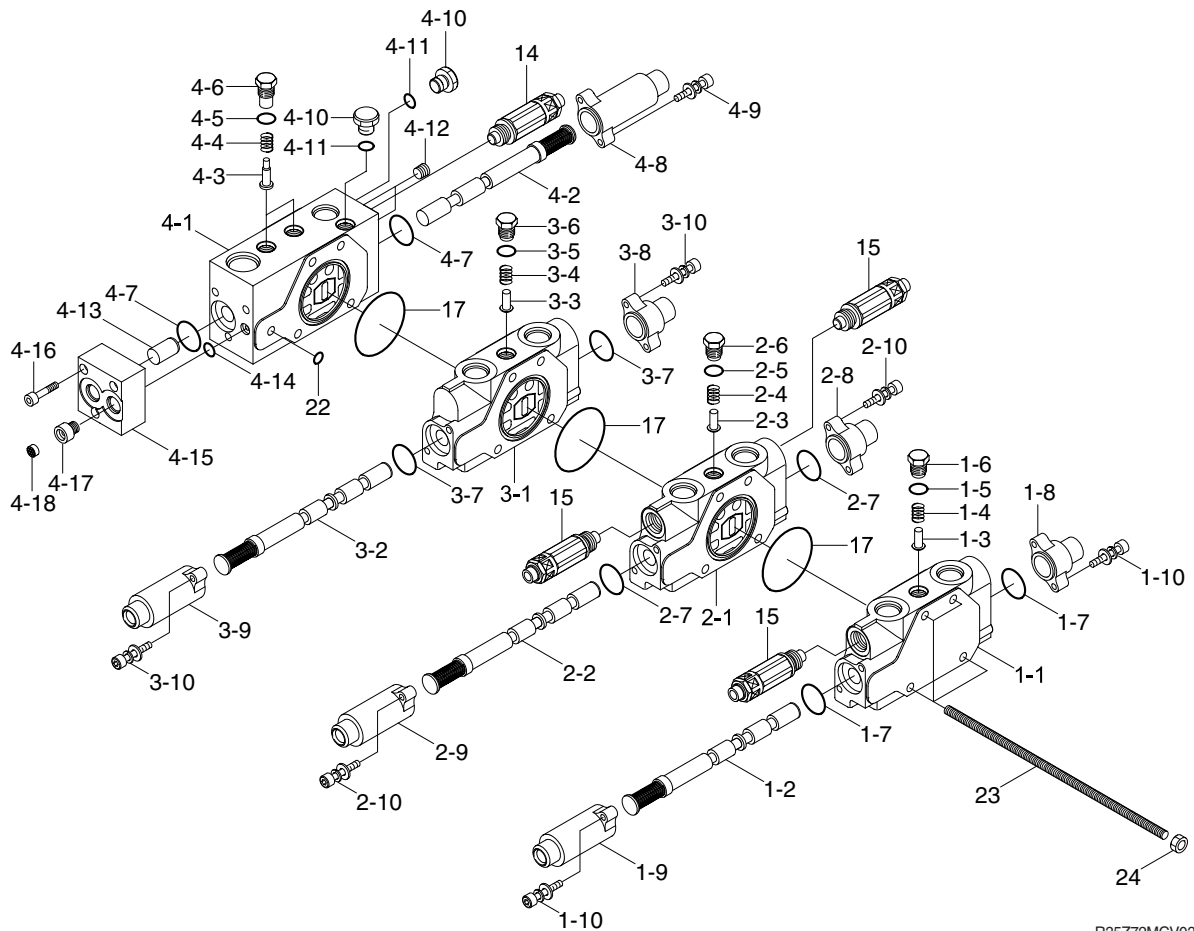
- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ▲ Escaping fluid under pressure can penetrate the skin causing serious injury.
- ※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.
- (4) Disconnect hydraulic hose.
- (5) Disconnect pilot line hoses.
- (6) Sling the control valve assembly and remove the control valve mounting bolt.
  - Weight : 25 kg (55 lb)
- (7) Remove the control valve assembly.  
When removing the control valve 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 below items.
  - ① Cylinder (boom, arm, bucket)
  - ② Swing motor
  - ③ Travel motor
- ※ See each item removal and install.
- (3) Confirm the hydraulic oil level and recheck the hydraulic oil leak or not.



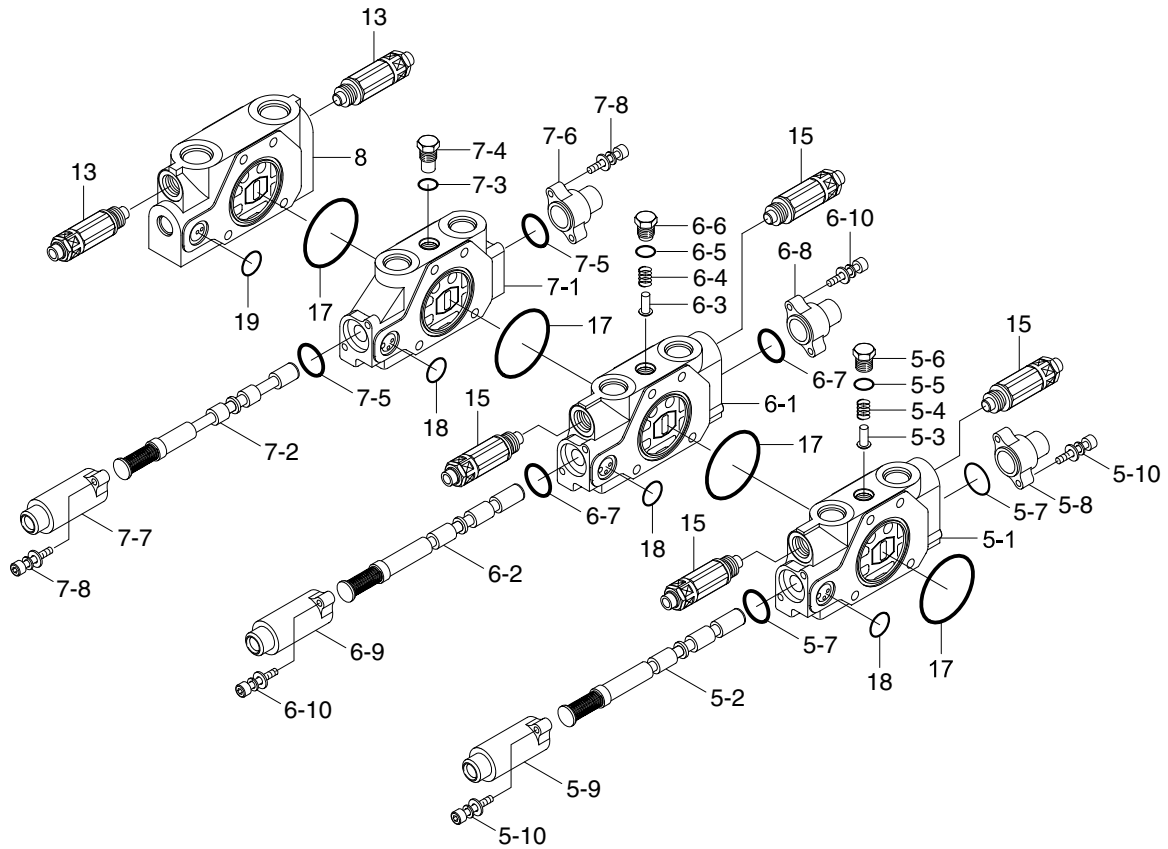
## 2. STRUCTURE (1/3)



R35Z72MCV03

- |      |                        |      |                        |      |                        |
|------|------------------------|------|------------------------|------|------------------------|
| 1    | Dozer work block       | 2-9  | Cover-pilot            | 4-6  | Plug                   |
| 1-1  | Body-work              | 2-10 | Bolt-soc head w/washer | 4-7  | O-ring                 |
| 1-2  | Spool assy             | 3    | Swing work block       | 4-8  | Cover-pilot            |
| 1-3  | Poppet                 | 3-1  | Body-work              | 4-9  | Bolt-soc head w/washer |
| 1-4  | Spring                 | 3-2  | Spool assy             | 4-10 | Plug                   |
| 1-5  | O-ring                 | 3-3  | Poppet                 | 4-11 | O-ring                 |
| 1-6  | Plug                   | 3-4  | Spring                 | 4-12 | Plug                   |
| 1-7  | O-ring                 | 3-5  | O-ring                 | 4-13 | Piston                 |
| 1-8  | Cover-pilot            | 3-6  | Plug                   | 4-14 | O-ring                 |
| 1-9  | Cover-pilot            | 3-7  | O-ring                 | 4-15 | Body-pilot             |
| 1-10 | Bolt-soc head w/washer | 3-8  | Cover-pilot            | 4-16 | Bolt-soc head w/washer |
| 2    | Boom swing work block  | 3-9  | Cover-pilot            | 4-17 | Orifice                |
| 2-1  | Body-work              | 3-10 | Bolt-soc head w/washer | 4-18 | Filter-coin type       |
| 2-2  | Spool assy             | 4    | Connecting block       | 14   | Relief valve           |
| 2-3  | Poppet                 | 4-1  | Body-work              | 15   | Overload relief valve  |
| 2-4  | Spring                 | 4-2  | Spool assy             | 17   | O-ring                 |
| 2-5  | O-ring                 | 4-3  | Poppet                 | 22   | O-ring                 |
| 2-6  | Plug                   | 4-4  | Spring                 | 23   | Bolt-tie               |
| 2-7  | O-ring                 | 4-5  | O-ring                 | 24   | Nut-hex                |
| 2-8  | Cover-pilot            |      |                        |      |                        |

## STRUCTURE (2/3)

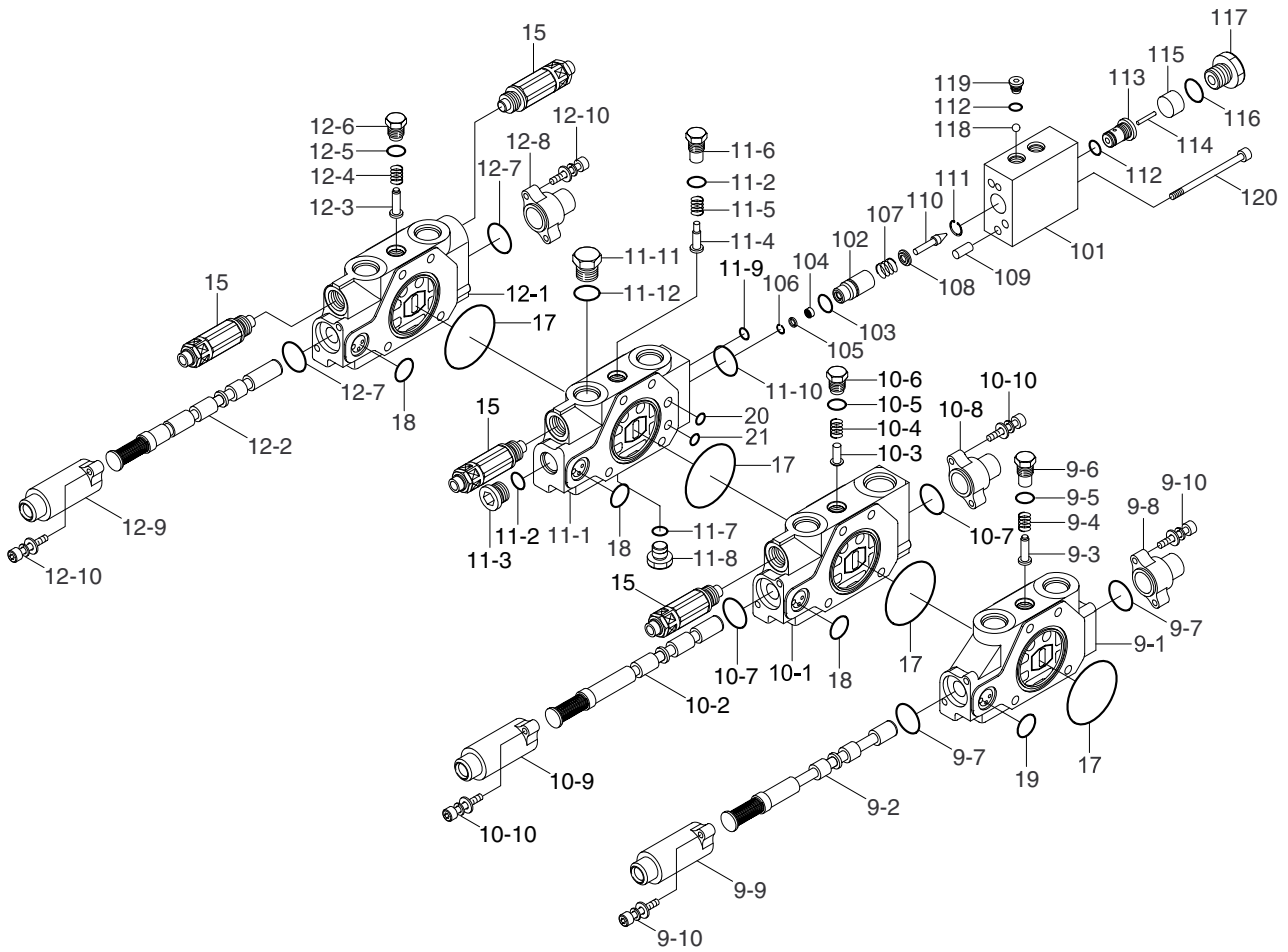


R35Z92MCV04

5	PTO work block	6-2	Spool assy	7-4	Plug
5-1	Body-work	6-3	Poppet	7-5	O-ring
5-2	Spool assy	6-4	Spring	7-6	Cover-pilot
5-3	Poppet	6-5	O-ring	7-7	Cover-pilot
5-4	Spring	6-6	Plug	7-8	Bolt-soc head w/washer
5-5	O-ring	6-7	O-ring	8	Inlet work block
5-6	Plug	6-8	Cover-pilot	13	Relief valve
5-7	O-ring	6-9	Cover-pilot	15	Overload relief valve
5-8	Cover-pilot	6-10	Bolt-soc head w/washer	17	O-ring
5-9	Cover-pilot	7	Travel work block	18	O-ring
5-10	Bolt-soc head w/washer	7-1	Body work	19	O-ring
6	Arm work block	7-2	Spool assy		
6-1	Body-work	7-3	O-ring		



### STRUCTURE (3/3)



R35Z72MCO5

9	Travel work block	10-7	O-ring	12-1	Body-work	103	Seal
9-1	Body-work	10-8	Cover-pilot	12-2	Spool assy	104	Filter
9-2	Spool assy	10-9	Cover-pilot	12-3	Poppet	105	Spacer
9-3	Poppet	10-10	Bolt-soc head w/washer	12-4	Spring	106	Ring-retaining
9-4	Spring	11	Boom lock valve	12-5	O-ring	107	Spring A-lock valve
9-5	O-ring	11-1	Body-work	12-6	Plug	108	Spring seat
9-6	Plug	11-2	O-ring	12-7	O-ring	109	Pin
9-7	O-ring	11-3	Plug	12-8	Cover-pilot	110	Poppet
9-8	Cover-pilot	11-4	Poppet	12-9	Cover-pilot	111	Ring-retaining
9-9	Cover-pilot	11-5	Spring	12-10	Bolt-soc head w/washer	112	O-ring
9-10	Bolt-soc head w/washer	11-6	Plug	15	Overload relief valve	113	Guide-piston
10	Boom work block	11-7	O-ring	17	O-ring	114	Piston A1
10-1	Body-work	11-8	Plug	18	O-ring	115	Piston B
10-2	Spool assy	11-9	O-ring	19	O-ring	116	O-ring
10-3	Poppet	11-10	O-ring	20	O-ring	117	Connector
10-4	Spring	11-11	Plug	21	O-ring	118	Ball-steel
10-5	O-ring	11-12	O-ring	101	Cover-lock valve	119	Plug
10-6	Plug	12	Bucket work block	102	Lock valve	120	Bolt-hex. socket head

### 3. DISASSEMBLY AND ASSEMBLY

#### 1) GENERAL PRECAUTIONS

- (1) All hydraulic components are manufactured to a high precision. Consequently, before disassembling and assembling them, it is essential to select an especially clean place.
- (2) In handling a control valve, pay full attention to prevent dust, sand, etc. from entering into it.
- (3) When a control valve is to be removed from the machine, apply caps and masking seals to all ports. Before disassembling the valve, recheck that these caps and masking seals are fitted completely, and then clean the outside of the assembly. Use a proper bench for working. Spread paper or a rubber mat on the bench, and disassemble the valve on it.
- (4) Support the body section carefully when carrying or transferring the control valve. Do not lift by the exposed spool, end cover section etc.
- (5) After disassembling and assembling of the component it is desired to carry out various tests (for the relief characteristics, leakage, flow resistance, etc.), but hydraulic test equipment is necessary for these tests. Therefore, even when its disassembling can be carried out technically, do not disassemble such components that cannot be tested, adjusted, and so on. Additionally one should always prepare clean cleaning oil, hydraulic oil, grease, etc. beforehand.

#### 2) TOOLS

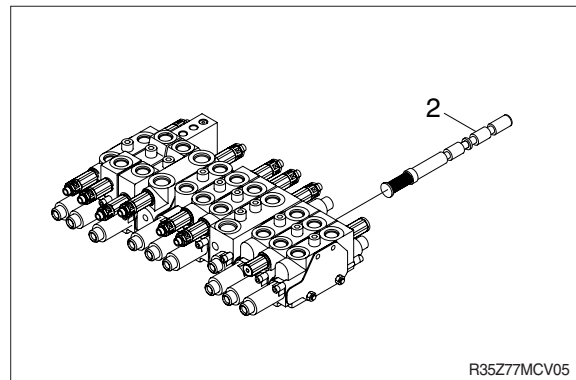
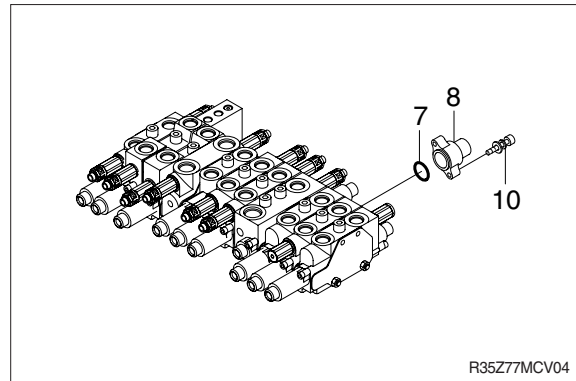
Before disassembling the control valve, prepare the following tools beforehand.

Name of tool	Quantity	Size (mm)
Vice mounted on bench (soft jaws)	1 unit	
Hexagon wrench	Each 1 piece	5, 6, 10, 12 and 14
Socket wrench	Each 1 piece	5 and 6
Spanner	Each 1 piece	13, 21 and 30
Rod	1 piece	Less than 10 × 250

### 3) DISASSEMBLY

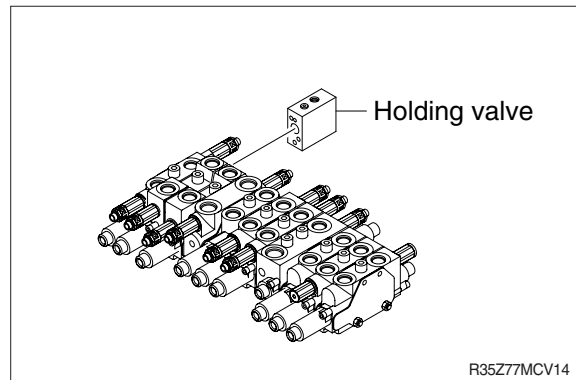
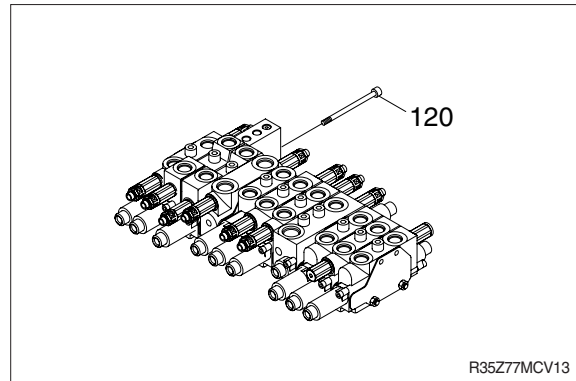
#### (1) Disassembly of spools (pilot type)

- ① Loosen hexagon socket head bolts (10) with washer.  
(Hexagon wrench : 5 mm)
- ② Remove the pilot cover (8).
  - ※ Pay attention not to lose the O-ring (7) under the pilot cover.
- ③ Remove the spool assembly (2) from the body by hand slightly.
  - ※ When extracting each spool from its body, pay attention not to damage the body.
  - ※ When extracting each spool assembly, it must be extracted from spring side only.
  - ※ When any abnormal parts are found, replace it with completely new spool assembly.
  - ※ When disassembled, tag the components for identification so that they can be reassembled correctly.



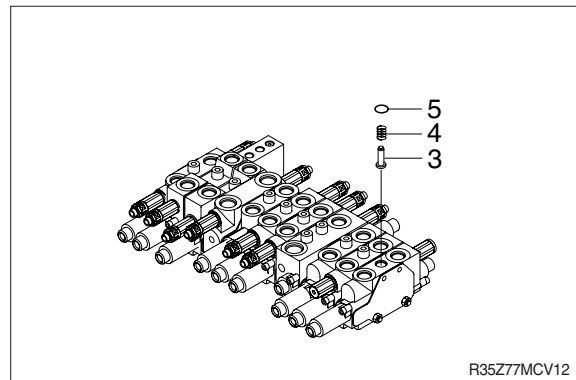
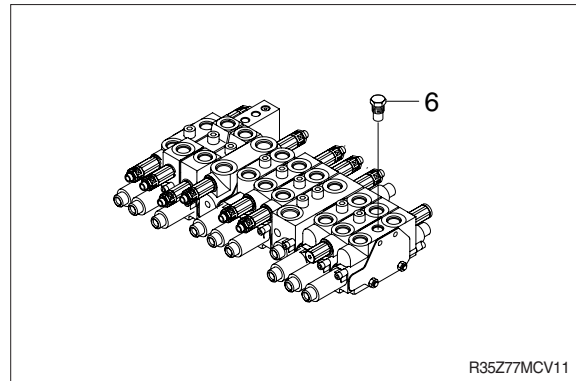
## (2) Disassembly of holding valve (boom 1)

- ① Loosen hexagon socket head bolts (120).  
(Hexagon wrench : 5 mm)
- ② Remove the holding valve.
  - ※ Pay attention not to lose the O-ring and the poppet under the pilot cover.
  - ※ Pay attention not to damage the "piston A" under pilot cover.
  - ※ When any abnormal parts are found, replace it with completely new holding valve assembly.
  - ※ When disassembled, tag the components for identification so that they can be reassembled correctly.



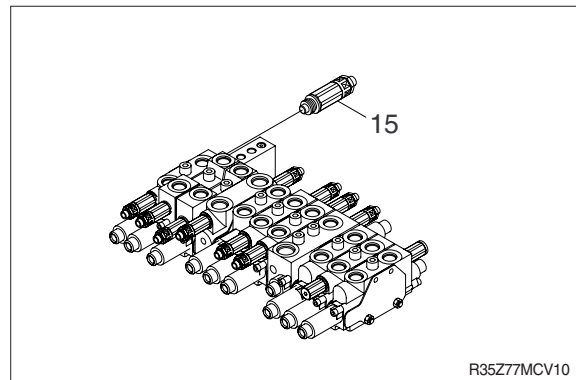
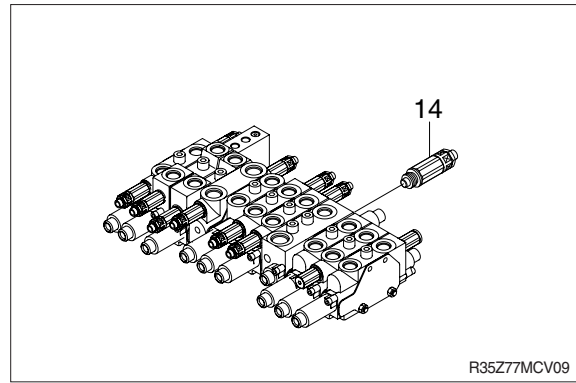
### (3) Disassembly of the load check valve and the negative relief valve

- ① The load check valve
  - a. Fix the body to suitable work bench.
  - ※ Pay attention not to damage the body.
  - b. Loosen the plug (6)  
(Hexagon wrench : 10 mm).
  - c. Remove the O-ring (5), spring (4) and the load check valve (3) with pincers or magnet.



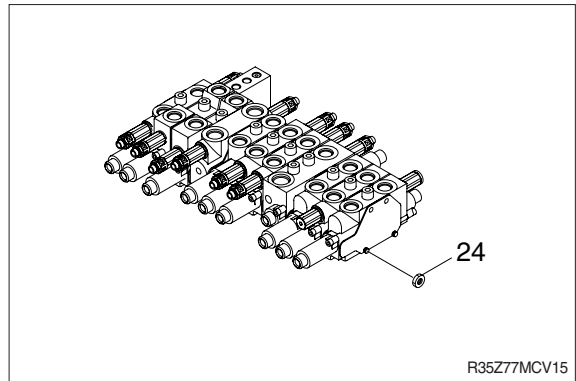
#### (4) Disassembly of the main and overload relief valve

- ① Fix the body to suitable work bench.
  - ② Remove the main relief valve (14).  
(Spanner : 30 mm)
  - ③ Remove the overload relief valve (15).  
(Spanner : 22 mm)
- ※ When disassembled, tag the relief valve for identification so that they can be reassembled correctly.
  - ※ Pay attention not to damage seat face.
  - ※ When any abnormal parts are found, replace it with completely new relief valve assembly.

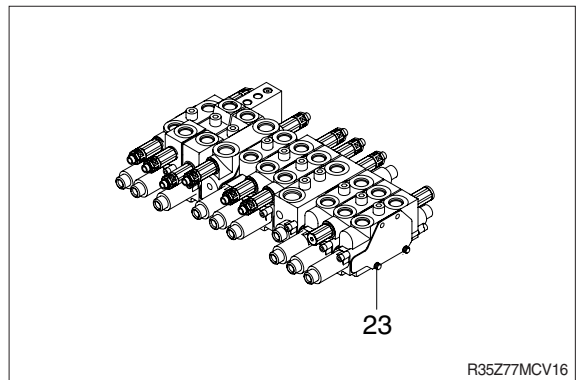


**(5) Disassembly of the block assembly**

- ① Fix the body to suitable work bench.
- ② Remove the nut (24).  
(Spanner : 13 mm)



※ Do not removed the tie bolt (23).



## **(6) Inspection after disassembly**

Clean all disassembled parts with clean mineral oil fully, and dry them with compressed air. Then, place them on clean papers or cloths for inspection.

### **① Control valve**

- a. Check whole surfaces of all parts for burrs, scratches, notches and other defects.
- b. Confirm that seal groove faces of body and block are smooth and free of dust, dent, rust etc.
- c. Correct dents and damages and check seat faces within the body, if any, by lapping.  
※ Pay careful attention not to leave any lapping agent within the body.
- d. Confirm that all sliding and fitting parts can be moved manually and that all grooves and paths are free foreign matter.
- e. If any spring is broken or deformed, replace it with new one.
- f. When a relief valve does not function properly, repair it, following it's the prescribed disassembly and assembly procedures.
- g. Replace all seals and O-rings with new ones.

### **② Relief valve**

- a. Confirm that all seat faces at ends of all poppets and seats are free of defects and show uniform and consistent contact faces.
- b. Confirm manually that main poppet and seat can slide lightly and smoothly.
- c. Confirm that outside face of main poppet and inside face of seat are free from scratches and so on.
- d. Confirm that springs are free from breakage, deformation, and wear.
- e. Confirm that orifices of main poppet and seat section are not clogged with foreign matter.
- f. Replace all O-rings with new ones.
- g. When any light damage is found in above inspections, correct it by lapping.
- h. When any abnormal part is found, replace it with a completely new relief valve assembly.



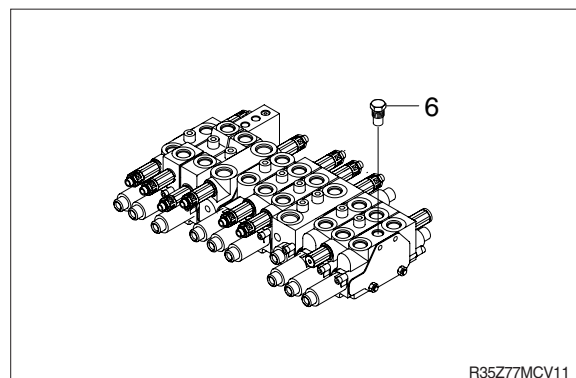
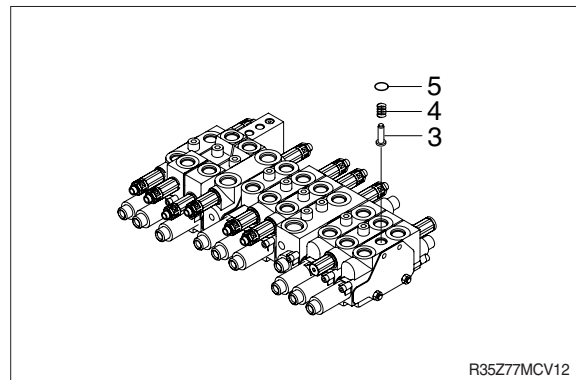
## 4) ASSEMBLY

### (1) General precaution

- ① In this assembly section, explanation only is shown.  
For further understanding, please refer to the figures shown in the previous structure & disassembly section.
- ② Pay close attention to keeping all seals free from handling damage and inspect carefully for damage before using them.
- ③ Apply clean grease or hydraulic oil to the seal so as to ensure it is fully lubricated before assembly.
- ④ Do not stretch seals so much as to deform them permanently.
- ⑤ In fitting O-rings, pay close attention not to roll them into their final position in addition, a twisted O-ring cannot easily untwist itself naturally and could thereby cause inadequate sealing and thereby both internal and external oil leakage.
- ⑥ Tighten fitting bolts for all sections with a torque wrench adjusted to the respective tightening torque.
- ⑦ Do not reuse removed O-rings and seals.

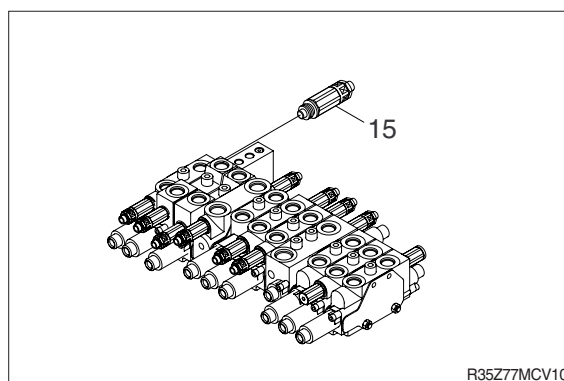
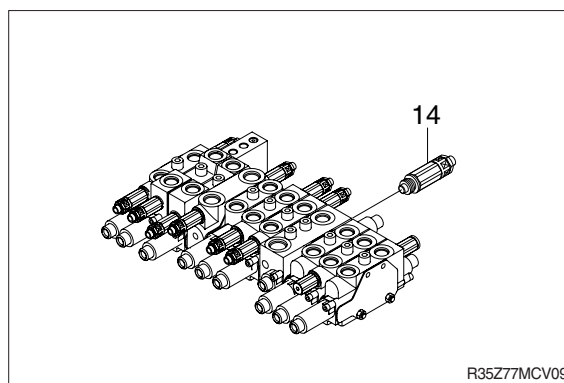
### (2) Load check valve

- ① Assemble the load check valve (3) and O-ring (5), spring (4).
- ② Put O-rings on to plug (6).
- ③ Tighten plug to the specified torque.
  - Hexagon wrench : 8 mm
  - Tightening torque : 3.7 kgf · m  
(26.7 lbf · ft)



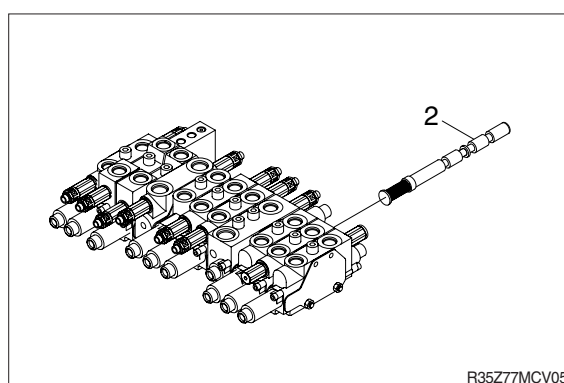
### (3) Main relief, port relief valves

- ① Install the main relief valve (14).
  - Spanner : 30 mm
  - Tightening torque : 6 kgf · m (43.4 lbf · ft)
- ② Install the over load relief valve (15).
  - Spanner : 22 mm
  - Tightening torque : 4 kgf · m (28.9 lbf · ft)



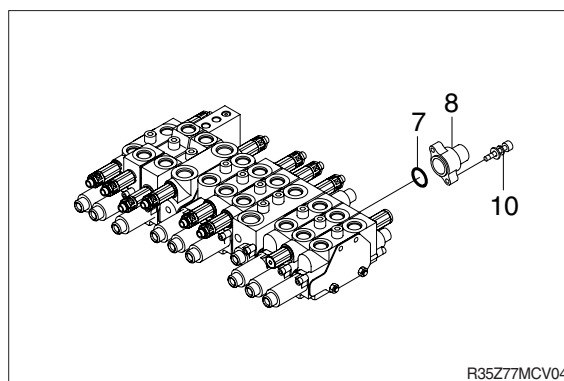
### (4) Main spools

- ① Carefully insert the previously assembled spool assemblies into their respective bores within of body.
- ※ Fit spool assemblies into body carefully and slowly. Do not under any circumstances push them forcibly in.



### (5) Covers of pilot type

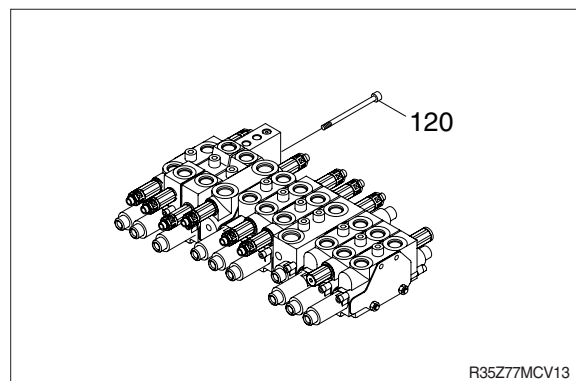
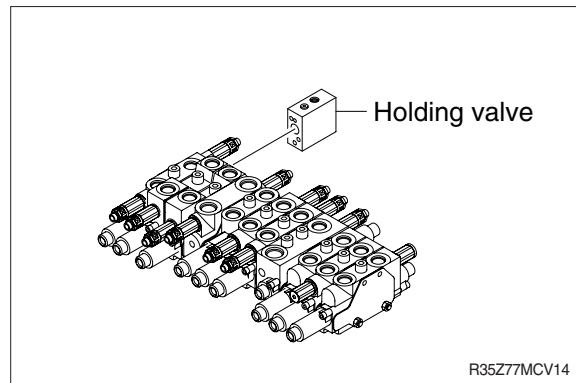
- ① Fit spool covers (8) tighten the hexagonal socket head bolts (10) with washer to the specified torque.
- Hexagon wrench : 5 mm
  - Tightening torque : 1~1.1 kgf · m  
(7.2~7.9 lbf · ft)
- ※ Confirm that O-rings (7) have been fitted.



## (6) Holding valve

① Fit the holding valve to the body and tighten hexagon socket head bolt (120) to specified torque.

- Hexagon wrench : 5 mm
- Tightening torque : 1.1 kgf · m (7.9 lbf · ft)



## GROUP 5 SWING DEVICE

### 1. REMOVAL AND INSTALL OF MOTOR

#### 1) REMOVAL

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

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

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

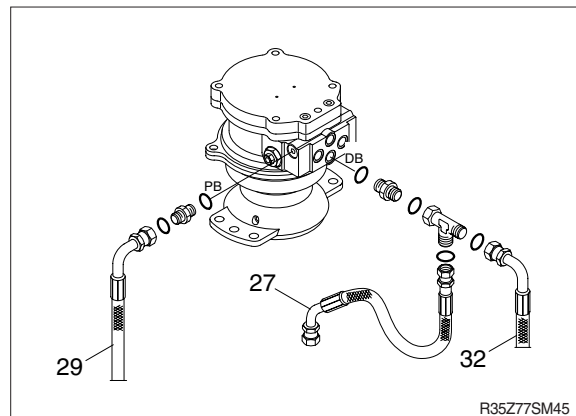
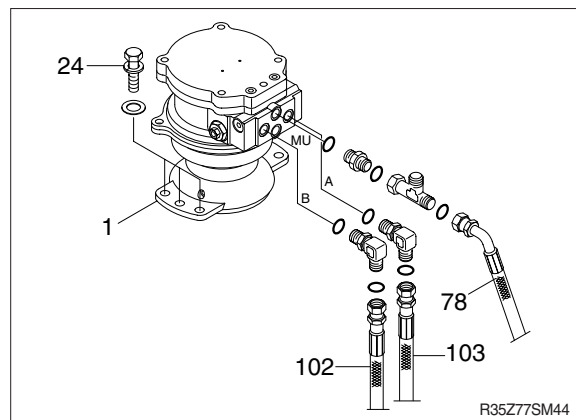
- (4) Disconnect hose assembly (78, 102, 103).
- (5) Disconnect pilot line hoses (27, 29, 32).
- (6) Sling the swing motor assembly (1) and remove the swing motor mounting bolts (24).

※ Motor device weight : 39 kg (86 lb)

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

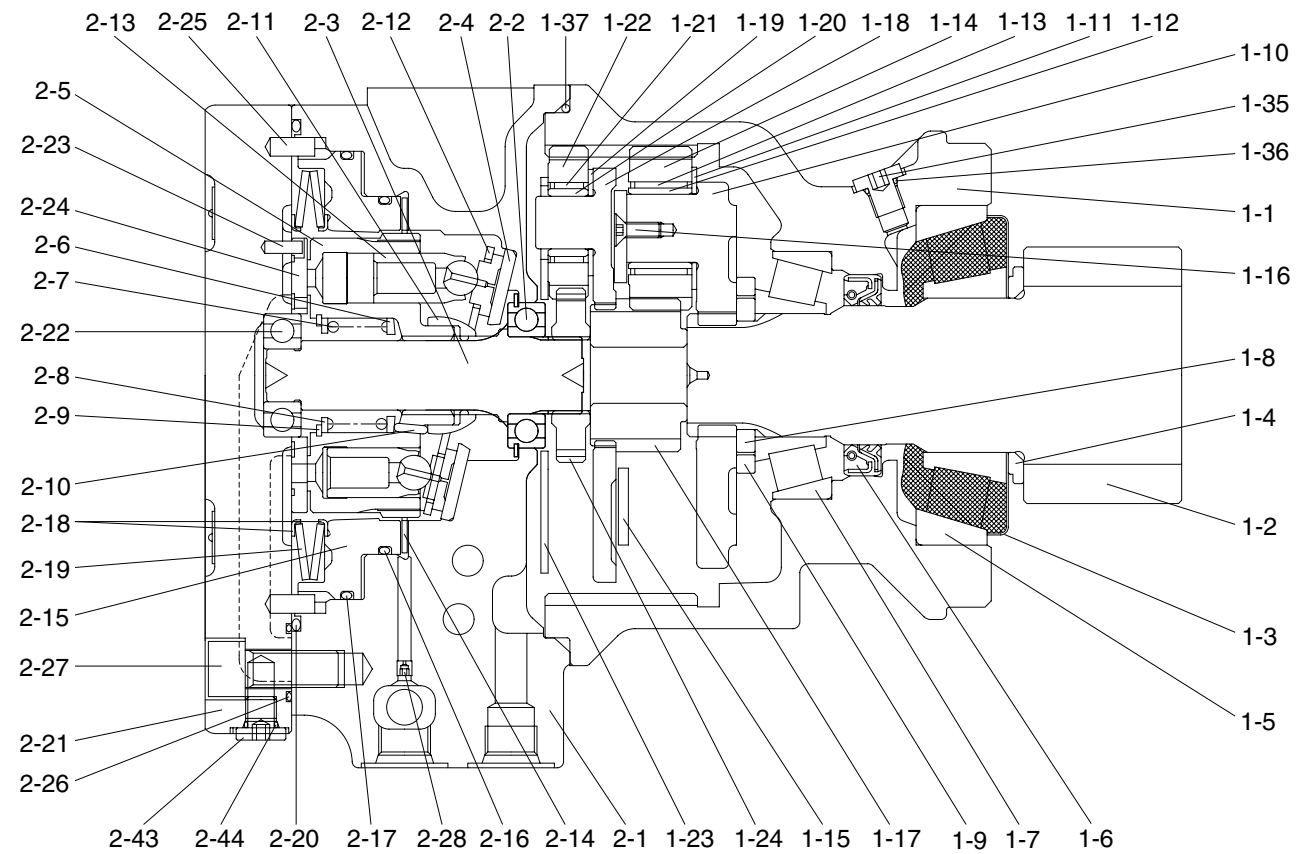
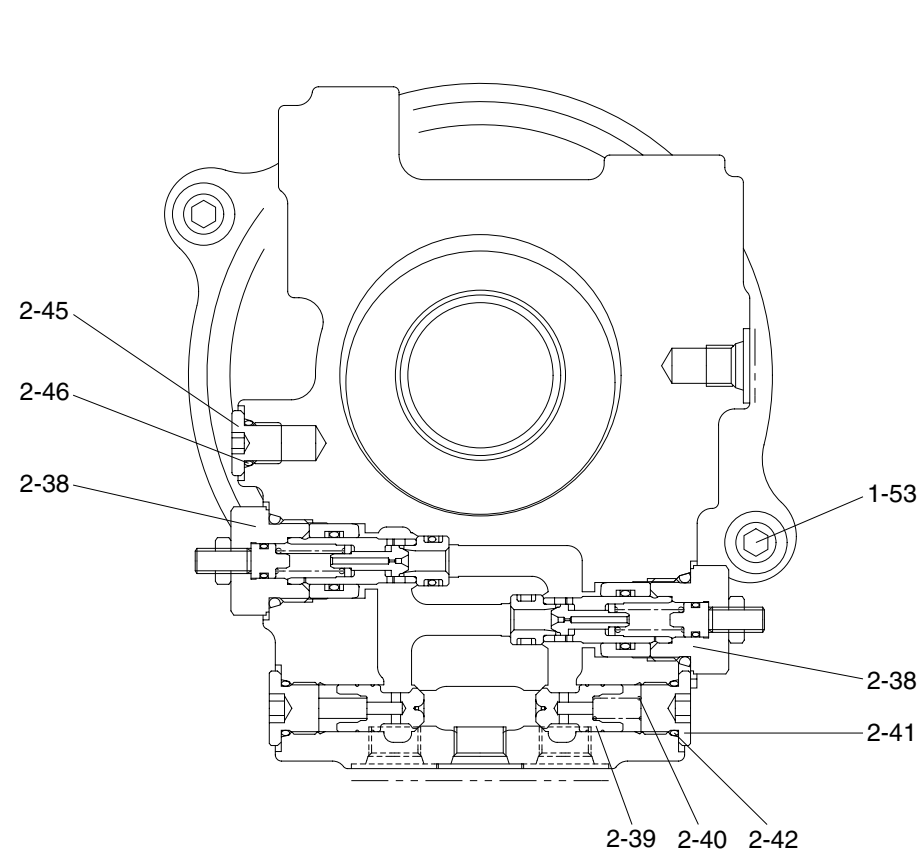
#### 2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Bleed the air from the swing motor.
  - 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. DISASSEMBLY AND ASSEMBLY OF SWING MOTOR

### 1) STRUCTURE



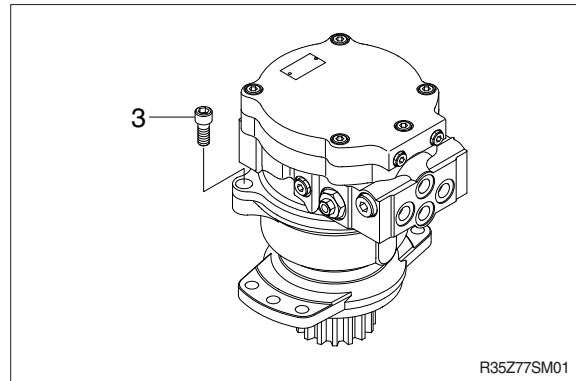
- |                           |                       |                      |                      |                   |                        |
|---------------------------|-----------------------|----------------------|----------------------|-------------------|------------------------|
| 1 Gear box                | 1-11 Thrust washer    | 1-22 Planetary gear  | 2-4 Thrust plate     | 2-15 Brake piston | 2-26 O-ring            |
| 1-1 Housing               | 1-12 Inner race       | 1-23 Thrust plate    | 2-5 Cylinder block   | 2-16 O-ring       | 2-27 Socket head bolt  |
| 1-2 Pinion shaft          | 1-13 Needle bearing   | 1-24 Drive gear      | 2-6 Collar           | 2-17 O-ring       | 2-28 Orifice           |
| 1-3 Plate                 | 1-14 Planetary gear B | 1-35 Plug            | 2-7 Spring           | 2-18 Spring seat  | 2-38 Relief valve assy |
| 1-4 Collar                | 1-15 Thrust plate     | 1-36 O-ring          | 2-8 Washer           | 2-19 Spring       | 2-39 Check valve       |
| 1-5 Tapper roller bearing | 1-16 Screw            | 1-37 O-ring          | 2-9 Snap ring        | 2-20 O-ring       | 2-40 Spring            |
| 1-6 Oil seal              | 1-17 Sun gear B       | 1-53 Socket bolt     | 2-10 Pin             | 2-21 Cover        | 2-41 Plug              |
| 1-7 Tapper roller bearing | 1-18 Holder           | 2 Axial piston motor | 2-11 Retainer holder | 2-22 Ball bearing | 2-42 O-ring            |
| 1-8 Plate                 | 1-19 Thrust washer    | 2-1 Case             | 2-12 Retainer plate  | 2-23 Pin          | 2-43 Plug              |
| 1-9 Collar                | 1-20 Inner race       | 2-2 Ball bearing     | 2-13 Piston assy     | 2-24 Valve plate  | 2-44 O-ring            |
| 1-10 Holder               | 1-21 Needle bearing   | 2-3 Shaft            | 2-14 Disc            | 2-25 Pin          | 2-45 Plug              |
|                           |                       |                      |                      |                   | 2-46 O-ring            |

## 2) DISASSEMBLY

Disassemble the parts by the following procedure.

### (1) Separating the motor and the reduction gear

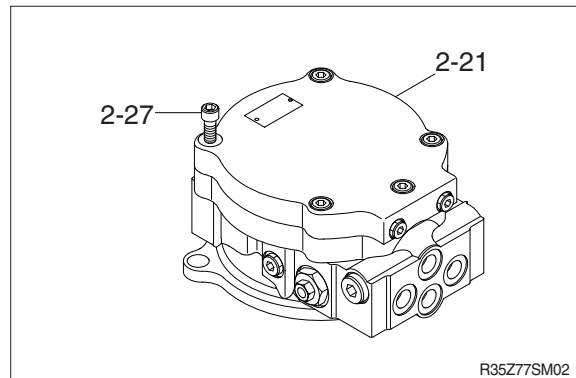
Secure the motor assembly in a vice and remove the socket head bolt (3).



### (2) Disassembling the motor

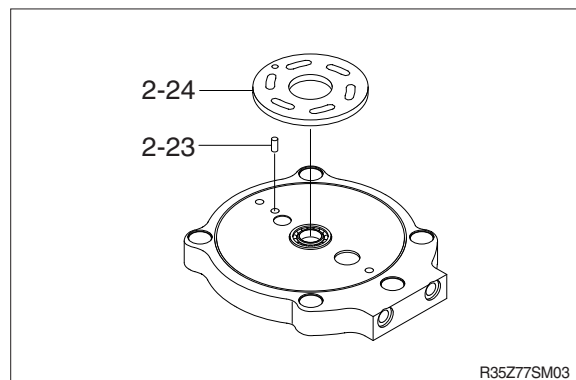
① Secure the motor assembly in a vice.  
Remove the socket head bolts (2-27) and separate the cover (2-21).

※ When separating the cover (2-21), be careful not to drop the valve plate (2-24).

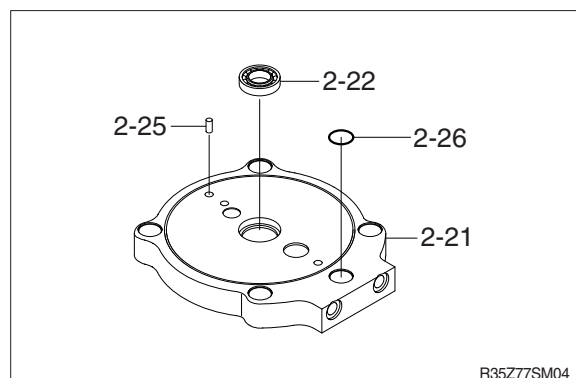


② Remove the valve plate (2-24) and the pin (2-23).

※ The valve plate (2-24) may remain on the motor side.

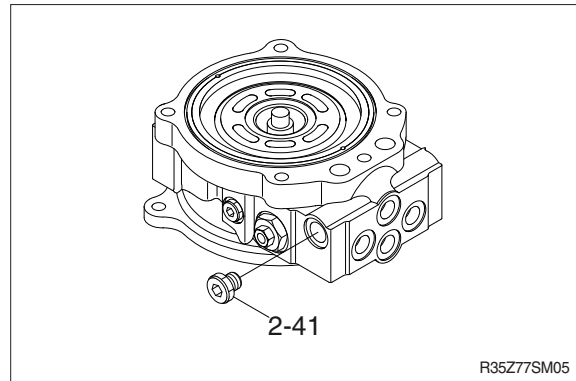


③ Remove the bearing (2-22). Remove the O-ring (2-26).

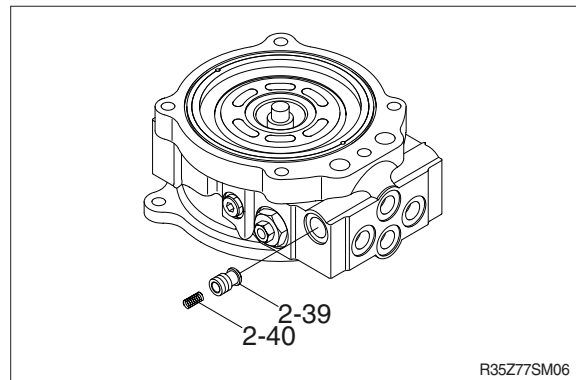


④ Disassemble the check valve.

- a. Loosen to remove the plug (2-41).



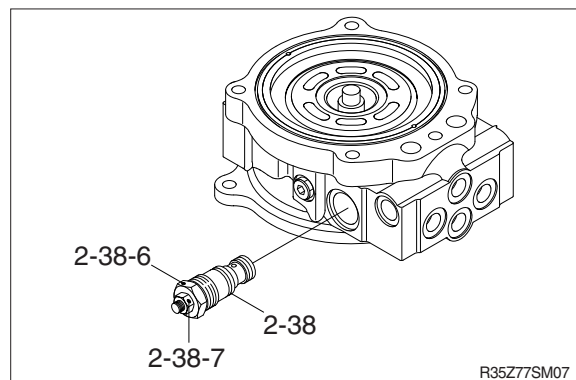
- b. Remove the spring (2-40) and the check valve (2-39).



⑤ Remove the relief valve.

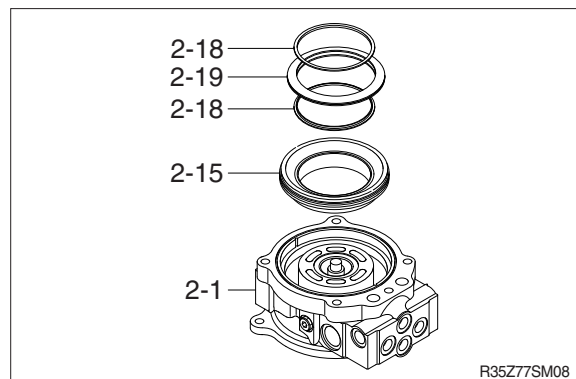
- a. Loosen the plug (2-38-6) to remove the relief valve assembly (2-38).

- ※ Do not move the adjuster kit (2-38-7). Otherwise, the set pressure will change.
- ※ Do not disassemble the relief valve assembly (2-38) because it is a functional component.



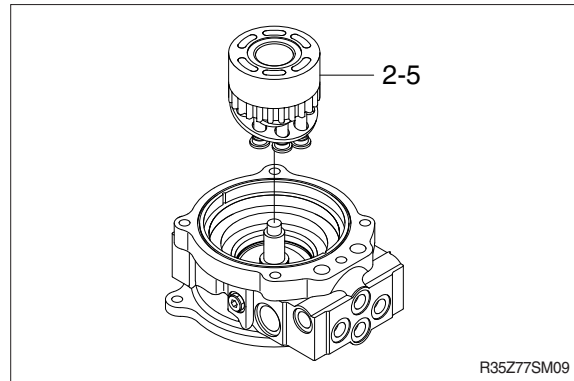
- ⑥ Remove the disc spring assembly (2-19) and the spring seat (2-18), and utilizing the gage port of the case (2-1), remove the parking brake piston (2-15).

- ※ The piston may be ejected by the air pressure. Exercise sufficient care during removal. At the beginning of the work, set a lower air pressure and adjust it while checking the piston for ejection.

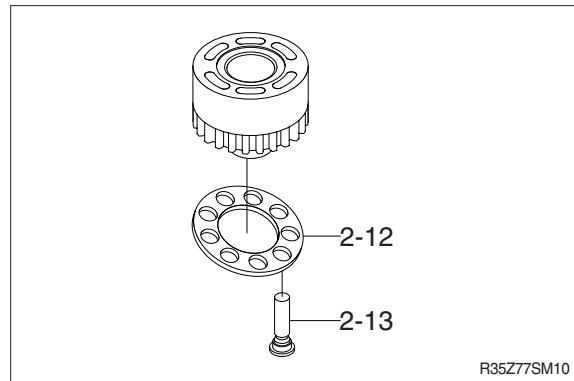


- ⑦ Remove the cylinder block and other associated parts.

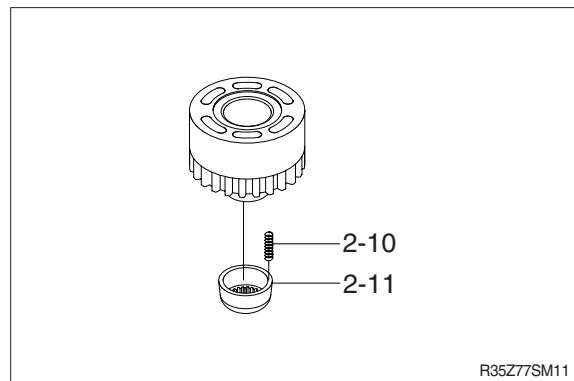
- (2-5) Cylinder block
- (2-6) Collar
- (2-7) Spring
- (2-8) Washer
- (2-9) Snap ring
- (2-10) Pin
- (2-11) Retainer holder
- (2-12) Retainer plate
- (2-13) Piston assembly
- (2-14) Disc(Parking brake spec. only)



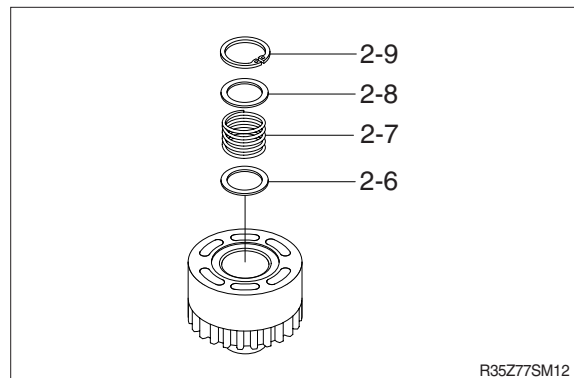
- ⑧ Remove the retainer plate (2-12) and the piston assembly (2-13).



- ⑨ Remove the pin (2-10) and the retainer holder (2-11).

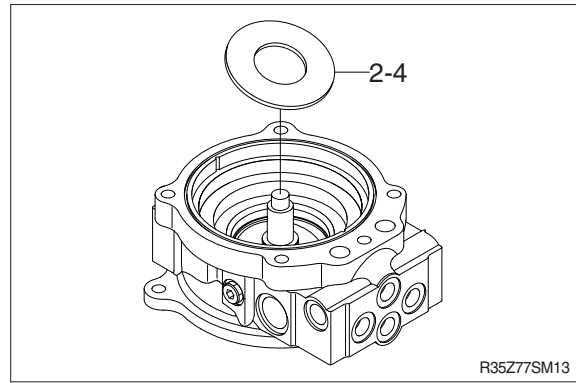


- ⑩ While pushing the washer (2-8), remove the snap ring (2-9).
- ⑪ Remove the collar (2-6), the spring (2-7) and the washer (2-8).

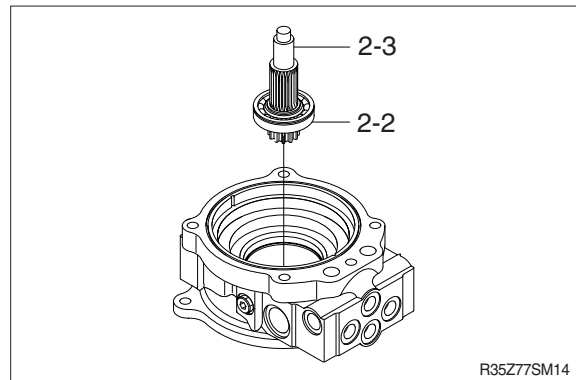




⑫ Remove the thrust plate (2-4).

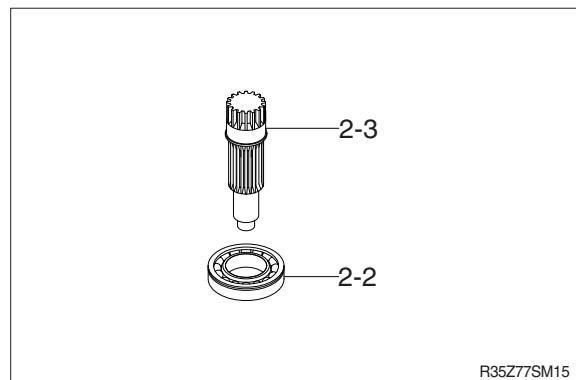


⑬ Lightly strike the end of the shaft (2-3) with a plastic hammer to remove the shaft.



⑭ Disassemble the ball bearing (2-2) and the shaft (2-3).

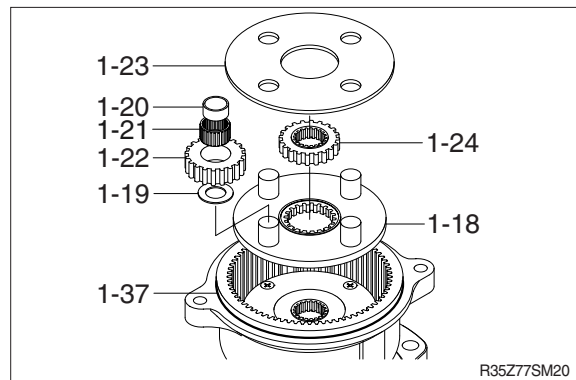
※ The disassembled bearing must not be used.



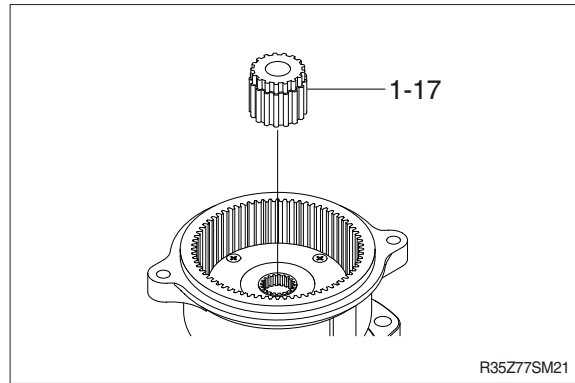
### (3) Disassembling the reduction gear

① Remove the following parts.

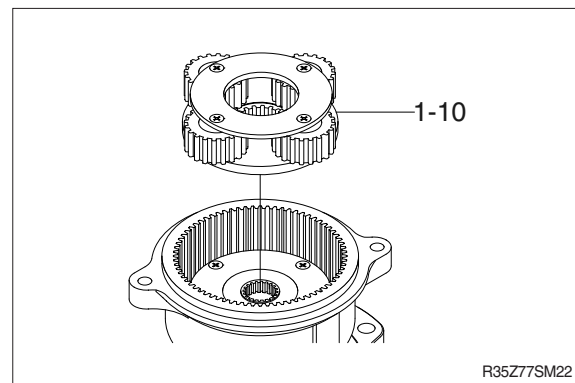
- (1-37) O-ring
- (1-24) Drive gear
- (1-23) Thrust plate
- (1-22) Planetary gear
- (1-21) Needle bearing
- (1-20) Inner race
- (1-19) Thrust washer
- (1-18) Holder



② Remove the sun gear (1-17).



③ Remove the holder (1-10) and other associated parts.

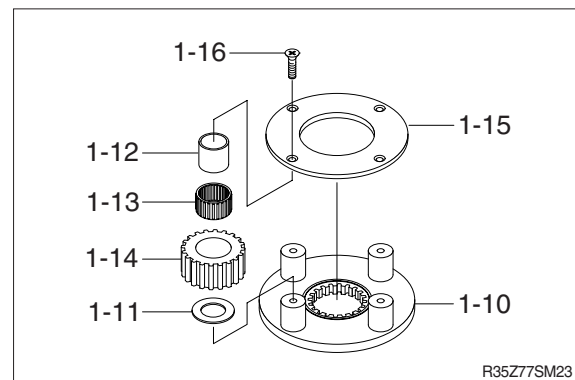


④ Secure the holder (1-10) in a vice and loosen the screw (1-16) to remove the thrust plate (1-15).

※ The screw is hard to remove because loctite was used during assembly. To facilitate the removal of the screw, warm the screw with a drier.

⑤ Remove the following parts.

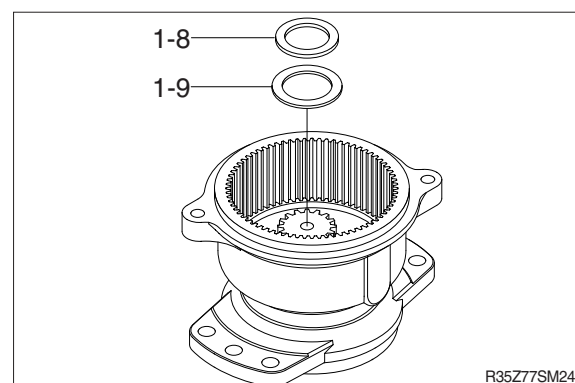
- (1-14) Planetary gear
- (1-13) Needle bearing
- (1-12) Inner race



※ When replacing the taper roller bearings (1-5) and (1-7), the collar (1-9) and the plate (1-8), they are to be replaced by the body assembly.

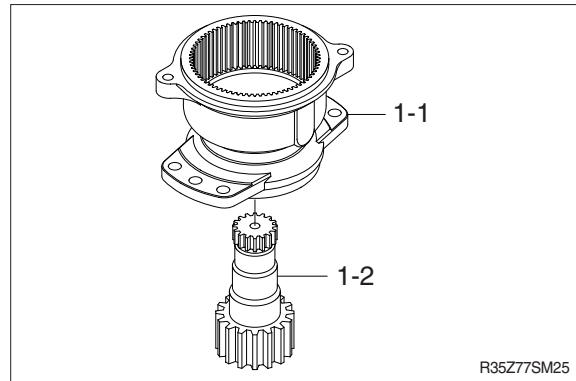
⑥ Remove the following parts.

- (1-8) Plate
- (1-9) Collar

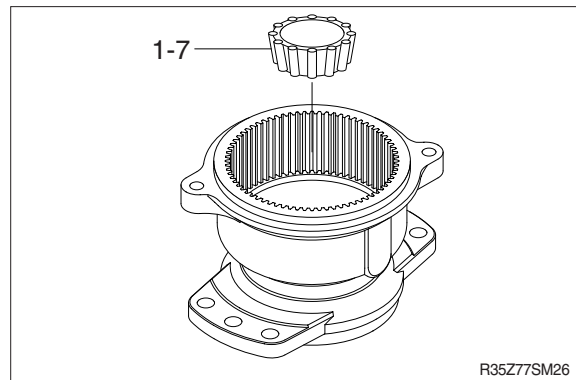


⑦ Remove the pinion shaft (1-2)

※ When removing the shaft, be careful not to drop it. If it is hard to remove, lightly strike it with a plastic hammer.



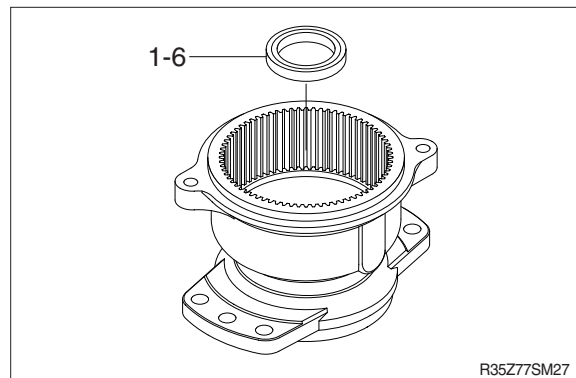
⑧ Remove the inner race of the taper roller bearing (1-7).



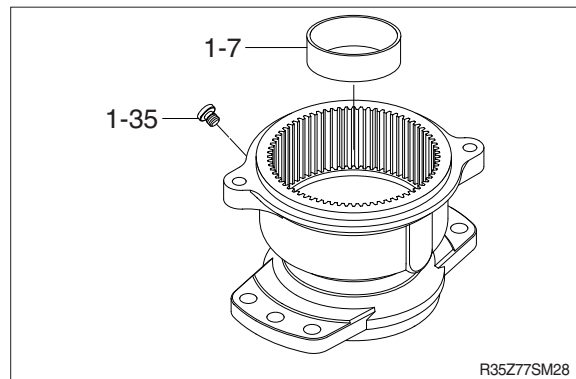
⑨ Break the oil seal (1-6) to remove it.

※ The removed oil seal must not be used again.

When removing it, exercise care to prevent damage to the outer races of the taper roller bearing (1-8) and (1-6).



⑩ Remove the outer race of the taper roller bearing (1-7) and the plug (1-35).



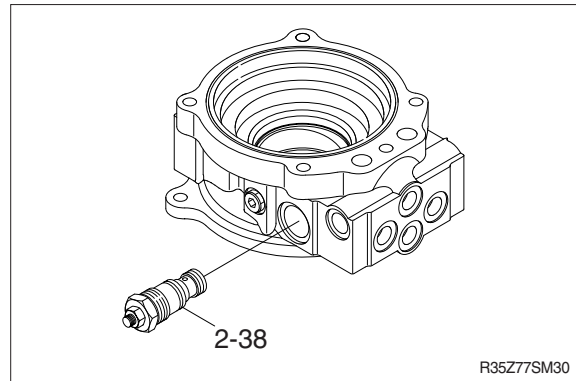
### 3) ASSEMBLY

Assemble the parts by the following procedure.

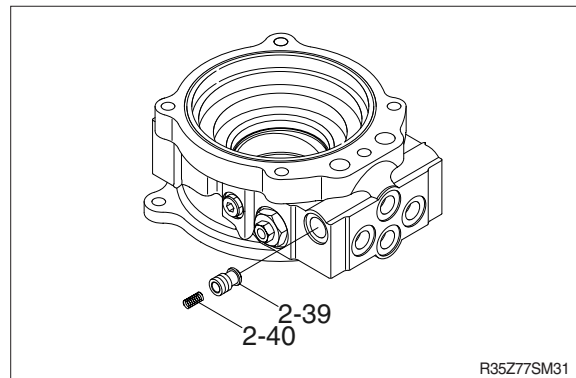
#### (1) Assembling the motor

① Install the relief valve assembly (2-38).

- Tightening torque :  $157 \pm 10 \text{ N} \cdot \text{m}$   
 $161 \pm 1 \text{ kgf} \cdot \text{m}$

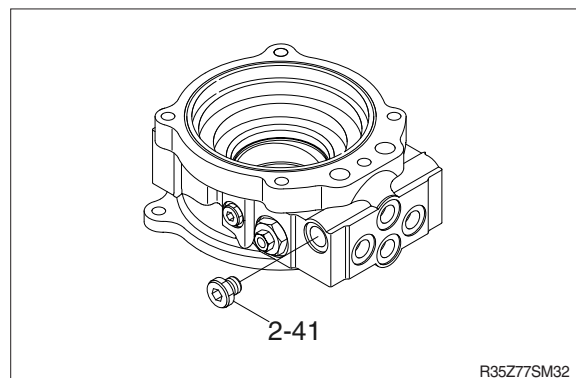


② Assemble the check valve (2-39) and the spring (2-40).



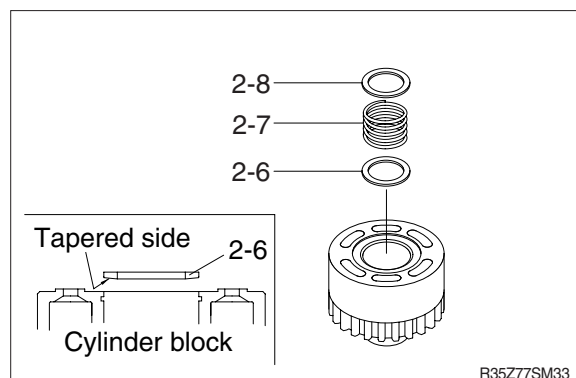
③ Install the plug (2-41).

- Tightening torque :  $39.2 \pm 2.0 \text{ N} \cdot \text{m}$   
 $4.0 \pm 0.2 \text{ kgf} \cdot \text{m}$

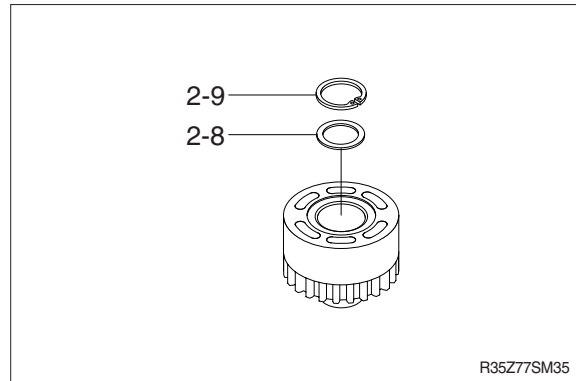


④ Assemble the collar (2-6), the spring (2-7) and the washer (2-8) in the cylinder block (2-5).

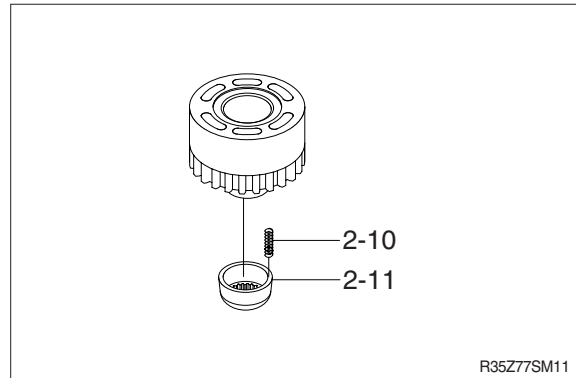
※ Be sure to assemble the collar (2-6) in the correct direction.



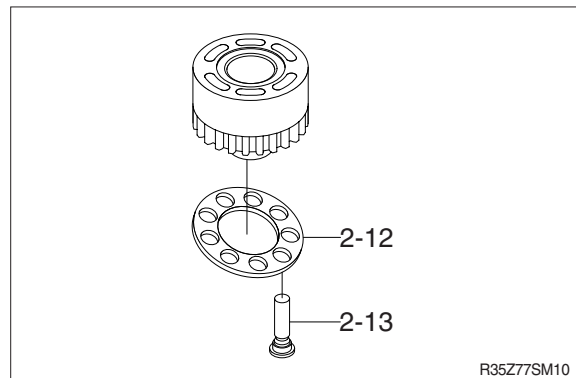
- ⑤ While pushing the washer (2-8), assemble the snap ring (2-9).



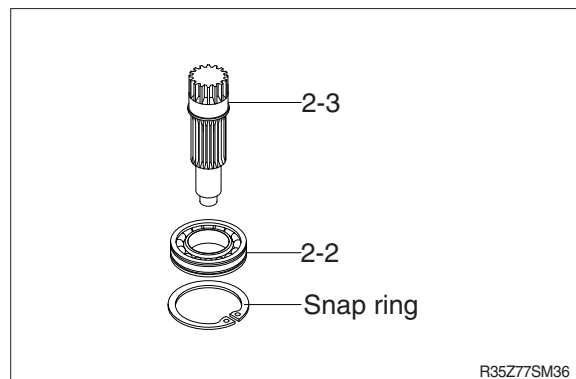
- ⑥ Apply grease to the pin (2-10) and assemble it in the cylinder block (2-5).
- ⑦ Assemble the retainer holder (2-11).



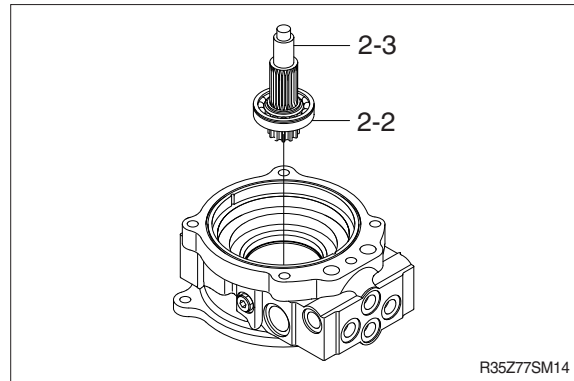
- ⑧ Set the piston assembly (2-13) on the retainer plate (2-12) and assemble it in the cylinder block (2-5).
- ※ Apply an ample amount of hydraulic fluid to the sliding part before assembly.



- ⑨ Press-fit the ball bearing (2-2) on the shaft (2-3).
- ※ Press-fit the ball bearing (2-2) with the attached snap ring facing as shown in the figure.

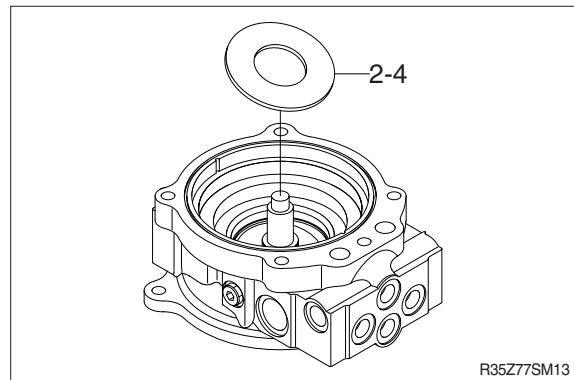


- ⑩ Press-fit the shaft (2-3) and the ball bearing (2-2) in the case (2-1).



- ⑪ Apply grease to the back side of the thrust plate (2-4) and assemble it.

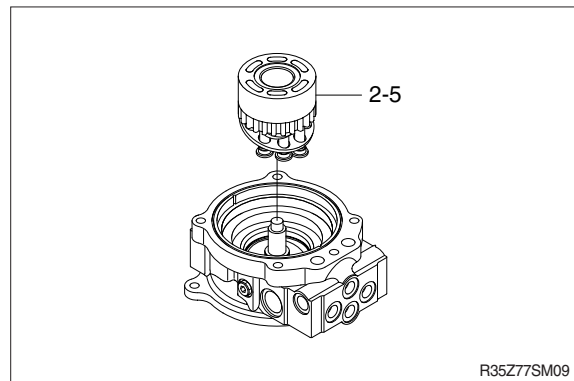
- ※ The thrust plate must be assembled in the correct direction.



- ⑫ Assemble the cylinder block (2-5) and other associated parts.

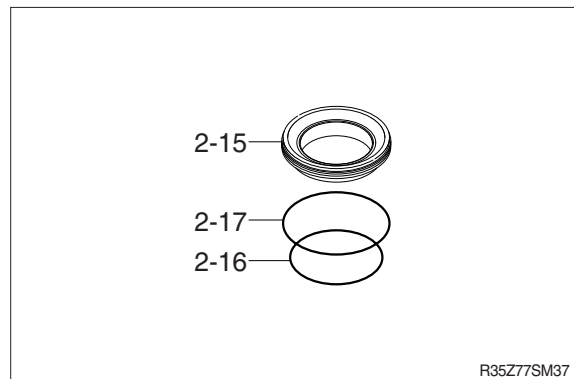
- ※ During assembly, be sure that the pin (2-10) will not come out.

- ※ The disc (2-14) is assembled only for the parking brake spec only.

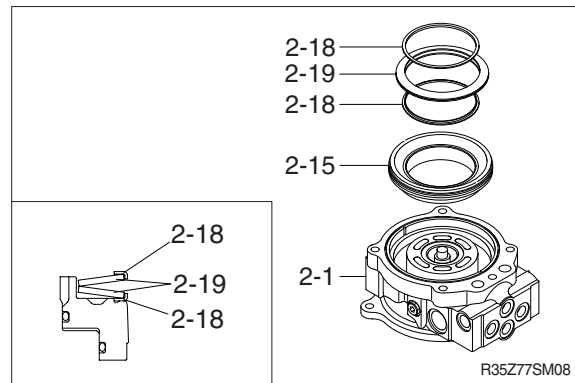


- ⑬ Apply grease to the O-ring (2-16) and the O-ring (2-17) and assemble them on the brake piston (2-15).

- ⑭ While paying attention to the location of the hole of the pin (2-25), assemble the brake piston (2-15) in the case (2-1).

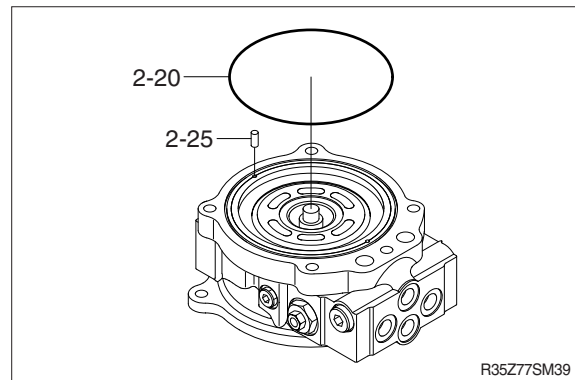


- ⑮ Assemble the spring seat (2-18) and the disc spring (2-19) in the correct direction.

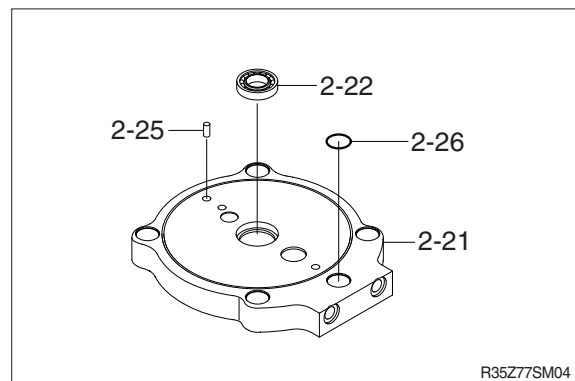


- ⑯ Apply grease to the O-ring (2-20) and assemble it in the case (2-1).  
Check to see if the pin (2-25) can be assembled in the brake piston and case hole. If not, remove the brake piston (2-15) and re-orient it, then reassemble.

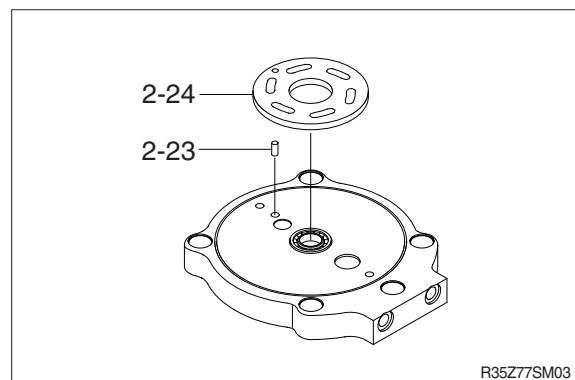
※ Assemble the pin (2-25) while being attached on the cover.



- ⑰ Apply grease to the O-ring (2-26) and the pin (2-25), then assemble them in the cover (2-21).  
Press-fit the ball bearing (2-22).



- ⑱ Install the pin (2-23), then install the valve plate (2-24).  
To prevent it from falling, apply grease to the back side.

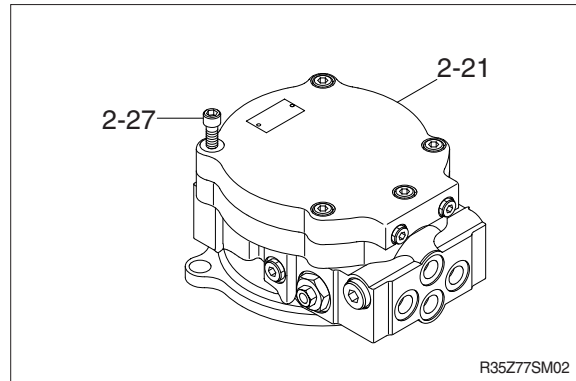


①⑨ While paying attention to the location of the pin (2-25), install the cover (2-21) and other associated parts to the case (2-1).

※ Exercise care so that the pin (2-25) and the valve plate (2-24) will not fall.

②⑩ Loosely tighten the socket head bolts (2-27), then using a torque wrench, tighten them to the specified torque.

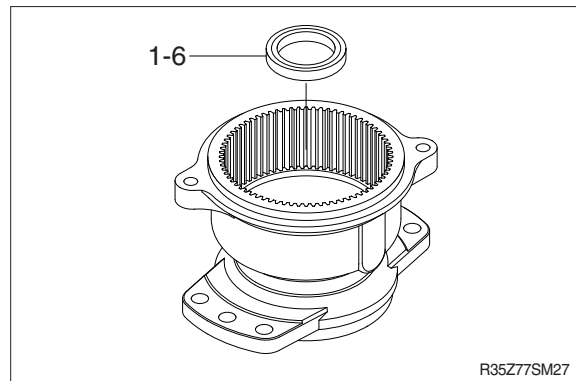
· Tightening torque :  $13 \pm 0.7 \text{ kgf} \cdot \text{m}$   
( $94.4 \pm 5 \text{ lbf} \cdot \text{ft}$ )



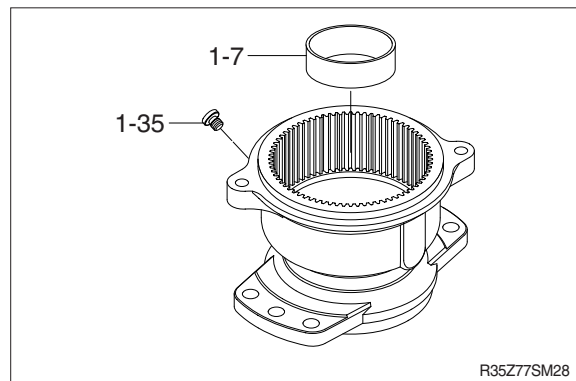
## (2) Assembling the reduction gear

① Press-fit the oil seal (1-6).

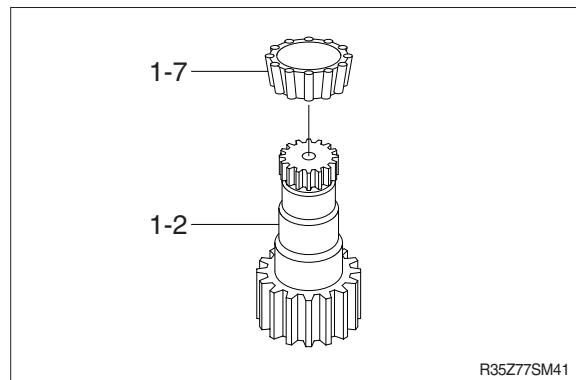
※ Prior to press-fit, apply grease to the oil seal mounting area of the housing and the periphery of the oil seal.



② Press-fit the taper roller bearing (1-7) and install the plug (1-35).



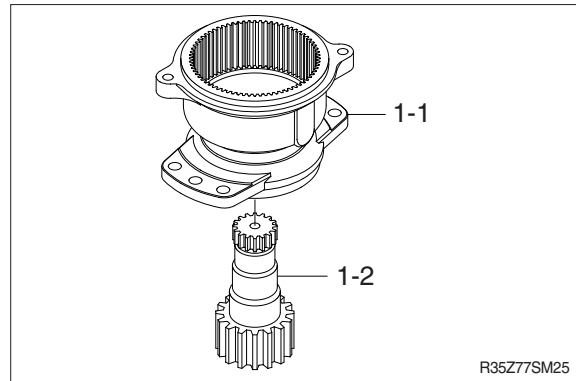
③ Apply grease to the inner race of the taper roller bearing (1-7) assembled on the pinion shaft (1-2).



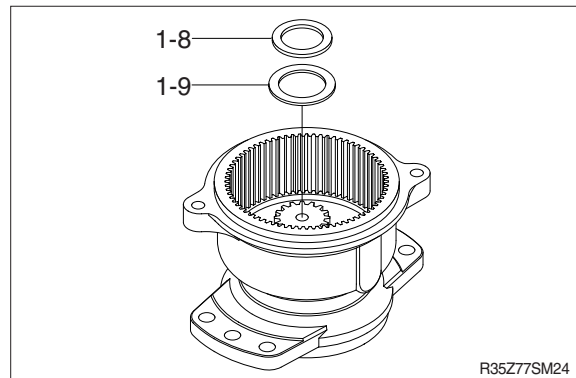


- ④ Install the pinion shaft (1-2) and other associated parts. Install the taper roller bearing inner race (1-7).

※ Prior to assembling the pinion shaft (1-2), etc. apply grease to the lip of the oil seal (1-6).



- ⑤ Install the collar (1-9) and the plate (1-8).

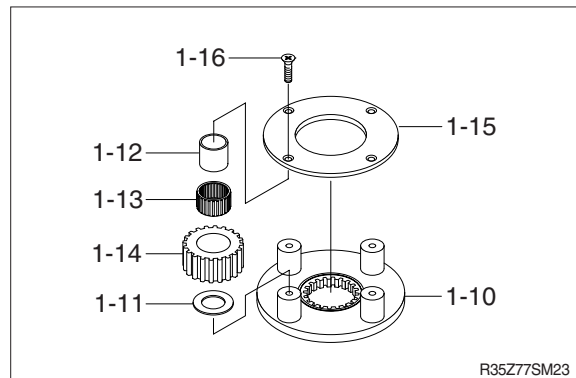


- ⑥ Install the following parts on the holder.

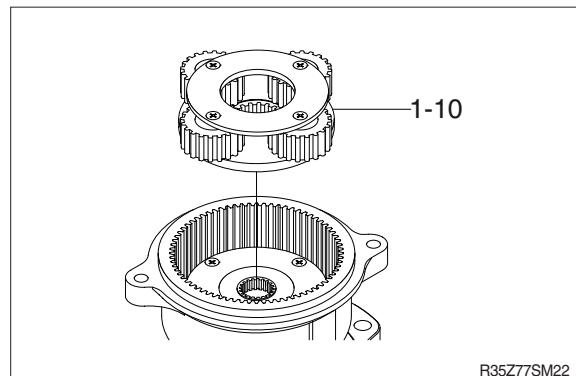
- (1-10) Holder
- (1-11) Thrust washer
- (1-12) Inner race
- (1-13) Needle bearing
- (1-14) Planetary gear B
- (1-15) Thrust plate
- (1-16) Screw

※ Apply loctite 242 to the screw prior to tightening it.

· Tightening torque :  $0.4 \pm 0.05 \text{ kgf} \cdot \text{m}$   
 $2.9 \pm 0.3 \text{ lbf} \cdot \text{ft}$

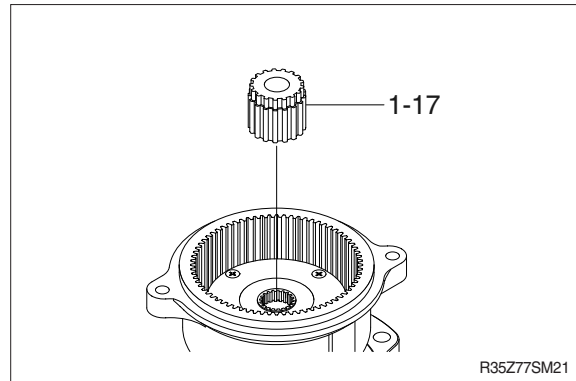


- ⑧ Install the holder (1-10) and other associated parts.

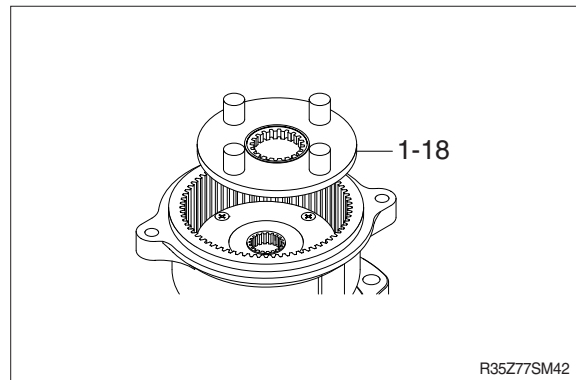


⑨ Install the sun gear (1-17).

※ Install the sun gear (1-17) with the snap ring facing as shown in the figure.

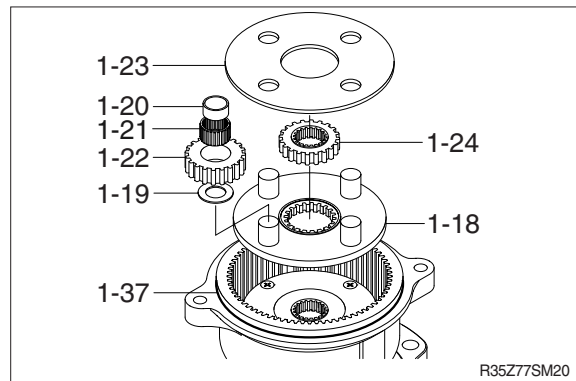


⑩ Install the holder (1-18).



⑪ Install the following parts.

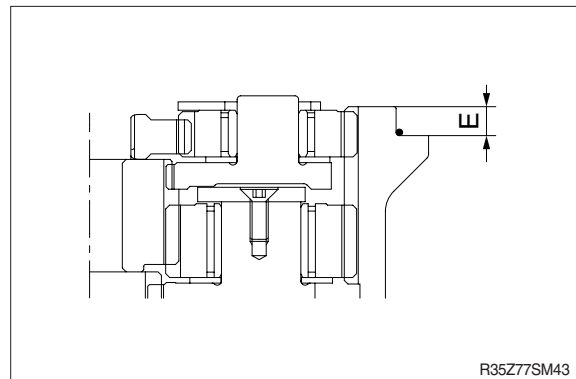
- (1-19) Thrust washer
- (1-20) Inner race
- (1-21) Needle bearing
- (1-22) Planetary gear A
- (1-23) Thrust plate
- (1-24) Drive gear
- (1-37) O-ring



※ Selection for thrust plate (1-15).

When any consisting parts of reduction unit were changed, select and install thrust plate corresponding to the measured value "E" referring to the below table.

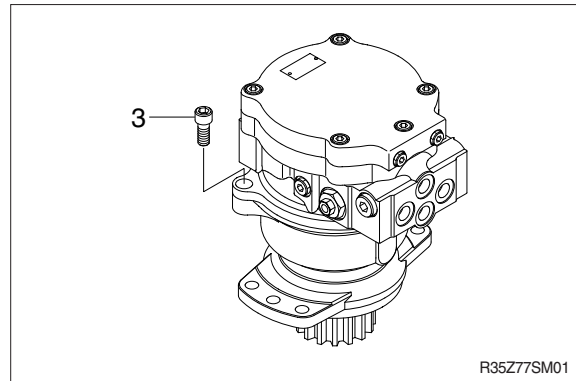
E dimension (measured value)	Less than 6.6	6.6~7.2	More than 7.2
Part no. of thrust plate 1-23 (plate thickness)	XJBV-00129 (3.2 mm)	XJBV-00130 (2.8 mm)	XJBV-00131 (2.3 mm)



### (3) Assembling the whole motor assembly

Place the reduction gear assembly on the motor assembly and loosely tighten the socket head bolt (3), then tighten it to the specified torque.

- Tightening torque :  $13 \pm 0.7 \text{ kgf} \cdot \text{m}$   
( $94.4 \pm 5 \text{ lbf} \cdot \text{ft}$ )



## GROUP 6 TRAVEL DEVICE

### 1. REMOVAL AND INSTALL

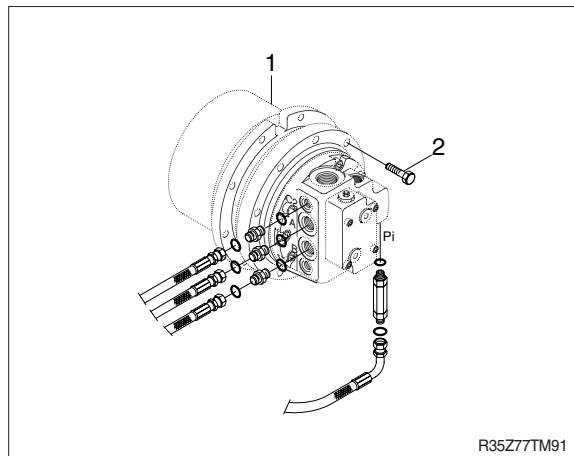
#### 1) REMOVAL

- (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.

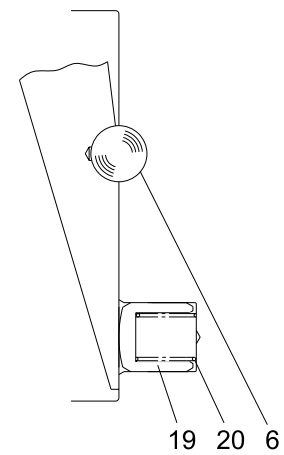
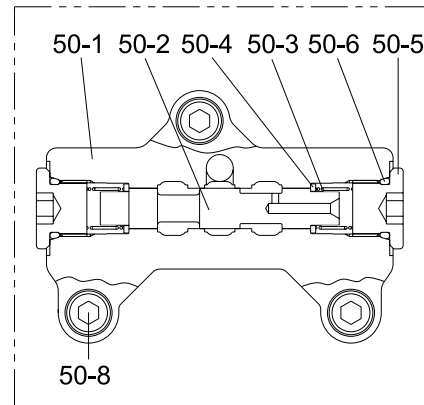
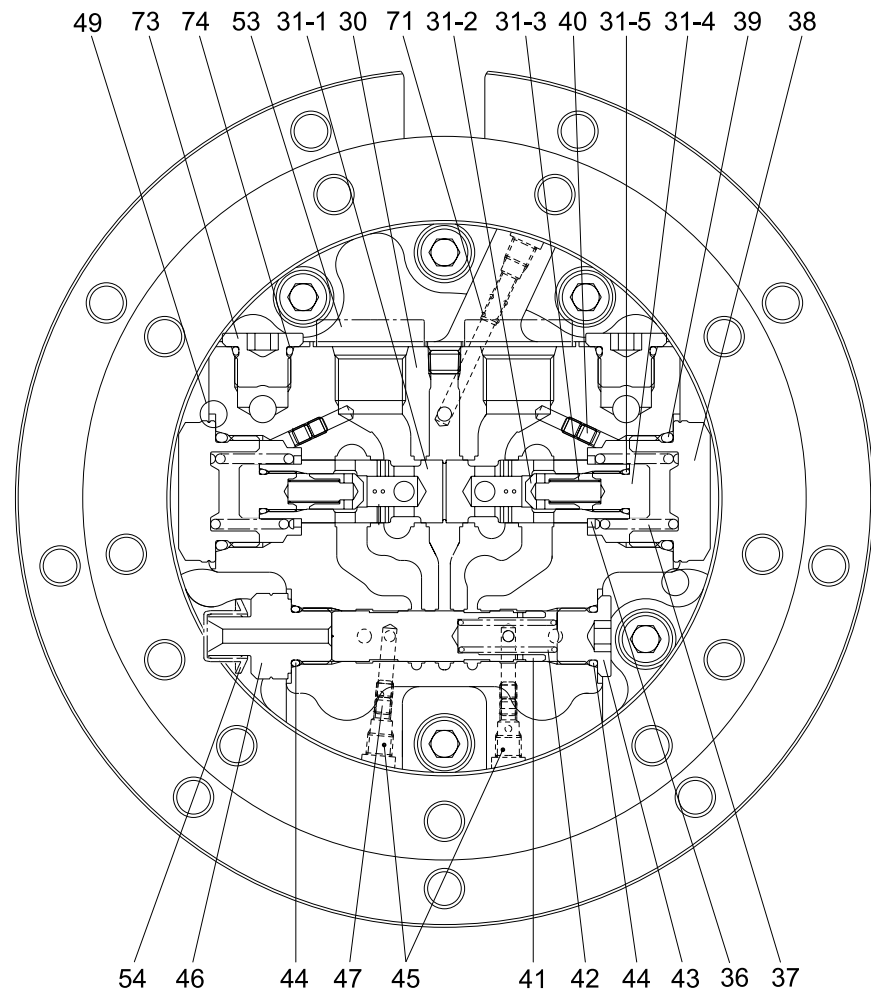
- (4) Remove the track shoe assembly.  
For details, see **removal of track shoe assembly**.
- (5) Remove the cover.
- (6) Remove the hose.  
※ Fit blind plugs to the disconnected hoses.
- (7) Remove the bolts and the sprocket.
- (8) Sling travel device assembly (1).
- (9) Remove the mounting bolts (2), then remove the travel device assembly.  
· Weight : 80 kg (180 lb)



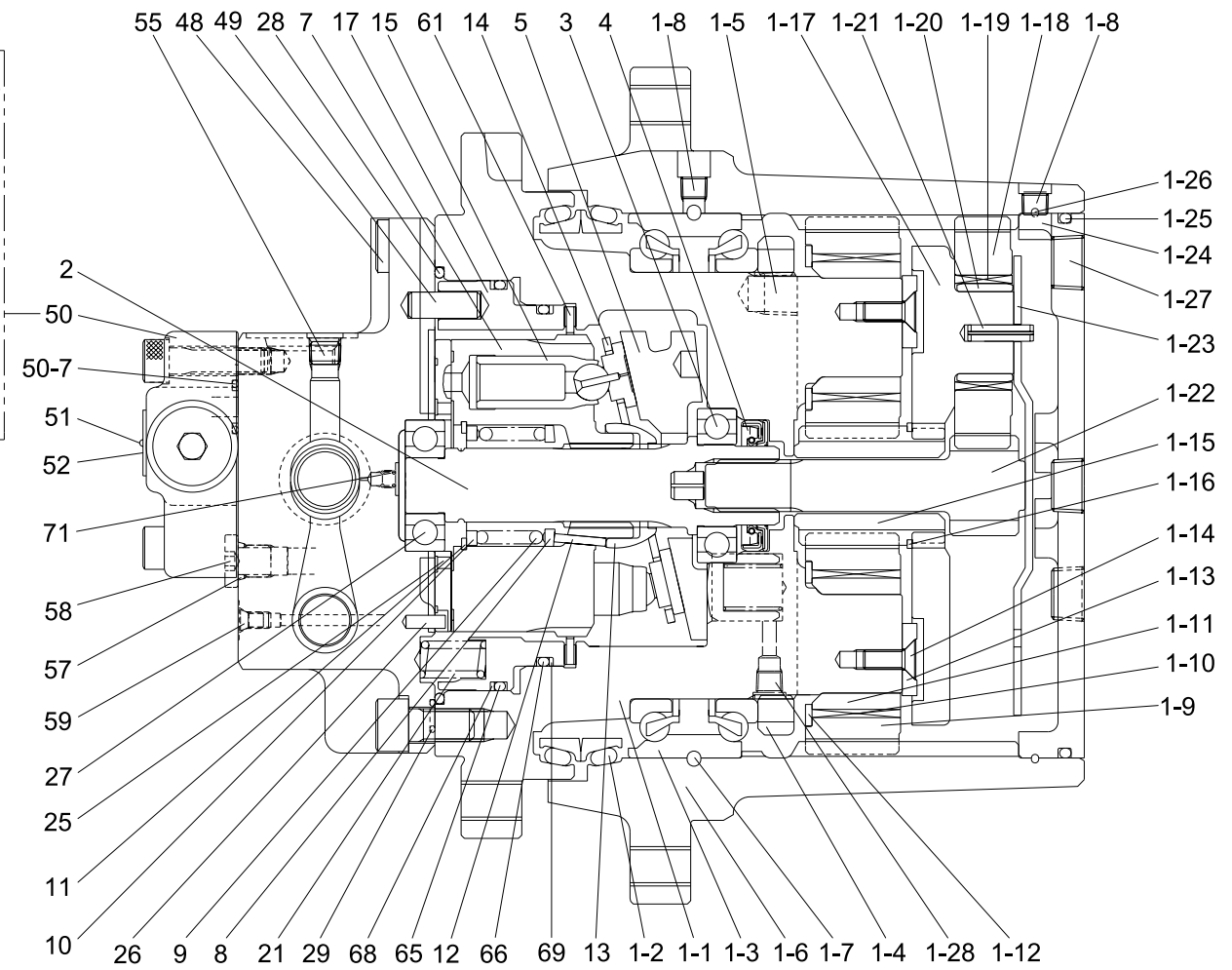
#### 2) INSTALL

- (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) STRUCTURE



DETAIL OF 2 SPEED  
LEAN TURNING PORTION



- |                      |                           |                   |                  |                     |                       |
|----------------------|---------------------------|-------------------|------------------|---------------------|-----------------------|
| 1 Gear box           | 1-16 Snap ring            | 3 Ball bearing    | 21 Spring        | 40 Orifice          | 50-7 O-ring           |
| 1-1 Flange holder    | 1-17 Holder               | 4 Oil seal        | 26 Pin           | 41 Spool            | 50-8 Socket head bolt |
| 1-2 Floating seal    | 1-18 Planetary gear (A)   | 5 Swash plate     | 27 Ball bearing  | 42 Spring           | 51 Name plate         |
| 1-3 Angular bearing  | 1-19 Needle bearing       | 6 Steel ball      | 28 O-ring        | 43 Plug             | 52 Drive screw        |
| 1-4 Ring nut         | 1-20 Inner race           | 7 Cylinder block  | 29 O-ring        | 44 O-ring           | 55 Plug               |
| 1-5 Plug             | 1-21 Spring pin           | 8 Color           | 30 Base plate    | 45 Plug             | 57 O-ring             |
| 1-6 Housing          | 1-22 Drive gear           | 9 Spring          | 31 Plunger assy  | 46 Plug             | 58 Plug               |
| 1-7 Steel ball       | 1-23 Thrust plate (1.8 t) | 10 Washer         | 31-1 Plunger     | 47 Orifice          | 59 Plug               |
| 1-8 Plug             | 1-23 Thrust plate (2.3 t) | 11 Snap ring      | 31-2 Check valve | 48 Socket head bolt | 61 Disc               |
| 1-9 Planetary gear B | 1-23 Thrust plate (2.8 t) | 12 Pin            | 31-3 Spring      | 49 Pin              | 65 O-ring             |
| 1-10 Needle bearing  | 1-24 Cover                | 13 Holder         | 31-4 Plug        | 50 Valve assy       | 66 O-ring             |
| 1-11 Collar          | 1-25 O-ring               | 14 Retainer plate | 31-5 O-ring      | 50-1 Valve body     | 68 Backup ring        |
| 1-12 Thrust washer   | 1-26 Wire                 | 15 Piston assy    | 36 Spring seat   | 50-2 Spool          | 69 Backup ring        |
| 1-13 Thrust plate    | 1-27 Plug                 | 17 Brake piston   | 37 Spring        | 50-3 Spring         | 71 Spring             |
| 1-14 Screw           | 1-28 Plug                 | 19 Piston assy    | 38 Cap           | 50-4 Spring seat    | 73 Plug               |
| 1-15 Sun gear        | 2 Shaft sub assy          | 20 Spring         | 39 O-ring        | 50-5 Plug           | 74 O-ring             |
|                      |                           |                   |                  | 50-6 O-ring         |                       |

R35Z72TM01

### 3) MAINTENANCE INSTRUCTION

#### (1) Necessary tool to assemble

No.	Parts name		Applicable components or parts
1	Torque wrench (preset type)	(230)	Plug (1-5), (1-8), (45), (58), Screw (1-14) Orifice (40), (47) Socket head bolt (50-8)
2		(450)	Socket head bolt (48) Plug (1-27), (31-4), (43), (46), (50-5)
3		(1800)	Housing (1-6), Ring nut (1-4) Cap (38)
4	Hexagon bit for torque wrench	Width across flats 2.0	Orifice (40)
5		Width across flats 2.5	Orifice (47)
6		Width across flats 4.0	Plug (45), Screw (1-14)
7		Width across flats 5.0	Plug (1-8), (31-4)
8		Width across flats 6.0	Socket head bolt (50-8) Plug (1-5), (1-27), (31-4), (43), (58) Socket head bolt (48)
9		Width across flats 8.0	Plug (1-5), (50-5), Housing (1-6)
10		Width across flats 10.0	Socket head bolt (48)
11	Socket for socket wrench	Width across flats 22.0	Plug (46)
12		Width across flats 36.0	Cap (38)
13	Screw driver		Floating seal (1-2) Wire (1-26), Base plate (30) Oil seal (4)
14	Hammer		Angular bearing (1-3) Plug (1-5), Steel ball (1-7) Shaft (2), Oil seal (4) Pin (26)
15	Plastic hammer		Base plate (30), Cover (1-24)
16	Cutting pliers		Wire (1-26)
17	Snap ring pliers		Snap ring (11)
18	Punch		Plug (1-5)

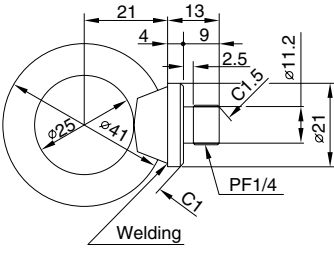
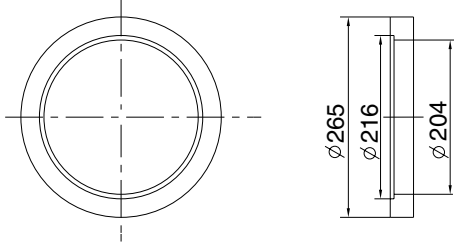
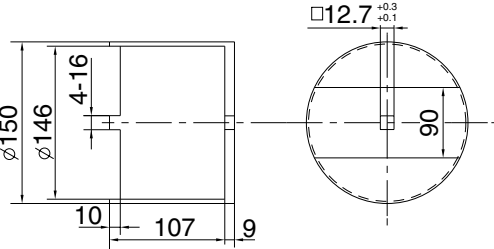
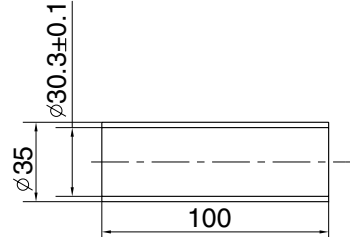
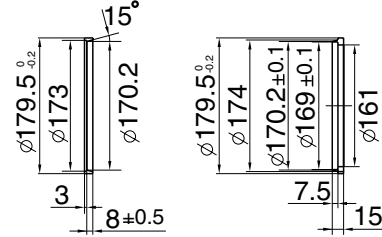
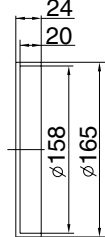
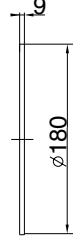
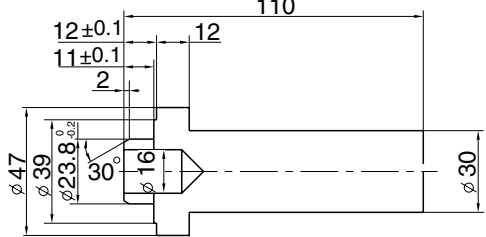
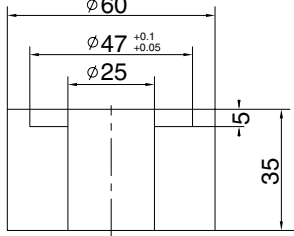
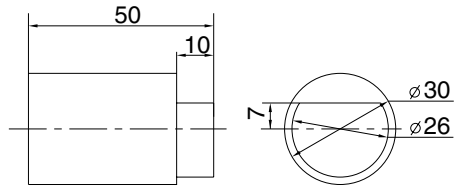
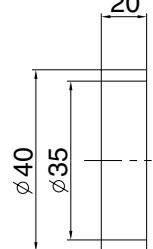
## (2) Special Tools

### Table

No.	Parts name	Applicable components or parts
S-1	Pin Dia. 5.5 × 30 mm	Plug (31-4)
S-2	Eyebolt PF 1/4	Cover (1-24), Wire (1-26)
S-3	Round bar dia. 20 × 1000 mm	Cover (1-24), Wire (1-26)
S-4	Piano wire dia. 0.2 × 700 mm	Steel ball (1-7)
S-5	Housing disassembly jig	Housing (1-6)
S-6	Ring nut tightener	Ring nut (1-4)
S-7	Round bar dia. 10 × 150 mm	Angular bearing (1-3), Shaft (2)
S-8	Ball bearing disassembly jig	Ball bearing (3)
S-9	Floating seal assembly jig	Floating seal (1-2)
S-10	Angular bearing press fitting jig	Angular bearing (1-3)
S-11	Flange holder press fitting jig	Flange holder (1-1)
S-12	Oil seal press fitting jig	Oil seal (4)
S-13	Ball bearing press fitting jig	Shaft (2), Ball bearing (3)
S-14	Shaft sub assembly press fitting jig	Shaft (2), Ball bearing (3)
S-15	Snap ring assembly jig	Snap ring (11)
S-16	Ball bearings press fitting jig	Ball bearing (27)

※ Refer to page 7-67 for detail figure. (S1~S16)

• Tools

 <p>S-2 Eye bolt</p>	 <p>S-5 Housing disassembly</p>
 <p>S-6 Ring nut tightener</p>	 <p>S-8 Ball bearing disassembly</p>
 <p>S-9 Floating seal assembly</p>	 <p>S-10 Angular bearing press fitting</p>
 <p>S-11 Flange holder press fitting</p>	 <p>S-12 Oil seal press fitting</p>
 <p>S-13 Ball bearing press fitting</p>	 <p>S-15 Snap ring assembly</p>
 <p>S-16 Ball bearing press fitting</p>	



## **2. DISASSEMBLY**

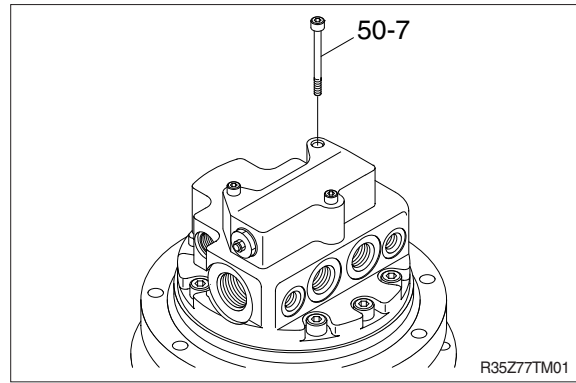
### **1) GENERAL PRECAUTIONS**

- (1) Before disassembling the TM motors, 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 2-2, 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) DISASSEMBLE TRAVEL MOTOR BY THE FOLLOWING PROCEDURE

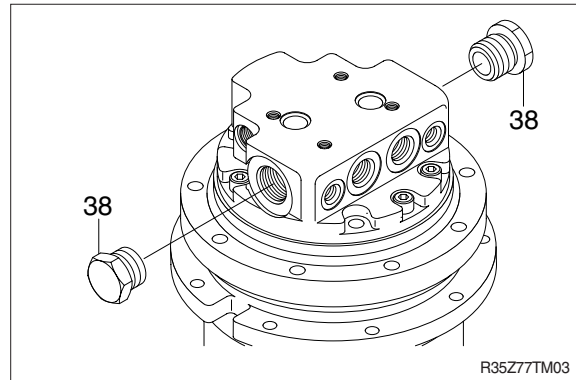
- (1) Fix the motor with vise.  
Loosen socket head bolt (50-7), (50-8)  
and remove valve assy (50).

- Tools required :  
Torque wrench (No. 1)  
Hexagonal bit for torque wrench (No. 7)

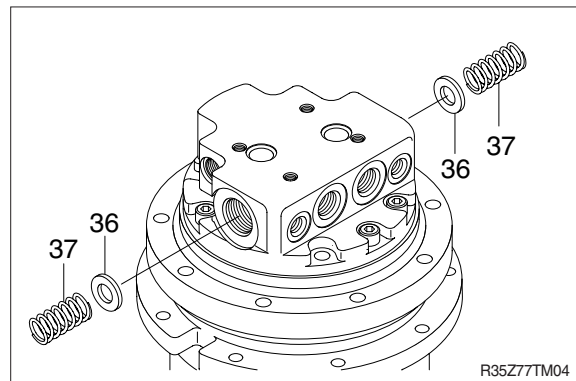


- (2) Remove cap (38).

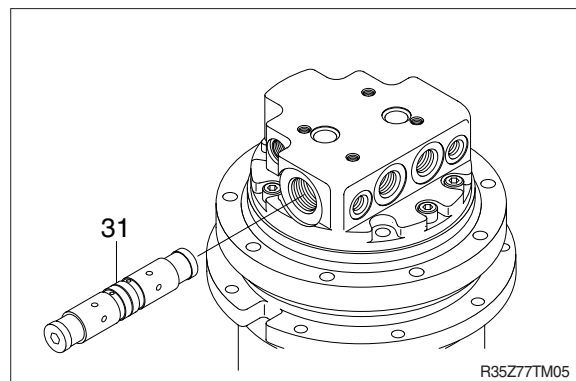
- Tools required :  
Torque wrench (No. 3)  
Socket for torque wrench (No. 12)



- (3) Take out spring (37), spring seat (36).

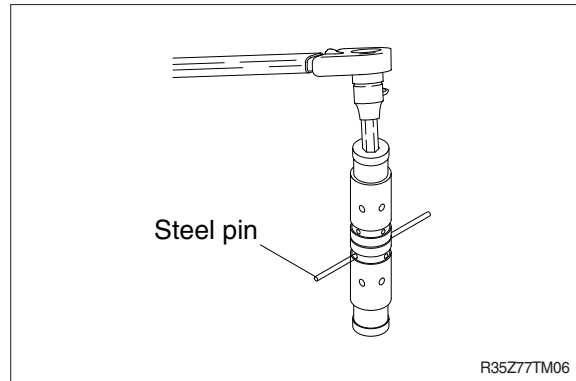


- (4) Remove plunger sub assy (31) turning slowly.  
Be careful not to damage around the plunger.

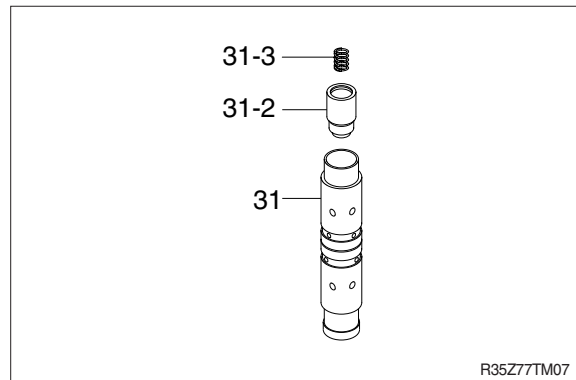


(5) Disassembly of plunger sub assy is not required when it operates normally.  
 Insert pin S-1, dia. 5.5×30, in the through hole dia.6 of the plunger sub assy, and fix it with vase.

- Tools required :  
 Torque wrench (No. 2)  
 Hexagonal bit for torque wrench (No. 8)  
 Pin (S-1)

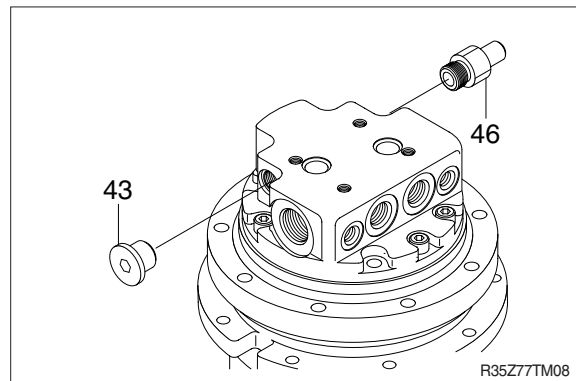


(6) Remove spring (31-3), check valve (31-2).  
 And store the parts so that the respective parts make a set as it was when assembling again, taking care of the combination of the right and left check valves to the plunger.

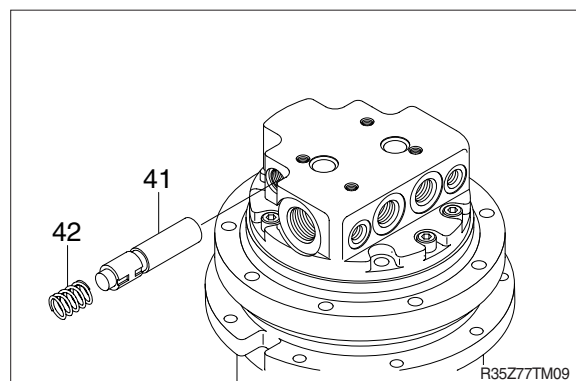


(7) Remove plugs (43), (46).

- Tools required :  
 Torque wrench (No. 2)  
 Hexagonal bit for torque wrench (No. 9)  
 Socket for torque wrench (No. 11)



(8) Removing spring (42), spool assy (41).  
 Be careful not to damage around the spool.

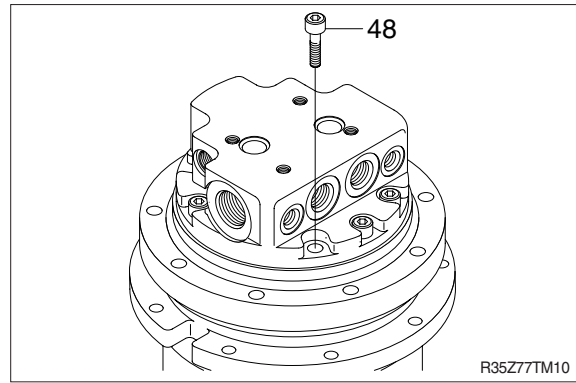


(9) Remove socket head bolt (48).

- Tools required :  
Torque wrench (No. 3)  
Hexagonal bit for torque wrench (No. 10)

※ **Points (with parking brake type)**

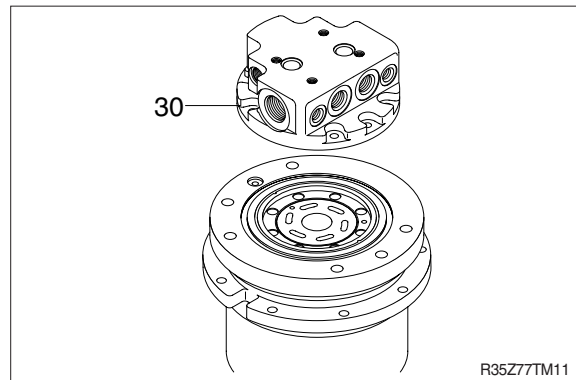
To disassemble the motor easily, socket head bolt (48) should be loosened evenly because base plate (30) lift up by the reactive force of springs (21), (32).



(10) Remove base plate (30).

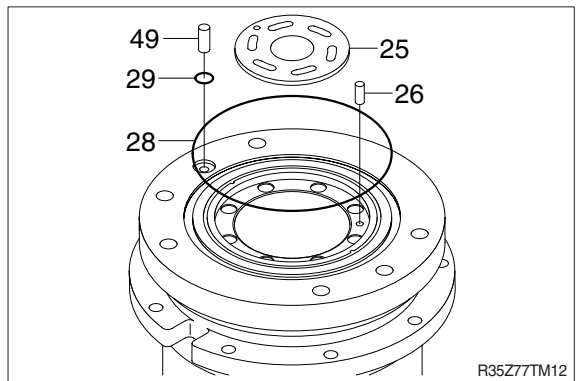
Then, pay attention so that cylinder block (7) does not come out. When it is difficult to remove, strike it by use of plastic hammer. If it is more difficult to remove, remove it by lightly prying with screwdriver.

- Tools required :  
Plastic hammer (No. 15)  
Screwdriver (No. 13)



(11) With parking brake type.

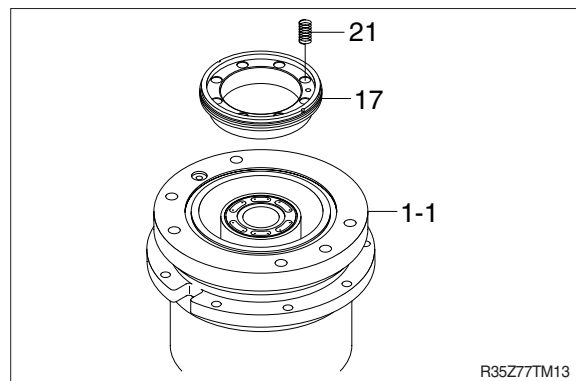
Remove pin (26), (49), valve plate (25), O-rings (28, 29).



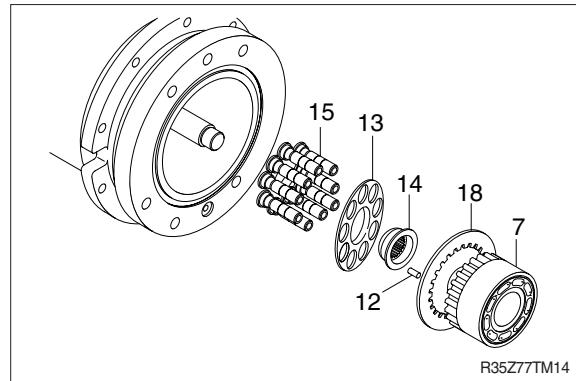
(12) This process is the only parking brake type.

Remove spring (21) and brake piston (17). Blow compressed air into parking brake releasing port (show the photograph with red circle) on flange holder(1-1).

- ※ Before working, put rag on all surface of brake piston because brake piston fly out and oil flies off when working.



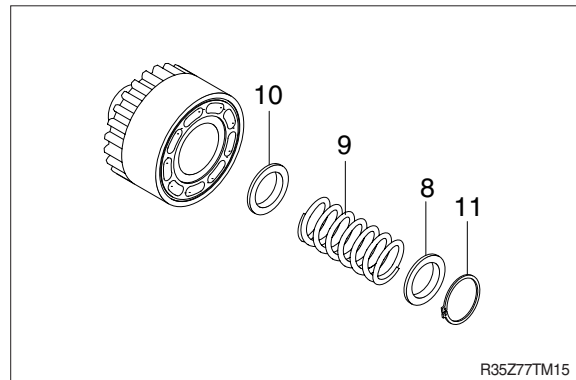
- (13) Remove cylinder block sub assy (7), pin (12), retainer holder (13), retainer plate (14), piston sub assy (15). Be careful not to damage the sliding surface of the cylinder block.  
Only parking brake type, remove disk plate (18)



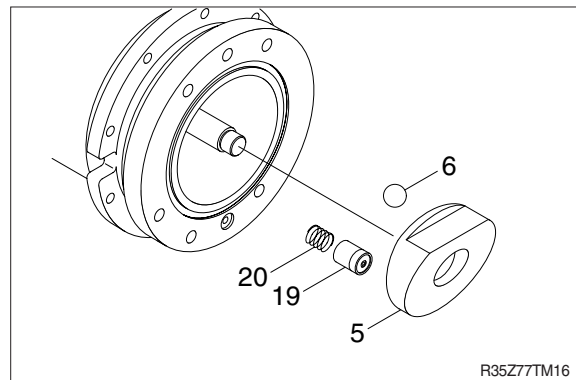
- (14) Remove snap ring (11) by use of plier.  
Remove washer (8), spring seat (10) and spring (9). Be careful not to damage the sliding surface of the cylinder block.

- Tools required :  
Snap ring pliers (No. 17)

- ※ Pay attention not to pinch fingers by the inside spring when removing the snap ring.

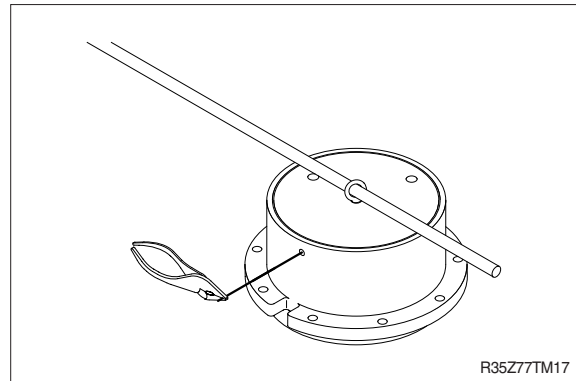


- (15) Remove swash plate (5), steel ball (6), piston sub assy (19) and spring (20).



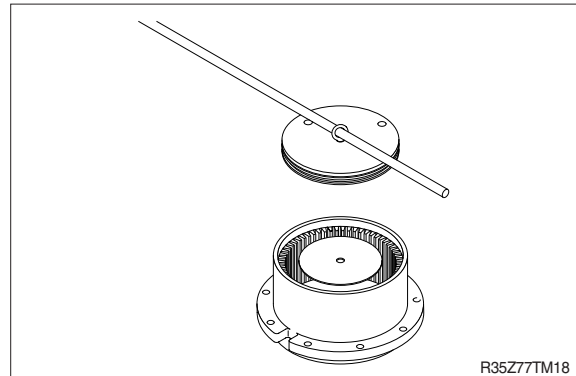
(16) Remove plugs (1-27), (1-8). Attach eyebolt (PF 1/4) to the threaded hole of plug (1-27) and insert pry-bar (length 1 [m]) in the eye hole, and turn the bar until wire (1-26) can be seen through the threaded hole of plug (1-8). Draw the wire outside when the wire end can be seen.

- Tools required :
  - Torque wrench (No. 1, No. 2)
  - Eyebolt PF 1/4 (S-2)
  - Hexagonal bit for torque wrench (No. 7, No. 8)
  - Round bar dia. 20 × 1000 mm (S-3)
  - Screw driver (No. 13), cutting pliers (No. 16)

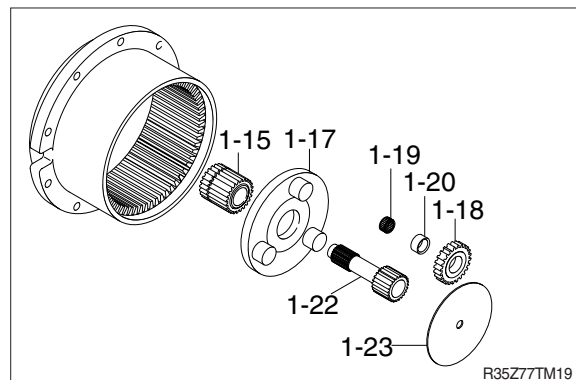


(17) Hook eyebolt and remove cover (1-24)

- Tools required :
  - Eyebolt PF 1/4 (S-2)
  - Round bar dia. 20 × 1000 mm (S-3)



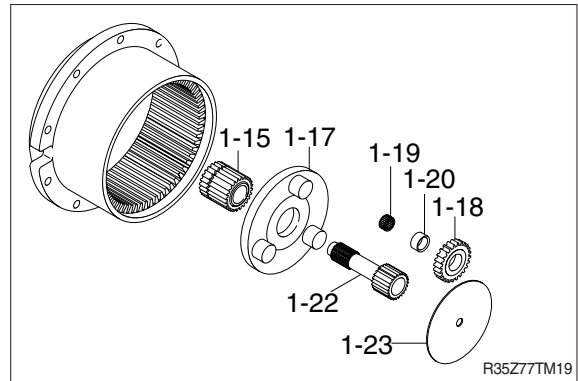
(18) Remove sun gear assy (1-15), holder (1-17), planetary gear A (1-18), needle bearing (1-19), inner race (1-20), drive gear (1-22) and thrust plate (1-23).



(19) Remove thrust plate (1-13) and screw (1-14).

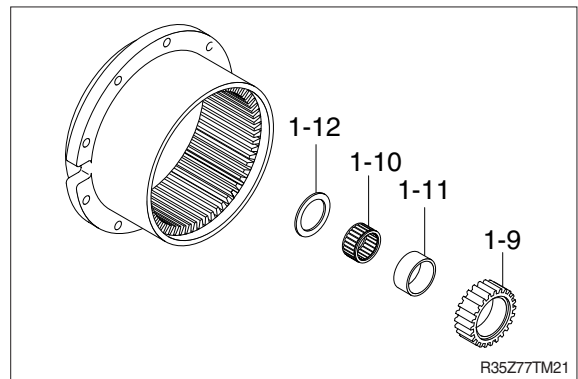
- Tools required :  
Torque wrench (No. 1)  
Hexagonal bit for torque wrench (No. 6)

※ It is easy to remove the screw after heated fully by heater because screw (1-14) is applied loctite.



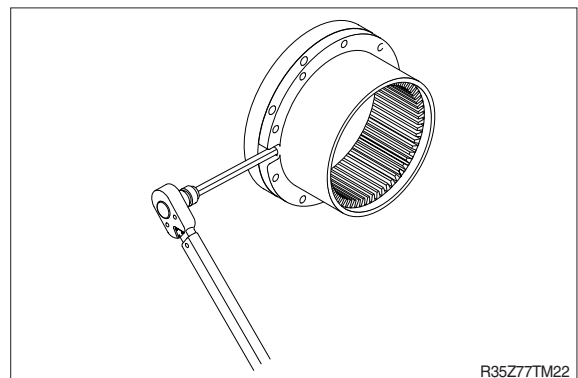
(20) Remove planetary gear B (1-9), needle bearing (1-10), inner race (1-11) and thrust washer (1-12).

Be careful not to damage the tooth surface of gear and the rolling section of the collar.



(21) Remove plug (1-8).

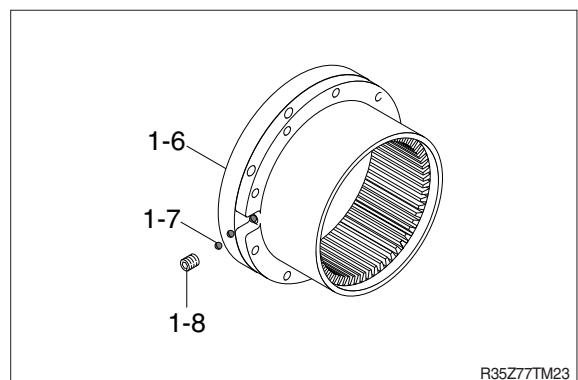
- Tools required :  
Torque wrench (No. 1)  
Hexagonal bit for torque wrench (No. 7)



(22) Take out steel balls (1-7) from the threaded hole of plug (1-8). After decreasing (thinner, white gasoline. etc), take out them by blowing air. Put piano wire through the threaded hole to be sure that all steel balls (1-7) are taken out.

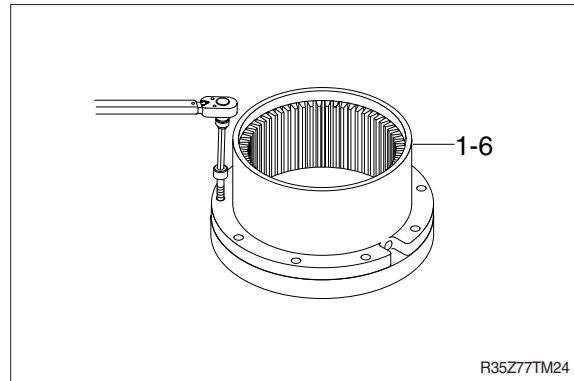
- Tools required :  
Hammer (No. 14), piano wire (S-4)

※ When it is difficult to remove, take out steel balls (1-7) striking around housing (1-6) by hammer.



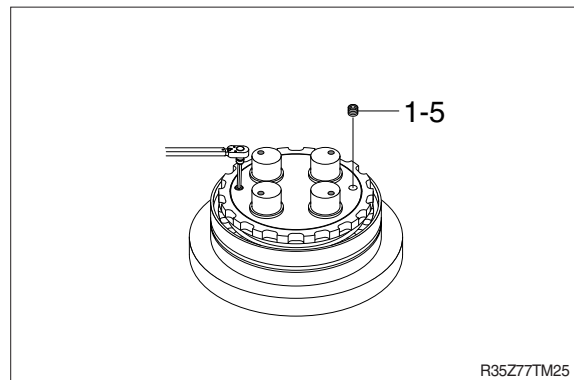
(23) Attach jig between flange holder (1-1) and housing (1-6), and tighten 3 bolts M14×2.0 uniform from the housing side.

- Tools required :  
Torque wrench (No. 3)  
Hexagonal bit for torque wrench (No. 10)  
Housing disassembly (S-5)



(24) Remove plug (1-5).

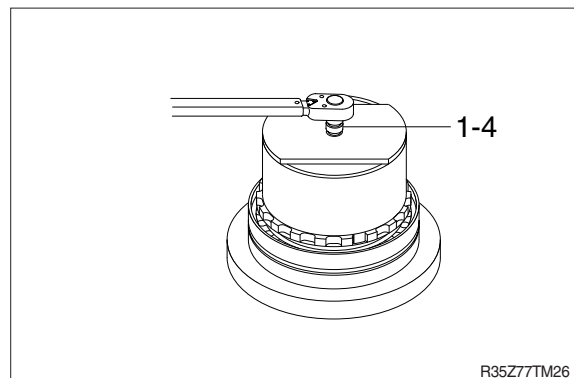
- Tools required :  
Torque wrench (No. 1)  
Hexagonal bit for torque wrench (No. 9)



(25) Removing ring nut (1-4).

- Tools required :  
Torque wrench (No. 3)  
Ring nut tightener (S-6)

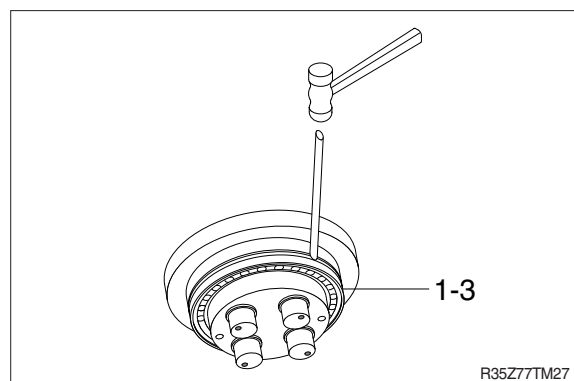
※ If fix them by vise, fix around of outside of flange holder absolutely.



(26) Apply pry-bar to the groove for steel balls (1-7), and remove angular bearing (1-3) striking it by hammer.

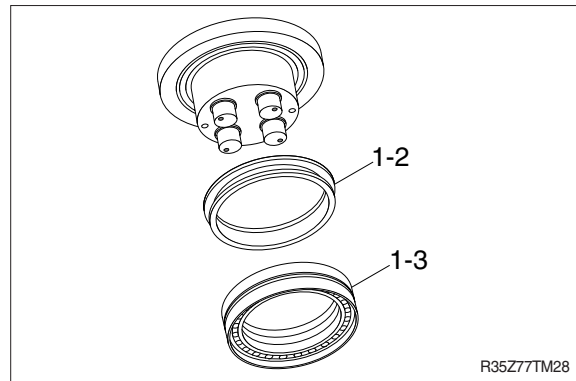
- Tools required :  
Hammer (No. 14)  
Round bar dia. 10×150 mm (S-7)

※ **When removing, strike the groove turning. If strike the groove on one portion, angular bearing wouldn't be removed.**





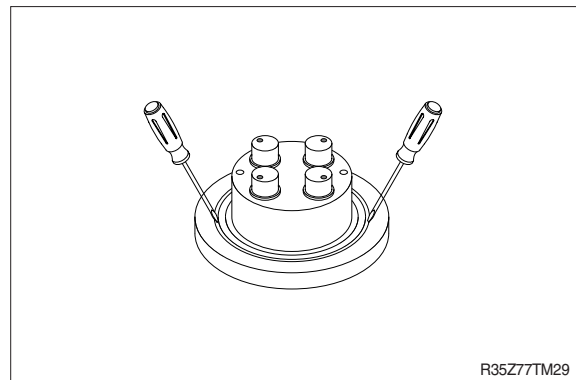
(27) Remove floating seal (1-2) and angular bearing (1-3).



(28) Remove other floating seal (1-2) by use of two drivers.

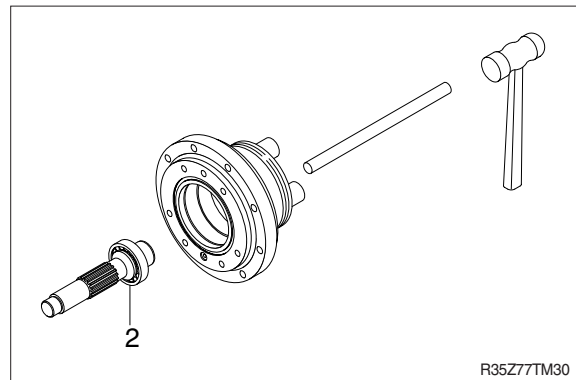
- Tools required :  
Screw driver (No. 13)

※ Be careful not to damage the sliding surface of floating seal (1-2).



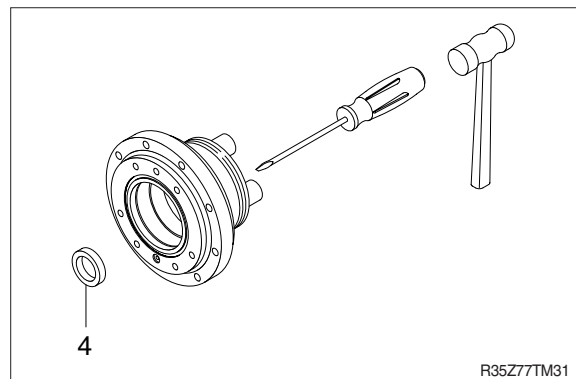
(29) Apply pre-bar to the hold of spline, and remove shaft (2) striking it by hammer.

- Tools required :  
Screw driver (No. 12)  
Round bar dia. 10 × 150 mm (S-7)



(30) Remove oil seal (4).

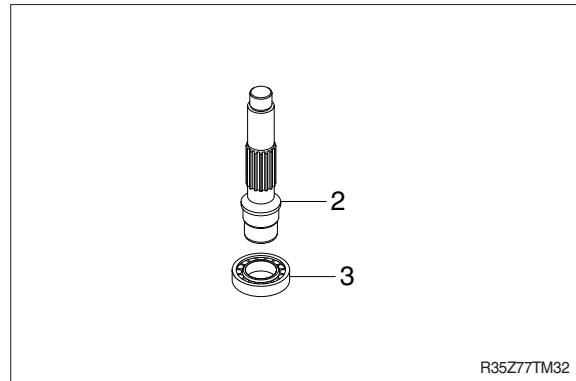
- Tools required :  
Screw driver (No. 13)  
Hammer (No. 14)



(31) Take out ball bearing (3) from shaft (2).

- Tools required :  
Ball bearing disassembly jig (S-8)

(32) Completed.



### **3. REASSEMBLY**

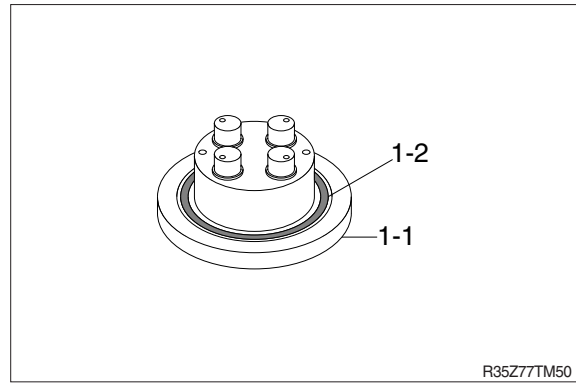
#### **1) GENERAL PRECAUTIONS**

- (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 lint or contaminants.
- (3) Repair or replace the damaged parts.  
Each part must be free of burrs at 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 TM 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) ASSEMBLE THE TRAVEL MOTOR BY THE FOLLOWING PROCEDURE

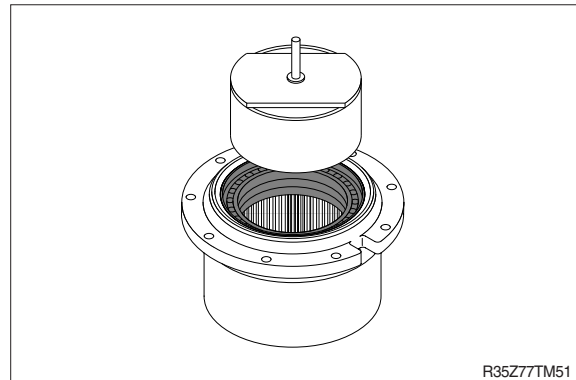
(1) Apply grease to floating seal (1-2) and install it on flange holder (1-1).

- Tools required :  
Floating seal assembly jig (S-9)



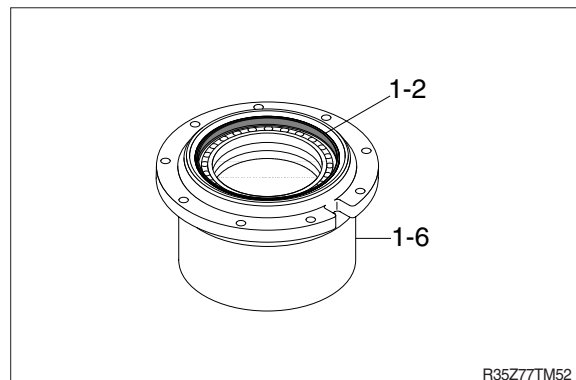
(2) Press fit angular bearings (1-3) to housing (1-6).

- Tools required :  
Angular bearings press fitting jig (S-10)



(3) Apply grease to the second floating seal and place it on the concentric circle. Install it on housing (1-6).

- Tools required :  
Floating seal assembly jig (S-9)

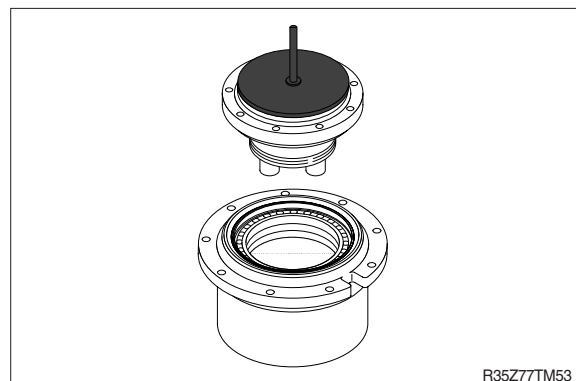


(4) Apply lubricating oil on the sliding surface of floating seal after make the surface clean by rags.

Install flange holder (1-1) in housing (1-6).

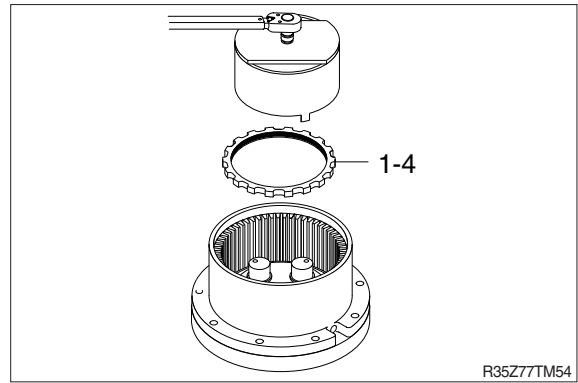
- Tools required :  
Flange holder press fitting jig (S-11)

※ If there are foreign articles on the sliding surface of floating seal (1-2), it causes oil leak.



(5) Tighten angular bearing (1-3) with ring nut (1-4)

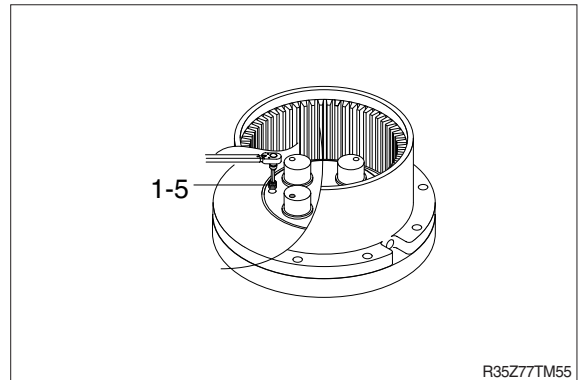
- Tools required :  
Torque wrench (No. 3)  
Ring nut tightener (S-6)  
Tightening torque  $23.9 \pm 1.0 \text{ kgf} \cdot \text{m}$   
( $173 \pm 7.2 \text{ lbf} \cdot \text{ft}$ )



(6) Tighten plug (1-5).

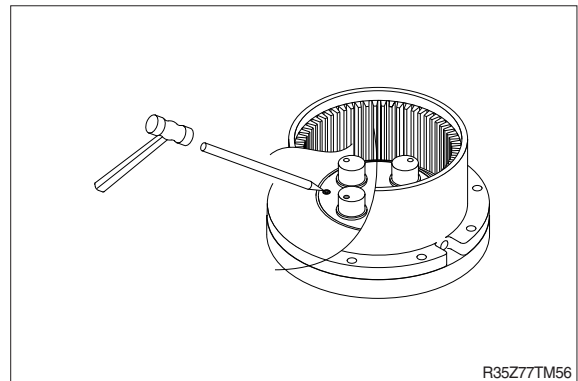
The seal tape is not allowed to wrap for assembling of this plug.

- Tools required :  
Torque wrench (No. 1)  
Hexagonal bit for torque wrench (S-9)  
Tightening torque  $3.5 \pm 0.5 \text{ kgf} \cdot \text{m}$   
( $25.2 \pm 3.6 \text{ lbf} \cdot \text{ft}$ )



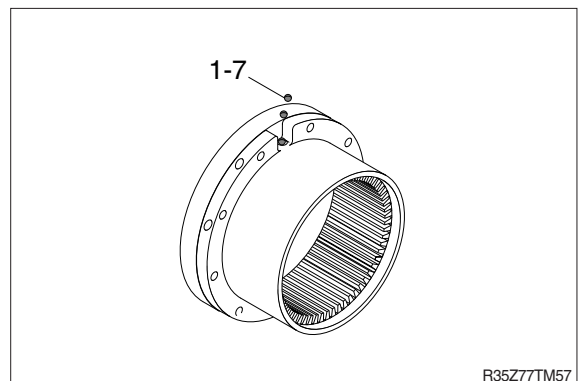
(7) Caulk plug (1-5) two positions with punch to lock.

- Tools required :  
Hammer (No. 14)  
Punch (No. 18)



(8) Place steel balls (1-7) (99 pcs) in.

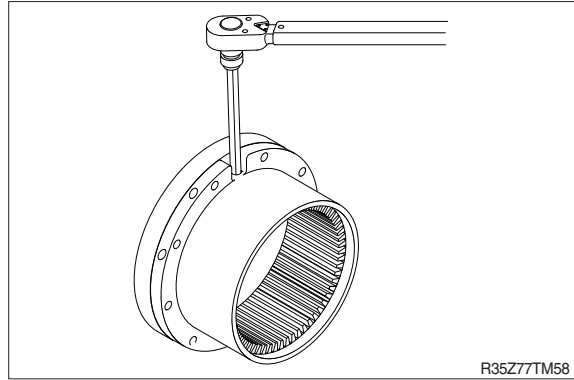
- ※ If it is difficult to place steel balls in, beat on the side of housing (1-6) by using of plastic hammer.



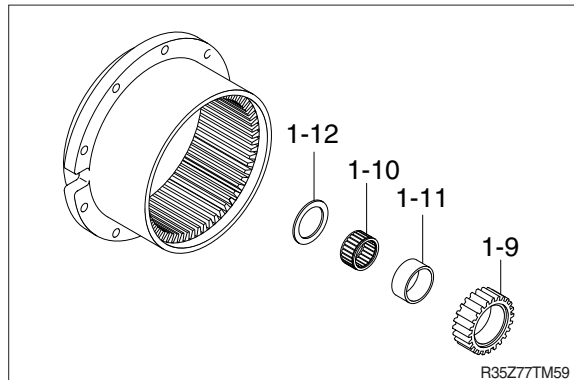
(9) Wrap plug (1-8) with seal tape, and tighten it.

- Tools required :  
Torque wrench (No. 1)  
Hexagonal bit for torque wrench (No. 7)  
Tightening torque  $0.8 \pm 0.1 \text{ kgf} \cdot \text{m}$   
( $5.8 \pm 0.7 \text{ lbf} \cdot \text{ft}$ )

※ Tighten plug (1-8) until the head of plug is obscured against the surface of sprocket guide.

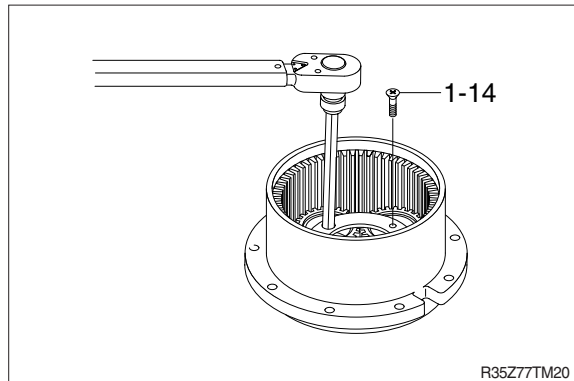


(10) Install planetary gear B (1-9), needle bearing (1-10), inner race (1-11) and thrust washer (1-12).

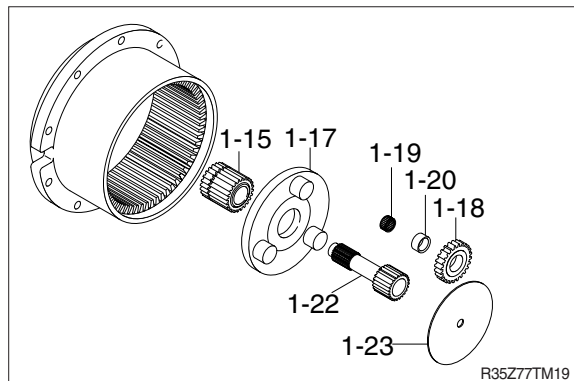


(11) Put thrust plate (1-13) on the trunnion section of flange holder, apply loctite #262 to screw (1-14) and tighten it. Before applying the loctite, decrease the parts completely and us hardening accelerator.

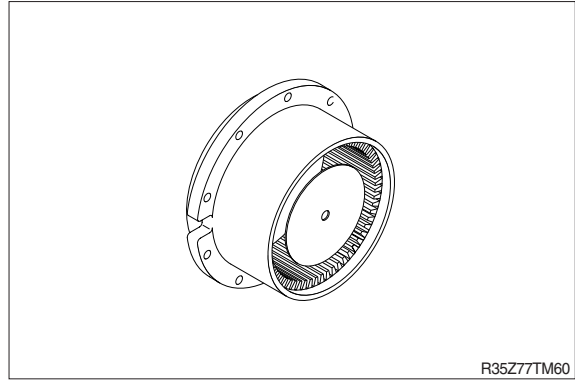
- Tools required :  
Torque wrench (No. 1)  
Hexagonal bit for torque wrench (No. 6)  
Tightening torque  $1.3 \pm 0.06 \text{ kgf} \cdot \text{m}$   
( $9.4 \pm 0.4 \text{ lbf} \cdot \text{ft}$ )



(12) Install sun gear assy (1-15) with snap ring (1-16), holder (1-17) with inner race (1-20), planetary gear A (1-18), needle bearing (1-19) and drive gear (1-22).

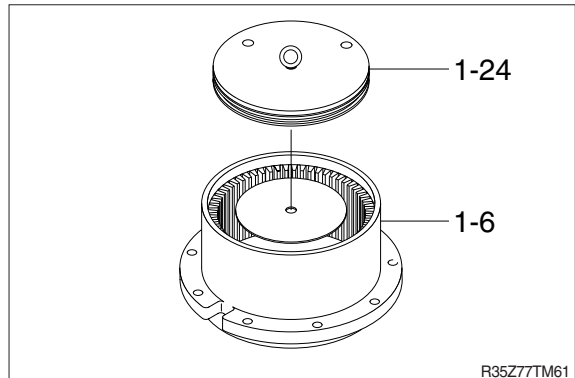


(13) Install thrust plate (1-23).



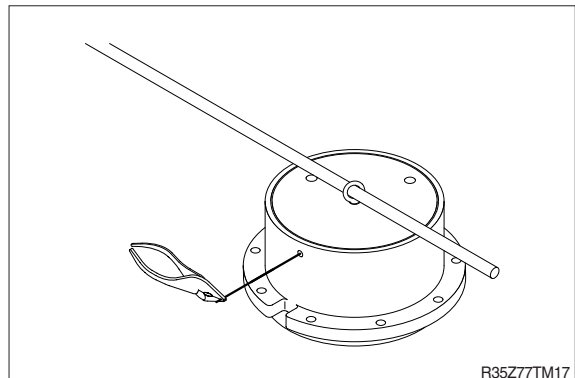
(14) Apply grease to O-ring (1-25), fit the O-ring on cover (1-24), and install cover (1-24) to housing (1-6) matching the threaded hole of socket plug (1-8) of housing (1-6) with the U-groove (for piano wire).

- Tools required :  
Plastic hammer (No. 14)  
Eye bolt (S-2)



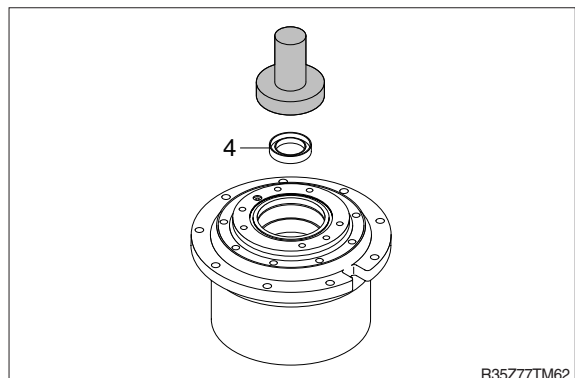
(15) Bend 6 [mm] of the top end of wire (1-26) at right angle, insert it into the threaded hole of the housing, and wind the piano wire turning the cover. Wrap socket plug (1-8) with seal tape before tightening.

- Tools required :  
Eye bolt (S-2)  
Round bar dia. 20 × 1000 [mm] (S-3)  
Torque wrench (No. 1)  
Hexagonal bit for torque wrench (No. 7)  
Tightening torque  $0.8 \pm 0.1$  kgf · m  
( $5.8 \pm 0.7$  lbf · ft)



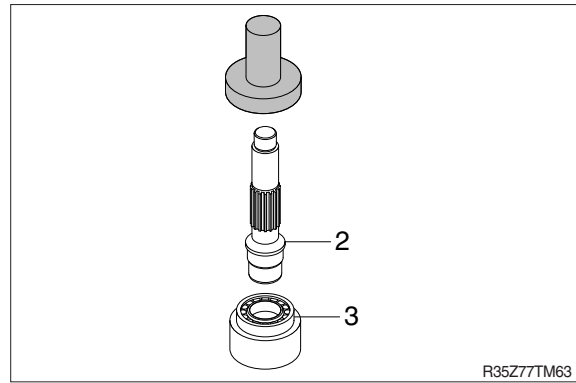
(16) Apply grease to oil seal (4) and press fit it in flange holder.

- Tools required :  
Oil seal press fitting jig (S-12)



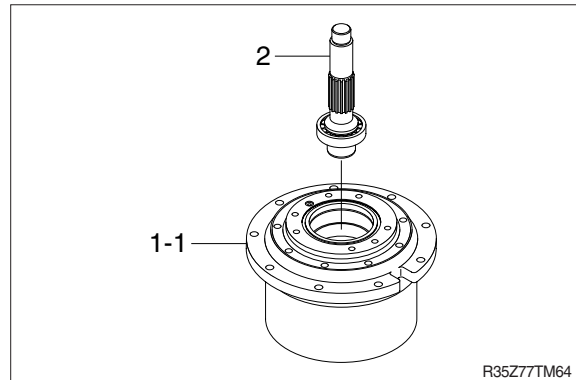
(17) Press fit ball bearing (3) on shaft (2).

- Tools required :  
Ball bearing press fitting jig (S-13)  
Shaft sub assembly press fitting jig (S-14)



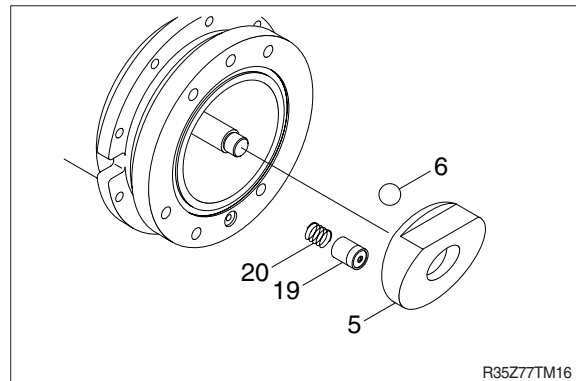
(18) Press fit shaft sub assy (2) in flange holder (1-1).

- Tools required :  
Shaft sub assembly press fitting jig (S-14)



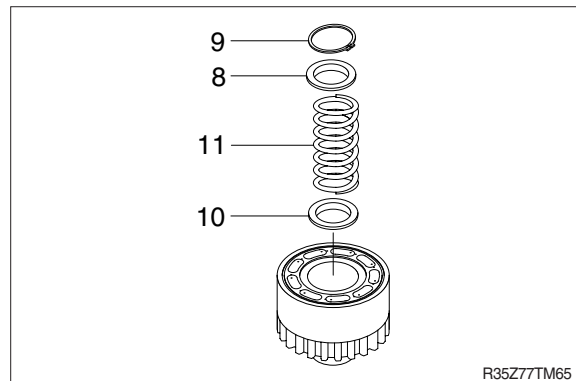
(19) Install steel ball (6), spring (20), piston assy (19) and swash plate (5) on flange holder (1-1).

Apply hydraulic oil to the sliding surface of the swash plate.



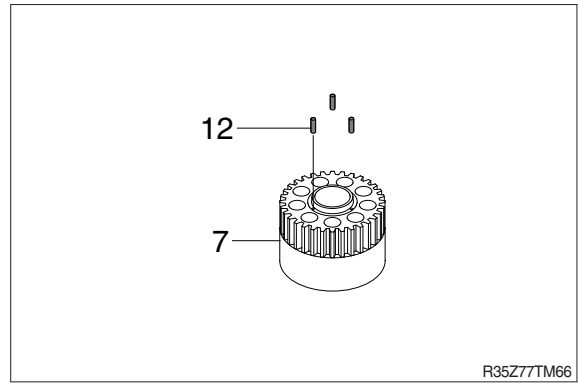
(20) Install washer (8), spring (11), spring seat (10) and snap ring (9) on cylinder block (7).

- Tools required :  
Snap ring pliers (No. 17)  
Snap ring assembly jig (S-16)



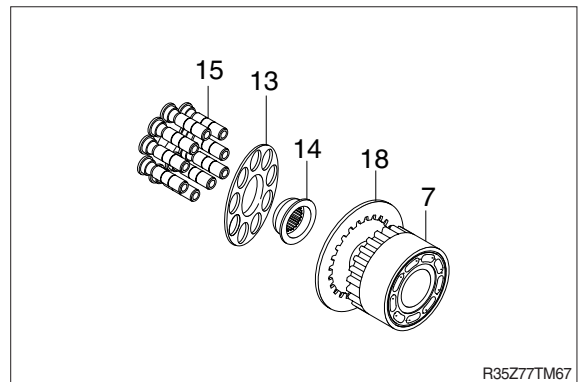


(21) Apply grease to pin (12) install pins in three holes of cylinder block (7).



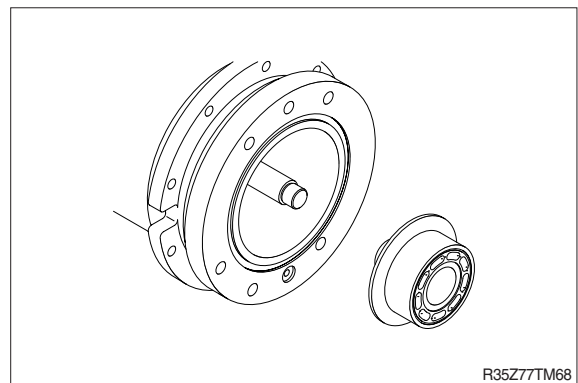
(22) Install retainer holder (13), retainer plate (14) and piston sub assy (15). Apply hydraulic oil in 99 holes of cylinder block (7).

Only parking brake type  
Install disk plate (18).



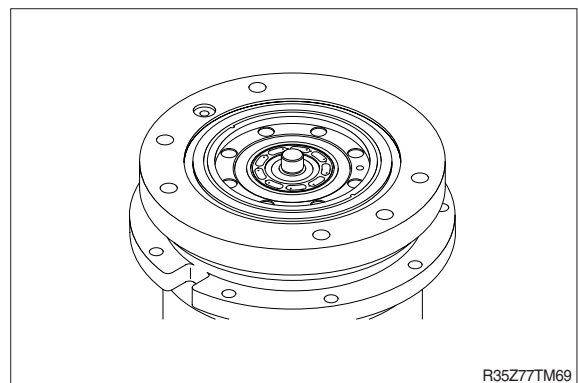
(23) Place the motor laterally, and install the cylinder block sub assy regarding the spline of the shaft as a guide.

※ Location of spline tooth of cylinder block (7) should be aligned that of retainer holder (13) to install them easily.

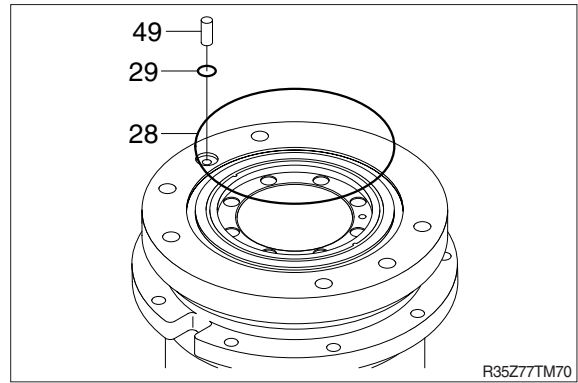


(24) Push the cylinder block by hand, and check that the spring contracts and restores. Apply hydraulic oil to the sliding surface of the cylinder block.

※ Confirm no foreign articles on surface of cylinder block, marked a circle. If there are foreign articles on it, wipe off them.

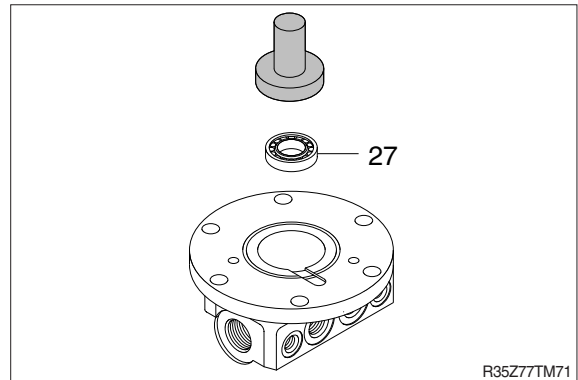


(25) Apply grease to O-ring (28), (29) and install pin (49) and them on flange holder (1-1)

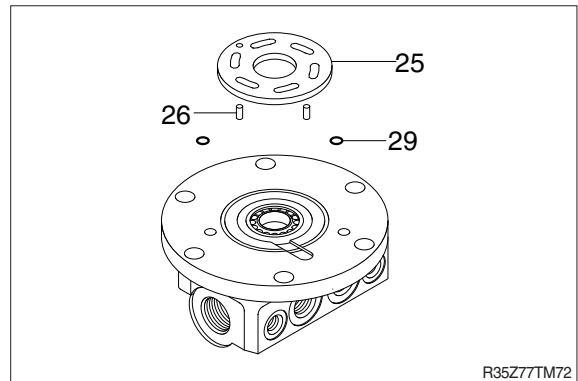


(26) Press fit ball bearing (27) on base plate (30).

- Tools required :  
Ball bearing press fitting jig (S-16)

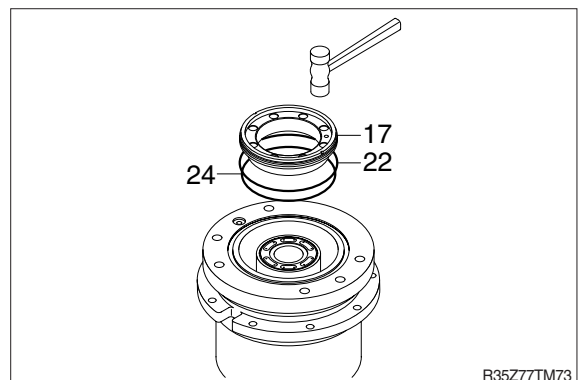


(27) Apply grease on the back side of valve plate (25), and install it and pin (26), O-ring (29) on base plate.



(28) This process is only parking brake type.  
Apply grease to O-rings (22), (24) and install them to brake piston (17).  
Install brake piston (17) to flange holder (1-1) to align pin (61) installed on base plate in No. 29 with holes on brake piston (17).  
When install it, beat on evenly outside of brake piston by using of plastic hammer.

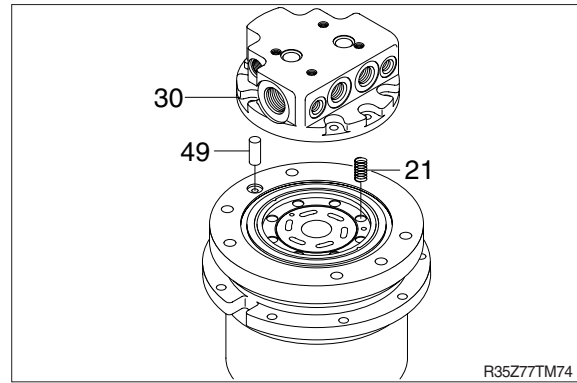
- Tools required :  
Plastic hammer (No. 15)



(29) With parking brake type.

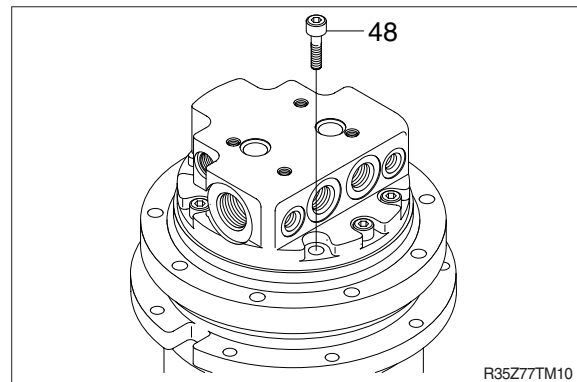
Install springs (21), base plate (30), Pin (49).

- ※ Be careful of installing as springs (21), (32) don't fall down.  
It's difficult to fall down by greased them.



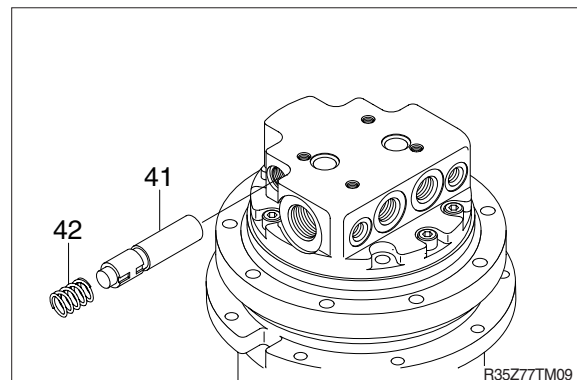
(30) Tighten socket head bolt (48).

- Tools required :  
Torque wrench (No. 2)  
Hexagonal bit for torque wrench (No. 10)  
Tightening torque :  $13.1 \pm 0.7$  kgf · m  
( $94.8 \pm 5.1$  lbf · ft)



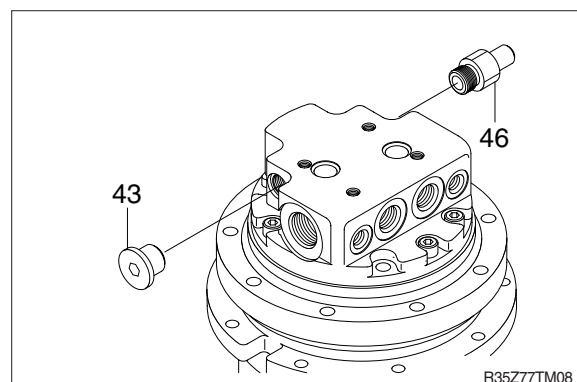
(31) Place spool (41) and spring (42) in.

Place the spool in while turning to prevent them from sticking.  
Apply hydraulic oil to the spool before installation.



(32) Tighten plugs (43), (46) with O-ring (44).

- Tools required :  
Torque wrench (No. 2)  
Hexagonal bit for torque wrench (No. 9)  
Socket for torque wrench (No. 11)  
Tightening torque :  $5.5 \pm 0.5$  kgf · m  
( $39.8 \pm 3.6$  lbf · ft)



(33) Install check valve (31-2), spring (31-3) and plug (31-4) with O-ring (31-5) to plunger (31-1).

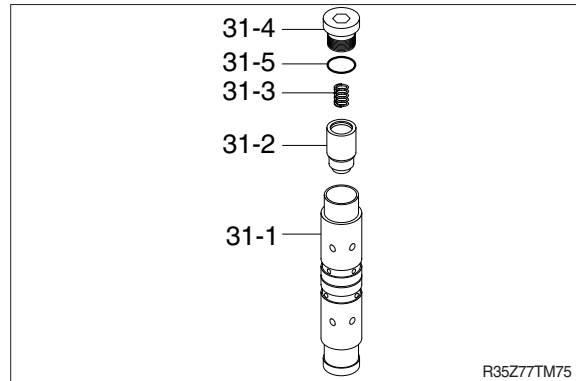
Apply a slight grease to the O-ring.

· Tools required :

Torque wrench (No. 2)

Hexagonal bit for torque wrench (No. 8)

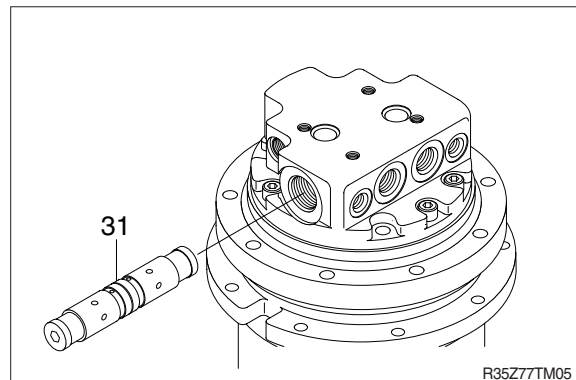
Tightening torque :  $3.3 \pm 0.2 \text{ kgf} \cdot \text{m}$   
 $(23.5 \pm 1.8 \text{ lbf} \cdot \text{ft})$



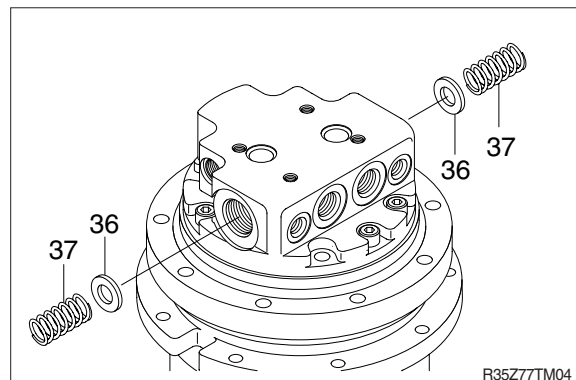
(34) Install plunger assy (31) on base plate (30).

Install it while turning to prevent it from sticking.

Apply hydraulic oil to plunger assy (31) before installation.



(35) Place spring (37) and spring seat (36) in.



(36) Tighten cap (38) with O-ring (39).

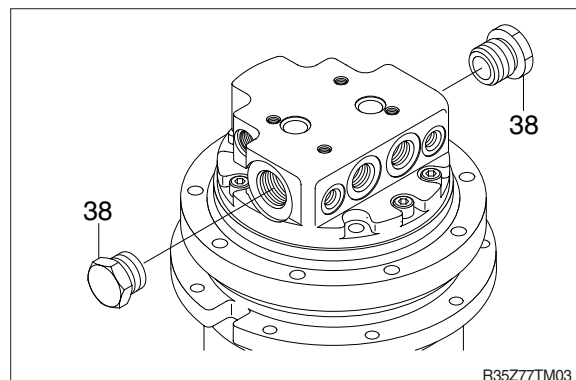
Apply a slight grease to the O-ring.

· Tools required :

Torque wrench (No. 3)

Hexagonal bit for torque wrench (No. 10)

Tightening torque :  $24.5 \pm 0.5 \text{ kgf} \cdot \text{m}$   
 $(177 \pm 3.7 \text{ lbf} \cdot \text{ft})$



(37) With parking brake type

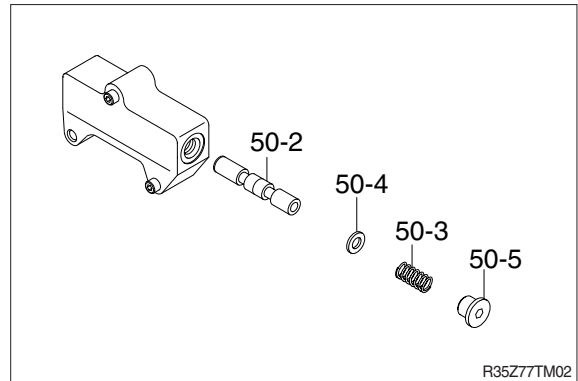
Install spool (50-2), spring (50-3) and spring seat (50-4) in valve body (50-1), and tighten plug (50-5)

· Tools required :

Torque wrench (No. 2)

Hexagonal bit for torque wrench (No. 9)

Tightening torque :  $5.5 \pm 0.5 \text{ kgf} \cdot \text{m}$   
( $39.8 \pm 3.6 \text{ lbf} \cdot \text{ft}$ )



(38) Fit O-rings (50-6) or (50-7) to valve body, and put valve assy (50) on base plate (30).

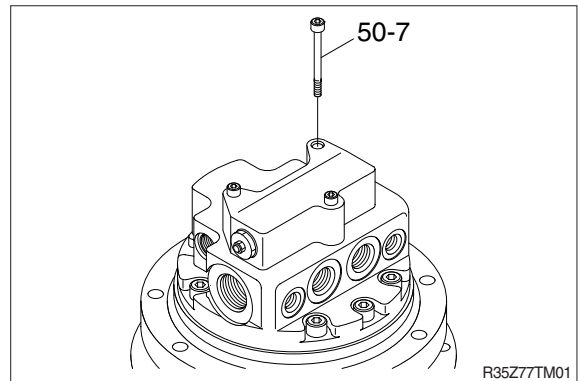
Tighten socket head bolt (50-7), (50-8).

· Tools required :

Torque wrench (No. 1)

Hexagonal bit for torque wrench (No. 7)

Tightening torque :  $3.8 \pm 0.2 \text{ kgf} \cdot \text{m}$   
( $27.2 \pm 1.4 \text{ lbf} \cdot \text{ft}$ )



(39) Pour the gear oil through the threaded hole of plug (1-27).

Wind the plug with seal tape before tightening.

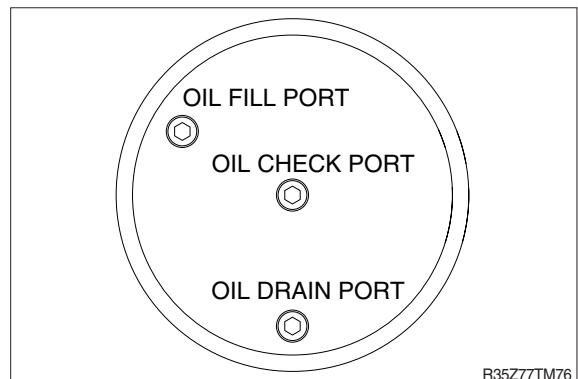
· Tools required :

Torque wrench (No. 2)

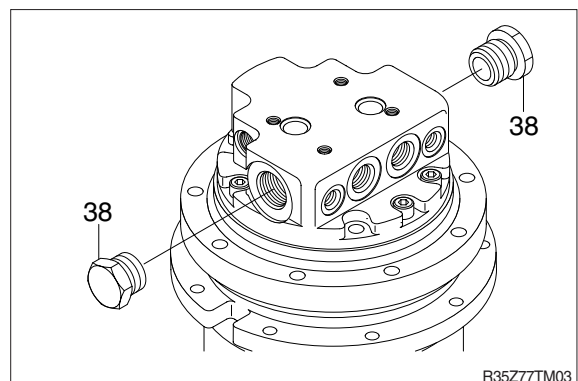
Hexagonal bit for torque wrench (No. 8)  
(No. 9)

PF 1/4 ... Tightening torque wrench  
 $3.5 \pm 0.5 \text{ kgf} \cdot \text{m}$   
( $25.3 \pm 3.6 \text{ lbf} \cdot \text{ft}$ )

PF 1/4 ... Tightening torque wrench  
 $4.0 \pm 0.2 \text{ kgf} \cdot \text{m}$   
( $28.9 \pm 1.5 \text{ lbf} \cdot \text{ft}$ )



(40) Completed.



### 3) QUALITY CHECK AFTER REASSEMBLY

(1) Air leak test of reduction unit

Remove one plug (① or ② or ③) of the reduction unit apply compressed air (0.03 [MPa]) through tapped hole of plug in water for two minutes, and observe that are no bubbles.

(2) Air leak test of motor

Seal all piping ports on the motor except one port with plugs, and apply compressed air (0.03 [MPa]) through open port in water for two minutes. Observe that there are no bubbles.

(3) Upon completion of leak test in subparagraphs (1) and (2) above, fill the motor case with new hydraulic fluid. Run the motor crosswise for two minutes filling hydraulic fluid at flow rate of 20 liters per minute.

Confirm that there is no excessive heat, vibration or noise during running.

## GROUP 7 RCV LEVER

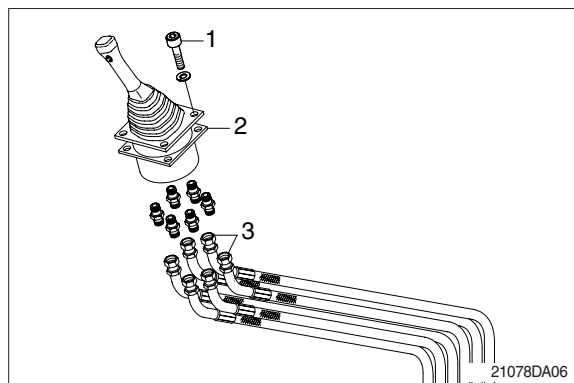
### 1. REMOVAL AND INSTALL

#### 1) REMOVAL

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

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

- (4) Loosen the socket bolt (1).
  - (5) Remove the cover of the console box.
  - (6) Disconnect pilot line hoses (3).
  - (7) Remove the pilot valve assembly (2).
- ※ When removing the pilot valve assembly, check that all the hoses have been disconnected.

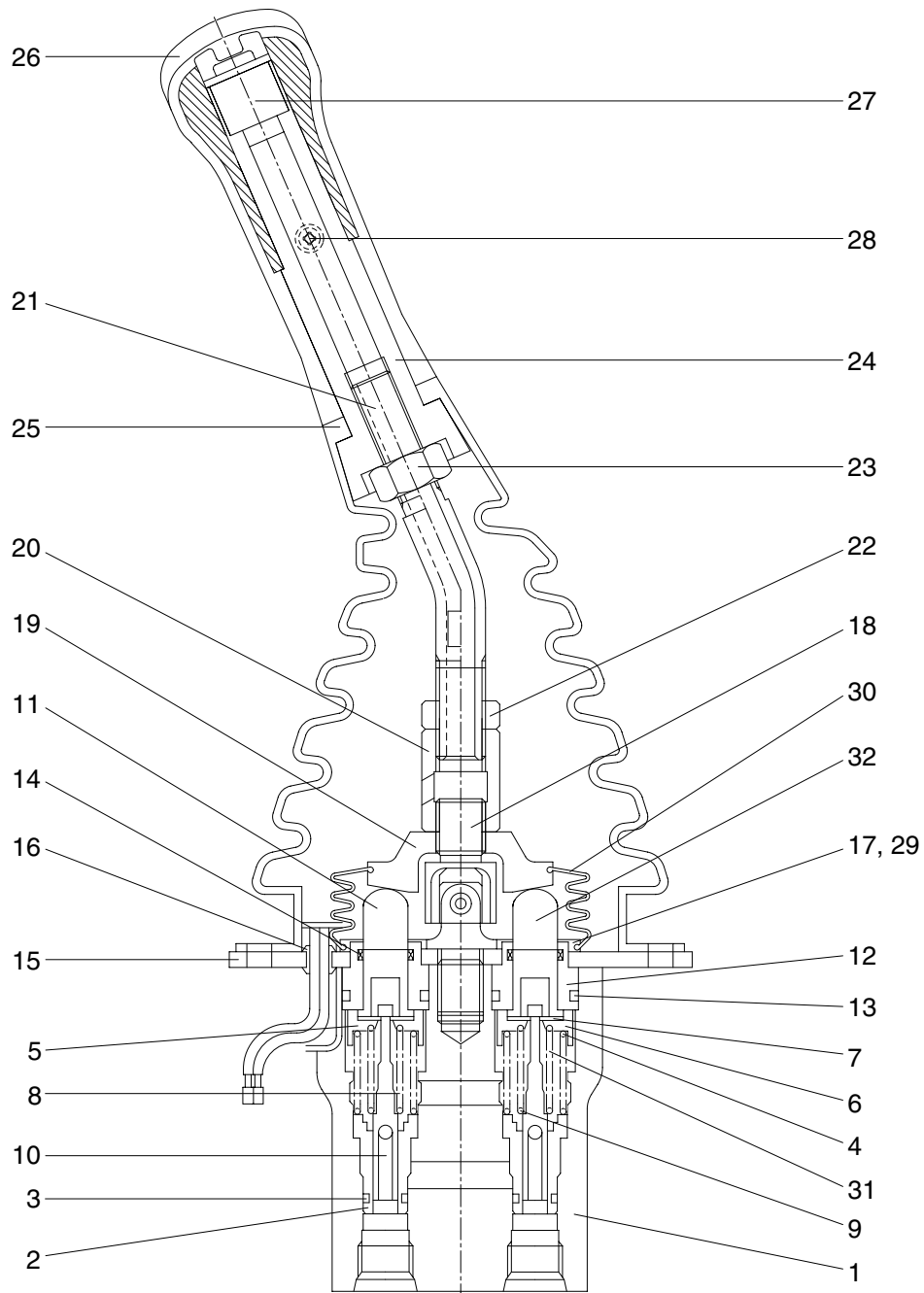


#### 2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

## 2. DISASSEMBLY AND ASSEMBLY

### 1) STRUCTURE



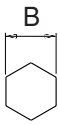
R35Z92RL02

1	Case	9	Spring seat	17	Machine screw	25	Boot
2	Plug	10	Spool	18	Joint assembly	26	Handle
3	O-ring	11	Push rod (1, 3)	19	Swash plate	27	Switch assembly
4	Spring	12	Plug	20	Hex nut	28	Screw
5	Spring seat (1, 3)	13	O-ring	21	Connector	29	Plate (B)
6	Spring seat (2, 4)	14	Rod seal	22	Nut	30	Boot
7	Stopper	15	Plate (A)	23	Nut	31	Spring (2, 4)
8	Spring (1, 3)	16	Bushing	24	Insert	32	Push rod (2, 4)



## 2) TOOLS AND TIGHTENING TORQUE

### (1) Tools

Tool name	Remark	
(L) Hexagonal wrench	10	
Spanner	22	
	27	
(+) Driver	Length 150	
(-) Driver	Width 4~5	
Torque wrench	Capable of tightening with the specified torques	

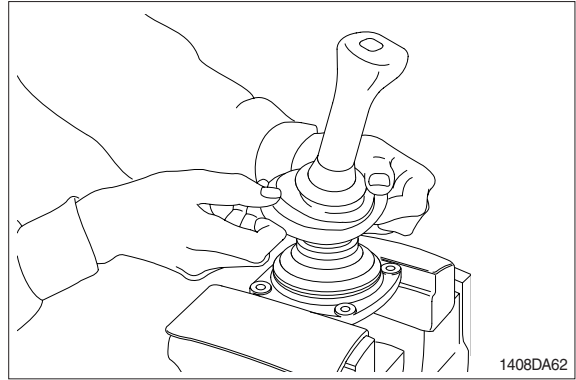
### 3) DISASSEMBLY

(1) Clean pilot valve with kerosene.

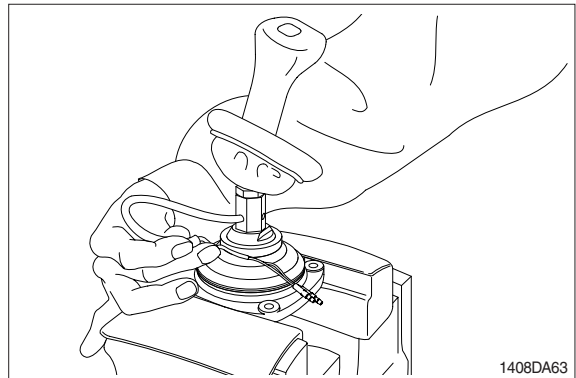
※ Put blind plugs into all ports.

(2) Fix pilot valve in a vise with copper (or lead) sheets.

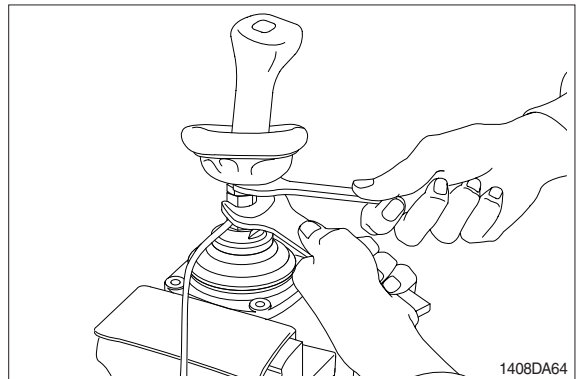
(3) Remove end of boot (30) from case (1) and take it out upwards.



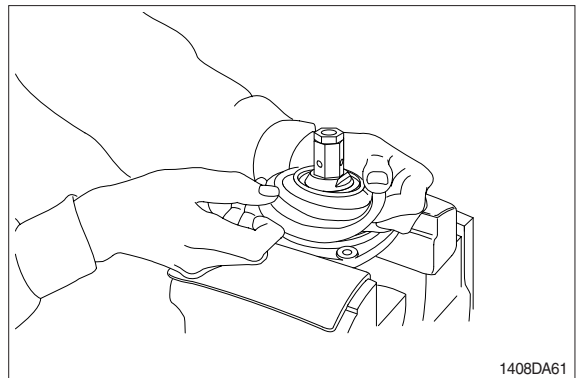
※ For valve with switch, remove cord also through hole of casing.



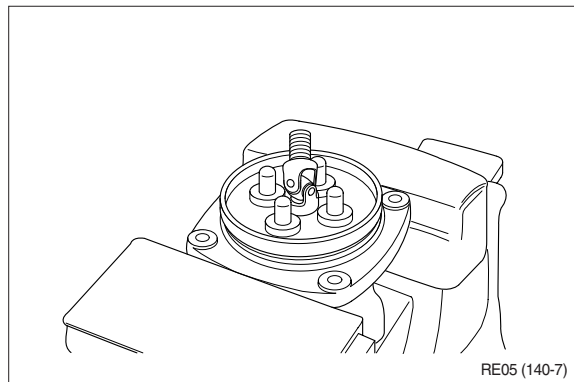
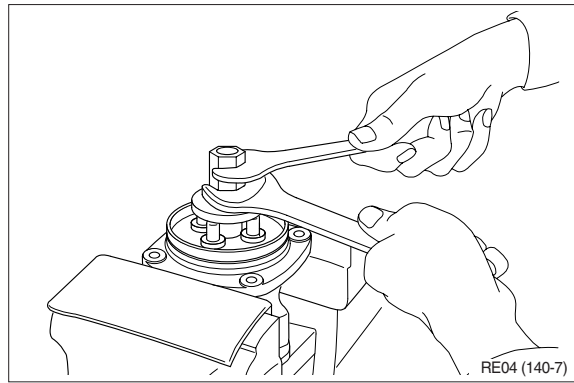
(4) Loosen lock nut (22) and adjusting nut (20) with spanners on them respectively, and take out handle section as one body.



(5) Remove the boot (30).

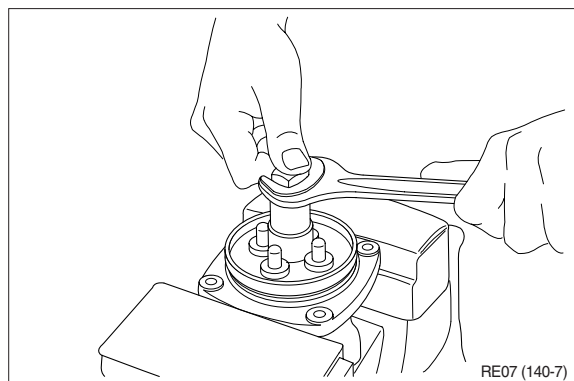
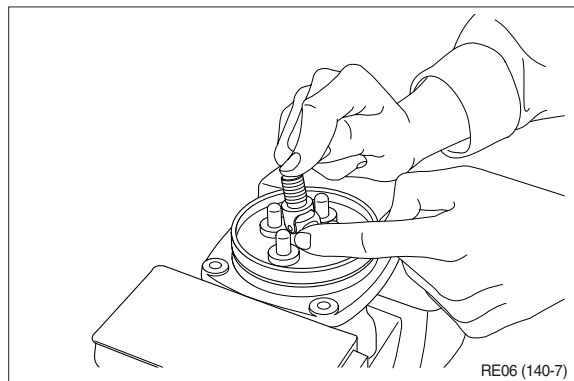


- (6) Loosen adjusting nut (20) and plate (29) with spanners on them respectively, and remove them.

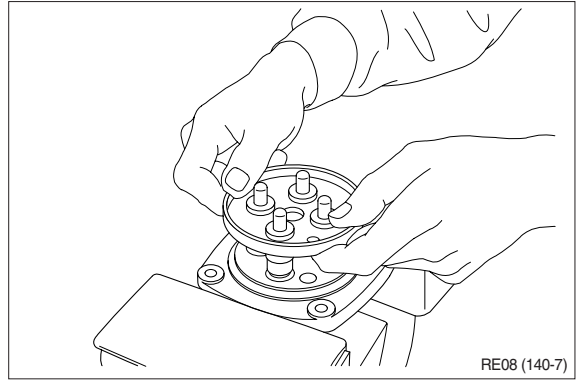


- (7) Turn joint anticlockwise to loosen it, utilizing jig (special tool).

※ When return spring (8, 31) is strong in force, plate (29), plug (12) and push rod (11, 32) will come up on loosening joint. Pay attention to this.



(8) Remove plate (29).



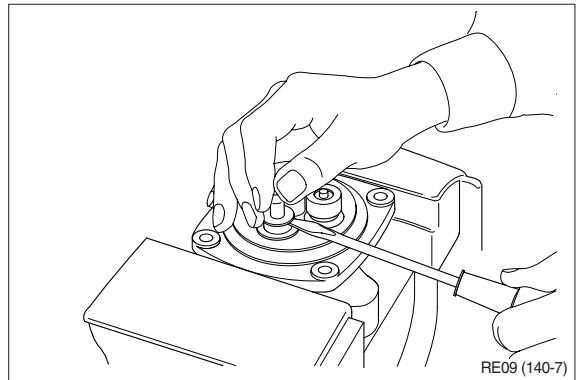
(9) When return spring (8, 31) is weak in force, plug (12) stays in casing because of sliding resistance of O-ring.

※ Take it out with minus screwdriver.

Take it out, utilizing external periphery groove of plug and paying attention not to damage it by partial loading.

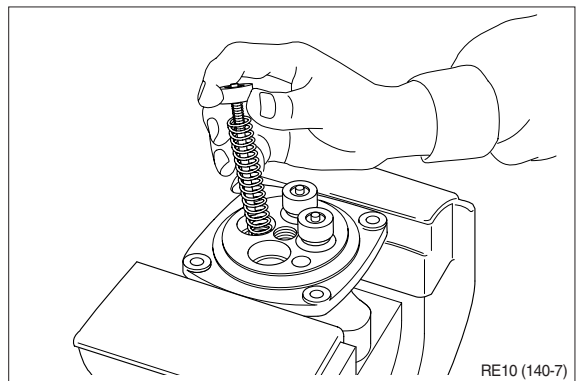
※ During taking out, plug may jump up due to return spring (8, 31) force.

Pay attention to this.

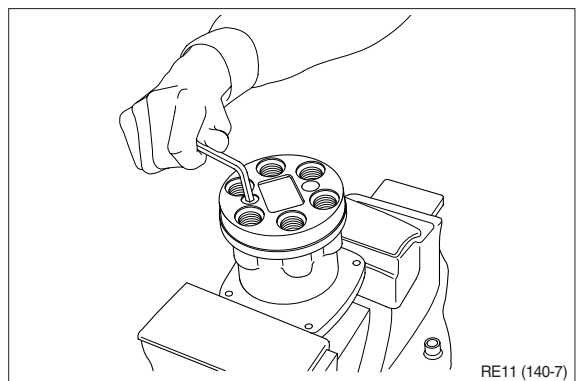


(10) Remove reducing valve subassembly and return spring (8, 31) out of casing.

※ Record relative position of reducing valve subassembly and return springs.

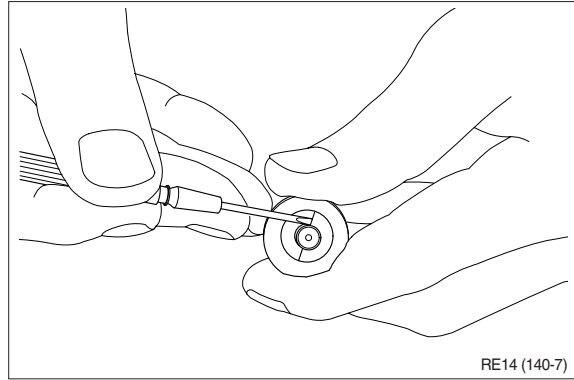


(11) Loosen hexagon socket head plug (2) with hexagon socket screw key.



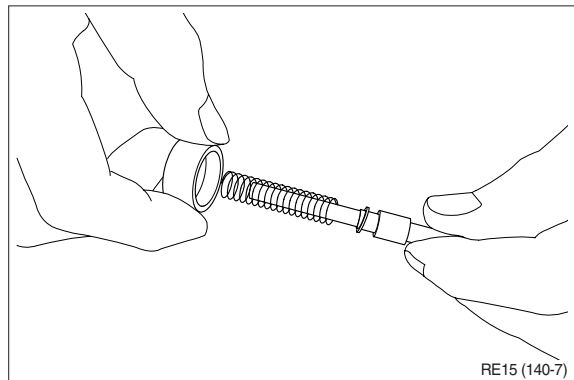
(12) For disassembling reducing valve section, stand it vertically with spool (10) bottom placed on flat workbench. Push down spring seat (5, 6) and remove two pieces of semicircular stopper (7) with tip of small minus screwdriver.

- ※ Pay attention not to damage spool surface.
- ※ Record original position of spring seat (5, 6).
- ※ Do not push down spring seat more than 6 mm.

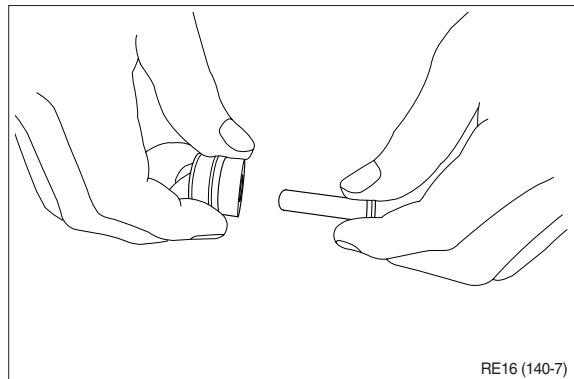


(13) Separate spool (10), spring seat (5, 6), spring (8, 31) and spring seat (9) individually.

- ※ Until being assembled, they should be handled as one subassembly group.

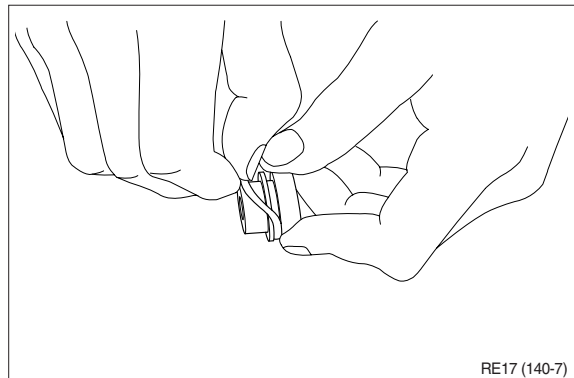


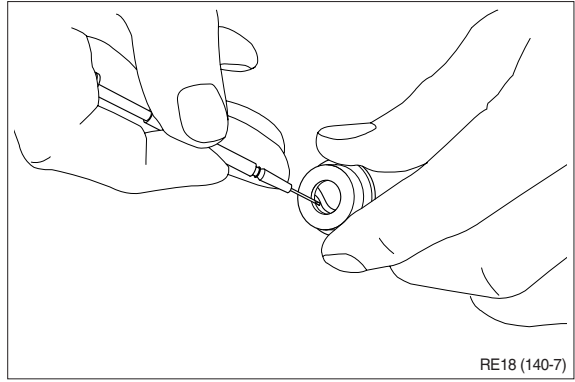
(14) Take push rod (11, 32) out of plug (12).



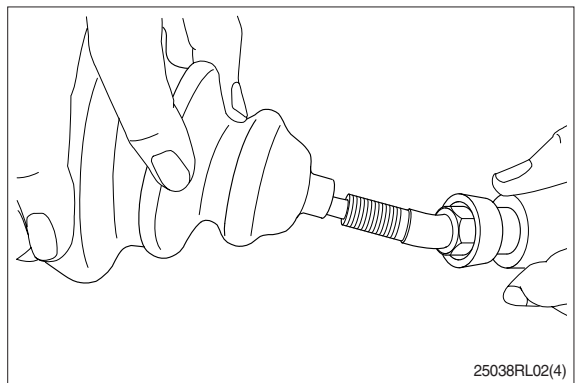
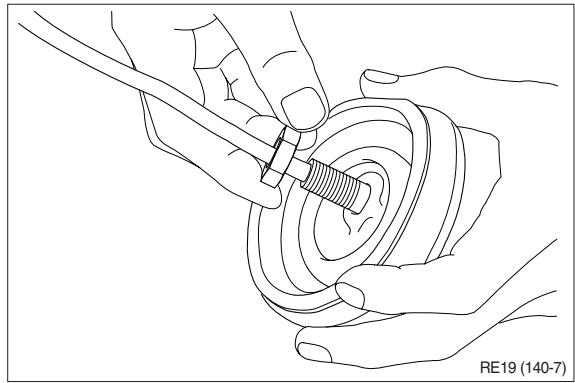
(15) Remove O-ring (13) and seal (14) from plug (12).

Use small minus screwdriver or so on to remove this seal.





(16) Remove lock nut (22) and then boot (25).



**(17) Cleaning of parts**

- ① Put all parts in rough cleaning vessel filled with kerosene and clean them (rough cleaning).
  - ※ If dirty part is cleaned with kerosene just after putting it in vessel, it may be damaged. Leave it in kerosene for a while to loosen dust and dirty oil.
  - ※ If this kerosene is polluted, parts will be damaged and functions of reassembled valve will be degraded.  
Therefore, control cleanliness of kerosene fully.
- ② Put parts in final cleaning vessel filled with kerosene, turning it slowly to clean them even to their insides (finish cleaning).
  - ※ Do not dry parts with compressed air, since they will be damaged and/or rusted by dust and moisture in air.

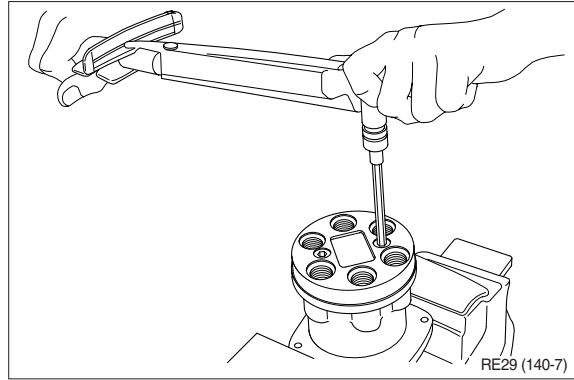
**(18) Rust prevention of parts.**

- Apply rust-preventives to all parts.
- ※ If left as they are after being cleaned, they will be rusted and will not display their functions fully after being reassembled.

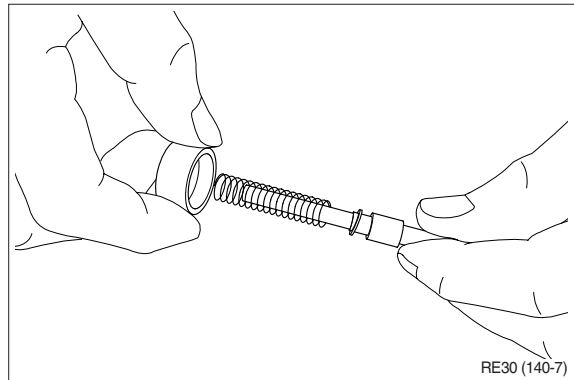
#### 4) ASSEMBLY

(1) Tighten hexagon socket head plug (2) to the specified torque.

※ Tighten two bolts alternately and slowly.

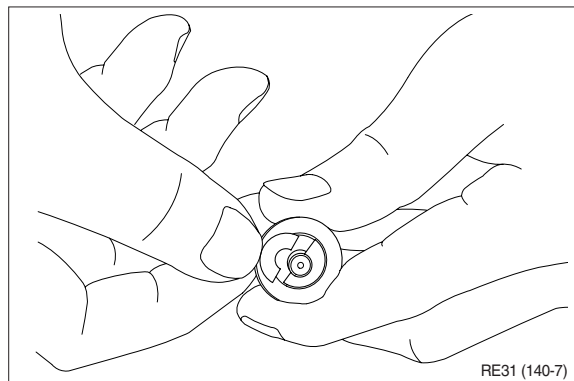


(2) Put spring seat (9), springs (8, 31) and spring seat (5, 6) onto spool (10) in this order.



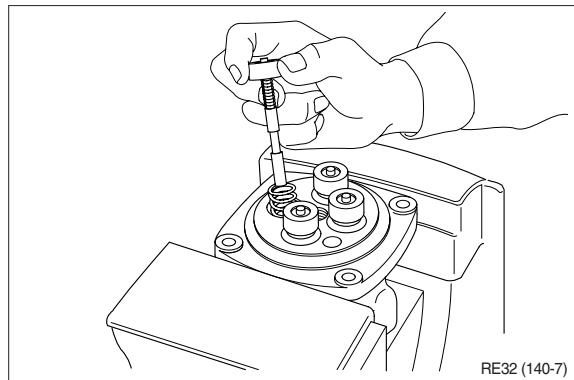
(3) Stand spool vertically with its bottom placed on flat workbench, and with spring seat pushed down, put two pieces of semicircular stopper (7) on spring seat without piling them on.

※ Assemble stopper (7) so that its sharp edge side will be caught by head of spool. Do not push down spring seat more than 6 mm.



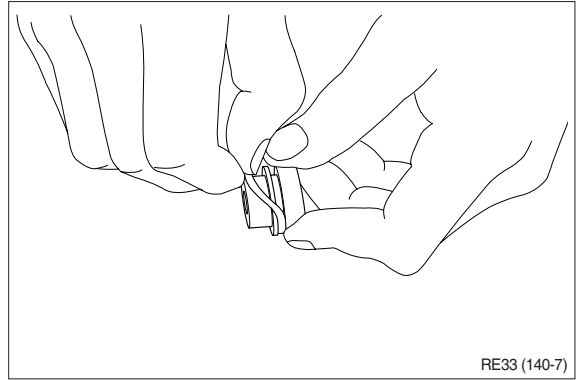
(4) Assemble spring (8, 31) into casing. Assemble reducing valve subassembly into casing.

※ Assemble them to their original positions.



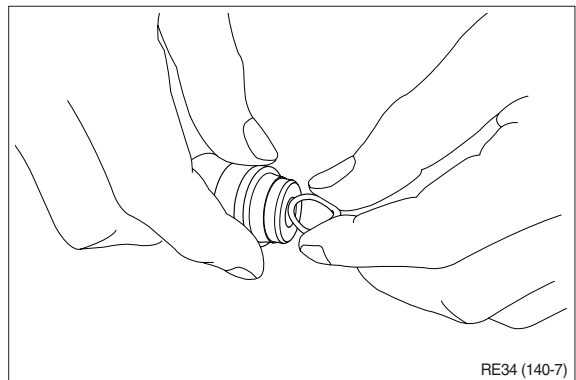


(5) Assemble O-ring (13) onto plug (12).



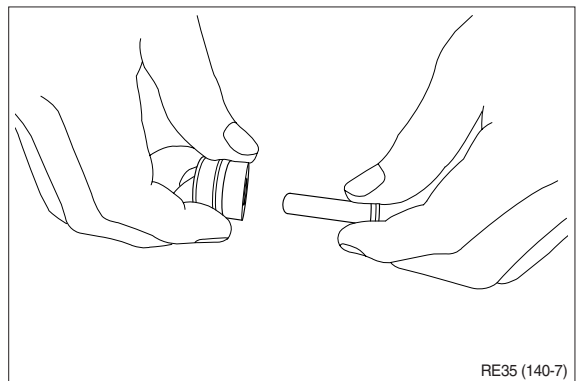
(6) Assemble rod seal (14) to plug (12).

※ Assemble seal in such lip direction as shown below.



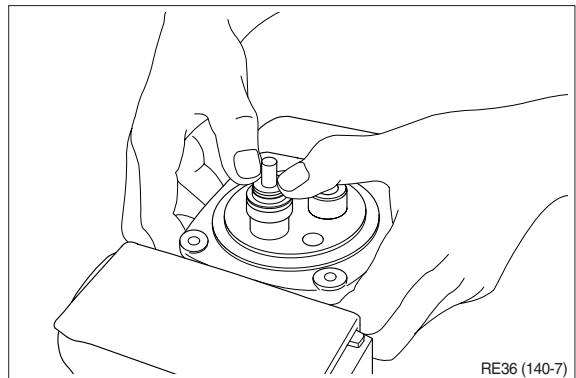
(7) Assemble push rod (11, 32) to plug (12).

※ Apply working oil on push-rod surface.



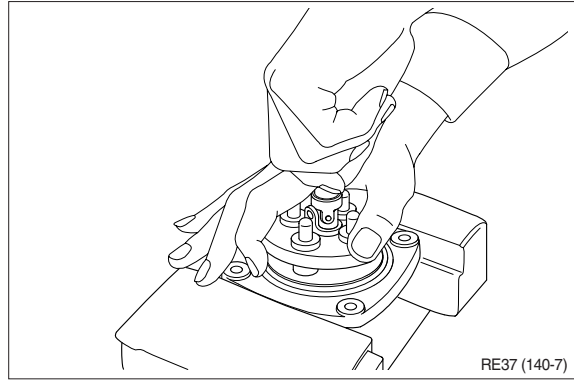
(8) Assemble plug subassembly to casing.

※ When return spring is weak in force, subassembly stops due to resistance of O-ring.

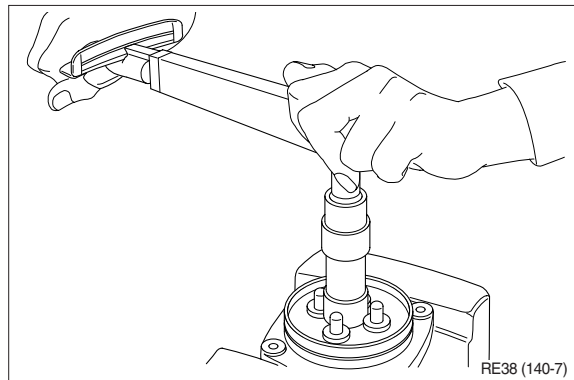


(9) When return spring is strong in force, assemble 4 sets at the same time, utilizing plate (29), and tighten joint (18) temporarily.

(10) Fit plate (29).

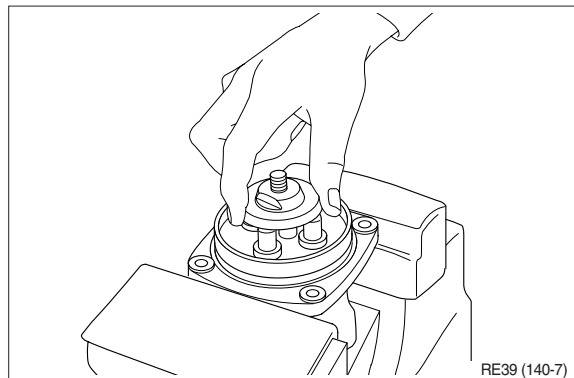


(11) Tighten joint (18) with the specified torque to casing, utilizing jig.



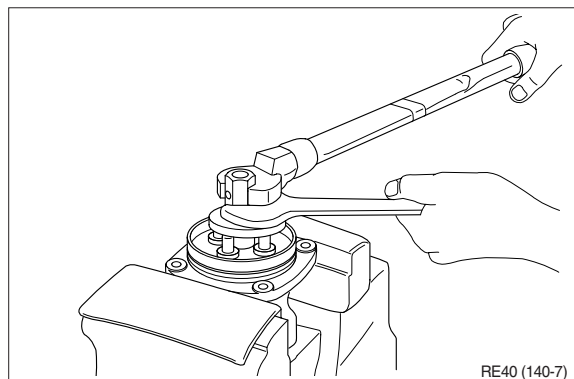
(12) Assemble swash plate (19) to joint (18).

- ※ Screw it to position that it contacts with 4 push rods evenly.
- ※ Do not screw it over.

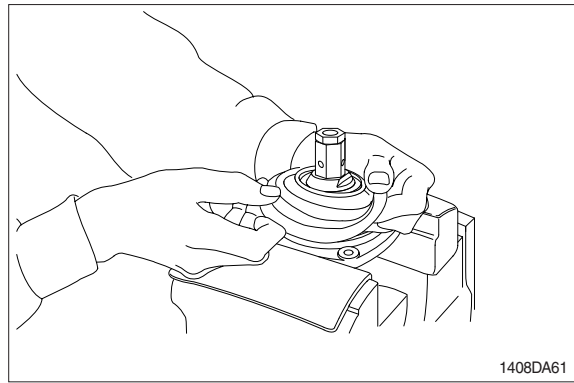


(13) Assemble adjusting nut (20), apply spanner to width across flat of plate (19) to fix it, and tighten adjusting nut to the specified torque.

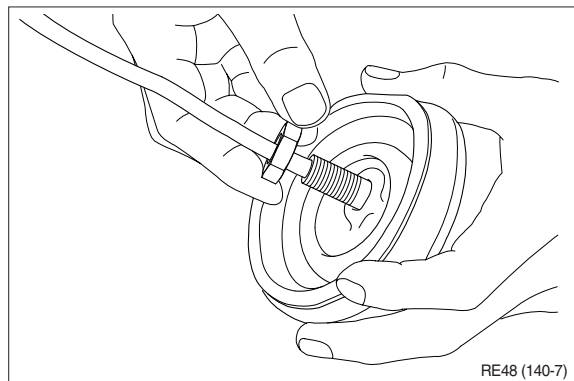
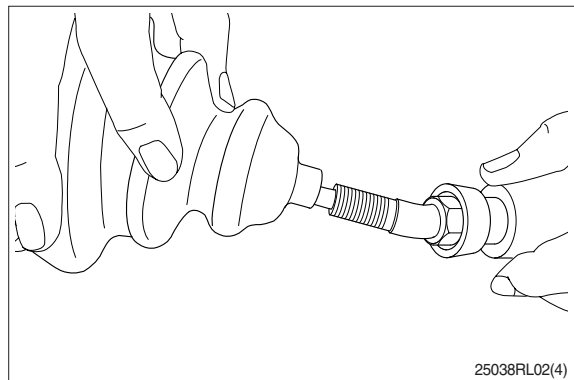
- ※ During tightening, do not change position of disk.



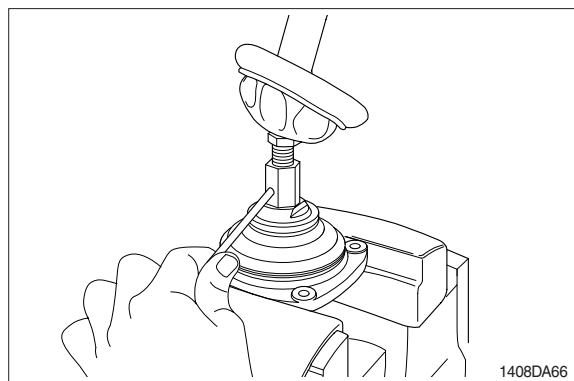
(14) Fit boot (30) to plate.



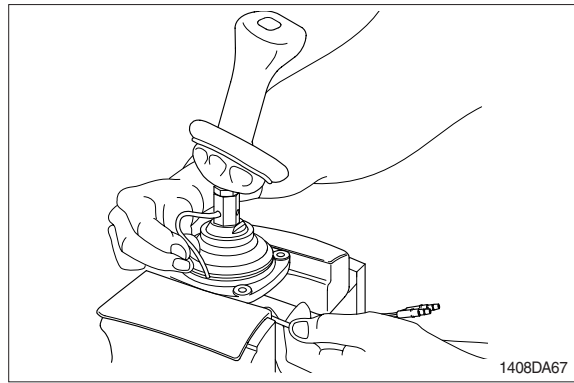
(15) Fit boot (25) and lock nut (22), and handle subassembly is assembled completely.



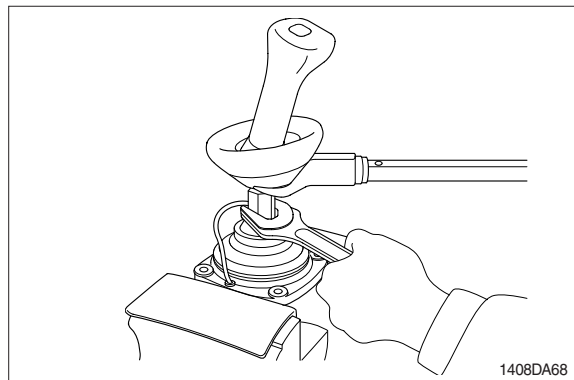
(16) Pull out cord and tube through adjusting nut hole provided in direction  $60^{\circ}$  to  $120^{\circ}$  from casing hole.



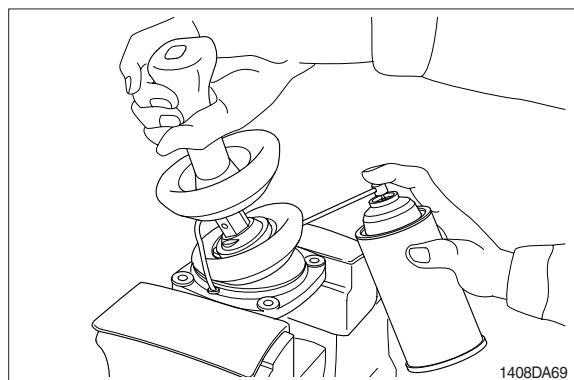
- (17) Assemble bushing (16) to plate and pass cord and tube through it.  
※ Provide margin necessary to operation.



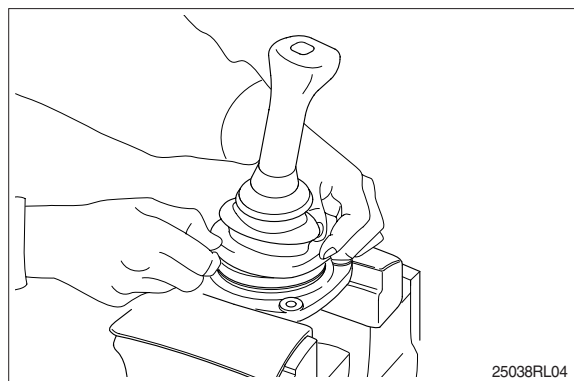
- (18) Determine handle direction, tighten lock nut (19) to specified torque to fix handle.



- (19) Apply grease to rotating section of joint and contacting faces of disk and push rod.



- (20) Assemble lower end of bellows to casing.  
(21) Inject volatile rust-preventives through all ports and then put blind plugs in ports.



## GROUP 8 TURNING JOINT

### 1. REMOVAL AND INSTALL

#### 1) REMOVAL

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

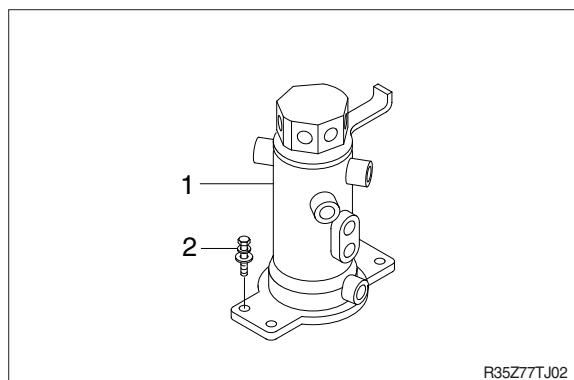
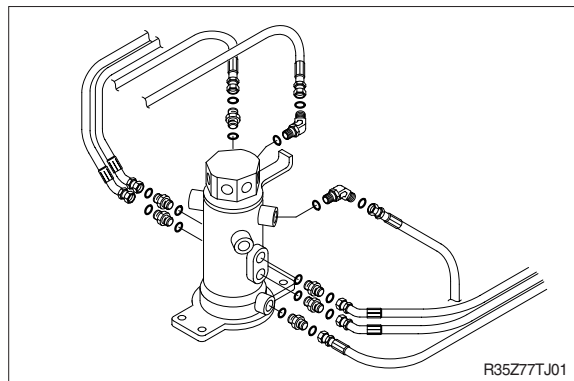
**▲ Escaping fluid under pressure can penetrate the skin causing serious injury.**

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

- (4) Disconnect all hoses.
  - (5) Sling the turning joint assembly (1) and remove the mounting bolt (2).
    - Weight : 15 kg (35 lb)
    - Tightening torque :  $6.9 \pm 1.4$  kgf · m  
( $49.9 \pm 10.1$  lbf · ft)
  - (6) Remove the turning joint assembly.
- ※ When removing the turning joint, check that all the hoses have been disconnected.

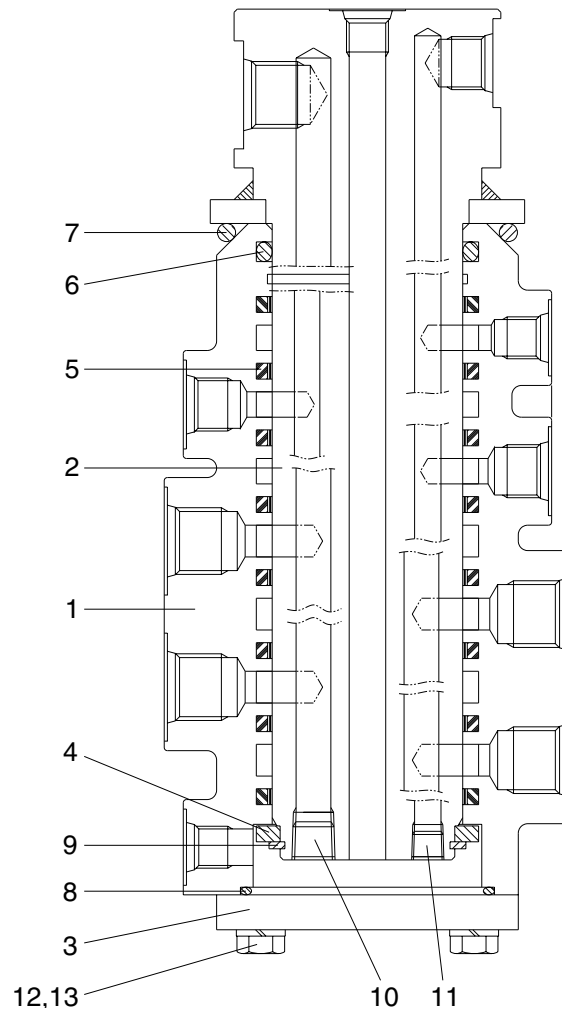
#### 2) INSTALL

- (1) Carry out installation in the reverse order to removal.
  - ※ Take care of turning joint direction.
  - ※ Assemble hoses to their original positions.
  - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.



## 2. DISASSEMBLY AND ASSEMBLY

### 1) STRUCTURE



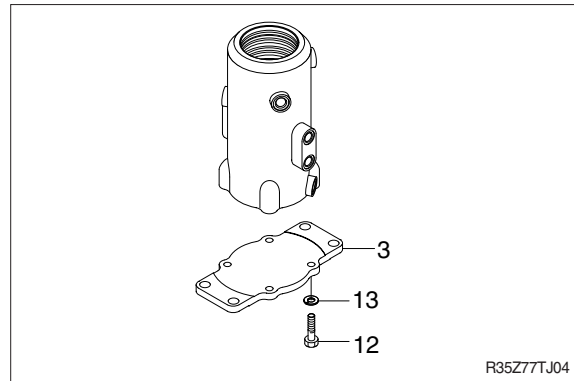
R35Z77TJ03

- |   |        |   |              |    |               |
|---|--------|---|--------------|----|---------------|
| 1 | Hub    | 5 | Slipper seal | 9  | Retainer ring |
| 2 | Shaft  | 6 | O-ring       | 10 | Plug          |
| 3 | Cover  | 7 | O-ring       | 11 | Plug          |
| 4 | Spacer | 8 | O-ring       | 12 | Hexagon bolt  |
|   |        |   |              | 13 | Spring washer |

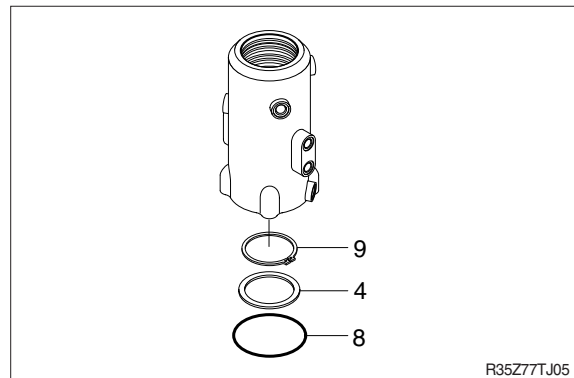
## 2) DISASSEMBLY

※ Before the disassembly, clean the turning joint.

- (1) Remove bolts (12), washer (13) and cover (3).

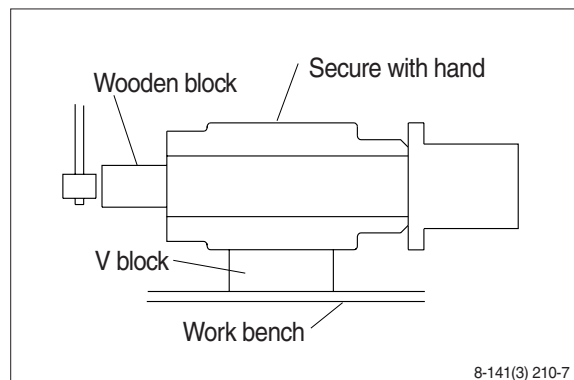


- (2) Remove O-ring (8).
- (3) Remove retainer ring (9) and spacer (4).

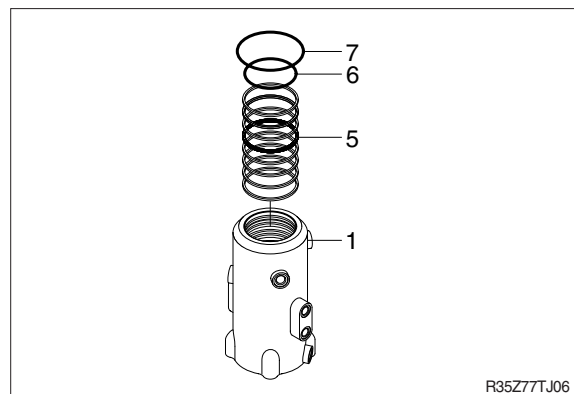


- (4) Place hub (1) on a V-block and by using a wood buffer at the shaft end, hit out shaft (2) to about 1/2 from the body with a hammer.

※ Take care not to damage the shaft (2) when remove hub (1) or rest it sideways.  
※ Put a fitting mark on hub (1) and shaft (2).



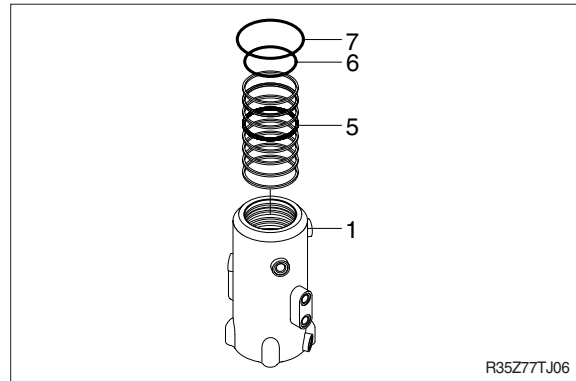
- (5) Remove eight slipper seals (5) and O-ring (6, 7) from hub (1).



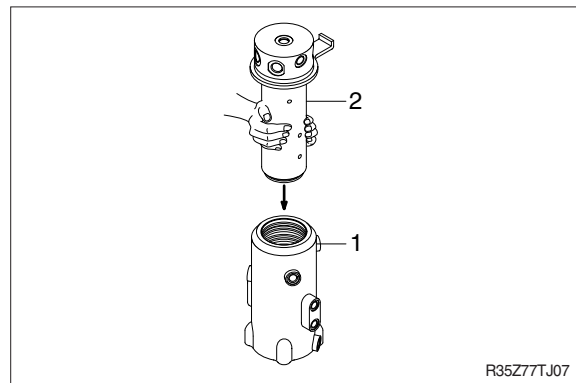
### 3) ASSEMBLY

- ※ Clean all parts.
- ※ As a general rule, replace oil seals and O-ring.
- ※ Coat the sliding surfaces of all parts with engine oil or grease before installing.

(1) Fix eight slipper seal (5) and O-ring (6, 7) to hub (1).

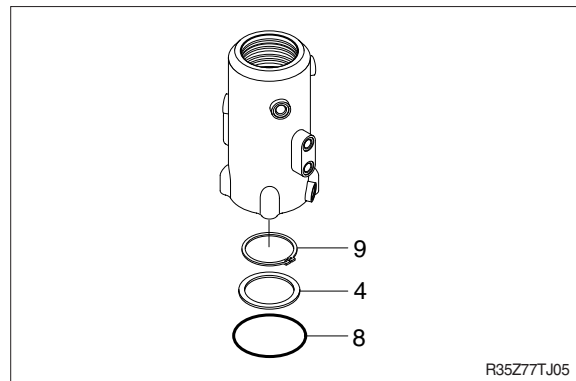


(2) Set hub (1) on block, install shaft (2) into hub (1) by hand.



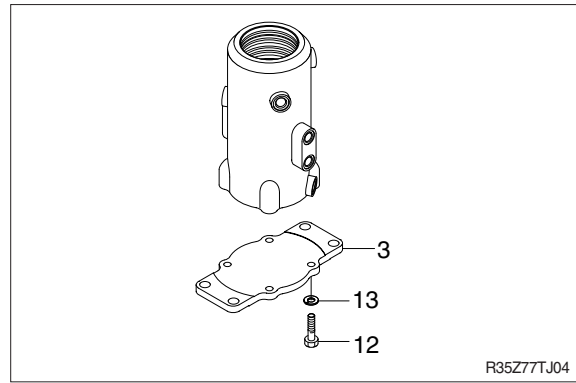
(3) Fit spacer (4) and retainer ring (9) to shaft (2).

(4) Fit O-ring (8) to hub (1).





(5) Install cover (3) to hub and tighten bolts (12).



## GROUP 9 BOOM, ARM AND BUCKET CYLINDERS

### 1. REMOVAL AND INSTALL

#### 1) BUCKET CYLINDER

##### (1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

**▲ Loosen the breather slowly to release the pressure inside the hydraulic tank. Escaping fluid under pressure can penetrate the skin causing serious injury.**

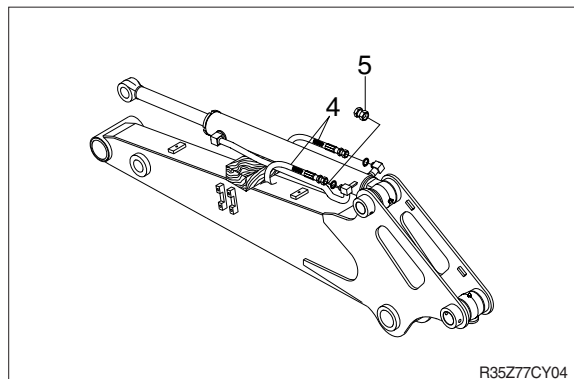
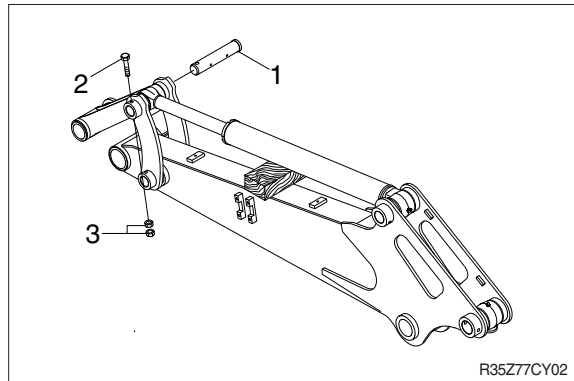
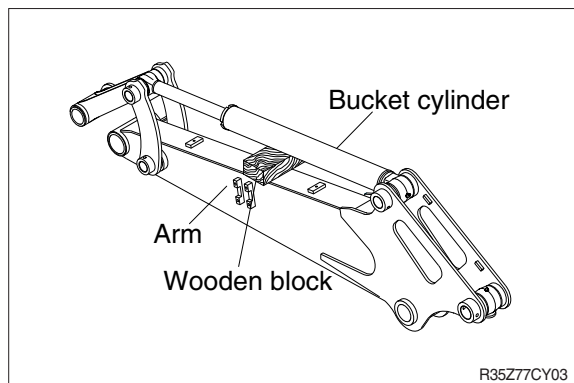
- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Set block between bucket cylinder and arm.

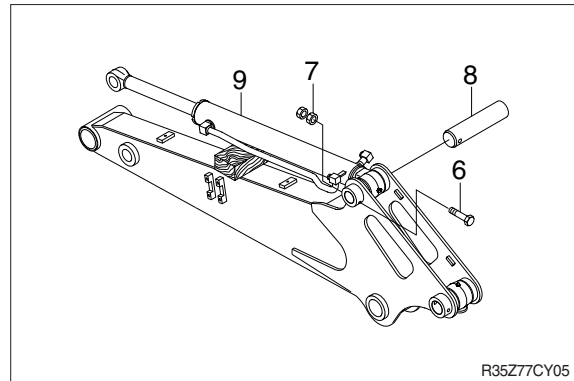
② Remove bolt (2), nut (3) and pull out pin (1).

- ※ Tie the rod with wire to prevent it from coming out.

③ Disconnect bucket cylinder hoses (4) and put plugs (5) on cylinder pipe.



- ④ Sling bucket cylinder assembly (9) and remove bolt (6) and nut (7) then pull out pin (8).
- ⑤ Remove bucket cylinder assembly (9).
  - Weight : 30 kg (70 lb)



## (2) Install

- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**
- ※ Bleed the air from the bucket cylinder.
  - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

## 2) ARM CYLINDER

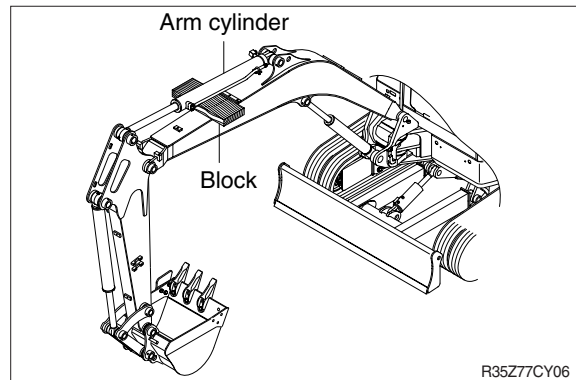
### (1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

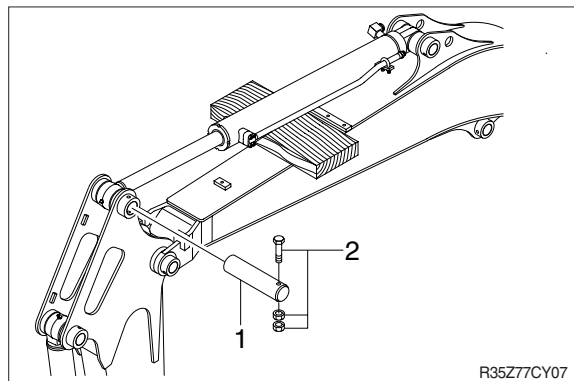
**▲ Loosen the breather slowly to release the pressure inside the hydraulic tank.**

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

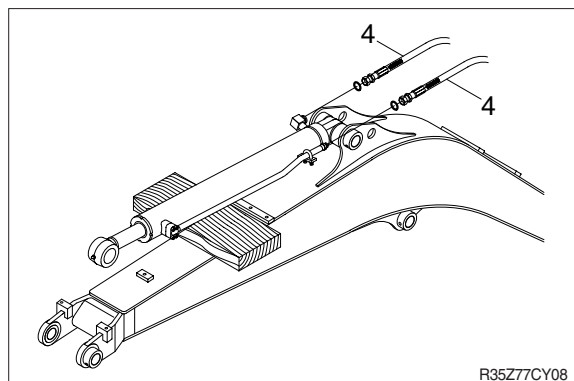
- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.
- ① Set block between arm cylinder and boom.



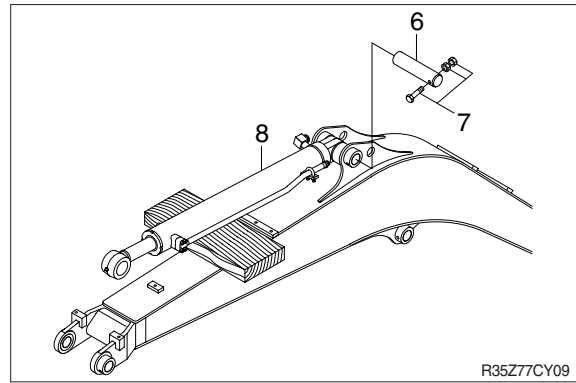
- ② Remove bolt and nut (2) and pull out pin (1).
- ※ Tie the rod with wire to prevent it from coming out.



- ③ Disconnect arm cylinder hoses (4) and put plugs on cylinder pipe.



- ⑤ Sling arm assembly (8) and remove bolt and nut (7) then pull out pin (6).
- ⑥ Remove arm cylinder assembly (8).
  - Weight : 40 kg (90 lb)



## (2) Install

- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**
- ※ Bleed the air from the arm cylinder.
  - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

### 3) BOOM CYLINDER

#### (1) Removal

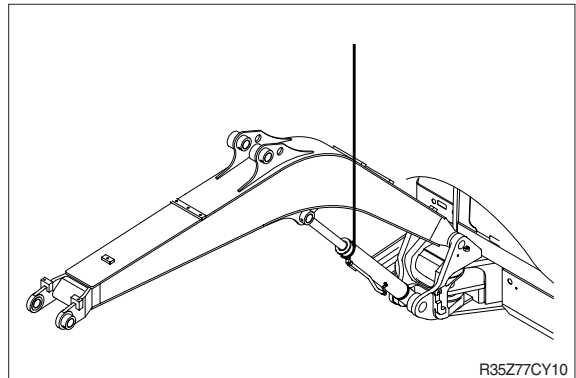
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

**▲ Loosen the breather slowly to release the pressure inside the hydraulic tank.**

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

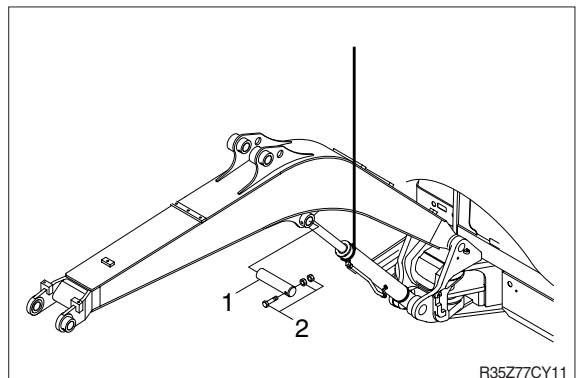
- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Sling boom cylinder assembly.

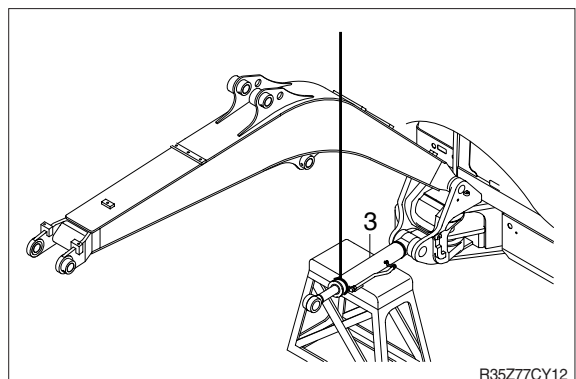


③ Remove bolt and nut (2) and pull out pin (1).

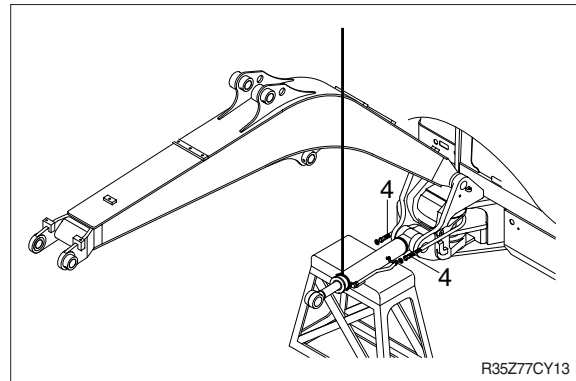
- ※ Tie the rod with wire to prevent it from coming out.



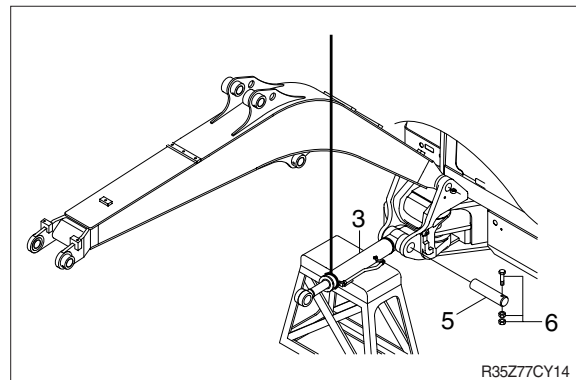
④ Lower the boom cylinder assembly (3) on a stand.



- ⑤ Disconnect boom cylinder hoses(4) and put plugs on cylinder pipe.



- ⑥ Remove bolt (6) and pull out pin (5).  
⑦ Remove boom cylinder assembly (3).  
· Weight : 60 kg (130 lb)



## (2) Install

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

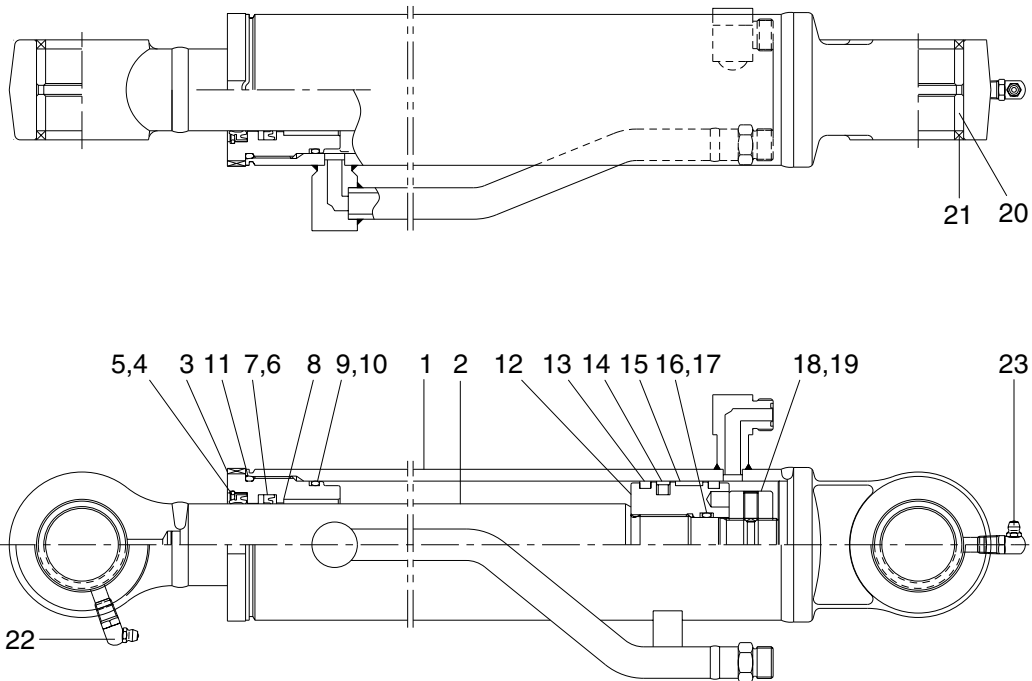
**▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**

- ※ Bleed the air from the boom cylinder.
- ※ Confirmed the hydraulic oil level and check the hydraulic oil leak or not.

## 2. DISASSEMBLY AND ASSEMBLY

### 1) STRUCTURE

#### (1) Bucket cylinder

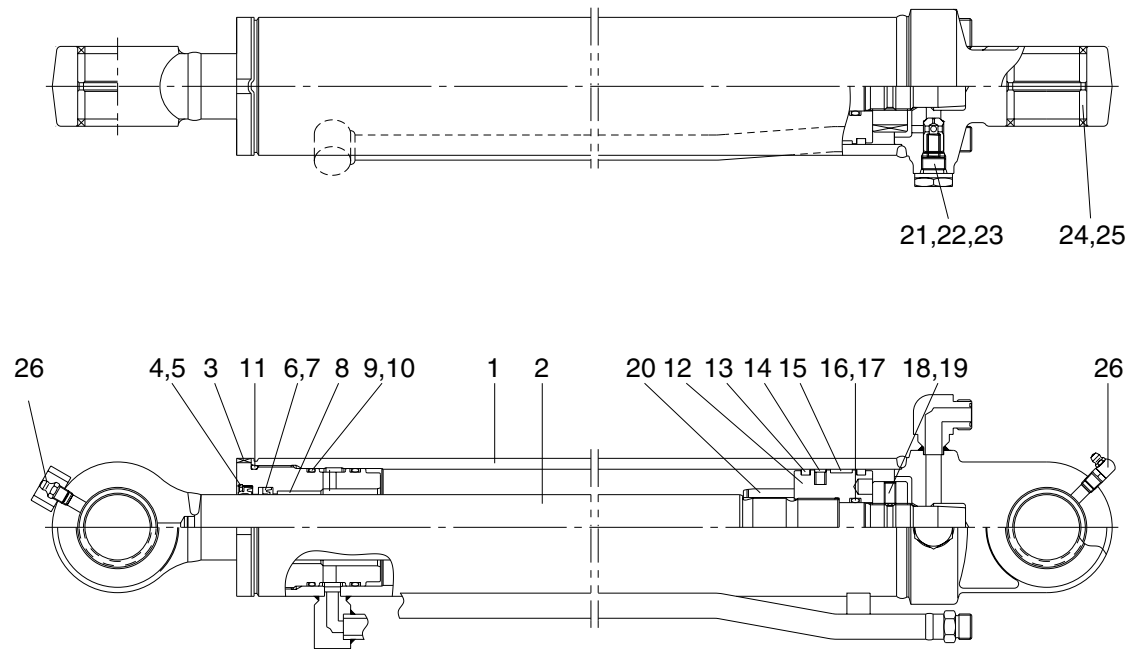


R35Z77CY15

1	Tube assembly	9	O-ring	17	Back-up ring
2	Rod assembly	10	Back-up ring	18	Piston nut
3	Gland	11	O-ring	19	Set screw
4	Dust wiper	12	Piston	20	Pin bushing
5	Snap ring	13	Dust ring	21	Dust seal
6	Rod seal	14	Piston seal	22	Grease nipple
7	Back-up ring	15	Wear ring	23	Grease nipple
8	DU bushing	16	O-ring		



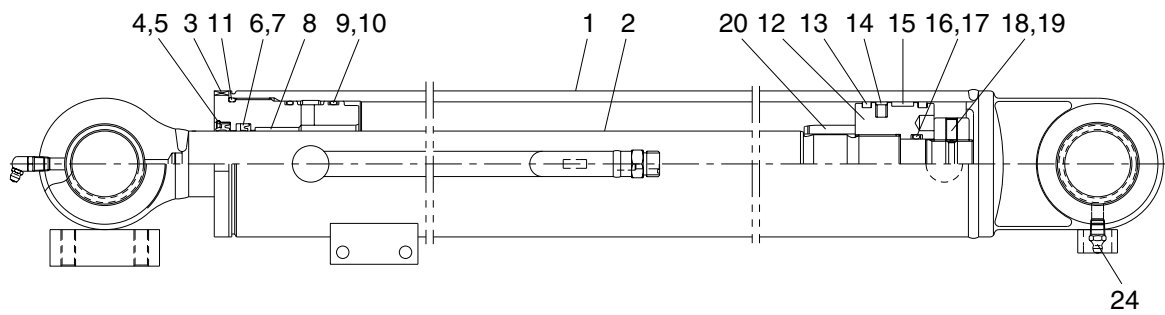
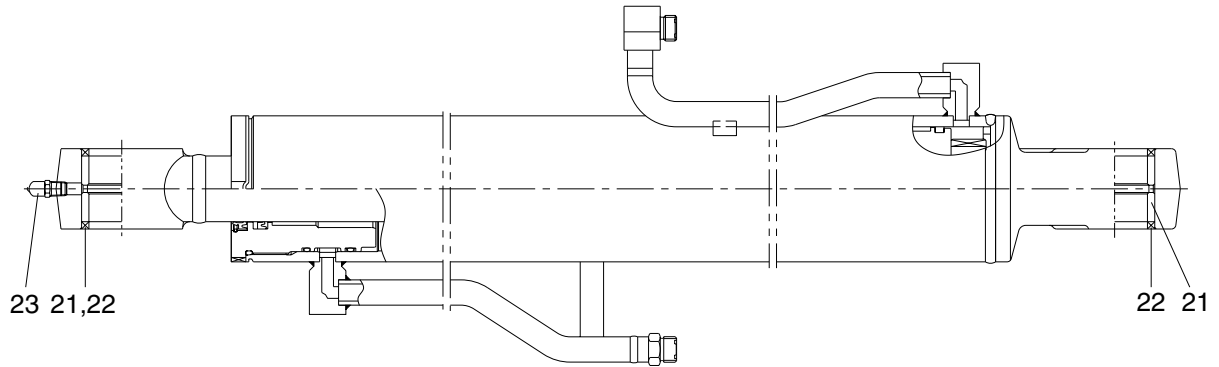
## (2) Arm cylinder



R35Z97CY16

1	Tube assembly	10	Back-up ring	19	Set screw
2	Rod assembly	11	O-ring	20	Cushion ring
3	Gland	12	Piston	21	Check valve
4	Dust wiper	13	Dust ring	22	Coil spring
5	Snap ring	14	Piston seal	23	Plug
6	Rod seal	15	Wearing	24	Pin bushing
7	Back-up ring	16	O-ring	25	Dust seal
8	DU bushing	17	Back-up ring	26	Grease nipple
9	O-ring	18	Piston nut		

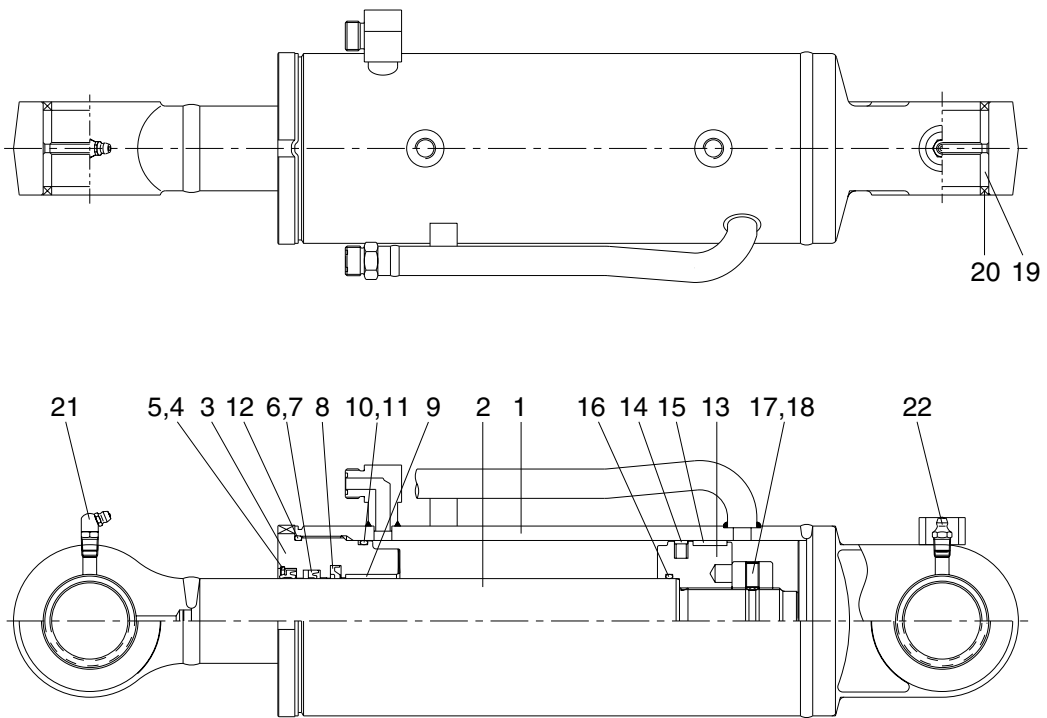
### (3) Boom cylinder



R35Z77CY17

- |   |               |    |              |    |               |
|---|---------------|----|--------------|----|---------------|
| 1 | Tube assembly | 9  | O-ring       | 17 | Back-up ring  |
| 2 | Rod assembly  | 10 | Back-up ring | 18 | Piston nut    |
| 3 | Gland         | 11 | O-ring       | 19 | Set screw     |
| 4 | Dust wiper    | 12 | Piston       | 20 | Cushion ring  |
| 5 | Snap ring     | 13 | Dust ring    | 21 | Pin bushing   |
| 6 | Rod seal      | 14 | Piston seal  | 22 | Dust seal     |
| 7 | Back-up ring  | 15 | Wear ring    | 23 | Grease nipple |
| 8 | DU bushing    | 16 | O-ring       | 24 | Grease nipple |

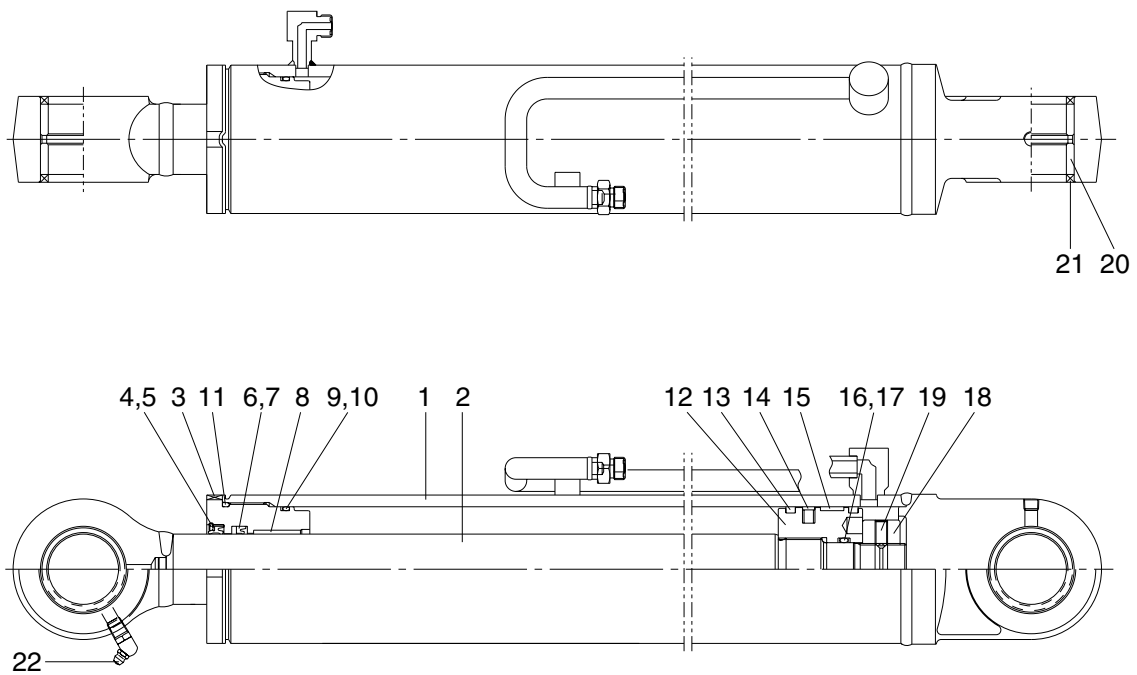
#### (4) Dozer cylinder



R35Z77CY18

- |   |               |    |              |    |               |
|---|---------------|----|--------------|----|---------------|
| 1 | Tube assembly | 8  | Buffer ring  | 15 | Wear ring     |
| 2 | Rod assembly  | 9  | DU bushing   | 17 | Piston nut    |
| 3 | Gland         | 10 | O-ring       | 18 | Set screw     |
| 4 | Dust wiper    | 11 | Back-up ring | 19 | Pin bushing   |
| 5 | Snap ring     | 12 | O-ring       | 20 | Dust seal     |
| 6 | Rod seal      | 13 | Piston       | 21 | Grease nipple |
| 7 | Back-up ring  | 14 | Piston seal  | 22 | Grease nipple |

(5) Boom swing cylinder

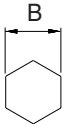


R35Z77CY19

- |   |               |    |              |    |               |
|---|---------------|----|--------------|----|---------------|
| 1 | Tube assembly | 9  | O-ring       | 16 | O-ring        |
| 2 | Rod assembly  | 10 | Back-up ring | 17 | Back-up ring  |
| 3 | Gland         | 11 | O-ring       | 18 | Piston nut    |
| 4 | Dust wiper    | 12 | Piston       | 19 | Set screw     |
| 5 | Snap ring     | 13 | Dust ring    | 20 | Pin bushing   |
| 6 | Rod seal      | 14 | Piston seal  | 21 | Dust seal     |
| 7 | Back-up ring  | 15 | Wear ring    | 22 | Grease nipple |
| 8 | DU bushing    |    |              |    |               |

## 2) TOOLS AND TIGHTENING TORQUE

### (1) Tools

Tool name	Remark	
Allen wrench	8	
	3	
Spanner	M22	
Hook spanner	Suitable size (80~120 mm)	
(-) Driver	Small and large sizes	
Torque wrench	Capable of tightening with the specified torques	

### (2) Tightening torque

Part name		Item	Size	Torque	
				kgf · m	lbf · ft
Gland	Boom cylinder	3	M90	68±6.8	492±49
	Arm cylinder	3	M85	64±6.4	463±46
	Bucket cylinder	3	M75	56±5.6	405±41
	Dozer cylinder	3	M100	75±7.5	542±54
	Boom swing cylinder	3	M85	64±6.4	463±46
Piston	Boom cylinder	18	M33	82±8	593±59
	Arm cylinder	18	M33	82±8	593±59
	Bucket cylinder	18	M29	73±7	528±53
	Dozer cylinder	17	M39	150±15	1085±109
	Boom swing cylinder	18	M33	93±9	673±67

### 3) DISASSEMBLY

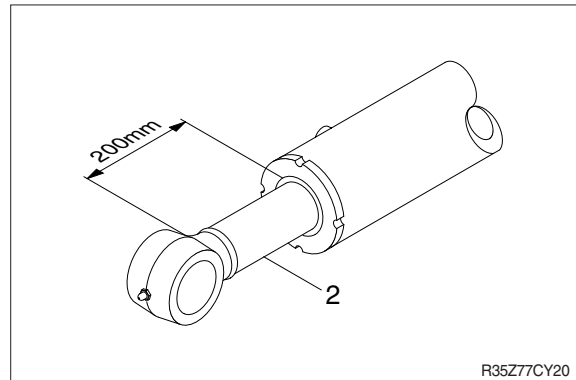
※ Procedures are based on the boom cylinder.

(1) Remove cylinder head and piston rod

① Hold the clevis section of the tube in a vise.

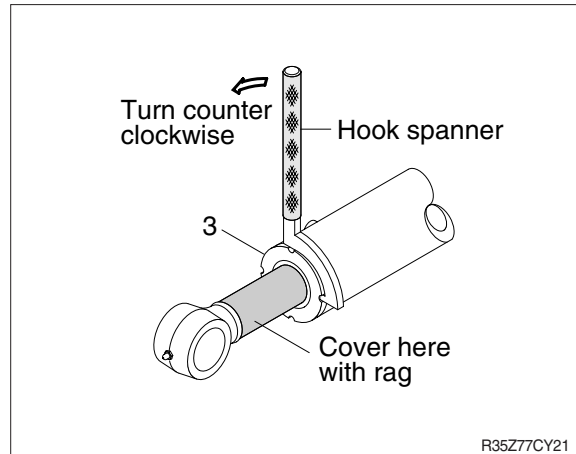
※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

② Pull out rod assembly (2) about 200 mm (7.1 in). Because the rod assembly is rather heavy, finish extending it with air pressure after the oil draining operation.



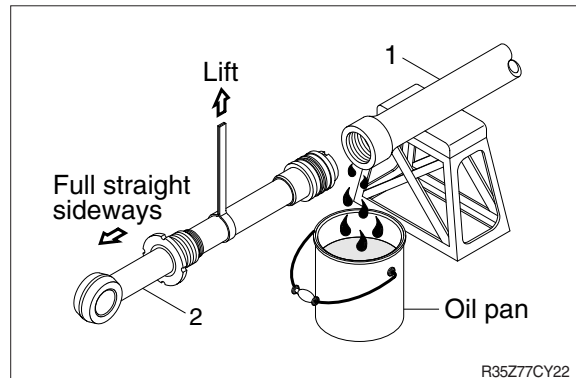
③ Loosen and remove the gland (3) by hook spanner.

※ Cover the extracted rod assembly (2) with rag to prevent it from being accidentally damaged during operation.



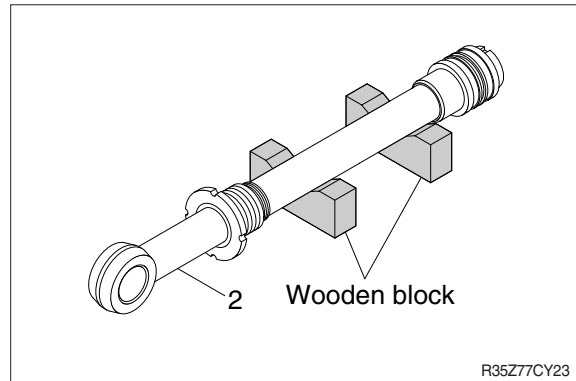
④ Draw out cylinder head and rod assembly together from tube assembly (1).

※ Since the rod assembly is heavy in this case, lift the tip of the rod assembly (2) with a crane or some means and draw it out. However, when rod assembly (2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.



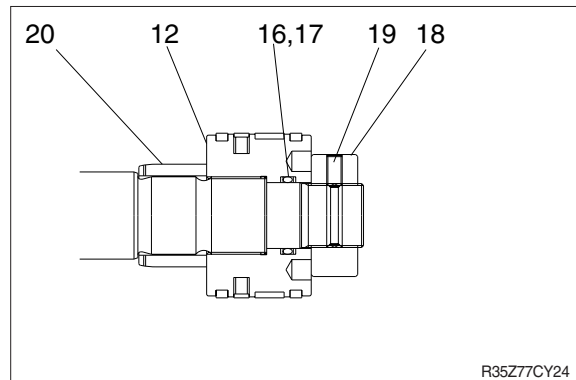
Note that the plated surface of rod assembly (2) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.

- ⑤ Place the removed rod assembly on a wooden V-block that is set level.
- ※ Cover a V-block with soft rag.



## (2) Remove piston and gland

- ① Remove set screw (19)
- ② Remove piston nut (18).
- ※ Since piston nut (18) is tightened to a high torque, use a hydraulic and power wrench that utilizes a hydraulic cylinder, to remove the piston nut (18).

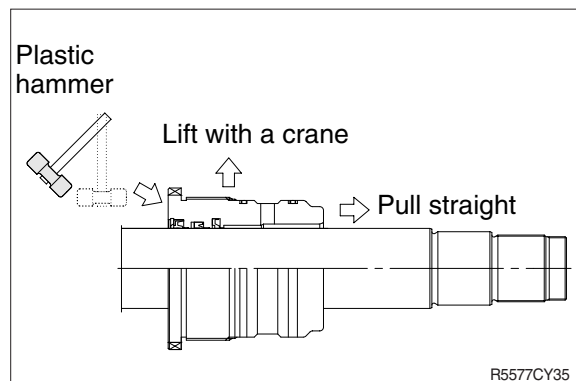


- ③ Remove piston assembly (12), back up ring (17), O-ring (10) and cushion ring (20).

- ④ Remove the gland assembly from rod assembly (2).

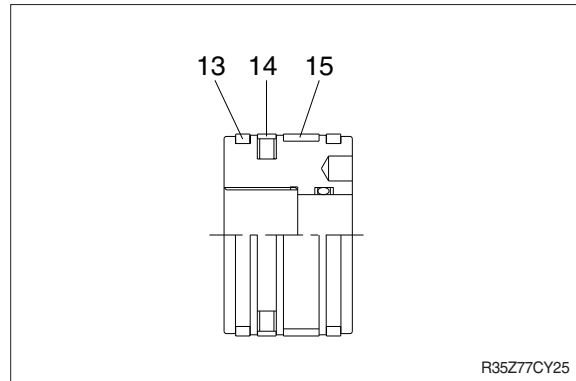
- ※ If it is too heavy to move, move it by striking the flanged part of gland with a plastic hammer.
- ※ Pull it straight with gland assembly lifted with a crane.

Exercise care so as not to damage the lip of DU bushing (8) and packing (4,5,6,7,9,10) by the threads of rod assembly (2).



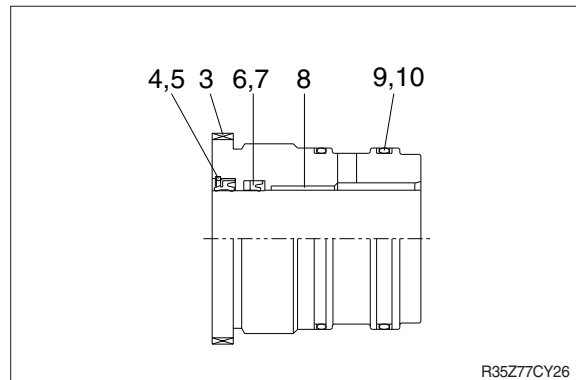
### (3) Disassemble the piston assembly

- ① Remove wear ring (15).
  - ② Remove dust ring (13) and piston seal (14).
- ※ Exercise care in this operation not to damage the grooves.



### (4) Disassemble gland assembly

- ① Remove back up ring (10) and O-ring (9).
  - ② Remove snap ring (5), dust wiper (4).
  - ③ Remove back up ring (7), rod seal (6).
  - ④ Remove the cushion ring (8).
- ※ Exercise care in this operation not to damage the grooves.
- ※ Do not remove seal and ring, if does not damaged.



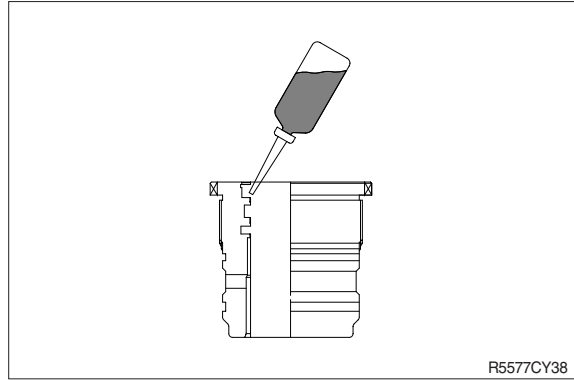


#### 4) ASSEMBLY

##### (1) Assemble cylinder head assembly

※ Check for scratches or rough surfaces if found smooth with an oil stone.

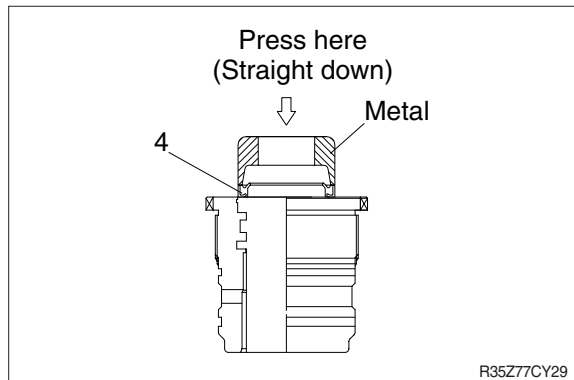
① Coat the inner face of gland (3) with hydraulic oil.



② Coat dust wiper (4) with grease and fit dust wiper (4) to the bottom of the hole of dust seal.

At this time, press a pad metal to the metal ring of dust seal.

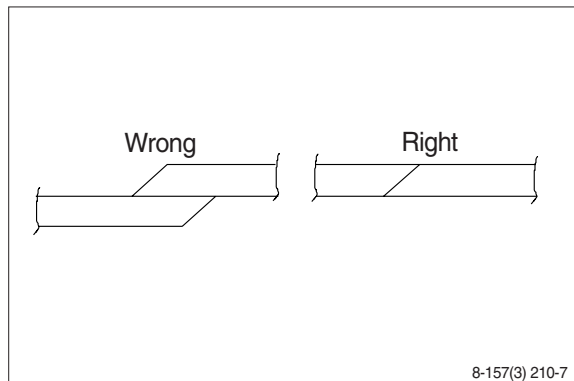
③ Fit retain ring (5) to the stop face.



④ Fit back up ring (7), rod seal (6) to corresponding grooves, in that order.

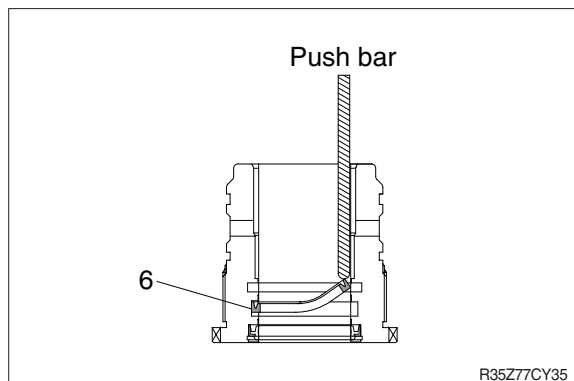
※ Coat each packing with hydraulic oil before fitting it.

※ Insert the backup ring until one side of it is inserted into groove.

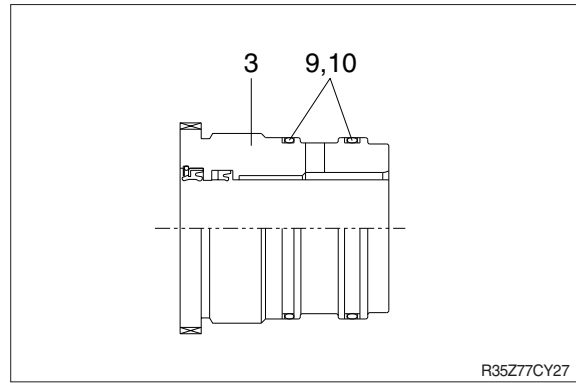


※ Rod seal (6) has its own fitting direction. Therefore, confirm it before fitting them.

※ Fitting rod seal (6) upside down may damage its lip. Therefore check the correct direction that is shown in fig.

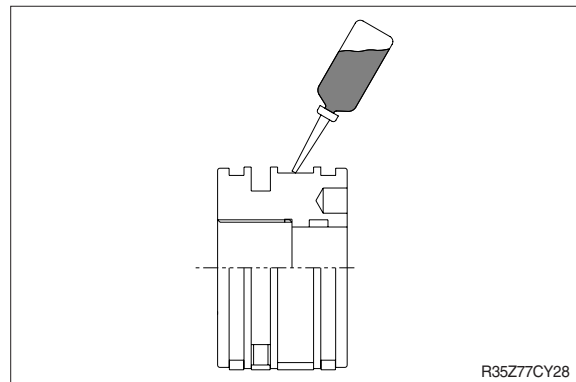


- ⑤ Fit back up ring (10) to gland (3).
- ※ Put the backup ring in the warm water of 30~50°C .
- ⑥ Fit O-ring (9) to gland (3).

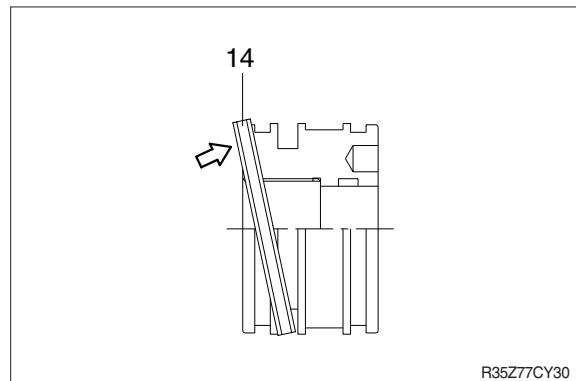


## (2) Assemble piston assembly

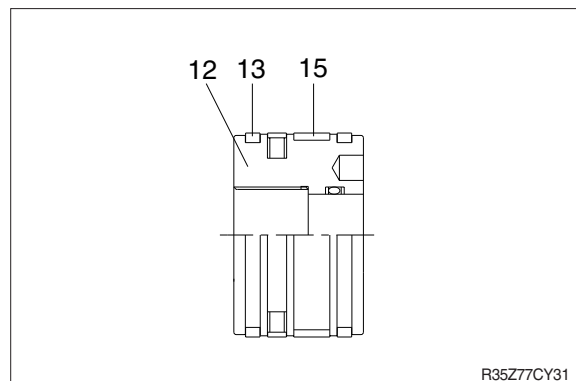
- ※ Check for scratches or rough surfaces.  
If found smooth with an oil stone.
- ① Coat the outer face of piston (16) with hydraulic oil.



- ② Fit piston seal (14) to piston.
- ※ Put the piston seal in the warm water of 60~100°C for more than 5 minutes.
- ※ After assembling the piston seal, press its outer diameter to fit in.

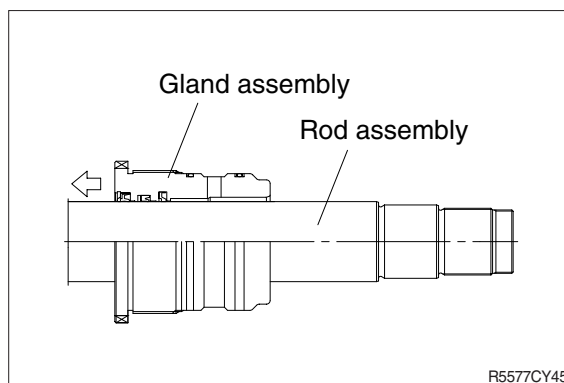


- ③ Fit wear ring (15) and dust ring (13) to piston (12).

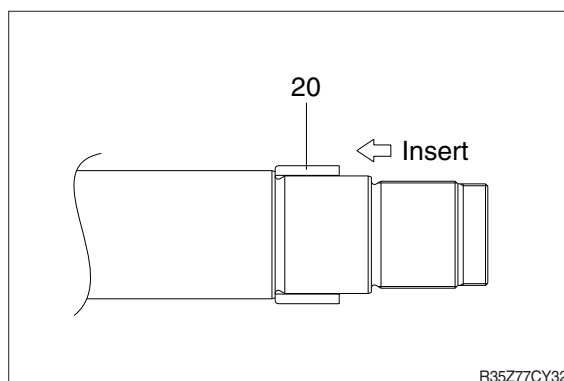


### (3) Install piston and cylinder head

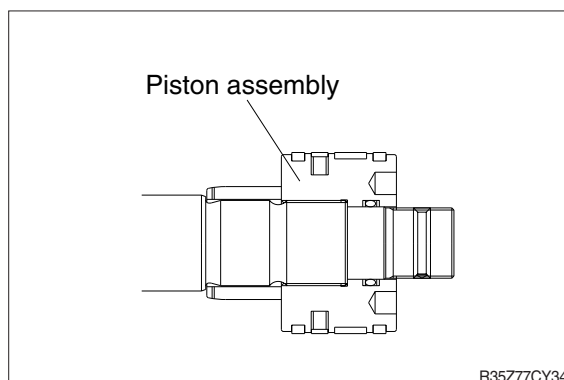
- ① Fix the rod assembly to the work bench.
- ② Apply hydraulic oil to the outer surface of rod assembly (2), the inner surface of piston and gland.
- ③ Insert gland assembly to rod assembly.



- ④ Insert cushion ring (20) to rod assembly.
- ※ Note that cushion ring (20) has a direction in which it should be fitted.



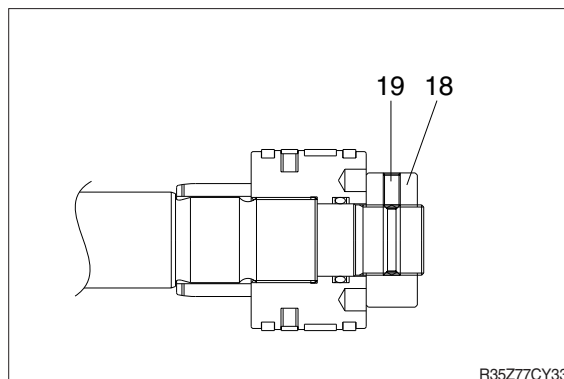
- ⑤ Fit piston assembly to rod assembly.



- ⑥ Fit piston nut (18) and set screw (19).

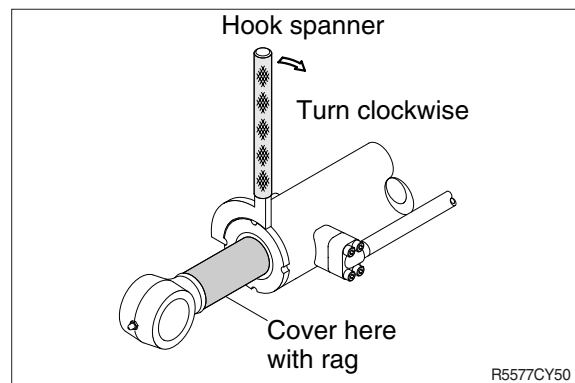
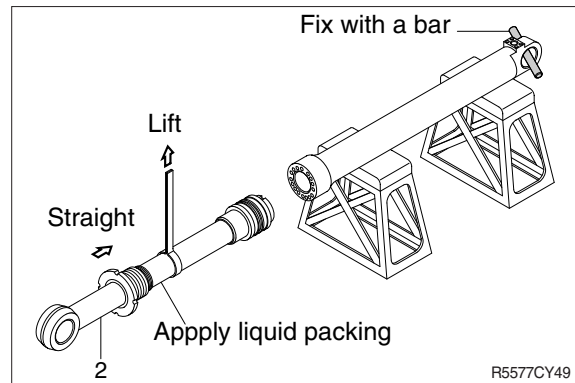
· Tightening torque :

Item		kgf · m	lbf · ft
Boom	18	82 ± 8	593 ± 59
Arm	18	82 ± 8	593 ± 59
Bucket	18	73 ± 7	528 ± 53
Dozer	17	150 ± 15	1085 ± 109
Boom swing	18	93 ± 9	673 ± 67



### (3) Overall assemble

- ① Place a V-block on a rigid work bench.  
Mount the tube assembly (1) on it and fix the assembly by passing a bar through the clevis pin hole to lock the assembly.
- ② Insert the rod assembly in to the tube assembly, while lifting and moving the rod assembly with a crane.
  - ※ Be careful not to damage piston seal by thread of tube assembly.
- ③ Match the bolt holes in the cylinder head flange to the tapped holes in the tube assembly and tighten socket bolts to a specified torque.
  - ※ Refer to the table of tightening torque.

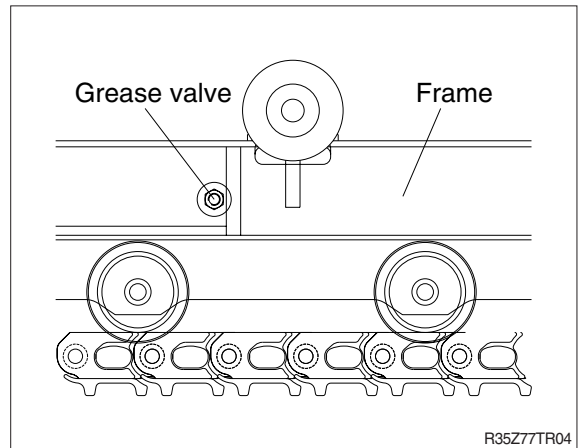


## GROUP 10 UNDERCARRIAGE

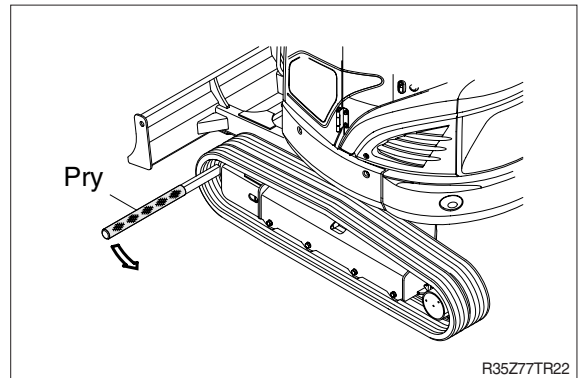
### 1. RUBBER TRACK

#### 1) REMOVAL

- (1) Loosen tension of the rubber track.
  - ※ If track tension is not relieved when the grease valve is loosened, move the machine backwards and forwards.

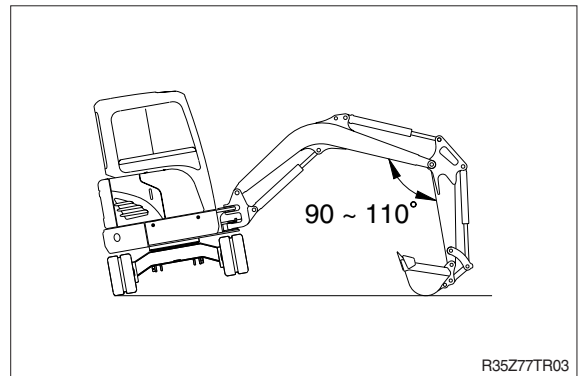


- (2) Remove the rubber track from lower frame using pry.



#### 2) INSTALL

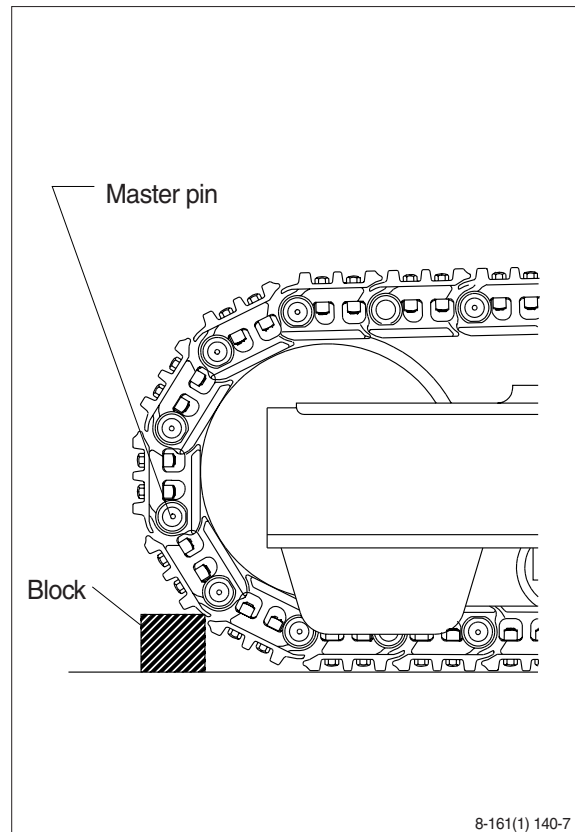
- (1) Carry out installation in the reverse order to removal.
  - ※ Adjust the tension of the rubber track.



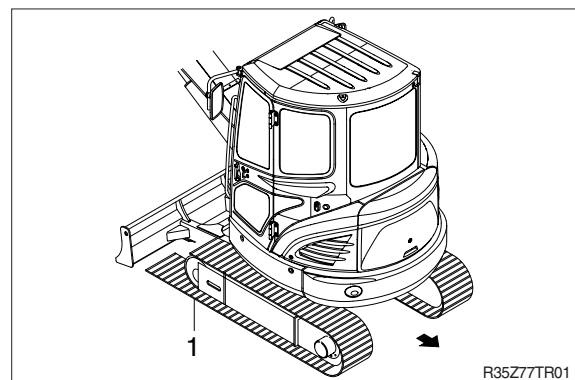
## 2. TRACK LINK

### 1) REMOVAL

- (1) Move track link until master pin is over front idler in the position put wooden block as shown.
- (2) Loosen tension of the track link.
  - ※ If track tension is not relieved when the grease valve is loosened, move the machine backwards and forwards.
- (3) Push out master pin by using a suitable tool.

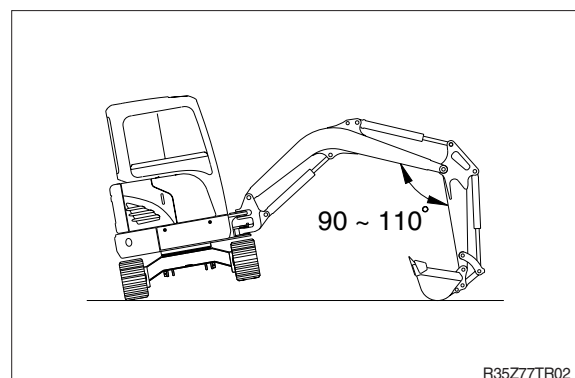


- (4) Move the machine slowly in reverse, and lay out track link assembly (1).
  - ※ Jack up the machine and put wooden block under the machine.
  - ※ Don't get close to the sprocket side as the track shoe plate may fall down on your feet.



### 2) INSTALL

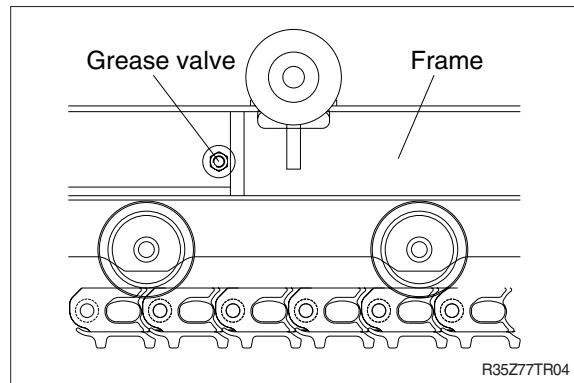
- (1) Carry out installation in the reverse order to removal.
  - ※ Adjust the tension of the track link.



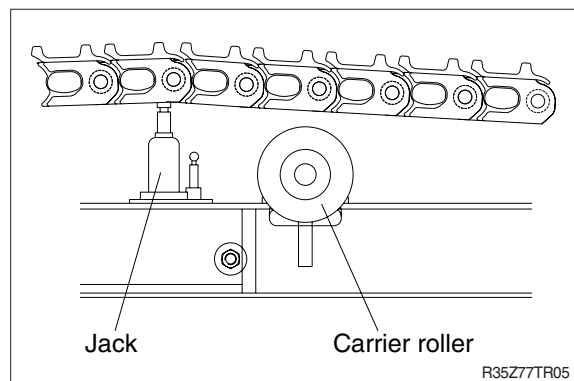
### 3. CARRIER ROLLER

#### 1) REMOVAL

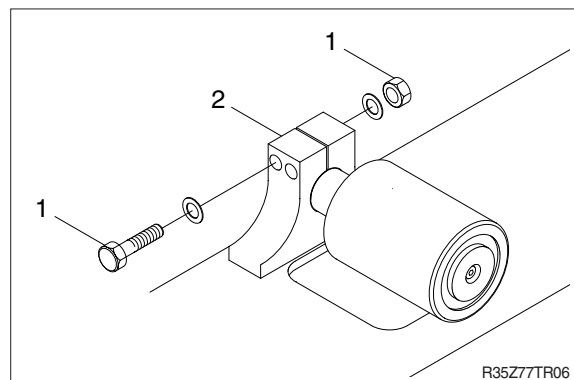
- (1) Loosen tension of the track link.



- (2) Jack up the track link height enough to permit carrier roller removal.



- (3) Loosen the bolt and nut (1)
- (4) Open bracket (2) with a screwdriver, push out from inside, and remove carrier roller assembly.
  - Weight : 5 kg (11 lb)



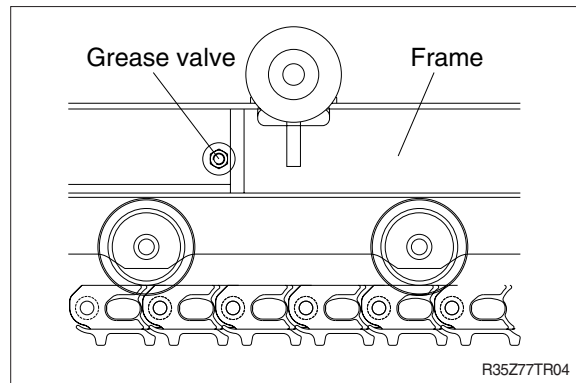
#### 2) INSTALL

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

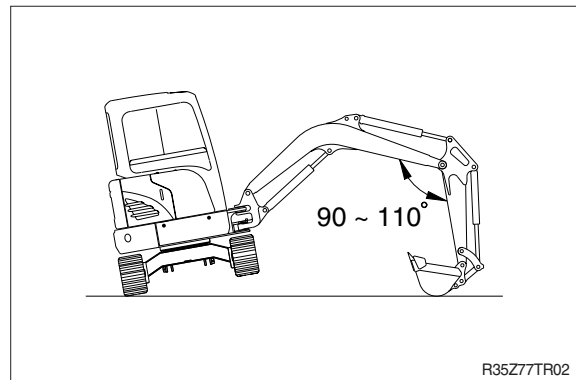
## 4. TRACK ROLLER

### 1) REMOVAL

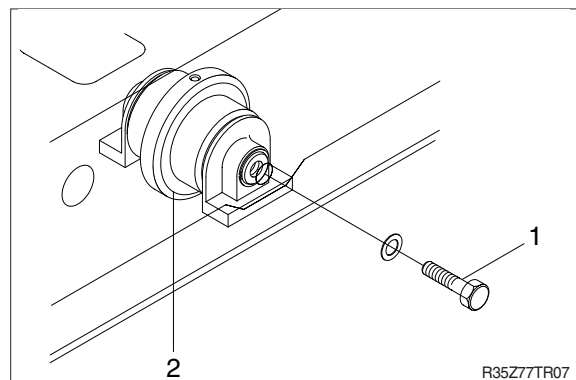
- (1) Loosen tension of the rubber track.



- (2) Using the work equipment, push up track frame on side which is to be removed.  
※ After jack up the machine, set a block under the unit.



- (3) Remove the mounting bolt (1) and draw out the track roller (2).  
· Weight : 8 kg (17.5 lb)



### 2) INSTALL

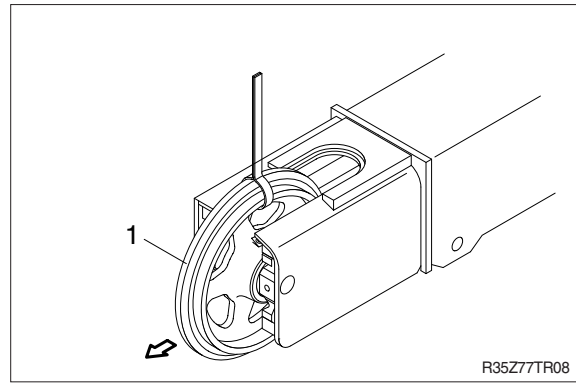
- (1) Carry out installation in the reverse order to removal.



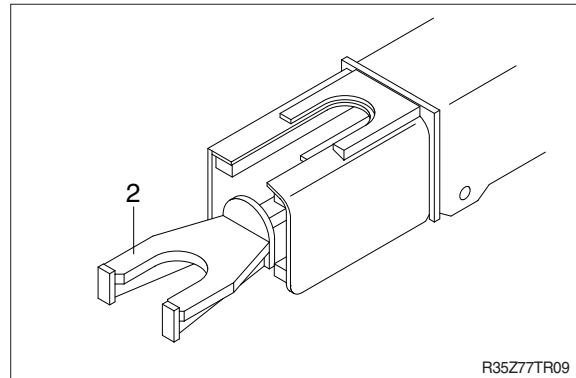
## 5. IDLER AND RECOIL SPRING

### 1) REMOVAL

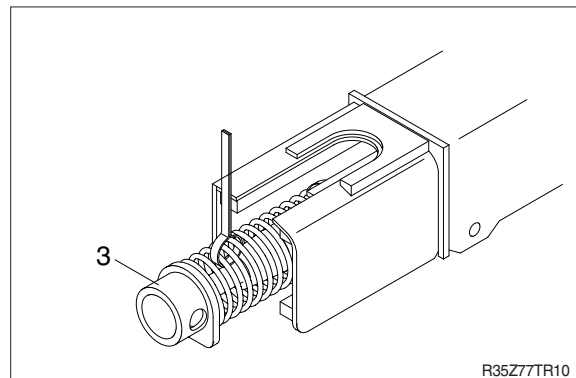
- (1) Remove the track link.  
For detail, see **removal of track link**.
- (2) Sling the idler (1) and pull out idler and recoil spring assembly from track frame, using a pry.
  - Weight : 40 kg (90 lb)



- (3) Pull out yoke and spring weld assembly from track frame, using a pry.
  - Weight : 10 kg (25 lb)

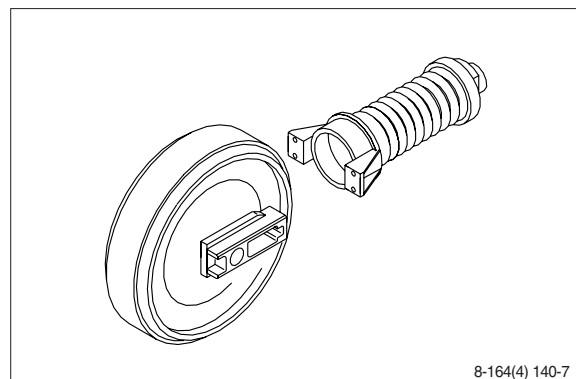


- (4) Sling the recoil spring (3) and pull out recoil spring (3) from track frame.
  - Weight : 25 kg (55 lb)



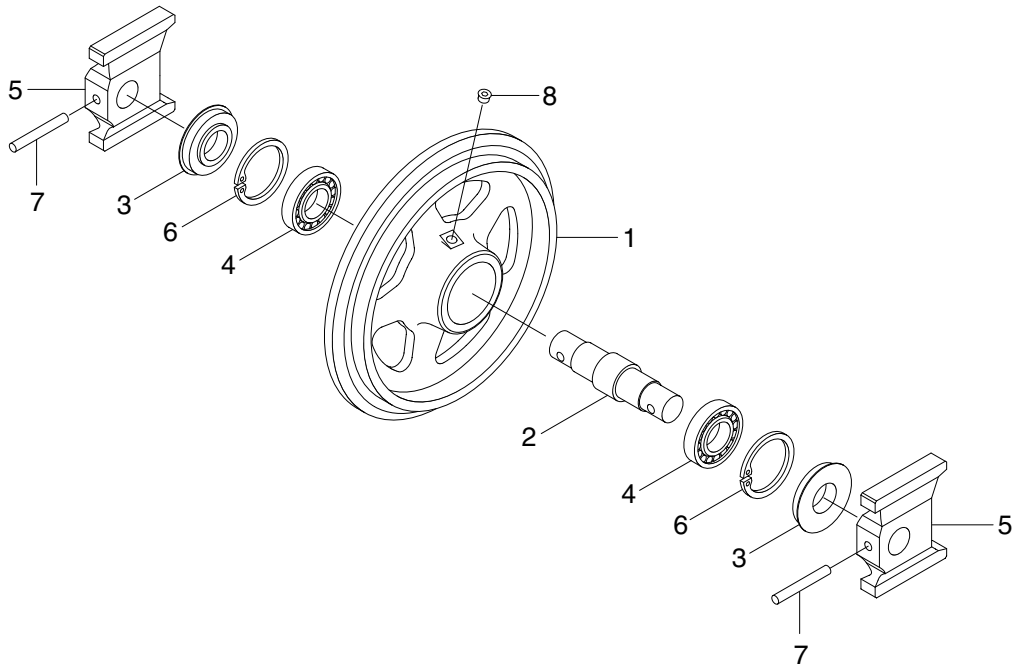
### 2) INSTALL

- (1) Carry out installation in the reverse order to removal.
  - ※ Make sure that the boss on the end face of the recoil cylinder rod is in the hole of the track frame.



### 3) DISASSEMBLY AND ASSEMBLY OF IDLER

#### (1) Structure



R35Z77TR11

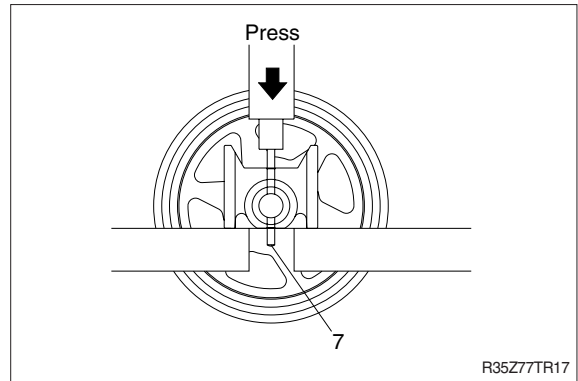
- 1 Shell
- 2 Shaft
- 3 Seal assembly

- 4 Ball bearing
- 5 Bracket
- 6 Snap ring

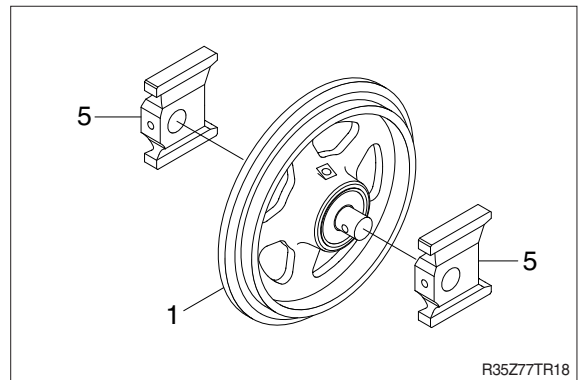
- 7 Spring pin
- 8 Plug

## (2) Disassembly

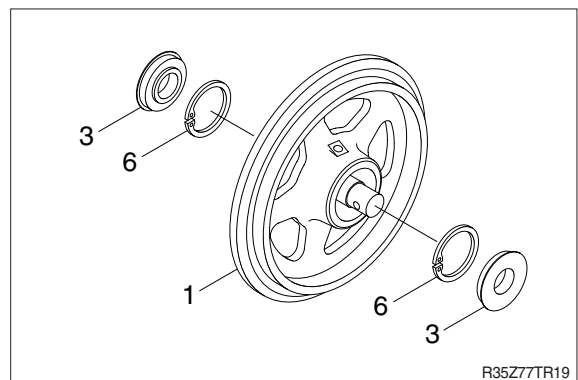
- ① Remove plug and drain oil.
- ② Draw out the spring pin (7), using a press.



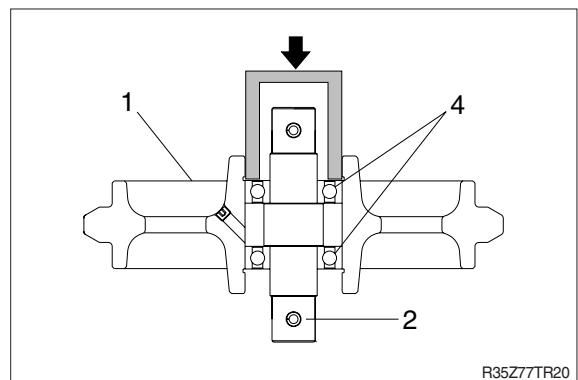
- ③ Remove brackets (5) from shaft.



- ④ Remove seal assembly (3) from shell (1) by pry.
- ※ Do not reuse seal assembly after removal.
- ⑤ Remove snap ring (6) from shell (1)

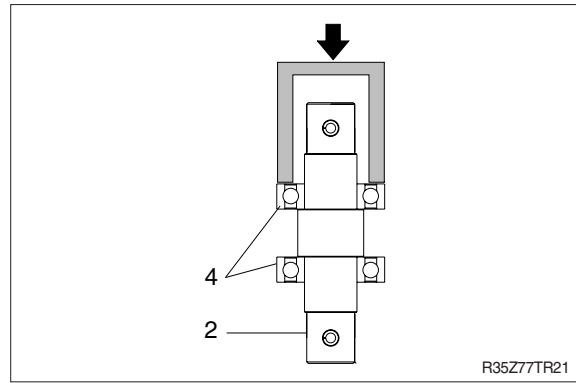


- ⑥ Draw out the ball bearing (4) with shaft (2) using press.
- ⑦ Remove the ball bearing (4) from shaft, using a special tool.
- ※ Only remove ball bearing if replacement is necessary.

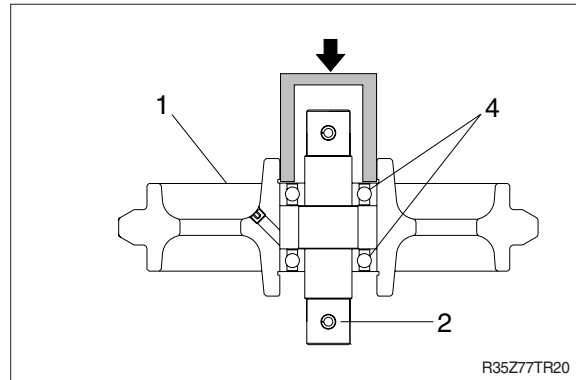


### (3) Assembly

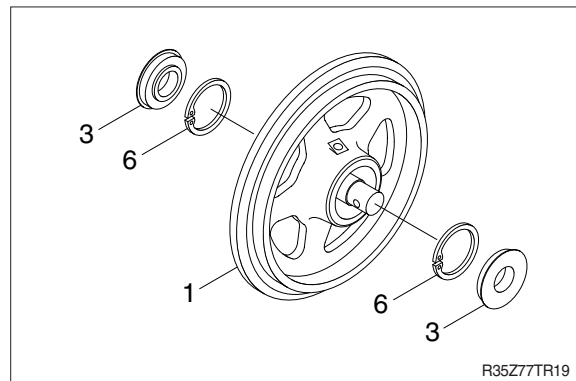
- ※ Before assembly, clean the parts.
- ※ Coat the sliding surfaces of all parts with oil.
- ① Do not press it at the normal temperature, assemble ball bearing (4) to shaft by press.



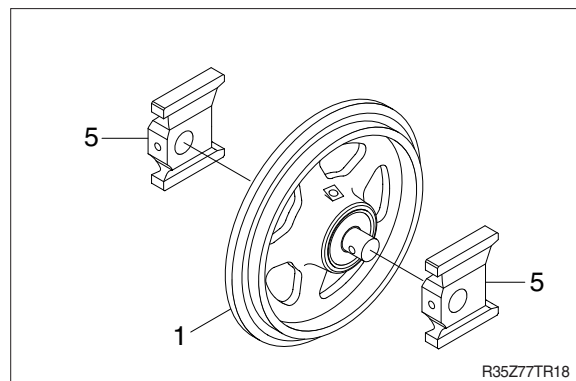
- ② Insert shaft (2) with ball bearing (4) assembly to shell (1).



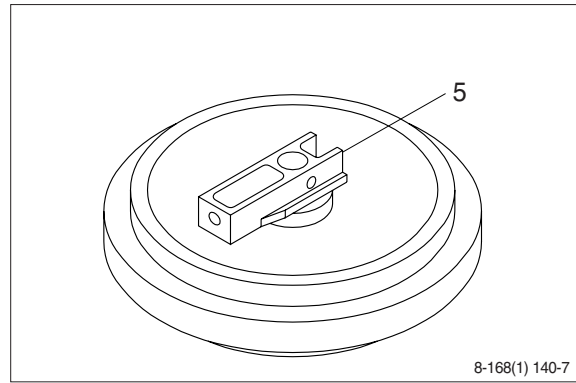
- ③ Assemble snap ring (6) and seal assembly (3).



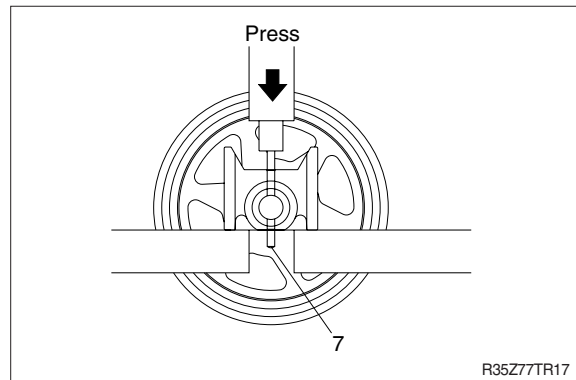
- ④ Assemble bracket (5) to shell (1).



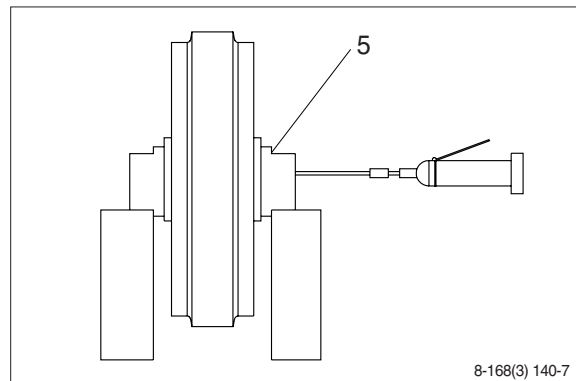
- ⑤ Install bracket (5) attached with seal (3).



- ⑥ Knock in the spring pin (7) with a hammer.

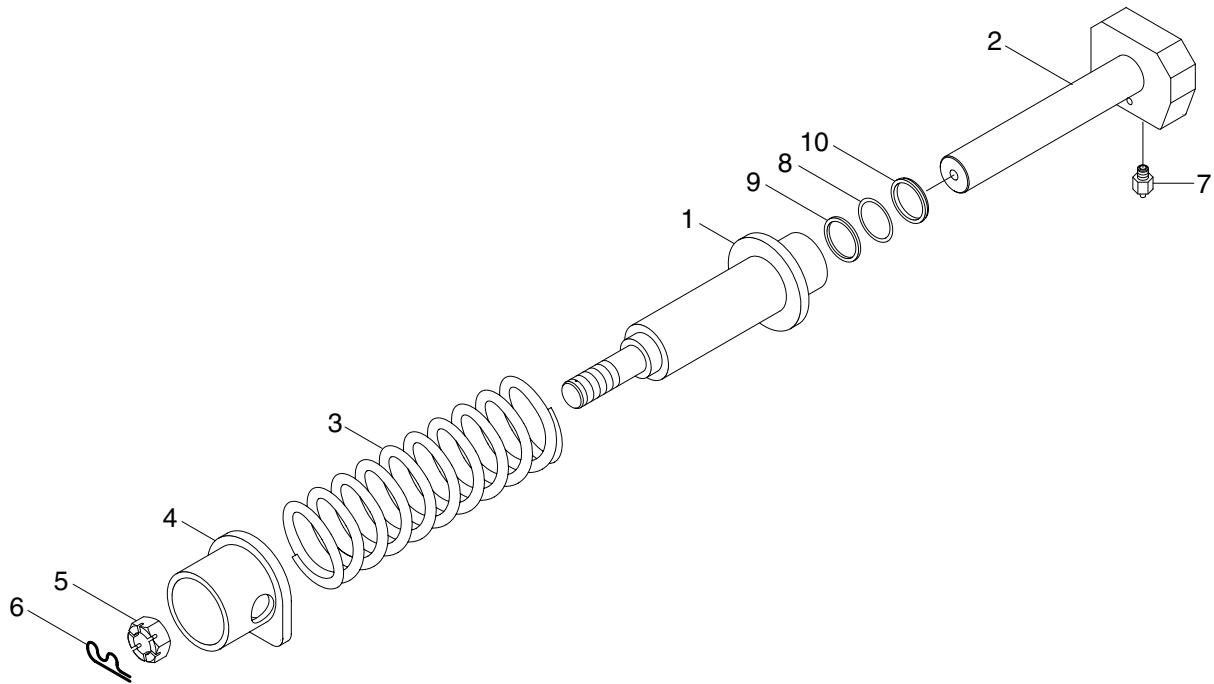


- ⑦ Lay bracket (5) on its side.  
Supply engine oil to the specified level,  
and tighten plug.



#### 4) DISASSEMBLY AND ASSEMBLY OF RECOIL SPRING

##### (1) Structure



R35Z77TR12

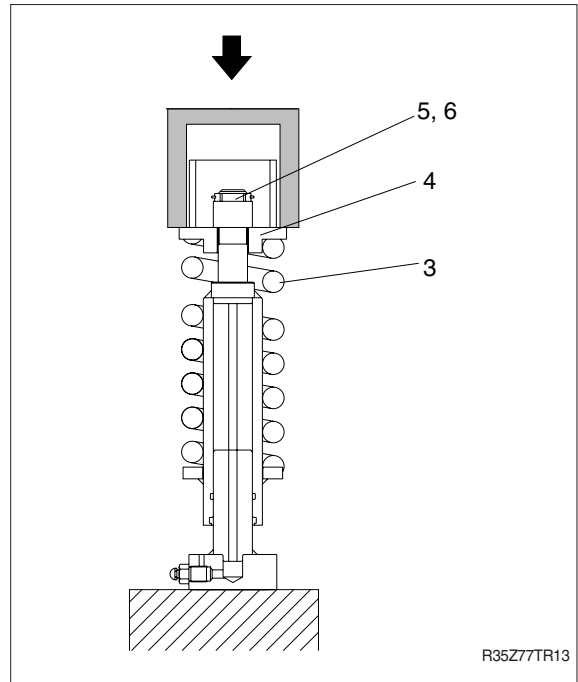
- 1 Body assy
- 2 Rod
- 3 Tension spring
- 4 Cap

- 5 Nut
- 6 Split pin
- 7 Grease valve

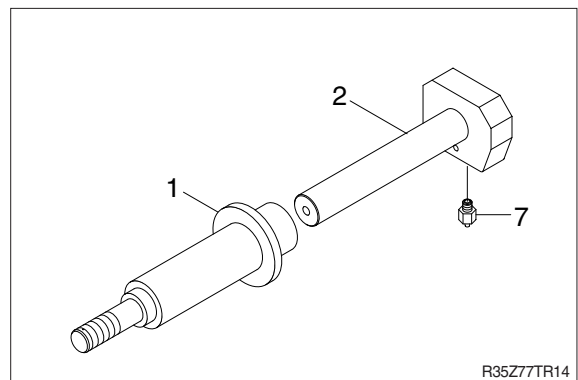
- 8 O-ring
- 9 Back-up ring
- 10 Packing

## (2) Disassembly

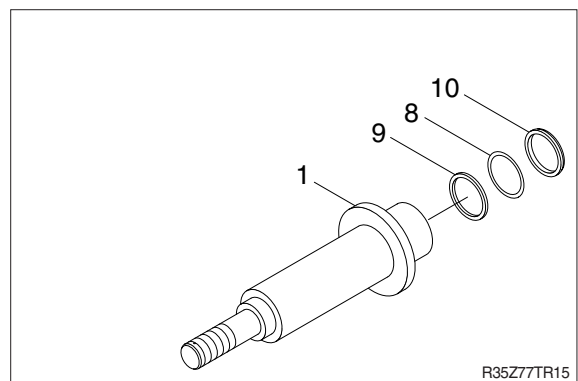
- ① Apply pressure on cap (4) with a press.
  - ※ The spring is under a large installed load. This is dangerous, so be sure to set properly.
  - Spring set load : 2700 kg (6000 lb)
- ② Remove split pin (6) and nut (5).
- ③ Lighten the press load slowly and remove cap (4) and spring (3).



- ⑤ Remove rod (2) from body (1).
- ⑥ Remove grease valve (7) from rod (2).

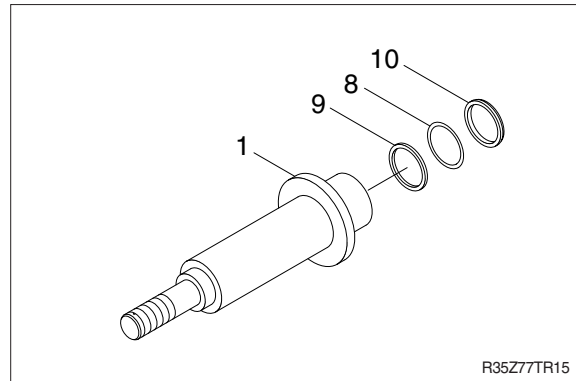


- ⑦ Remove packing (10), back-up ring (9) and O-ring (8) from body (1).



### (3) Assembly

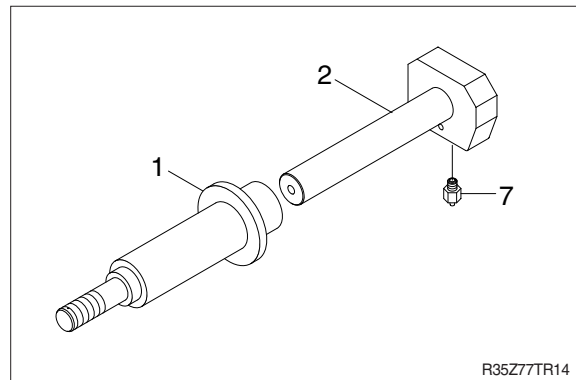
- ① Install O-ring (8), back-up ring (9), and packing (10) body (1).



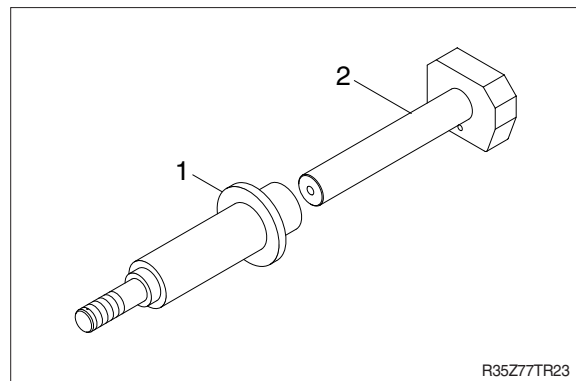
- ② Pour grease into body (1), then push in rod (2) by hand.

After take grease out of grease valve mounting hole, let air out.

- ※ If air letting is not sufficient, it may be difficult to adjust the tension of crawler.
- ③ Fit grease valve(7) to rod(2).
    - Tightening torque :  $10 \pm 0.5 \text{ kgf} \cdot \text{m}$   
( $72.4 \pm 3.6 \text{ lbf} \cdot \text{ft}$ )

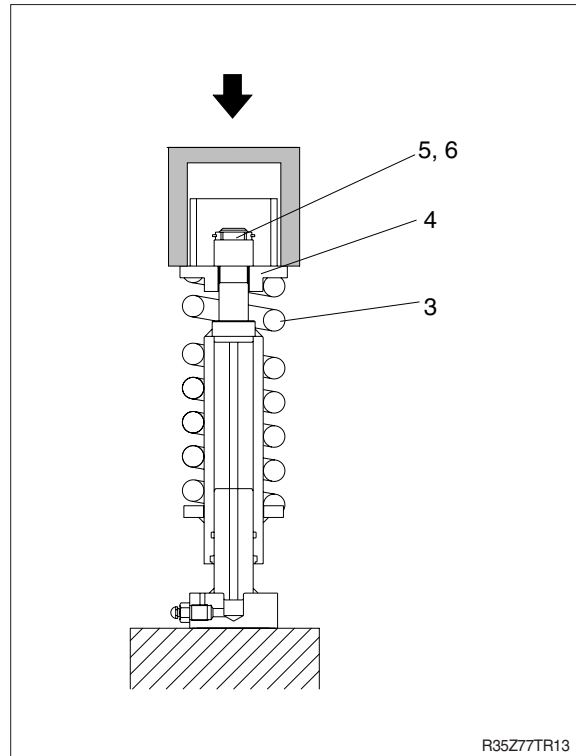


- ④ Install rod (2) to body (1).

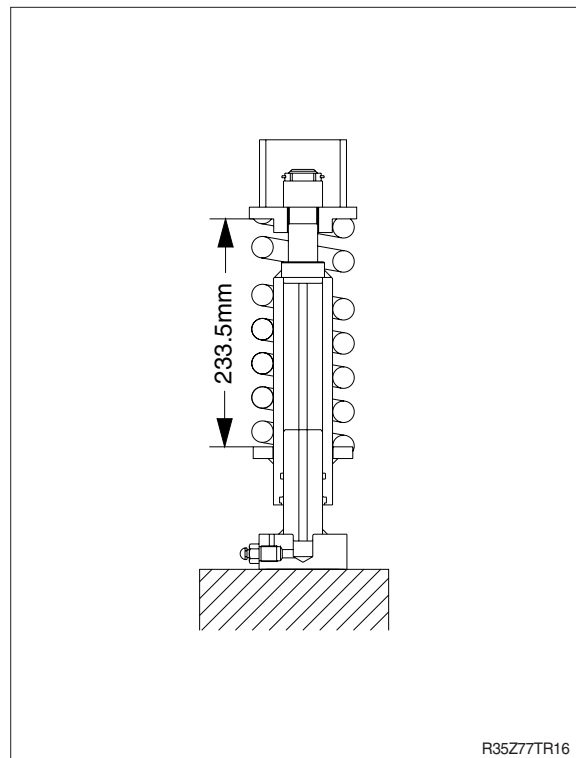




- ⑤ Install spring (3) and cap (4) to body (1).
- ⑥ Apply pressure to spring (3) with a press and tighten nut (5).
- ※ During the operation, pay attention specially to prevent the press from slipping out.
- ⑦ Tighten nut (5) and insert split pin (6).

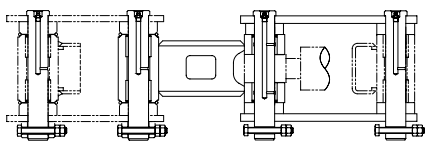
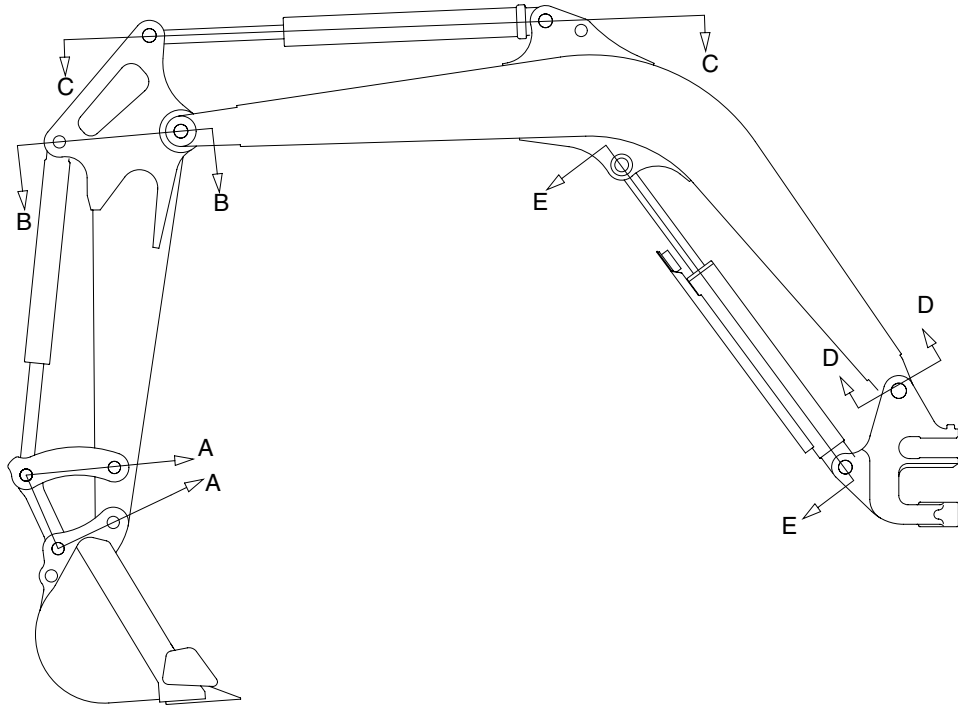


- ⑧ Lighten the press load and confirm the set length of spring (2).
- Spring length : 233.5 mm

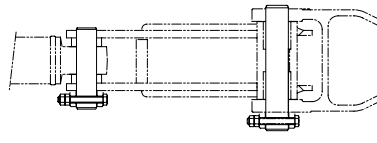


# GROUP 11 WORK EQUIPMENT

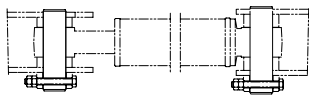
## 1. STRUCTURE



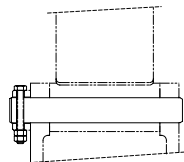
SECTION A-A



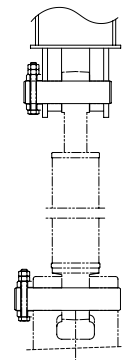
SECTION B-B



SECTION C-C



SECTION D-D



SECTION E-E

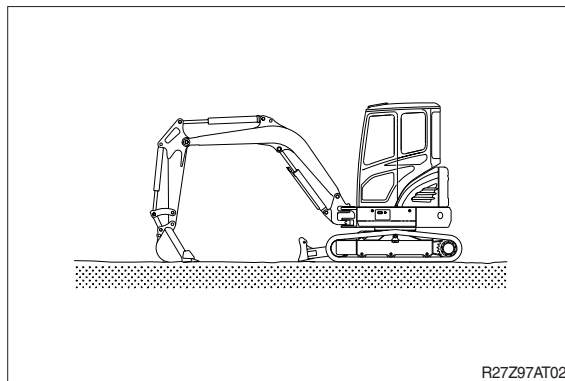
R27Z97AT01

## 2. REMOVAL AND INSTALL

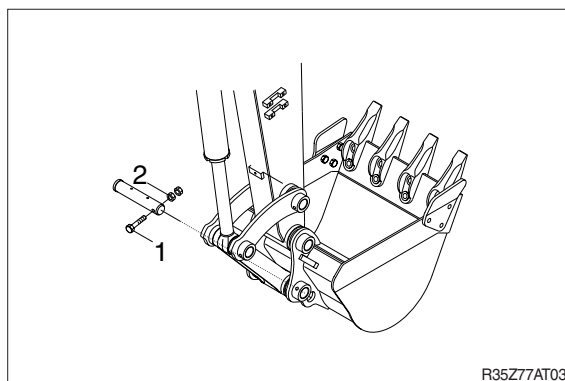
### 1) BUCKET ASSEMBLY

#### (1) Removal

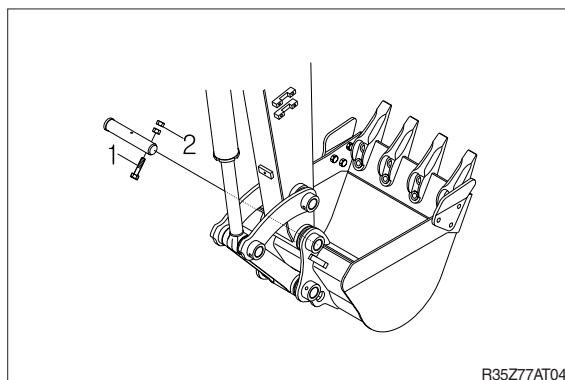
- ① Lower the work equipment completely to ground with back of bucket facing down.



- ② Remove nut (1), bolt (2) and draw out the pin (4).



- ③ Remove nut (1), bolt (2) and draw out the pin (3) then remove the bucket assembly.  
· Weight : 80 kg (180 lb)

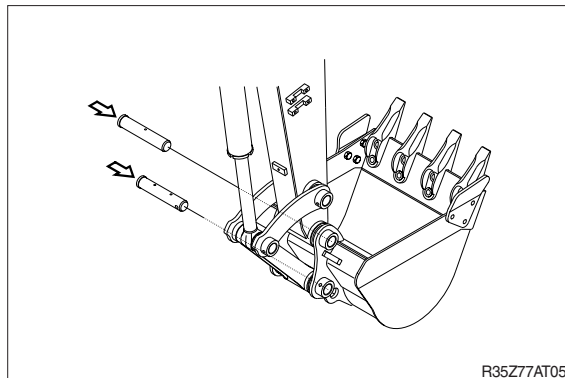


#### (2) Install

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

**▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**

- ※ Adjust the bucket clearance.  
For detail, see operator's manual.



## 2) ARM ASSEMBLY

### (1) Removal

※ Loosen the breather slowly to release the pressure inside the hydraulic tank.

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

① Remove bucket assembly.

For details, see removal of bucket assembly.

② Disconnect bucket cylinder hose (4).

**▲ Fit blind plugs (5) in the piping at the chassis end securely to prevent oil from spurting out when the engine is started.**

③ Sling arm cylinder assembly, remove spring, pin stopper and pull out pin.

※ Tie the rod with wire to prevent it from coming out.

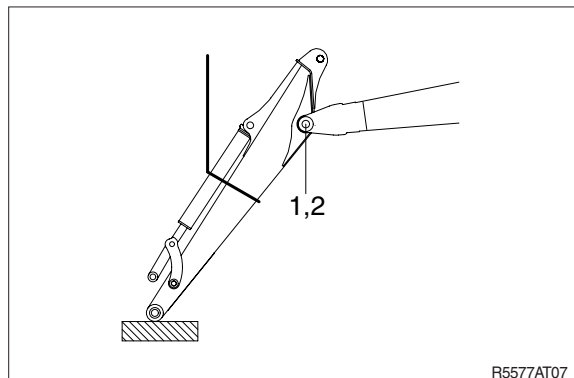
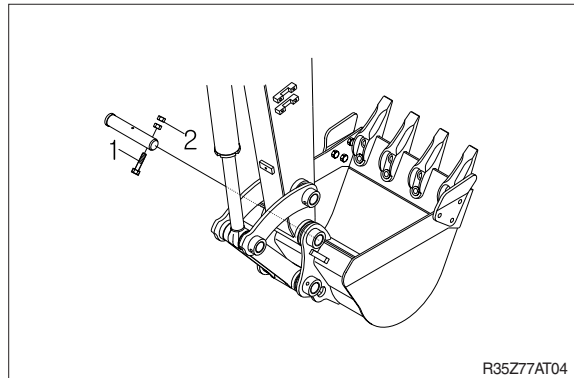
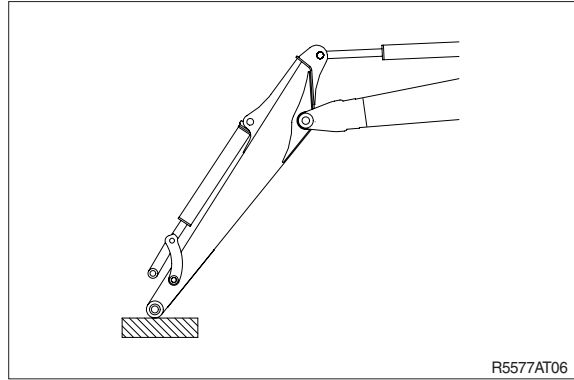
④ For details, see removal of arm cylinder assembly.

Place a wooden block under the cylinder and bring the cylinder down to it.

⑤ Remove bolt (1) and pull out the pin (2) then remove the arm assembly.

· Weight : 80 kg (180 lb)

※ When lifting the arm assembly, always lift the center of gravity.



### (2) Install

① Carry out installation in the reverse order to removal.

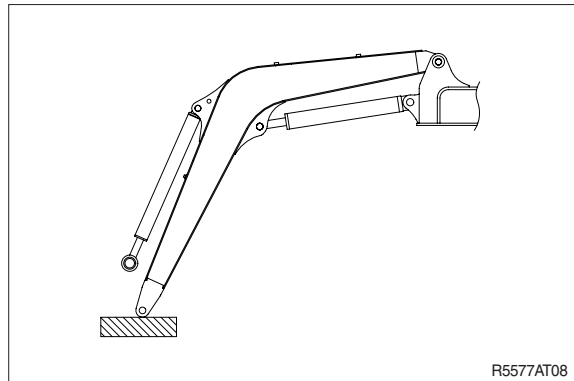
**▲ When lifting the arm assembly, always lift the center of gravity.**

※ Bleed the air from the cylinder.

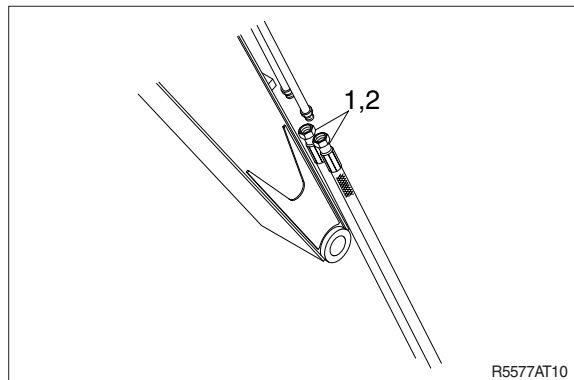
### 3) BOOM CYLINDER

#### (1) Removal

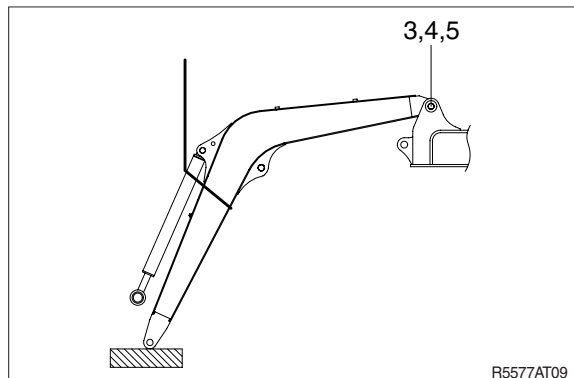
- ① Remove arm and bucket assembly.  
For details, see removal of arm and bucket assembly.
- ② Remove boom cylinder assembly from boom.  
For details, see removal of arm cylinder assembly.



- ③ Disconnect head lamp wiring.
- ④ Disconnect bucket cylinder hose (2) and arm cylinder hose (1).  
※ When the hose are disconnected, oil may spurt out.
- ⑤ Sling boom assembly (3).



- ⑥ Remove bolt (3), nut (4) and pull out the pin (5) then remove boom assembly.  
· Weight : 140 kg (310 lb)  
※ When lifting the boom assembly always lift the center of gravity.



#### (2) Install

- ① Carry out installation in the reverse order to removal.
- ▲ When lifting the arm assembly, always lift the center of gravity.
- ※ Bleed the air from the cylinder.

