

SECTION 7 DISASSEMBLY AND ASSEMBLY

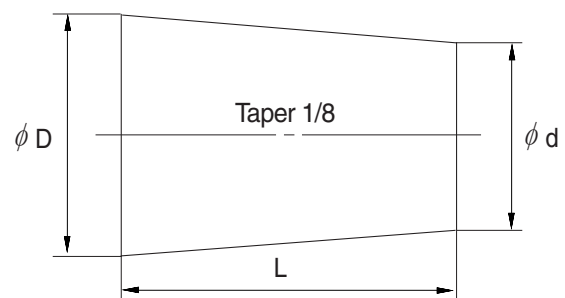
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GROUP 1 PRECAUTIONS

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.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 × 1.25	5.35 ± 0.35	38.7 ± 2.5
2		Engine mounting bolt (bracket-frame)	M12 × 1.75	13.0 ± 1.0	94.0 ± 7.2
3		Radiator mounting bolt, nut	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
4		Coupling mounting bolt	M10 × 1.5	5.2 ± 0.3	37.6 ± 2.2
5		Flywheel housing bolt, nut	M 8 × 1.25	2.6 ± 0.2	18.8 ± 0.4
6	Hydraulic system	Main pump mounting bolt	M12 × 1.75	14.7 ± 2.2	106 ± 15.9
7		Main control valve mounting bolt	M 8 × 1.25	3.4 ± 0.7	24.6 ± 5.1
8		RCV lever mounting bolt	M 6 × 1.0	1.44 ± 0.3	10.4 ± 2.2
9		Fuel tank mounting bolt	M10 × 1.5	6.9 ± 1.4	50 ± 10.1
10		Hydraulic oil tank mounting bolt	M10 × 1.5	6.9 ± 1.4	50 ± 10.1
11		Turning joint mounting bolt, nut	M10 × 1.5	6.9 ± 1.4	50 ± 10.1
12	Power train system	Swing motor mounting bolt	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
13		Swing bearing upper mounting bolt	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
14		Swing bearing lower mounting bolt	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
15		Travel motor mounting bolt	M10 × 1.5	6.9 ± 1.4	50 ± 10.1
16		Sprocket mounting bolt	M10 × 1.5	6.9 ± 0.7	50 ± 5.1
17	Under carriage	Track roller mounting bolt	M12 × 1.75	12.3 ± 1.2	89 ± 8.7
18	Others	Counterweight mounting bolt	M14 × 2.0	19.6 ± 2.7	142 ± 19.5
19		Additional counterweight mounting bolt	M24 × 3.0	100 ± 15	723 ± 108
20		Canopy mounting bolt, nut	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
21		Operator's seat mounting bolt	M 8 × 1.25	3.4 ± 0.7	24.6 ± 5.1

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 : 12.1 ℓ
(3.2 U.S.gal)

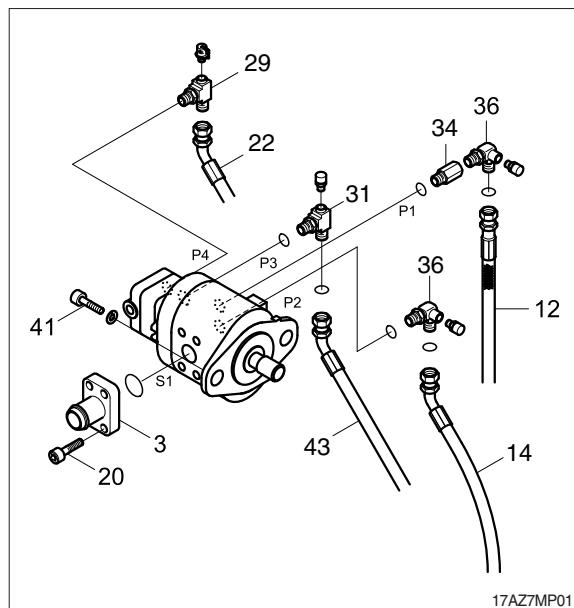
- (5) Disconnect hoses (22) and remove connectors (29).
- (6) Disconnect pilot line hoses (12, 14, 43) and remove connectors (31, 34, 36).
- (7) Remove socket bolts (20) and disconnect pump suction tube (3).

※ 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 (41).

· Weight : 13 kg (29 lb)
· Tightening torque : 14.7±2.2 kgf·m
(106±15.9 lbf·ft)

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

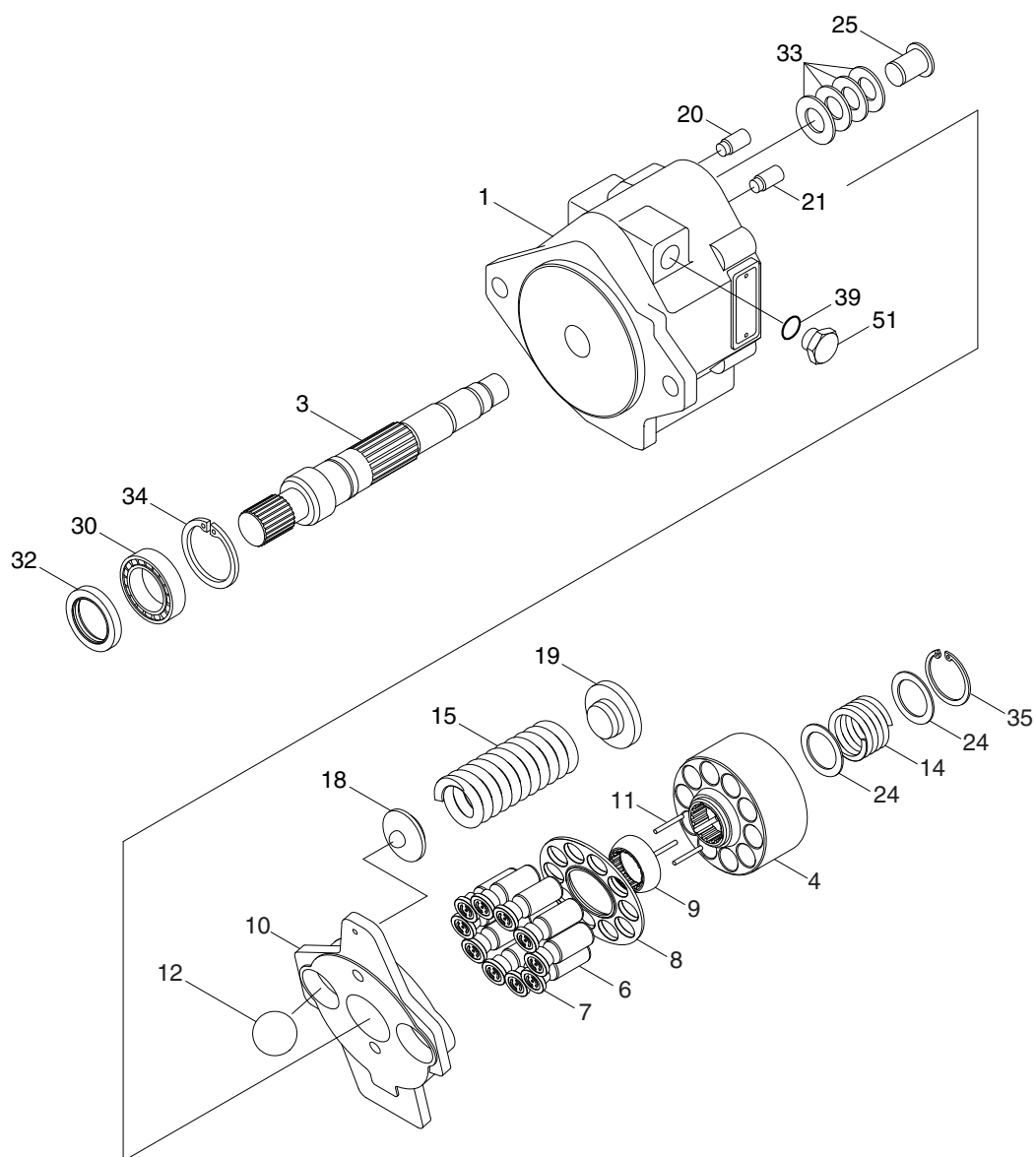


2) INSTALL

- (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

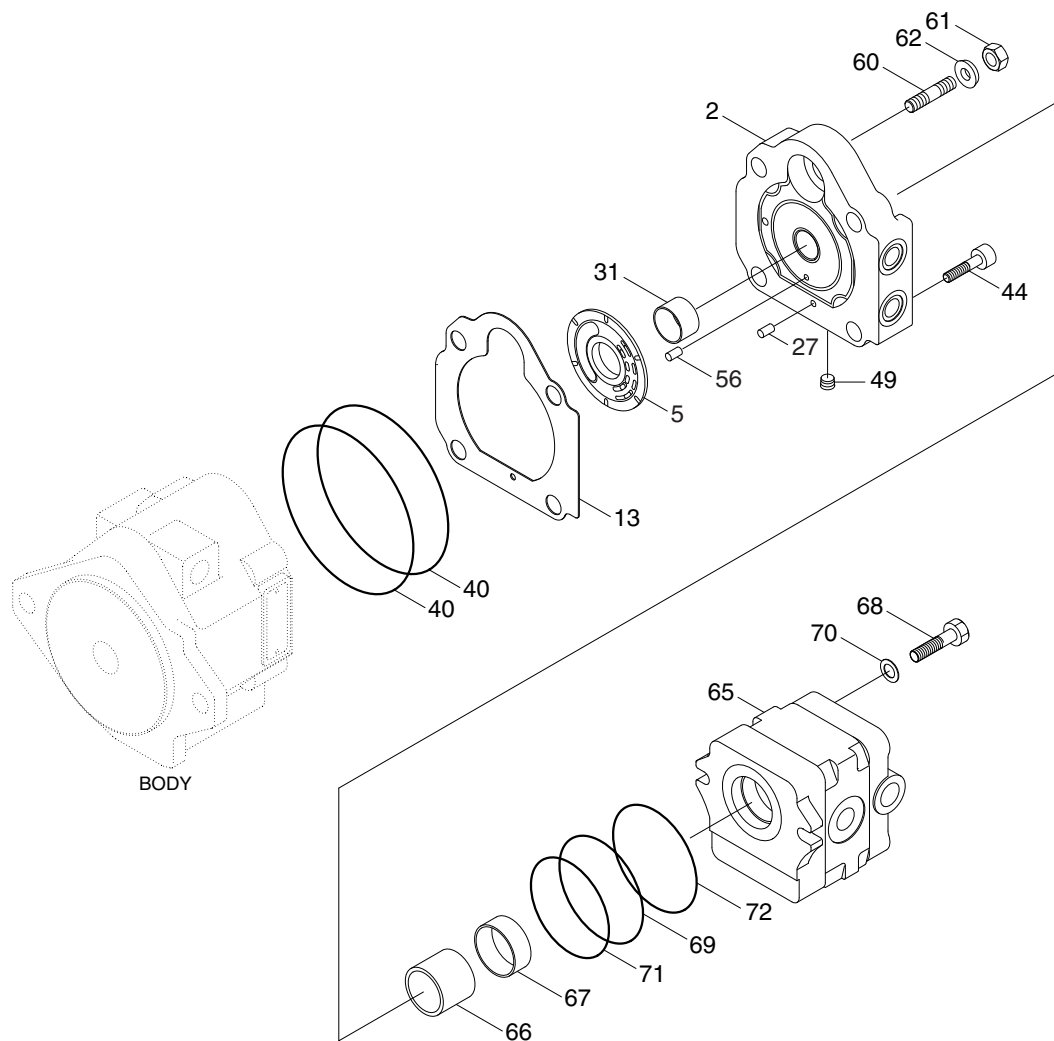
1) STRUCTURE (1/2)



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1	Body S	12	Ball	30	Ball bearing
3	Shaft	14	Spring C	32	Oil seal
4	Cylinder barrel	15	Spring T	33	Dish spring
6	Piston	18	Spring holder	34	Snap ring
7	Shoe	19	Spring guide	35	Snap ring
8	Shoe holder	20	Pin	36	Snap ring
9	Barrel holder	21	Rod G	39	O-ring
10	Swash plate	24	Retainer	51	Plug
11	Needle	25	Stopper pin A		

STRUCTURE (2/2)



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2	Body H	49	Plug	67	Collar
5	Valve plate	56	Spring pin	68	Screw
13	Packing	60	Screw	69	O-ring
27	Pin	61	Nut	70	Washer
31	Needle bearing	62	Seal washer	71	O-ring
40	O-ring	65	Gear pump assy	72	O-ring
44	Screw	66	Coupling		

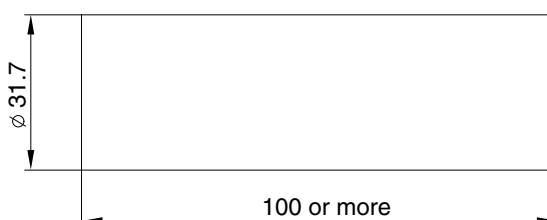
3. ASSEMBLE AND DISASSEMBLE

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	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

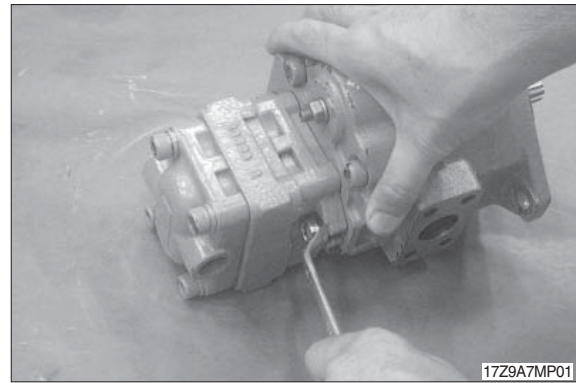
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3) DISASSEMBLING

(1) Disassembling of gear pump

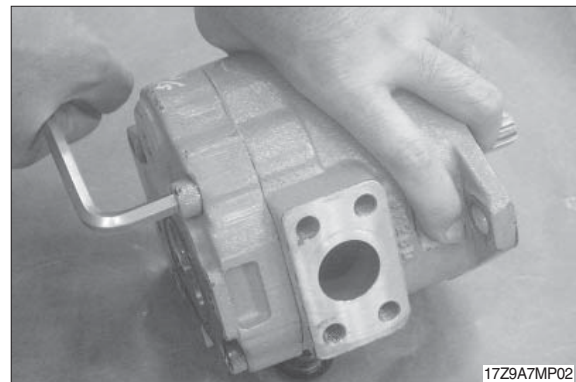
Remove two screws (68) with spanner wrench 13 mm, and after that remove two washer (70), gear pump (65), collar (67) and coupling (66).

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

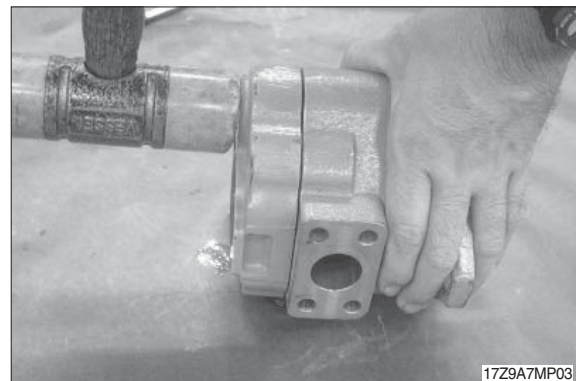


(2) Separation of body S and body H

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

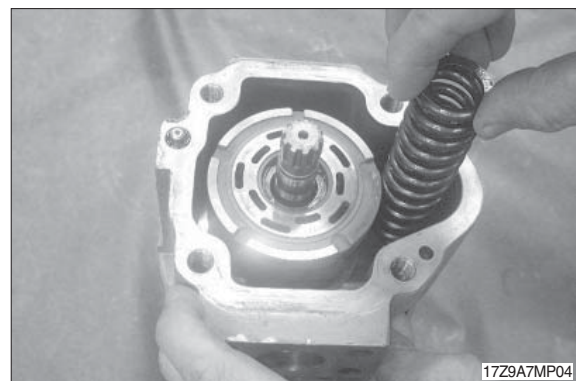


- ※ If you tap the part of inserted spring of body H with hummer softly, it is easy for separation.

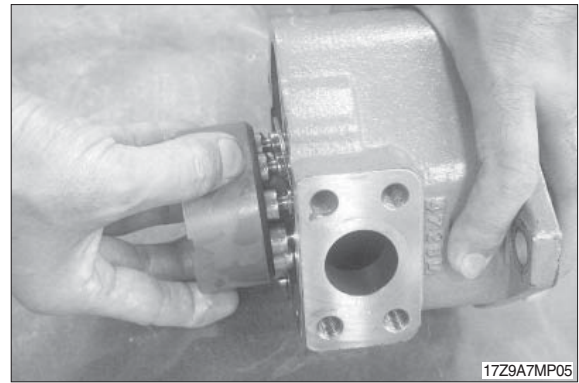


(3) Disassembling of body S kit

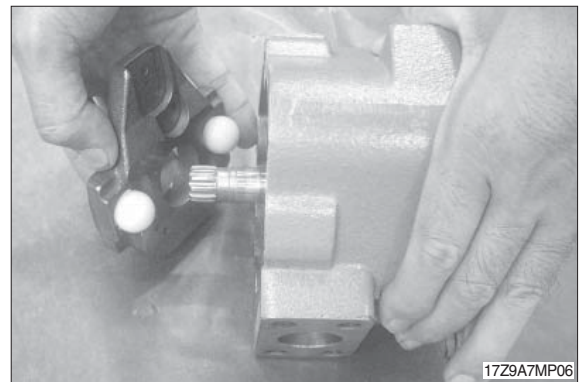
- ① Remove spring T (15) from body S kit, then take off spring holder (18).



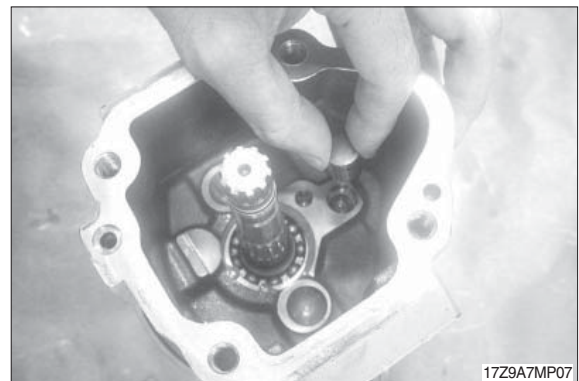
- ② Remove cylinder barrel kit.



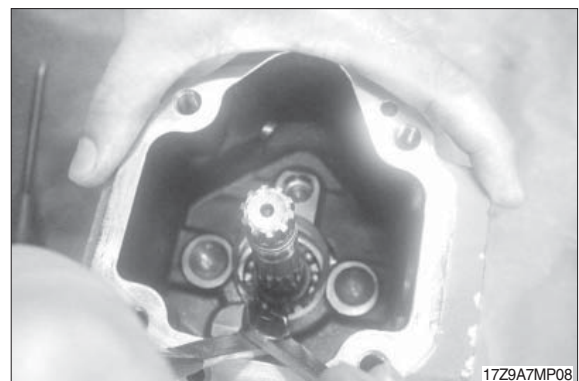
- ③ Remove swash plate (10) and two balls (12).



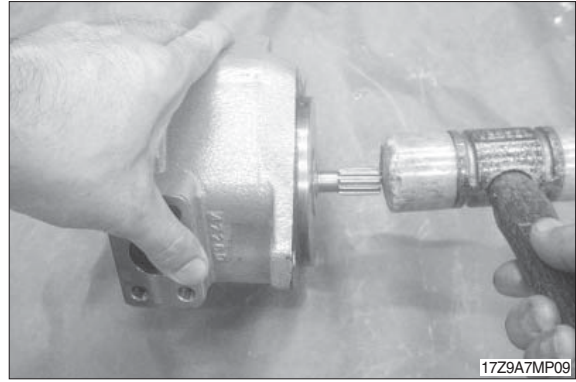
- ④ Remove stopper pin A (25), dish washers (33), rod G (21).



- ⑤ Remove snap ring (34) from body S (1).

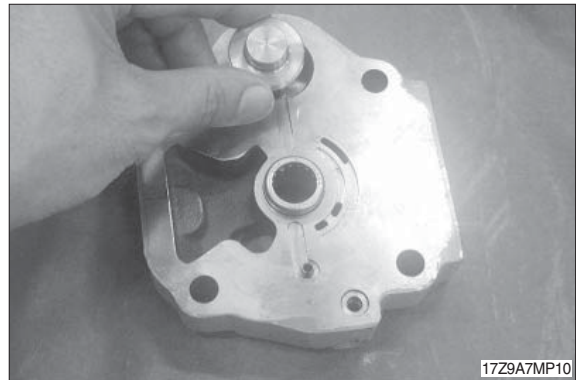


- ⑥ Tap the end of shaft (3) with hammer, then shaft with bearing (30) come off.



(4) Disassembling of body H kit

Remove spring guide (19) from body H.



4) ASSEMBLING

(1) Precautions during assembling

Reverse the above procedures for assembling.

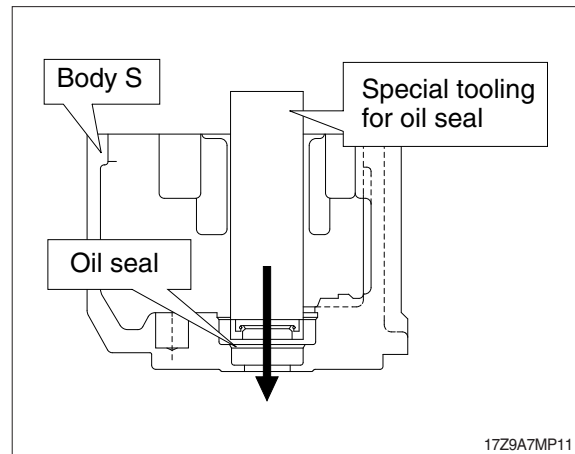
When assembling, be very careful to wash parts in clean oil, to prevent dusts and water from adhering to parts entering assemblies and not to scratch on the sliding surfaces of all parts.

- ※ 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 body S kit

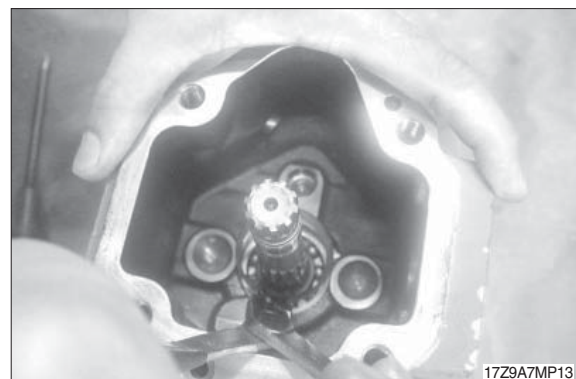
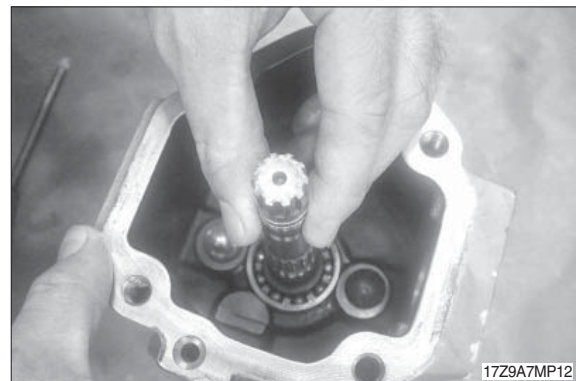
- ① Press-fit oil seal into body S (1).

- ※ 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 following special tooling with hammer.



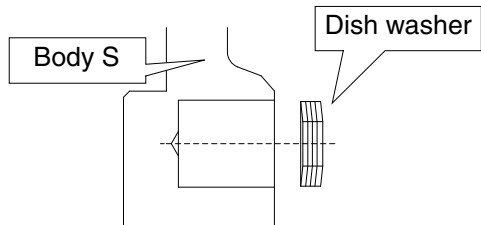
- ② Set shaft (3) with bearing (30) and snap ring (34) in this order into body S (1).

- ※ Pay attention not to damage the oil seal when assembling the shaft.

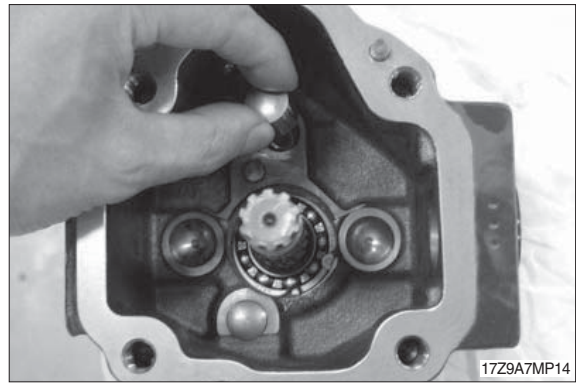


- ③ Set four dish springs (33), then set stopper pin A (25) and stopper pin B (26) into body S (1).

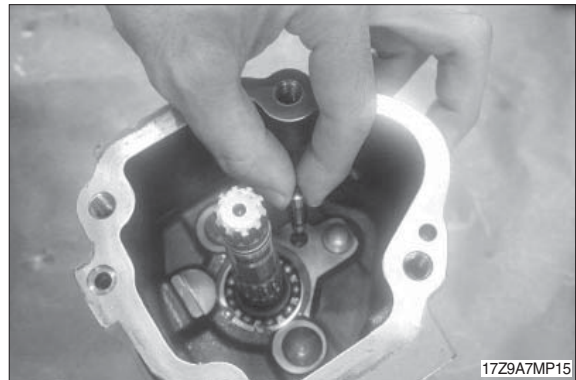
※ Pay attention to direction of the dish washer.



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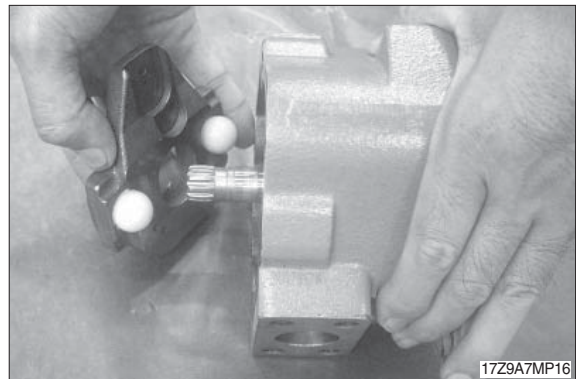


- ④ Set rod G (21) into body S (1).

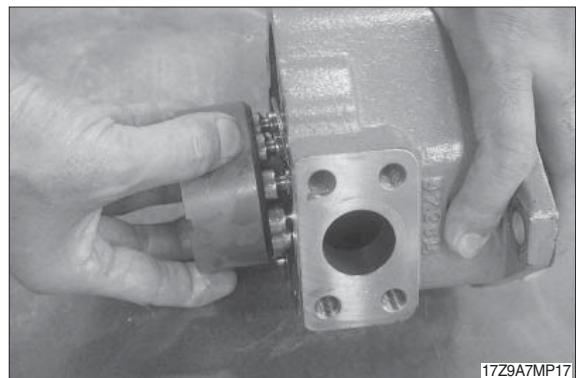


- ⑤ Put two balls (12) in the hole of swash plate (10) and install it in body S.

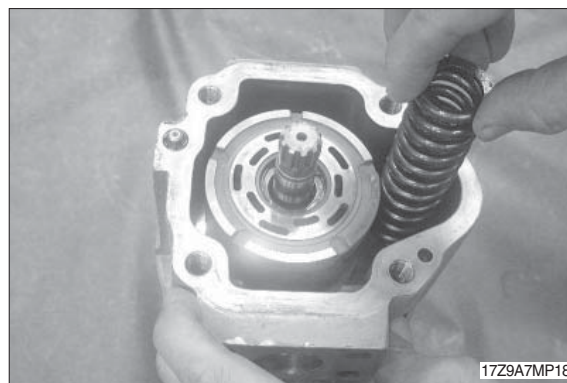
※ Apply grease on the balls if they drop out.



- ⑥ Assemble cylinder barrel kit into the body S (1).



- ⑦ Set spring T (15) to spring holder (18), then set them together into the body S (1).



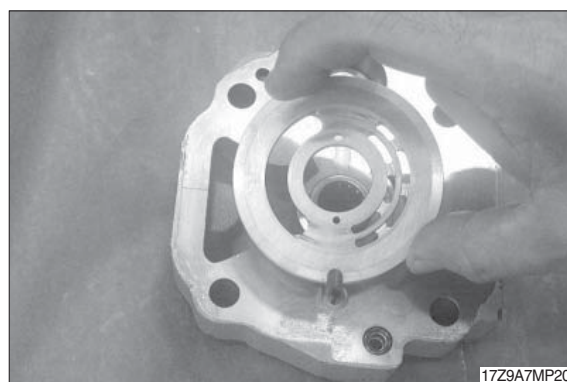
(3) Assembling of body H kit

- ① Set spring guide (19) in body H (2).



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

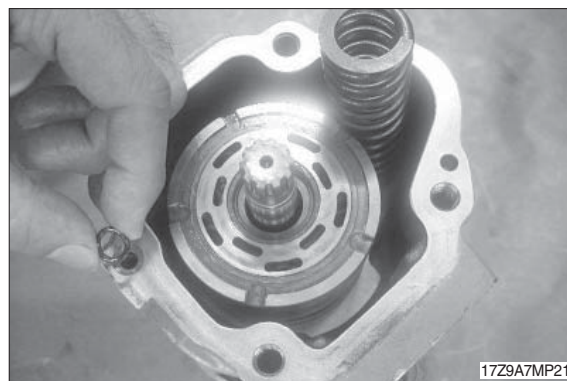
- ※ V notch copper alloy side of valve plate slides with cylinder barrel (4) and be careful not to set the valve plate to a wrong direction.



(4) Assembling of body S kit with body H kit

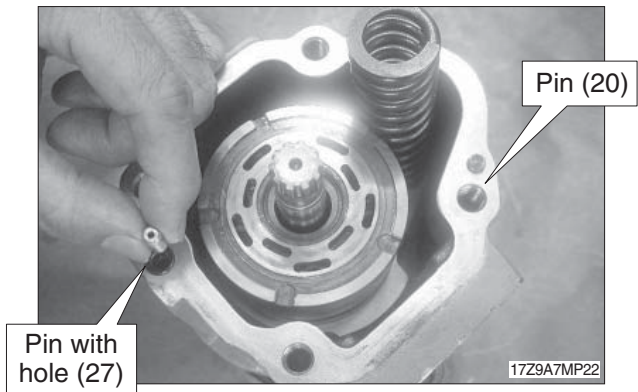
- ① Place O-ring (40) on body S.

- ※ Use new O-ring for assembling.



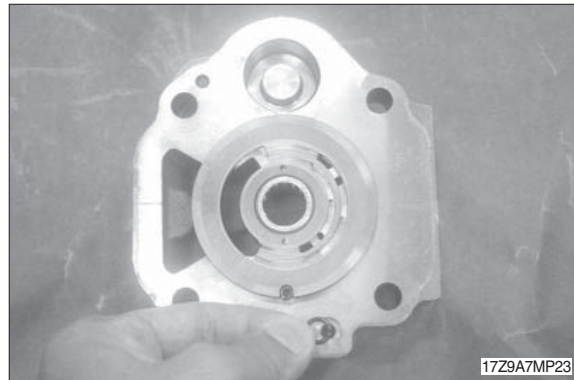
② Set pin (20) and pin (27) on body S.

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



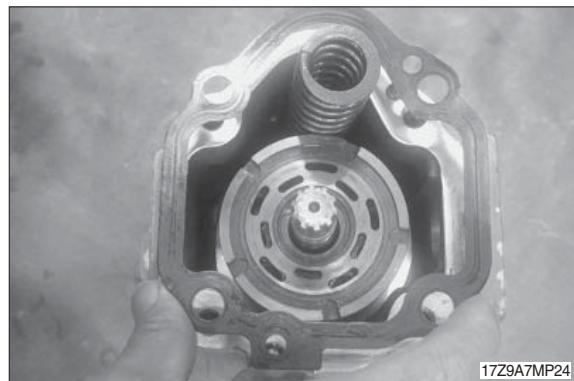
③ Place O-ring (40) on body S.

Use new O-ring for assembling.



④ Place packing (13), position it with locating pin (20) on body S.

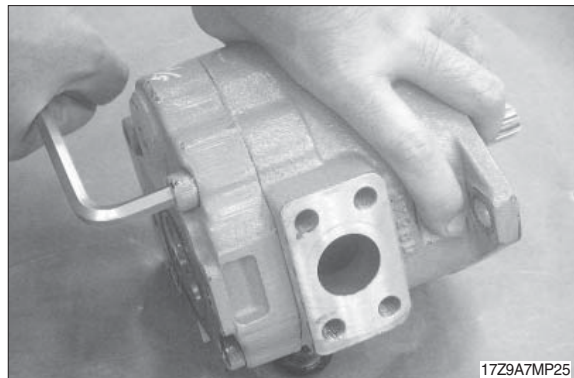
Use new gasket for assembling.



⑤ 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, M10×40) into the lower side two screw holes, after that, replace the upper side two screws (M10×65) to the regular size screws (44, M10×40) and fix them.

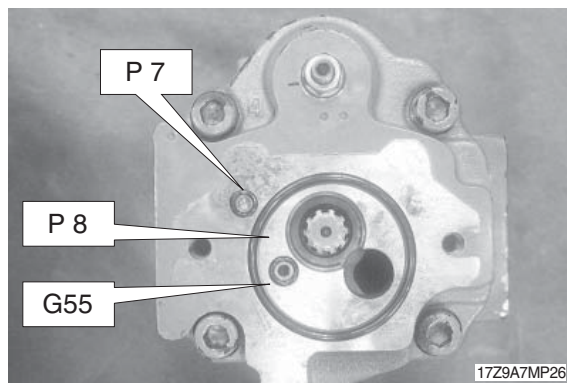
· Tightening torque : 5.2~6.6 kgf · m
(37.6~47.7 lbf · ft)



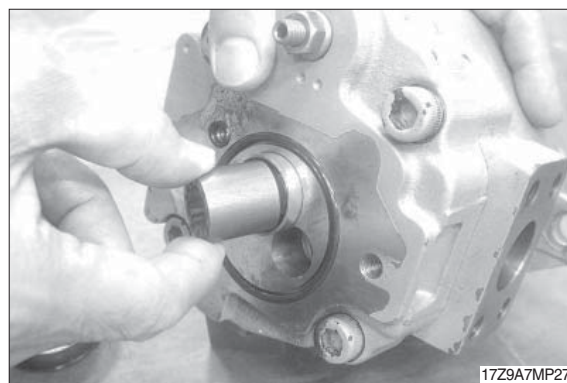
(5) Installation of gear pump kit

- ① Place O-ring (69, 71, 72) on the installation side of body H.

※ Use new O-ring for assembling.

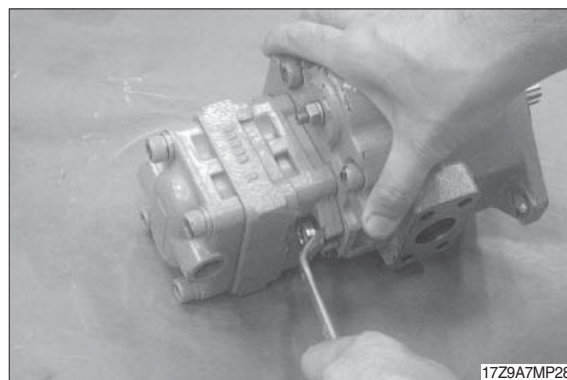


- ② Set collar (67), coupling (66).



- ③ Install gear pump kit (65) and fix it by two screws (68, M8×25) and washers (70) with spanner wrench 13 mm.

· Tightening torque : 2.0~2.4 kgf · m
(14.5~17.4 lbf · ft)



(6) 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

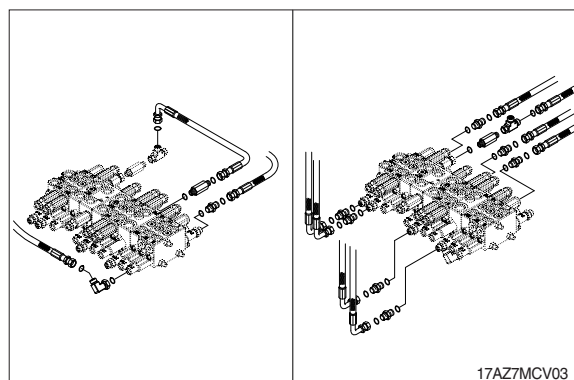
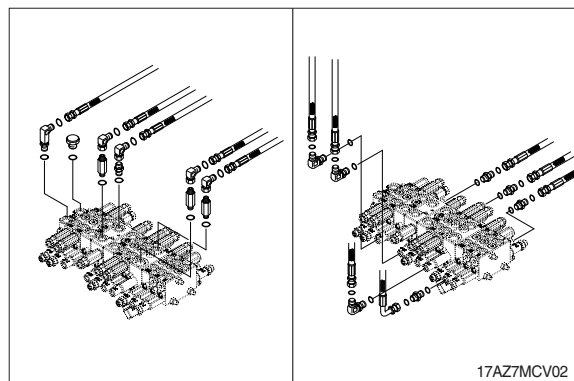
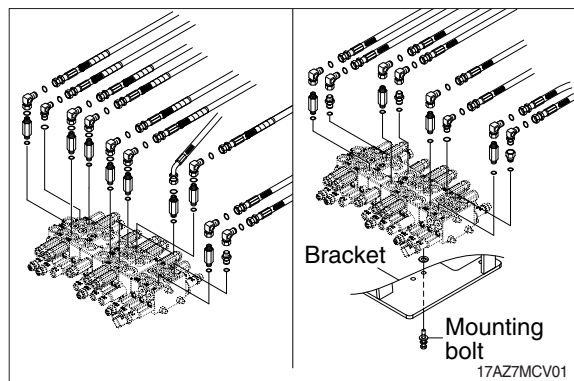
- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ▲ **Escaping fluid under pressure 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 : 14 kg (31 lb)
- Tightening torque : 3.4 ± 0.7 kgf·m
(24.6 ± 5.1 lbf·ft)

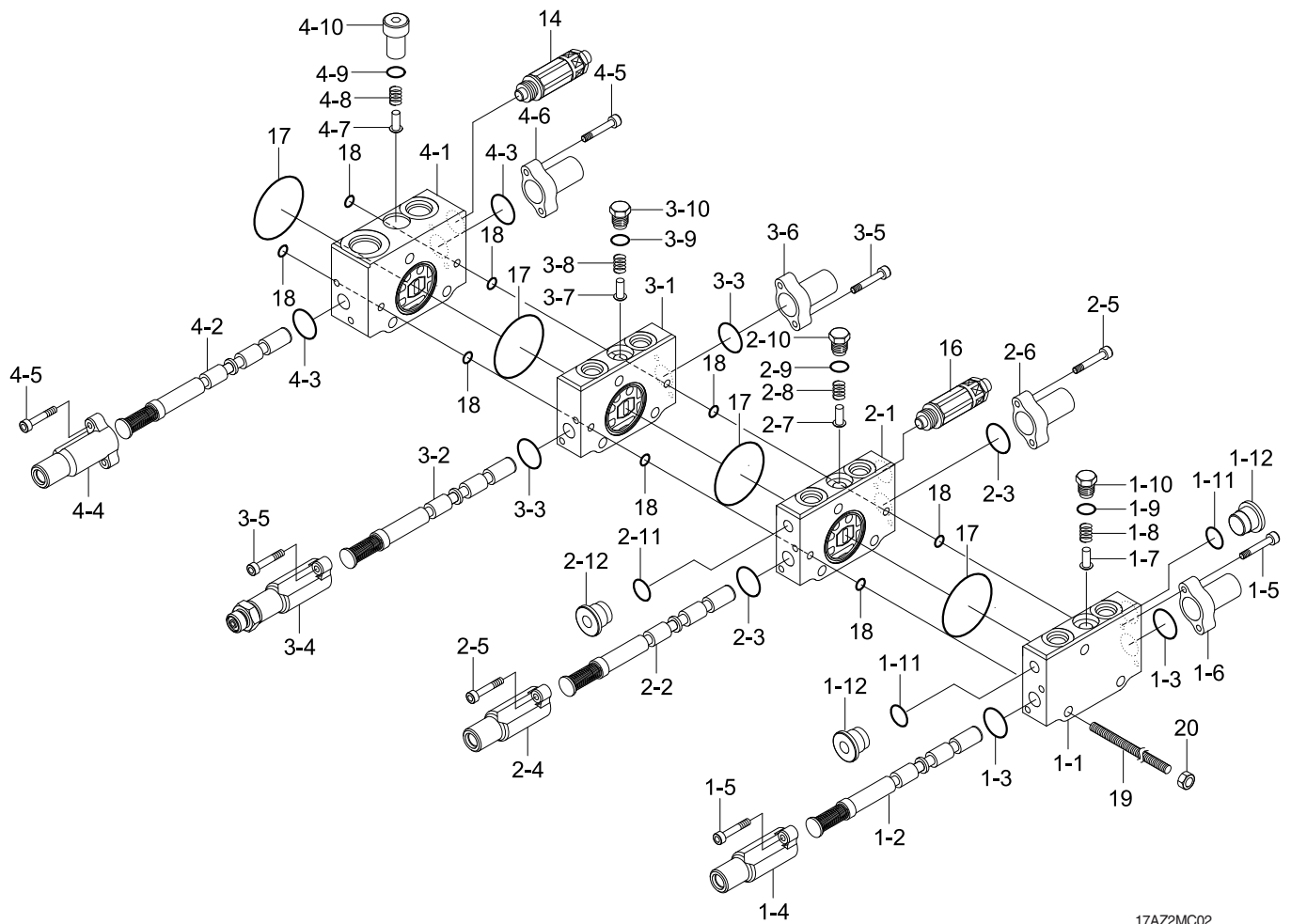
- (7) Remove the control valve assembly.
When removing the control valve assembly, check that all the piping have been disconnected.

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.



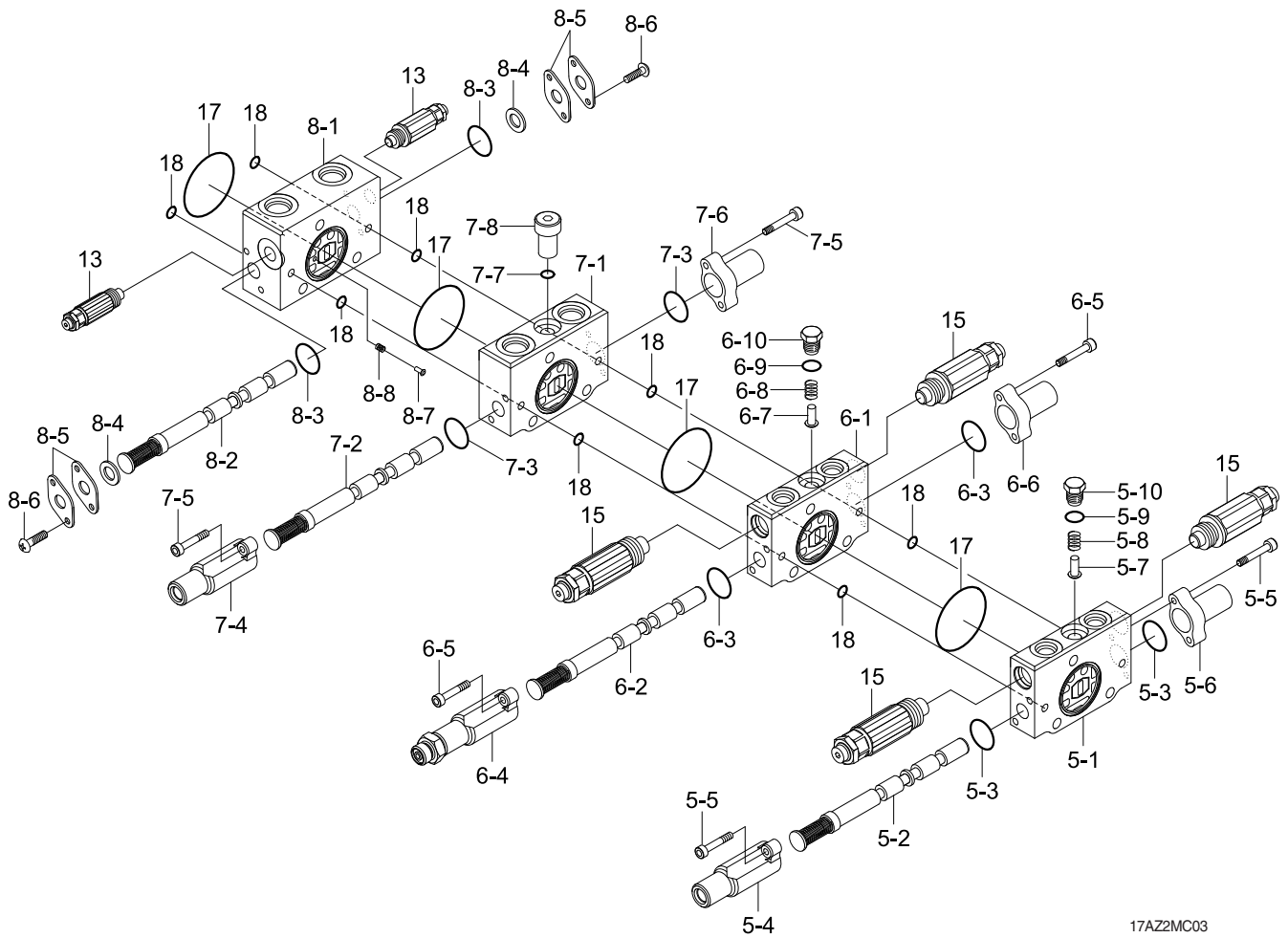
2. STRUCTURE (1/3)



17AZ2MC02

1 Dozer work body	2-5 Hex socket bolt w/washer	3-10 Check valve plug
1-1 Work body	2-6 Pilot cover	4 Connecting body
1-2 Dozer spool assy	2-7 Poppet	4-1 Work body
1-3 O-ring	2-8 Spring	4-2 Connecting spool assy
1-4 Pilot cover	2-9 O-ring	4-3 O-ring
1-5 Hex socket bolt w/washer	2-10 Check valve plug	4-4 Pilot cover
1-6 Pilot cover	2-11 O-ring	4-5 Hex socket bolt w/washer
1-7 Poppet	2-12 Plug	4-6 Pilot cover
1-8 Spring	3 Swing work body	4-7 Poppet
1-9 O-ring	3-1 Work body	4-8 Spring
1-10 Check valve plug	3-2 Swing spool assy	4-9 O-ring
1-11 O-ring	3-3 O-ring	4-10 Check valve plug
1-12 Plug	3-4 Cover	14 Relief valve assy
2 Boom swing work body	3-5 Hex socket bolt	16 Anticavitation valve assy
2-1 Work body	3-6 Pilot cover	17 O-ring
2-2 Boom swing spool assy	3-7 Poppet	18 O-ring
2-3 O-ring	3-8 Spring	19 Tie bolt
2-4 Pilot cover	3-9 O-ring	20 Hex nut

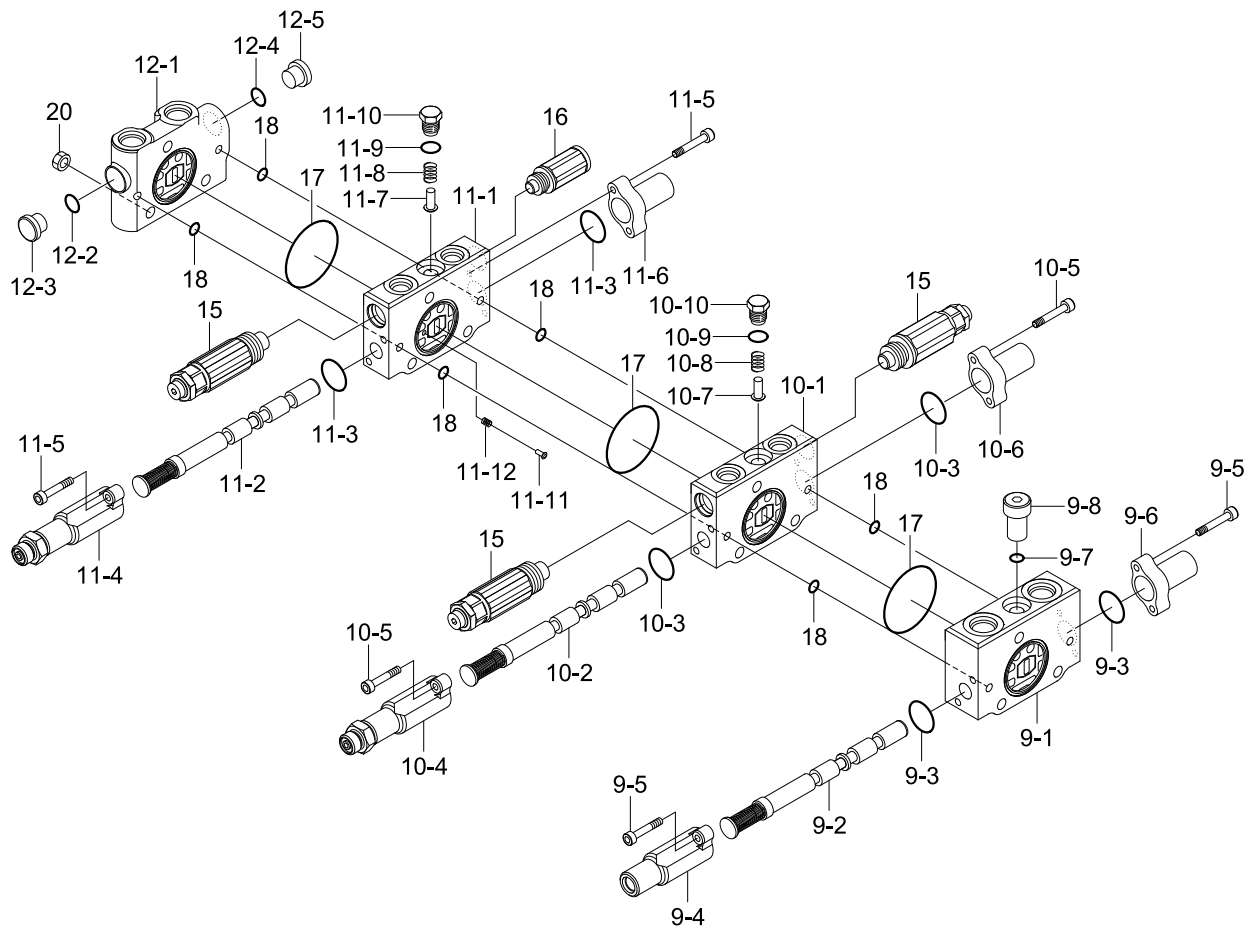
STRUCTURE (2/3)



17AZ2MC03

5	PTO work body	6-4	Pilot cover	7-8	Plug
5-1	Work body	6-5	Hex socket bolt w/washer	8	Inlet work body
5-2	Spool assy	6-6	Pilot cover	8-1	Work body
5-3	O-ring	6-7	Poppet	8-2	Spool
5-4	Pilot cover	6-8	Poppet	8-3	O-ring
5-5	Hex socket bolt w/washer	6-9	O-ring	8-4	Seat plate
5-6	Pilot cover	6-10	Check valve plug	8-5	Seat plate
5-7	Poppet	7	Travel work body	8-6	Cross recessed head screws
5-8	Spring	7-1	Work body	8-7	Poppet
5-9	O-ring	7-2	Travel spool assy	8-8	Spring
5-10	Check valve plug	7-3	O-ring	13	Relief valve assy
6	Arm work body	7-4	Pilot cover	15	Overload relief valve assy
6-1	Work body	7-5	Hex socket bolt w/washer	17	O-ring
6-2	Arm spool assy	7-6	Pilot cover	18	O-ring
6-3	O-ring	7-7	O-ring		

STRUCTURE (3/3)



17AZ2MC04

9	Travel work body	10-6	Pilot cover	11-10	Check valve plug
9-1	Work body	10-7	Poppet	11-11	Poppet
9-2	Travel spool assy	10-8	Spring	11-12	Spring
9-3	O-ring	10-9	O-ring	12	Outlet work body
9-4	Pilot cover	10-10	Check valve plug	12-1	Work body
9-5	Bolt	11	Bucket work body	12-2	O-ring
9-6	Pilot cover	11-1	Work body	12-3	Plug
9-7	O-ring	11-2	Bucket spool assy	12-4	O-ring
9-8	Plug	11-3	O-ring	12-5	Plug
10	Boom work body	11-4	Pilot cover	15	Overload relief valve assy
10-1	Work body	11-5	Bolt	16	Anticavitation valve assy
10-2	Boom spool assy	11-6	Pilot cover	17	O-ring
10-3	O-ring	11-7	Poppet	18	O-ring
10-4	Pilot cover	11-8	Spring	20	Hex nut
10-5	Bolt	11-9	O-ring		

3. DISASSEMBLY

1) PRECAUTIONS FOR DISASSEMBLY

- (1) Since hydraulic devices are all machined precisely with clearances being very little, carry out the disassembly and assembly work at a clean place and make sure to prevent the device from being entered with dust, sand, and the like.
 - (2) Before disassembly work, prepare necessary material such as the structural drawing for control valve to fully understand the structure and others.
 - (3) When removing the control valve from the machine, put a dustproof cap on each port and then clean the outside of assembly after checking the installation of caps.
Furthermore, prepare a suitable workbench with clean paper or rubber mat on it for the work.
 - (4) Since there is a possibility of rust when the disassembled parts are left, apply anti-corrosive oil to the parts and seal them.
 - (5) Hold the control valve body when carrying or moving. Especially, do not hold the exposed spool after removing a pilot cover from the control valve.
 - (6) Do not hit the control valve even if it does not move smoothly.
 - (7) It is recommend carrying out various tests (relief valve setting, leak test, internal pressure loss check, etc.) after the disassembly and assembly of the control valve, which requires a hydraulic test device.
Accordingly, when the disassembly might be possible technically but the test and/or adjustment might be impossible, do not carry out the work.
- ※ Before removing the pipes, attach suitable indications on them to be able to locate their positions later. If there is a mistake in piping between the ports, unintentional movement could result in an accident.
 - ※ Falling or hitting the control valve could bend the spool, which could result in an accident.
 - ※ If foreign matter enters each port, there could be a control valve malfunction, resulting in an accident.
 - ※ Since the load side port could hold an empty weight or enclosed pressure, release the inside pressure before loosening the piping.
There could be a fall of attachments or a jet of high-temperature hydraulic fluid.
 - ※ The control valve becomes high temperature after operating the machine; after checking that the temperature becomes low, start the work.
 - ※ The control valve has complicated connections and seals through the internal passages, which means that there could be enclosed pressure, resulting in an oil jet after disassembly.
 - ※ Wear safety goggles during disassembly work because there could be a blow off of parts if they are caught.

2) NECESSARY TOOLS AND OTHERS

- (1) Before disassembling the control valve, prepare the following tools.

The tools below are used to disassemble this control valve only; tools for disassembling the port fittings are not included.

Name	Quantity	Application
Hexagon spanner	Each 1	4, 6 and 8 mm
Spanner	Each 1	13, 19 and 22 mm
Socket wrench	Each 1	13, 19 and 22 mm
Torque wrench	1	0.2~2.0 kgf · m (1.4~14.5 lbf · ft)
Torque wrench	1	2.0~10.0 kgf · m (14.5~72.3 lbf · ft)
Magnet	1	-
Pliers	1	-
Screwdriver for cross	1	-
Tweezers	1	-

- (2) Prepare clean wash oil, hydraulic fluid, grease, tag paper, marker pen, and others before work.

3) DISASSEMBLY OF EACH PART

Before disassembly work, check that there is no dust on the outside of the control valve and then place it on a workbench with actuator ports facing upward.

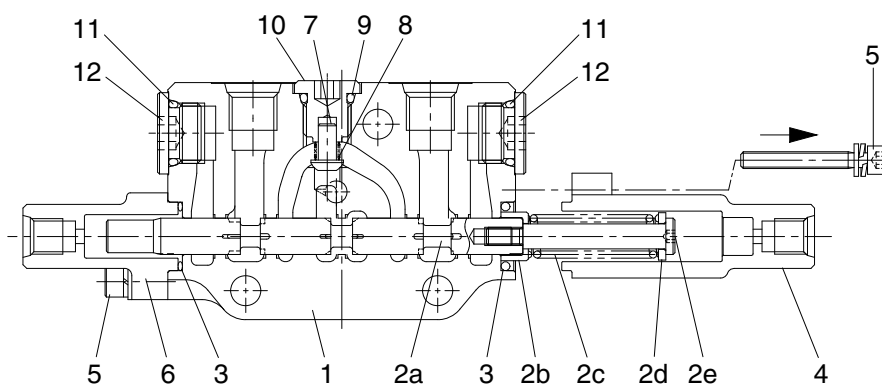
(1) Spool draw-out procedures

Except P1, P2 inlet component

Taking the dozer spool as an example, the draw-out procedures are as follows.

- ① Remove 2 hexagonal socket head bolt with washer (5) with 4 mm hexagonal wrench.
- ② Remove pilot cover (4).
- ③ With a spring in the dozer spool exposed, pull out spool assy from the control valve slowly and horizontally (parallel to spool sleeve) by holding spring.
- ④ The other spools can also be pulled out in the same manner.

At this time, check O-ring (3) is on the bottom of body side flange.



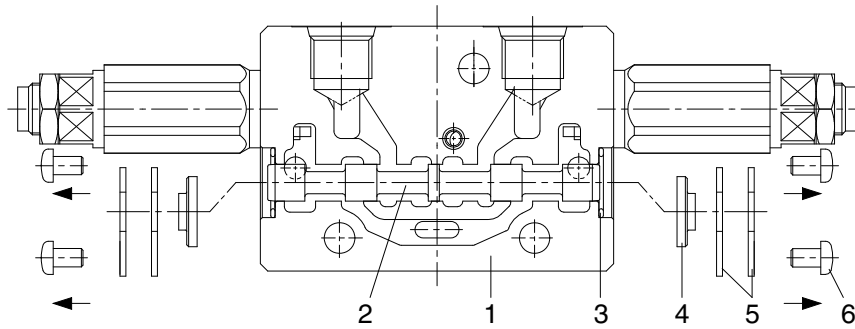
17Z9A7MCV01

1	Work body	2e	Spool end	8	Check valve spring
2	Dozer spool assy	3	O-ring	9	O-ring
2a	Dozer spool	4	Pilot cover	10	Check valve plug
2b	Spring seat	5	Hex socket bolt w/washer	11	O-ring
2c	Spring	6	Pilot cover	12	Plug
2d	Spring seat	7	Check valve poppet		

P1, P2 inlet component

The draw-out procedures for P1, P2 inlet component spool are as follows.

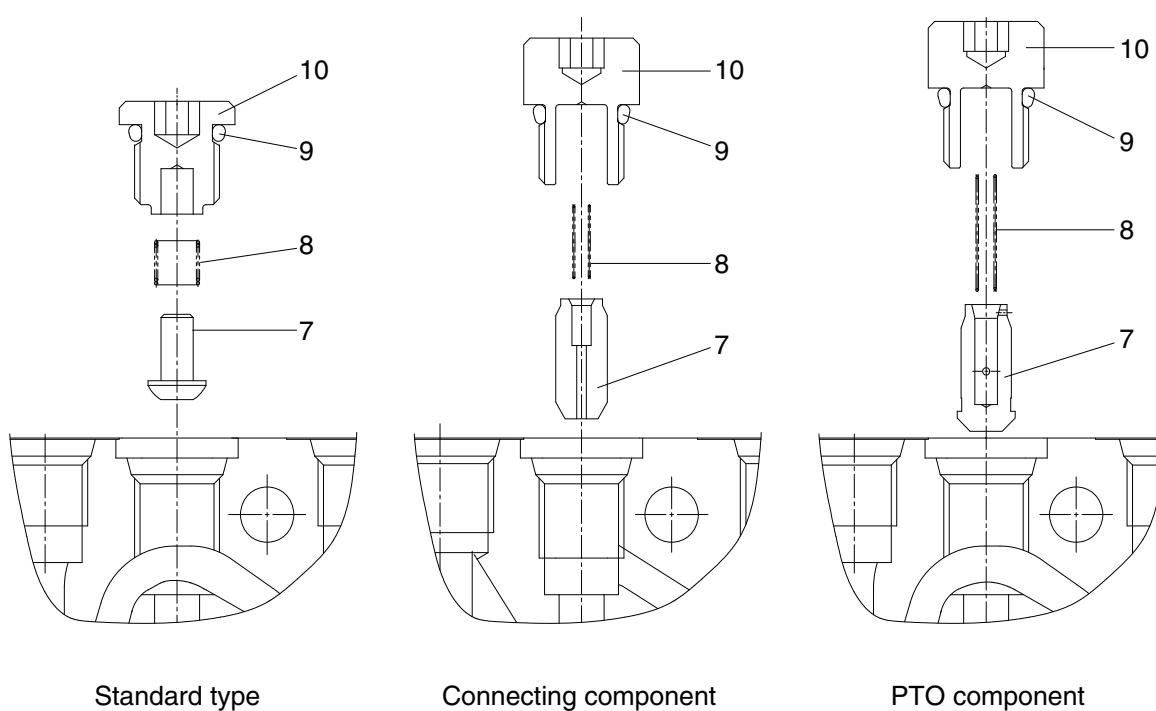
- ① Loosen and remove 2-M5 cross recessed head screws (6) by using screwdriver for cross.
- ② Remove 2-seat plates (5), and pull a seat plate (4) out by using tweezers.
- ③ A reverse-side also similarly pull out 2-seat plates (5) and a seat plate (4).
- ④ With a spool (2) exposed, pull out a spool by magnet.



17Z9A7MCV02

(2) Check valve disassembly procedures

- ① Hold the control valve body at workbench or hold it by two or more people.
- ② Loosen and remove check valve plug (10) at the center of the control valve upper surface with 6 mm hexagonal wrench.
When it is hard to loosen the plug because O-ring (9) bites the screw, do not loosen forcibly; refasten it once and then try to loosen again.
- ③ From the hole where check valve plug has been removed, remove check valve spring (8) and check valve (7) with tweezers or magnet.
- ④ Connecting component and PTO component are different in shape; however, they can be disassembled in the same manner.
- For travel component pull out only check valve plug (8, see page 7-22) in the same procedures since there is no check valve.



17Z9A7MCV03

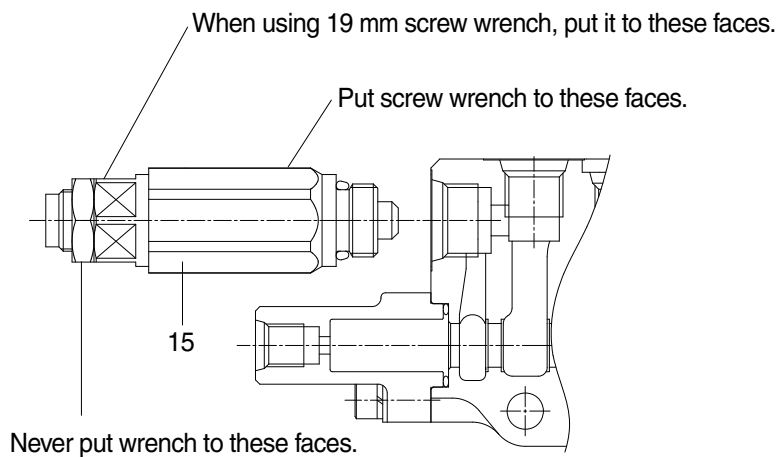
(3) Accessory valve disassembly procedures

※ Accessory valves are the most important parts for performance and safety; in particular, the relief valve is very difficult to readjust the setting so that replace the accessory valve as assy if any malfunction occurs.

Main relief valve and overload relief valve

Taking overload relief valve in the arm section as an example, the removal procedures are as follows.

- ① Loosen and remove overload relief valve (15) by using 22 mm screw wrench or socket wrench.
 - ② Put screw wrench (or socket wrench) to 22 mm hexagonal part of pressure regulating body.
 - ③ If there is no 22 mm screw wrench (or socket wrench), it is also possible to loosen and remove by putting 19 mm screw wrench to the hexagonal part as shown in the figure.
 - ④ The main relief valve for P1, P2 and P3 are slightly different in shape; however, they can be disassembled in the same manner.
- ※ If using 19 mm screw wrench to remove, never put it to the lock nut part.
If not, only lock nut is loosened to change the relief valve setting, which could result in the degradation in performance or damage.

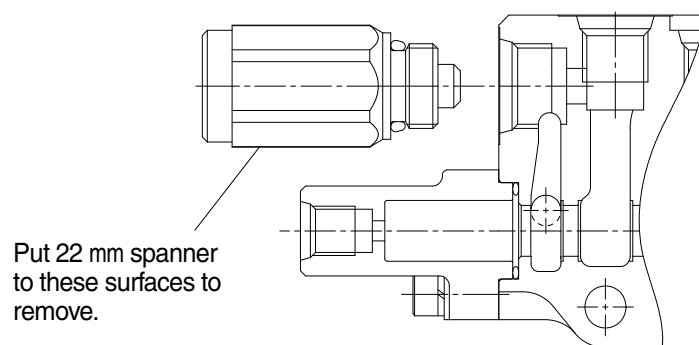


17Z9A7MCV04

Anticavitation valve

As well as overload relief valve, loosen and remove anticavitation valve by using 22 mm spanner or socket wrench.

- ※ Removing anticavitation valve causes the seat to be exposed.
Flaws on the seat causes internal leakage, which makes the holding performance of actuator worse. When storing it, be careful not to damage the seat.



17Z9A7MCV05

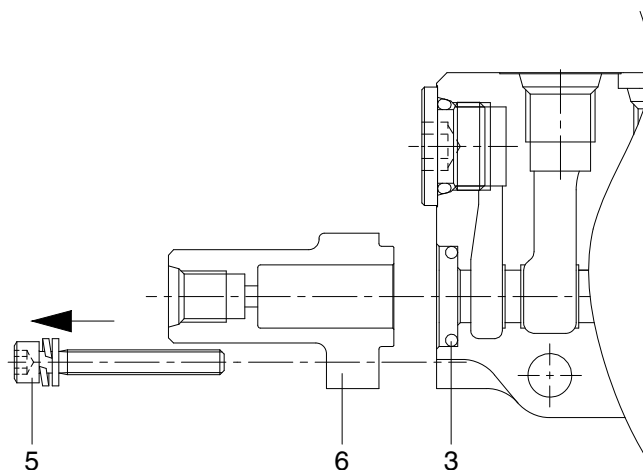
(4) The other parts disassembly procedures

Remove the other parts that have not been removed at the work (1) through (3) as shown below.

Pilot cover

- ① Remove 2 hexagonal socket head bolt with washer (5) with 4 mm hexagonal wrench.
- ② Remove pilot cover (6).

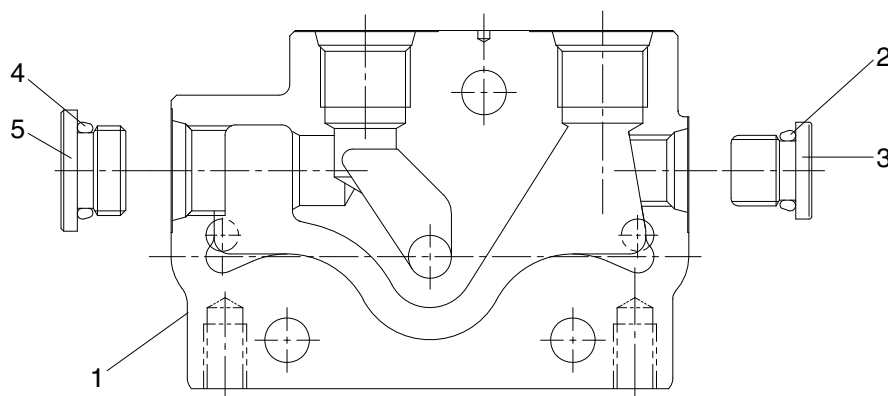
Check O-ring (3) is on the bottom of body-side flange.



17Z9A7MCV06

The plug (PF3/8, PF1/4) of outlet component

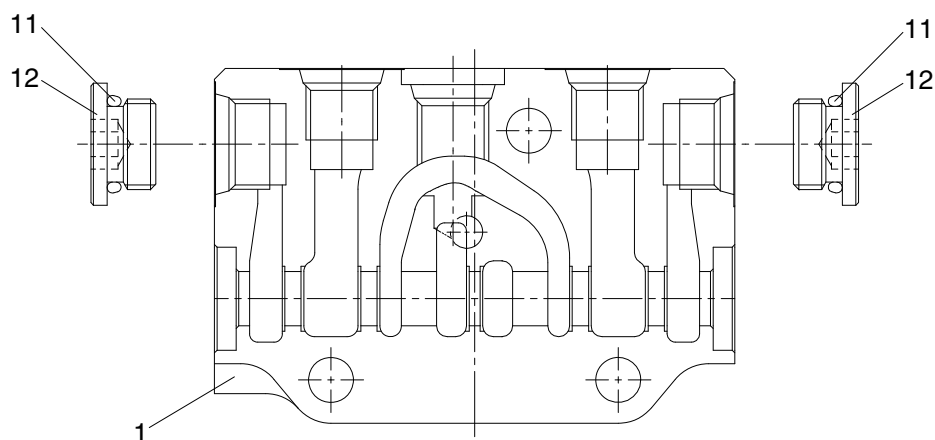
- ① Loosen plug (3) by using 6 mm hexagonal wrench to remove it from outlet body (1).
- ② Loosen plug (5) by using 8 mm hexagonal wrench to remove it from outlet body (1).



17Z9A7MCV07

The plug (PF3/8) of boom swing and dozer component

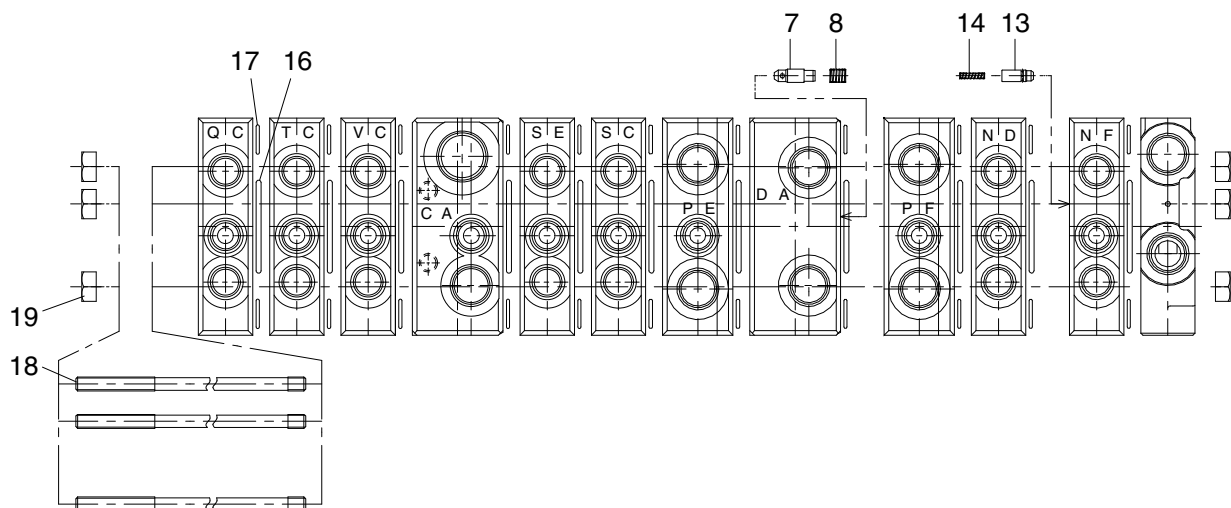
- ① Using dozer component as an example, the disassembly procedures are as follows.
- ② Remove plug (12) from the body (1) by using 8 mm hexagonal wrench to loosen.



17Z9A7MCV08

(5) Component body disassembly procedures

- ① Loosen and remove 3-M8 nuts (19) from both end faces of control valve, which are for assembling component body, by using 13 mm spanner or socket wrench.
- ② When pulling out 3-M8 tie bolts (18) from the side faces, each component body can be in individual condition. At this time, be careful not to drop or lose O-rings (16, 17), poppet check valve (7,13) and spring check valve (8, 14) mounted on mating surfaces of each component body.



17Z9A7MCV09

QC	Dozer	SE	PTO	PF	Travel
TC	Boom swing	SC	Arm	ND	Boom
VC	Swing	PE	Travel	NF	Bucket
CA	Connecting	DA	Inlet P1 and P2	-	Outlet

(6) Precautions after disassembly

- ※ For the parts already removed in the work, store and/or transport them with attention on flaws and dirt.
- ※ When carrying out another work, storage, or transportation with the parts removed condition, apply caps or plastic tape to the holes from which the parts have been taken out, protecting the holes from being entered with dust or the like.

4. ASSEMBLY

1) PRECAUTIONS FOR ASSEMBLY

The disassembly and assembly of our products are to be carried out at our factory in principle.

If there is a necessity of them unavoidably, observe the following precautions and carry out the work at a factory where there are engineers with sufficient technique for hydraulic devices.

- (1) Be careful that the unevenness of fastening torque and the contamination of dust during assembly work could result in malfunction.

In addition, observe fastening torque values specified in the specifications and drawings.

- (2) During assembly work, compare valves with the specifications and drawings and check the number of parts whether there is any improper assembly and/or the omission of parts.

- (3) For the parts to be used in assembly, dip in fluid oil as need arises to reassemble after washing well in washing oil and being dried.

- (4) After cleaning and degreasing the surface sufficiently, apply loctite to 2 threads of the screw from the tip (Too much loctite could result in malfunction after squeezing out).

- (5) For the part to be attached or assembled with two or more bolts and nuts, fastening them evenly and alternately for several times, not once with the specified torque.

The unevenness of fastening torque could result in the leakage of hydraulic fluid to the outside and/or malfunctions.

2) PRECAUTIONS FOR ASSEMBLING SEAL PARTS

- (1) All seals are to be renewed at assembly.

- (2) Check seals for defects in molding and flaws in handling.

Do not use the seal with defect and/or flaw.

- (3) The seals used on sliding surfaces and the places to be installed with seals are to be applied with grease or hydraulic fluid for sufficient lubrication where not specially noted.

- (4) Do not make seals longer up to permanent deformation.

- (5) O-ring is not to be twisted during assembly.

Kinked O-ring could cause oil leakage after installation because kinks are hard to restored.

3) NECESSARY TOOLS AND OTHERS

Before assembling the control valve, prepare the following tools.

The tools below are used to assemble this control valve only; tools for assembling the port fittings are not included.

Name	Quantity	Application
Hexagon spanner	Each 1	4, 6 and 8 mm
Spanner	Each 1	13, 19 and 22 mm
Socket wrench	Each 1	13, 19 and 22 mm
Torque wrench	1	0.2~2.0 kgf · m (1.4~14.5 lbf · ft)
Torque wrench	1	2.0~10.0 kgf · m (14.5~72.3 lbf · ft)
Magnet	1	-
Pliers	1	-
Screwdriver for cross	1	-
Tweezers	1	-

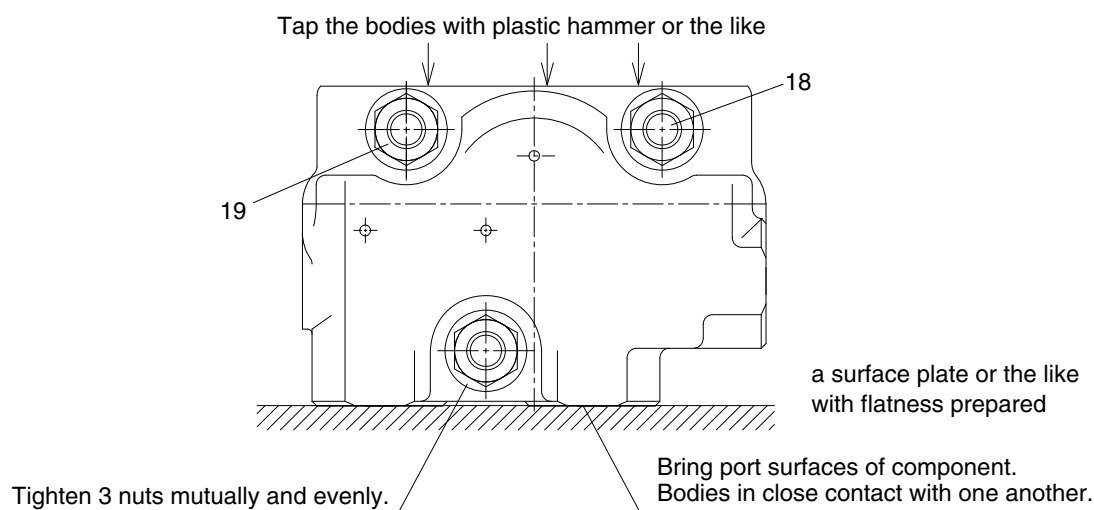
Prepare clean wash oil, hydraulic fluid, grease, tag paper, marker pen, and others before work.

4) ASSEMBLING WORK

For the fastening torque values for screws, see the page 2-6.

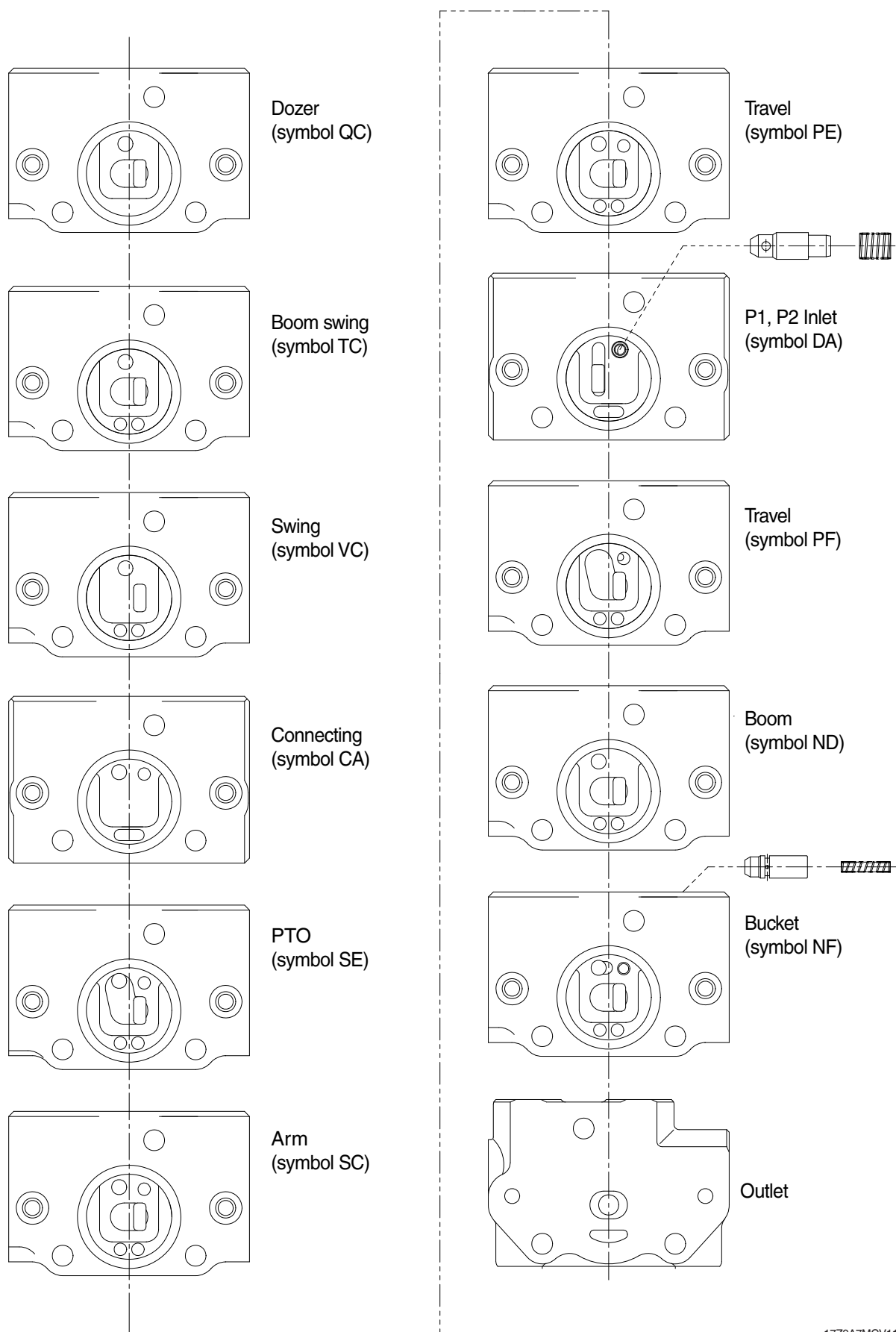
(1) Assembling body work

- ① Place component bodies with each mating surface facing up in the order of assembling.
Then, mount O-rings on mating surfaces of each component body.
However, do not apply hydraulic oil or grease to these O-rings.
(There is a possibility of mistaking them for oil leakage when oozing out from mating surfaces)
The next page shows the order of assembling component bodies and O-rings mounted on mating surfaces.
- ② On a surface plate or the like with flatness prepared, place each component body with actuator port surface facing down in the same order with the above ①.
At this time, insert it from the mating face in order of poppet check valve (7) and spring check valve (8) in P1, P2 inlet component body symbol "DA". And insert it also in the bucket component body symbol "NB" similarly in order of poppet check valve (13) and spring check valve (14).
 - ※ Then, check the mating surfaces in each component body for dust or the like and check whether O-rings shown in the delivery specifications are surely put in each groove for O-ring.
 - ※ Kinked O-rings could cause the leakage of hydraulic fluid to the outside due to the malfunction of sealing performance.
If O-rings are not installed surely in O-ring grooves, there would be the nip of O-ring, resulting in the leakage of hydraulic fluid to the outside when assembling the bodies.
- ③ Put 3-M8 tie bolts (18) through each component body from the side, and screw M8 nuts (19) on both ends lightly.
At this time, tap the bodies with plastic hammer or the like to align the port surface of each component body.
Then, tighten one-side nuts with the opposite side nuts fixed by 13 mm spanner.
Tighten 3-nuts equally and mutually, not all at once with specified torque.
Be careful that applying not specified torque causes the deformation of body or oil leakage.
 - Nut tightening torque : 1.4~1.5 kgf · m (10.1~10.8 lbf · ft)



Array of body

※ Do not apply hydraulic oil or grease to O-rings.



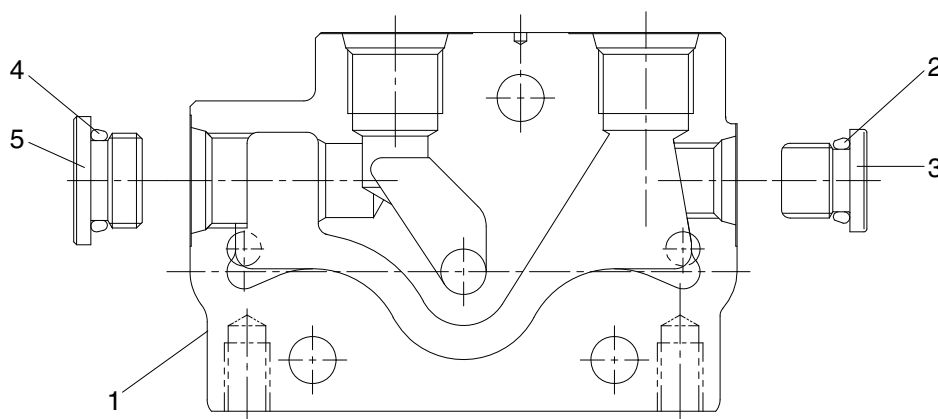
17Z9A7MCV11

(2) The other parts assembly procedures

① The plug (PF3/8, PF1/4) of outlet component

After checking that plug (3) is mounted with O-ring (2), screw the plug into outlet body (1) loosely and then tighten it with specified torque by using 6 mm hexagonal wrench.

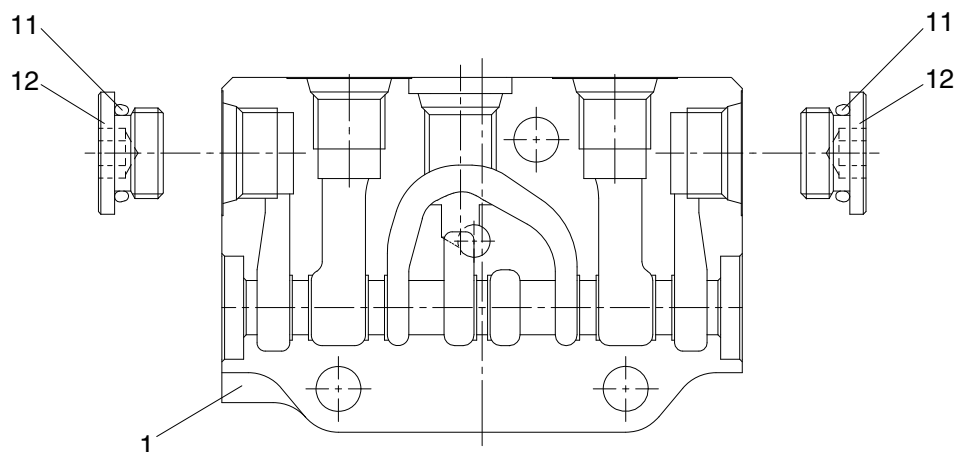
And after checking that plug (5) is mounted with O-ring (4), screw the plug into outlet body (1) loosely and then tighten it with specified torque by using 8 mm hexagonal wrench.



17Z9A7MCV12

② The plug (PF3/8) of boom swing and dozer component

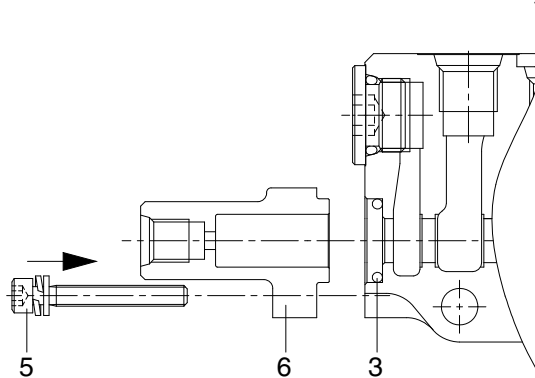
After checking that plug (12) is mounted with O-ring (11), screw the plug into component body (1) loosely and then tighten it with specified torque by using 8 mm hexagonal wrench.



17Z9A7MCV13

③ Pilot cover

- Install O-ring (3) securely on the flange bottom of the body.
- Insert pilot cover (6) into the flange of the body.
- Tighten bolt with washers (5) with specified torque by using 4 mm hexagonal wrench.



17Z9A7MCV14

(3) Accessory valve disassembly procedures

① Main relief valve and overload relief valve

Tighten main relief valve and overload relief valve by using 22 mm spanner or socket wrench.

- Put spanner (socket wrench) to 22 mm hexagonal part of pressure regulating body.
- If there is no 22 mm spanner (socket wrench), it is also possible to loosen and remove by putting 19 mm spanner to the hexagonal part as shown in the figure.

※ If using 19 mm screw wrench to remove, never put it to the lock nut part.

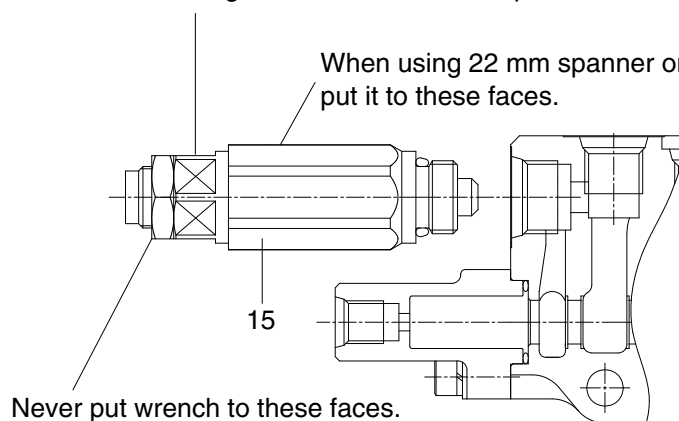
If not, only lock nut is loosened to change the relief valve setting, which could result in the degradation in performance or damage.

※ Before installing accessory valves (main relief valve, overload relief valve), check that there is no flaw or dust on the seat.

The presence of flaw or dust on the seat can cause internal leakage, resulting in the holding failure of actuator.

When using 19 mm screw wrench, put it to these faces.

When using 22 mm spanner or socket wrench, put it to these faces.



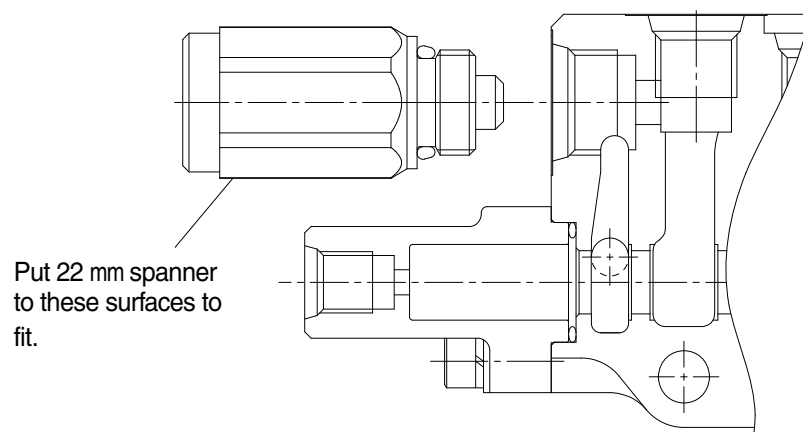
17Z9A7MCV15

② Anticavitation valve

As well as overload relief valve, fit anticavitation valve by using 22 mm spanner or socket wrench.

- ※ Before installing accessory valves (anticavitation valve), check that there is no flaw or dust on the seat.

The presence of flaw or dust on the seat can cause internal leakage, resulting in the holding failure of actuator.

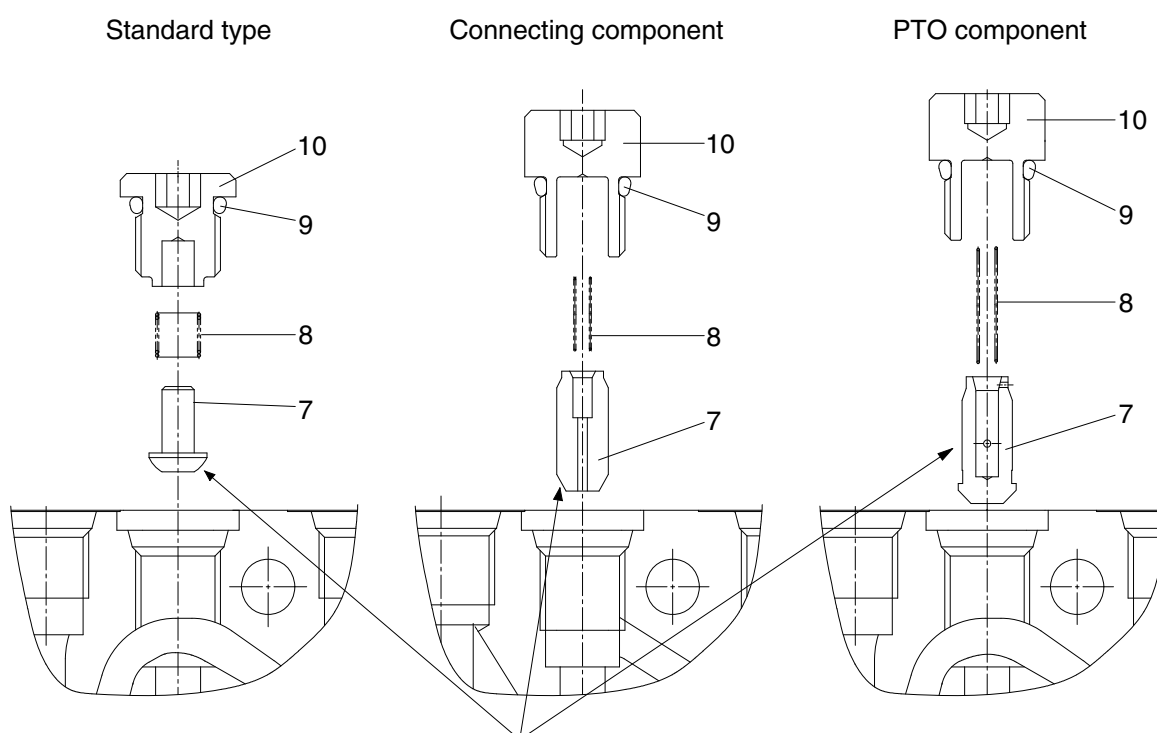


17Z9A7MCV16

(4) Check valve assembly procedures

- ① Hold the control valve body at workbench or hold it by two or more people.
- ② Insert check valve (7) with its bevel facing down vertically into the upper center of control valve's body (1). Then, insert check valve spring (8) into the body of check valve (7).
Be careful that inclined check valve (7) cannot be inserted into the hole of check valve plug (10).
(It is necessary to check that check valve is almost at the center.)
- ③ After checking that check valve plug (10) is surely mounted with O-ring (9), screw it in and tighten with specified torque by using 6 mm hexagonal wrench.
- ④ Connecting component and PTO component are different in shape; however, they can be assembled in the same manner.

Meanwhile, since track component does not have check valve nor check valve spring-check valve, the working in ② can be omitted and plug(8, see page 7 -22) is to be tightened as well.



When the check valve doesn't screw smoothly in,
discontinue screwing in.
(The check valve has the possibility of falling)

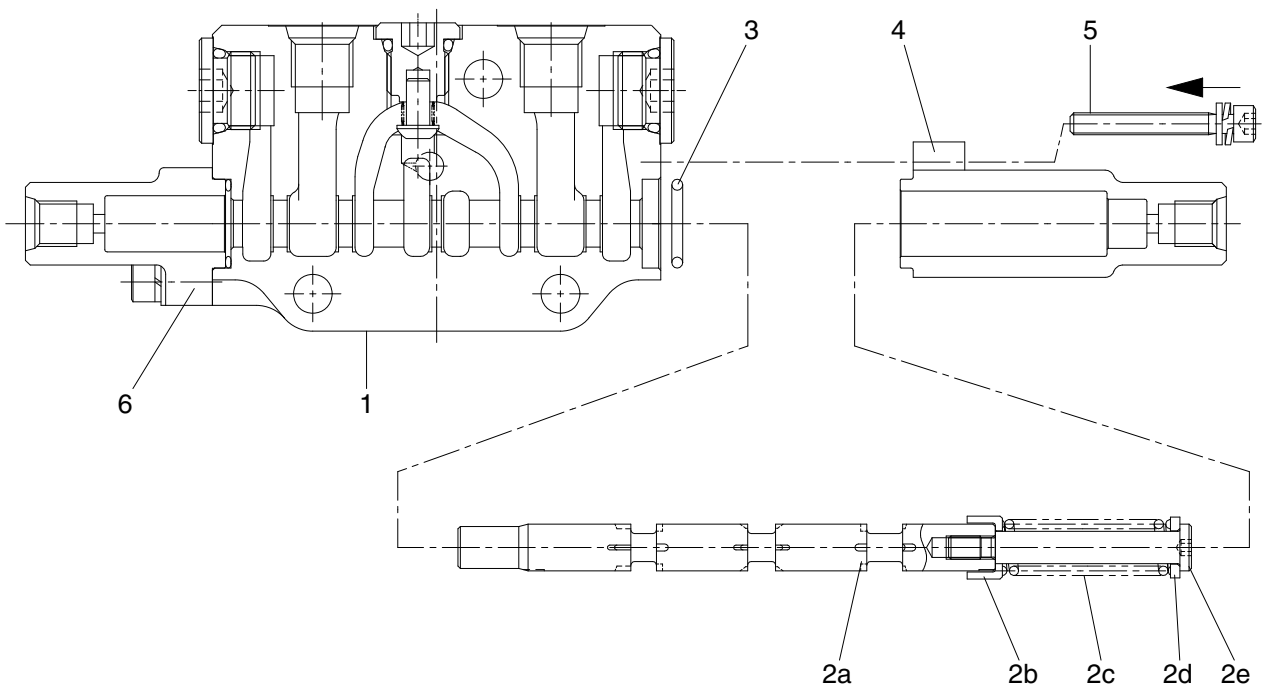
17Z9A7MCV17

(5) Spool installing procedures

Except P1, P2 inlet component

Taking the dozer spool as an example, the installing procedures are as follows.

- ① After checking whether there is no dust or the like in the spool sleeves of the body and/or spool assy and O-ring (3) is securely installed with that the flange bottom of the body, insert the dozer spool assy into spool sleeve of the body with attention on the position and direction.
 - Then, apply little hydraulic fluid to spool before the insertion.
- ※ Carefully insert spool assy into the spool sleeve horizontally.
 - If it is hard to insert, forcible insertion could cause impressions on spool sleeves and/or spools, resulting in malfunction.
- ※ If you feel any feeling of wrongness such as catches or strong resistance, pull it out once to check whether there is the adhesion of dust or the development of flaw or burr.
 - If there are flaws or burrs, there could be malfunction so that replace body and spool in set.
 - When there is no feeling of wrongness, check for any heavy movement or a feeling of catches.
- ② With pilot cover (4) being pressed in a direction from the spring side of spool assy to the flange of body, tighten bolt with washers (5) with specified torque by using 4 mm hexagonal wrench.
- ③ The other spools can be assembled in the same manner.

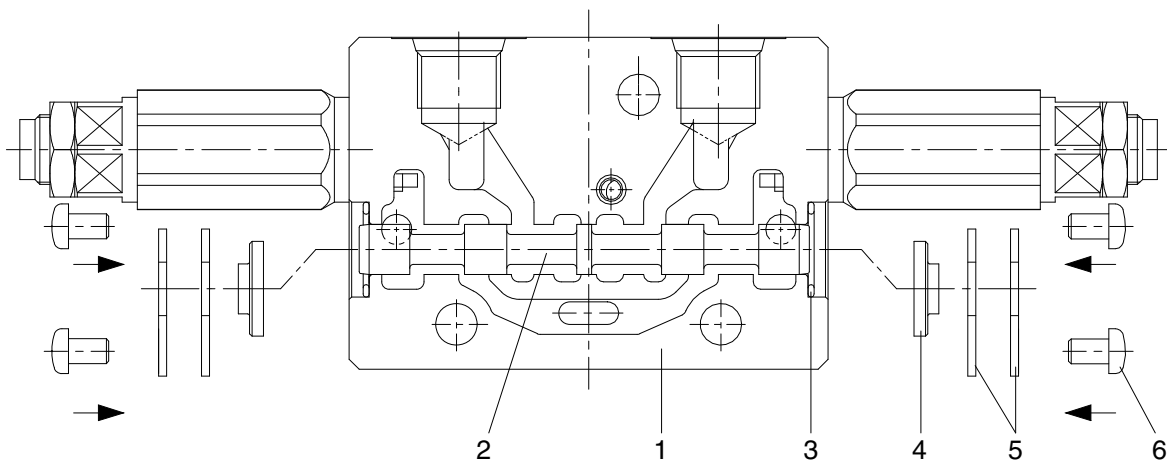


17Z9A7MCV18

P1, P2 Inlet component

The fitting procedures for P1, P2 inlet component spools are as follows.

- ① After checking whether there is dust or the like in the spool hole of spool and/or body and that the flange bottom of the body is securely installed with O-ring (3), insert the spool into spool hole of the body with attention on the position and direction.
 - The insertion direction in the spool can be inserted according to any direction because there is no right and left specification.
 - Apply little hydraulic fluid to spools before the insertion.
- ② A seat plate (4) and two seat plates (5) are installed, and tighten 2-M5 cross recessed head screws (6) with the specified torque by using screwdriver for cross.
- ③ Tighten a reverse-side with the specified torque similarly.



17Z9A7MCV19

5. PROBLEM CAUSES AND MEASURES

Since the cause of trouble occurred in hydraulic devices might be a complexity of various factors, first check whether the trouble occurs in any control valve, the other hydraulic device, or the circuit if you find any abnormality.

It is necessary to measure the pressure, flow rate, and so on of each important point.

Before disassembling even a part, follow to the above-mentioned disassembly and assembly procedures. The followings show typical trouble examples in control valves.

Phenomenon	Possible cause	Remedy
Spool's sliding movement is not smooth.	<ul style="list-style-type: none"> Storage of foreign matter. Oil-film shortage between spool and body due to abnormal rise of oil temperature. Friction of spool. Insufficient lubrication due to oil deterioration. Set or breakage of return spring. Bend of spool. Distortion of valve due to fitting surface failure. Abnormal tightening of fitting surface. Failure in link fitting. 	<ul style="list-style-type: none"> Disassemble, check, correct, or replace it. Decrease oil temperature or change hydraulic oil. Replace spool. Change hydraulic oil and carry out flashing of circuit. Replace spring. Replace spool. Loosen fitting bolts, carry out check and correction. Retighten them with specified torque. Inspect and correct link fitting.
Oil leakage from spool seals.	<ul style="list-style-type: none"> Damaged or cut O-rings. Dent or score on sliding part of spool seal. Paint adhered on sliding part of spool seal. 	<ul style="list-style-type: none"> Replace O-rings. Correct or replace spool. Remove paint with thinner or the like.
Attachment does not operate, moves slow, or outputs less power.	<ul style="list-style-type: none"> Storage of foreign matter on the seat of relief valve or overload relief valve. Loosened adjusting screw in relief valve or overload relief valve. Storage of foreign matter on the seat of anticavitation valve. 	<ul style="list-style-type: none"> Disassemble, check, and replace it. If the seat contacting with overload relief valve's body is damaged, replace body also. Readjust with specified torque. Disassemble, check, and replace it. If the seat contacting with overload relief valve's body is damaged, replace body also.
Even when spool position is neutral, cylinder sinks under its own weight.	<ul style="list-style-type: none"> Damaged body or spool. Storage of foreign matter between body and spool, or stick. Set or breakage of check valve spring or return spring. Storage of foreign matter on the seat of overload relief valve. Loosened adjusting screw in overload relief valve. Storage of foreign matter on the seat of anticavitation valve. 	<ul style="list-style-type: none"> Replace body and/or spool. Disassemble, check, correct, or replace it. When there is a stick, replace body and spool as a set. Replace spring. Disassemble, check, and replace it. If the seat contacting with overload relief valve's body is damaged, replace body also. Readjust it with specified torque. Disassemble, check, and replace it. If the seat contacting with anticavitation valve's body is damaged, replace body also.
When operating it upward, cylinder falls conversely.	<ul style="list-style-type: none"> Storage of foreign matter between load check valve and component body's seat. Stick of check valve. Set or breakage of check valve spring. 	<ul style="list-style-type: none"> After disassembling and cleaning, replace body if damage is serious. Replace check valve and check valve plug as a set. Replace spring.

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 (10, 11).
- (5) Disconnect pilot line hoses (21, 25).
- (6) Sling the swing motor assembly (1) and remove dowel pin (18) and the swing motor mounting bolts (14).

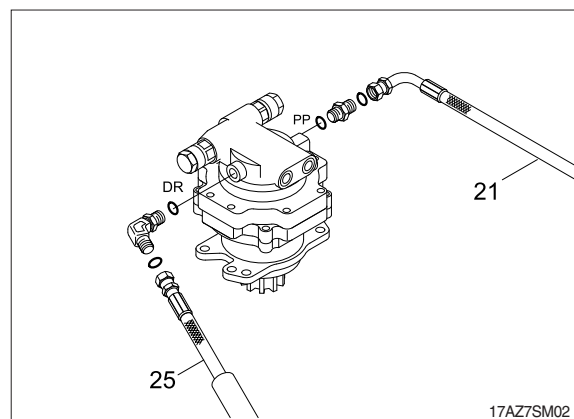
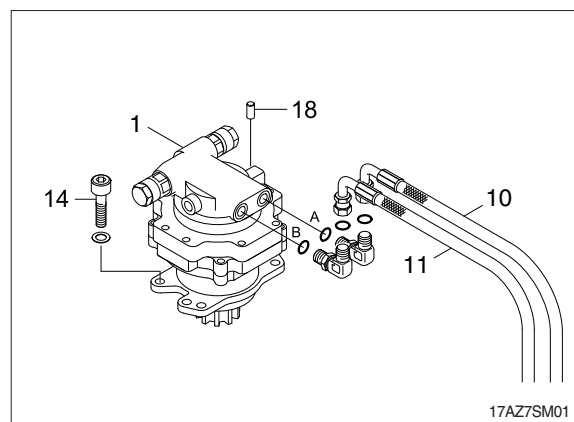
Motor device weight : 23 kg (50 lb)

· Tightening torque : 12.8 ± 3.0 kgf·m
(92.6 ± 21.7 lbf·ft)

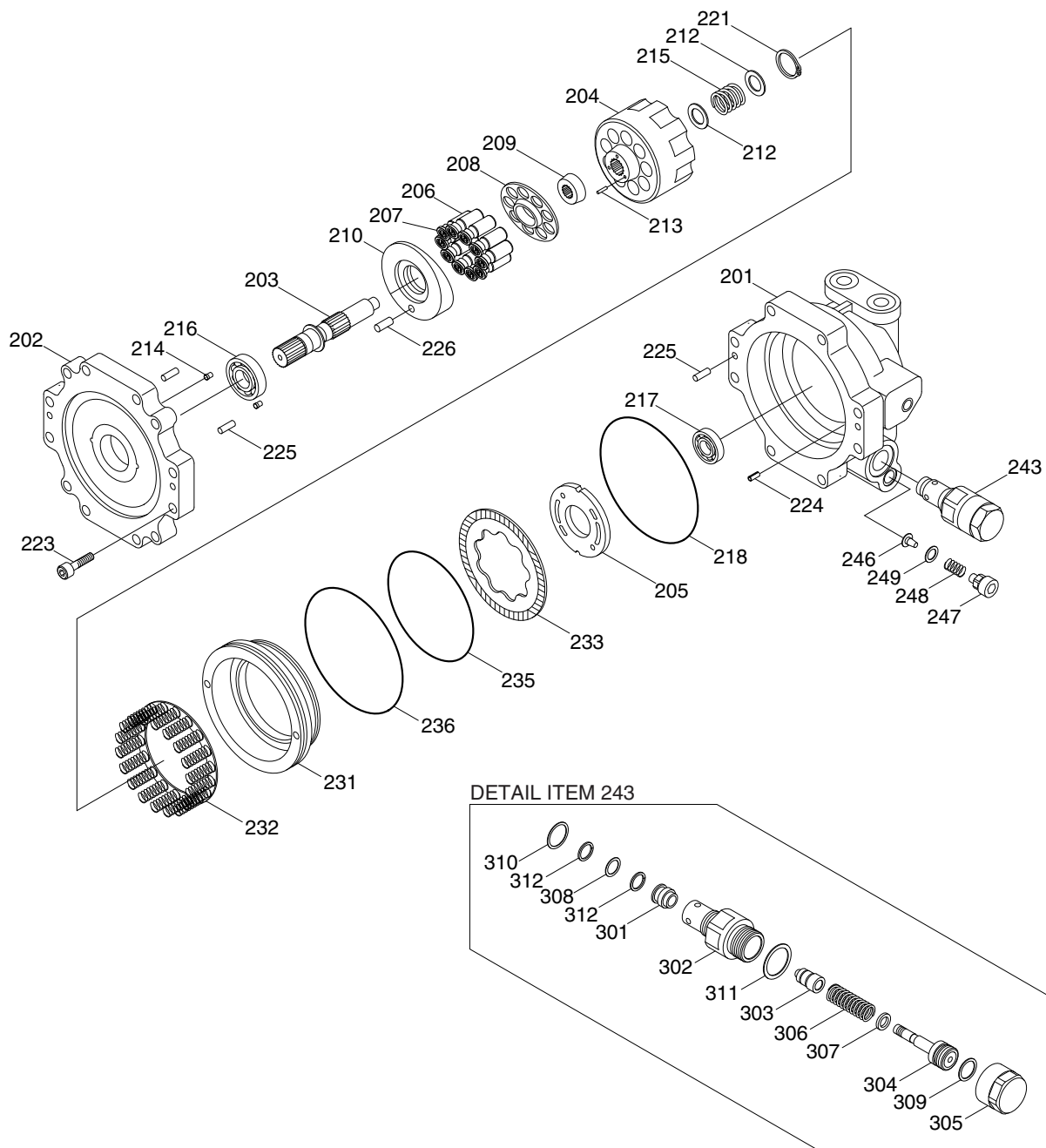
- (7) Remove the swing motor assembly.
When removing the swing motor assembly, check that all the piping have been disconnected.

2) INSTALL

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



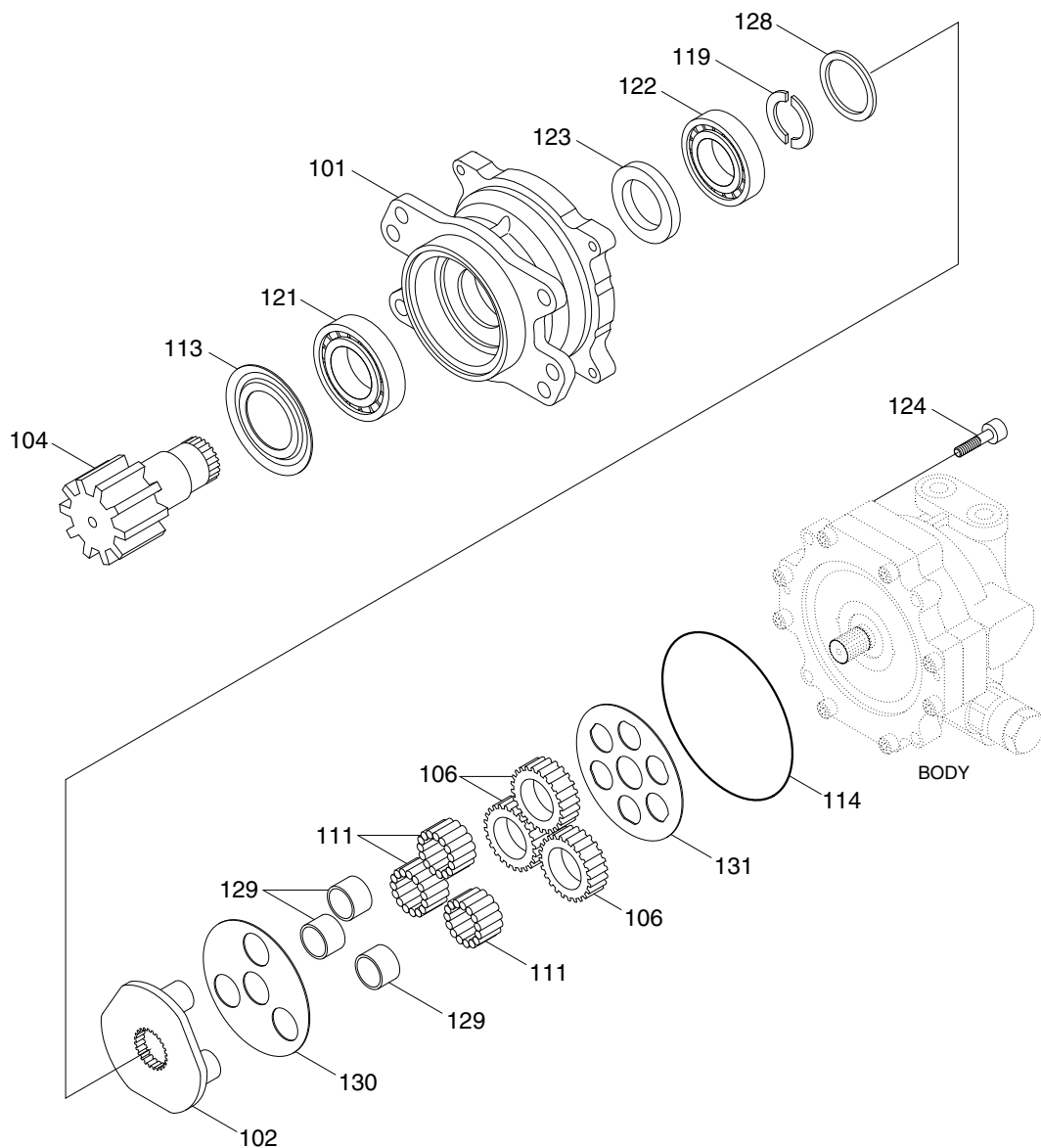
3) COMPONENTS (1/2)



1892SM06

201	Body	213	Pin	231	Brake piston	302	Retainer
202	Plate	214	Filter	232	Spring assy	303	Poppet
203	Shaft	215	Spring C	233	Disk plate	304	Piston
204	Cylinder barrel	216	Bearing	235	O-ring	305	Cap
205	Valve plate	217	Bearing	236	O-ring	306	Spring
206	Piston	218	O-ring	243	Relief valve assy	307	Spacer
207	Shoe	221	Snap ring	246	Check valve	308	O-ring
208	Shoe holder	223	Screw	247	Plug	309	O-ring
209	Barrel holder	224	Spring pin	248	Spring	310	O-ring
210	Swash plate	225	Pin	249	O-ring	311	O-ring
212	Retainer	226	Pin	301	Seat	312	Back up-ring

COMPONENTS (2/2)



1892SM08

101	Body	114	O-ring	128	Ring
102	Carrier 1	119	Preload collar	129	Ring 1
104	Pinion shaft	121	Bearing	130	Thrust plate 1
106	Gear B1	122	Bearing	131	Thrust plate 2
111	Needle	123	Oil seal		
113	Seal ring	124	Screw		

4) GENERAL ATTENTION

Please pay attention following points.

- (1) Working should be done at the clean place and pay attention not to attach dust, paint cake and water. And prepare the clean box to put into the disassembled parts.
- (2) Before disassembling, clean up the dust which is attached to the outside of the swing motor and take out paint which is attached to the binding parts by the wire brush.
- (3) To make the original position when assembling, make a marking before disassembling.
- (4) Give special care to protect parts from damage.
- (5) Wash parts with washing oil sufficiently.
- (6) Check parts whether there is friction loss or seize and take out burr with sand paper.
- (7) Change the seals and snap rings to new ones.

2) DISASSEMBLY AND ASSEMBLY PROCEDURE

As the swing motor composes 2 blocks (hydraulic motor and reduction gear), explain each block disassembly and assembly procedure.

And please refer to the page 7-37~38.

5) TOOLS FOR DISASSEMBLY AND ASSEMBLY

No.	Tool	
1	Preset type hand torque wrench	45 N (JIS B4650)
2		90 N (JIS B4650)
4	Hexagon bar bit for above wrench	Two-plane width 6
5		Two-plane width 8
6	Single purpose type hand torque wrench	$T = 15 \pm 1.5 \text{ kgf} \cdot \text{m}$ ($108 \pm 10.8 \text{ lbf} \cdot \text{ft}$) Two-plane 36
8	Hexagon bar wrench	Two-plane width 6
9		Two-plane width 8
10	Spanner	Two-plane width 36
11	Minus driver	Width 6~10
12	Snap ring pliers	Ø28 For hole
13	Hammer	-
14	Plastic hammer	-
15	Other	Grease
16		(Oil designated hydraulic oil)
17		Wire brush
18		Sand paper
19		Anti-loose adhesive (three bond #1305)

2. DISASSEMBLY

1) HYDRAULIC MOTOR

- (1) Loose the hexagon socket head cap bolts (124), and take out the hydraulic motor assembly from the reduction gear body.

· Tools required :
Hexagon bar wrench : 6 mm

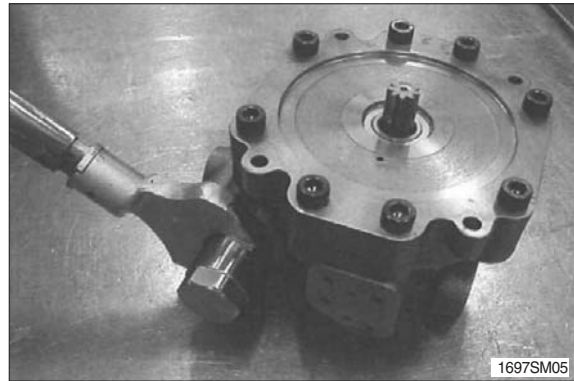
- ※ When taking out the hydraulic motor assembly from the reduction gear body, the drain port should be open.
When it is difficult to take out, insert the minus driver into the binding face to the body and take out the burr completely.



- (2) Take out the relief valve assembly (243).

· Tools required :
Spanner : 36 mm

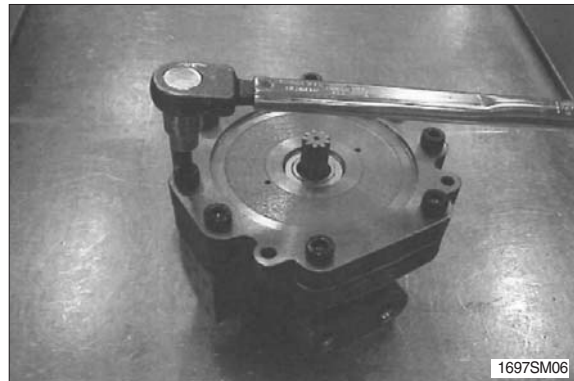
- ※ Do not disassemble the relief valve assembly, unless it is necessary.



- (3) Loose the hexagon socket head cap bolts (223), and take out the plate S (202).

· Tools required :
Hexagon bar wrench : 8 mm

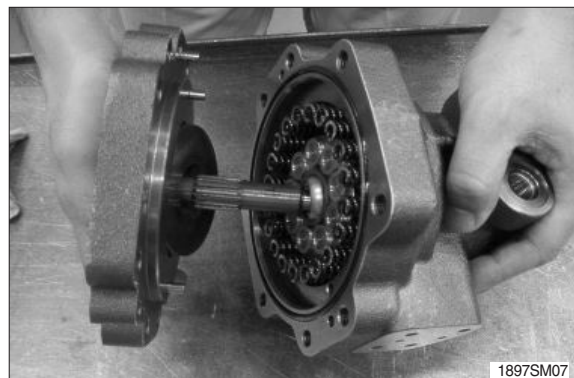
- ※ Pay attention not to drop out the swash plate (210).



- (4) Take out the swash plate (210) and the shaft kit from the plate S (202).

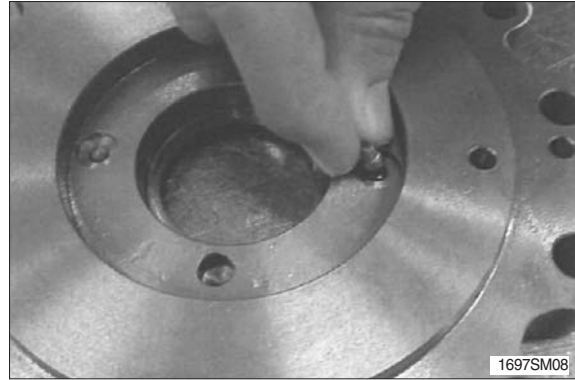
- ※ When it is difficult to take out the shaft, hit the opposite side slightly by the plastic hammer.

As the bearing (216) is pressed into the shaft, do not disassemble unless it is necessary to change the bearing.

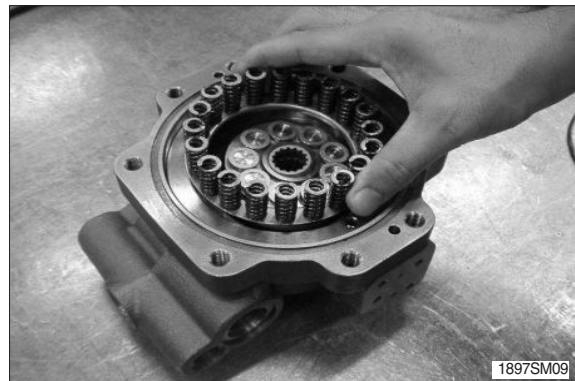


(5) Take out the filters (214) and the parallel pins (225) from the plate S (202).

- Filter (214) : 2 pcs
- Parallel pin (225) : 3 pcs

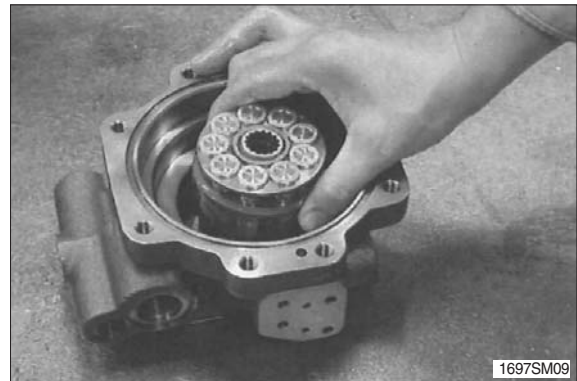


(6) Take out the O-ring (218) and the spring assembly (232) from the body H (201).

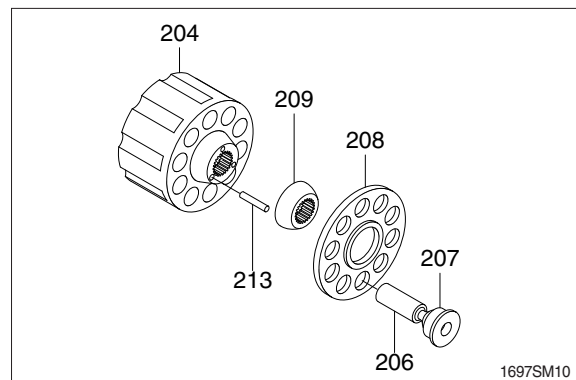


(7) Take out the cylinder barrel kit.

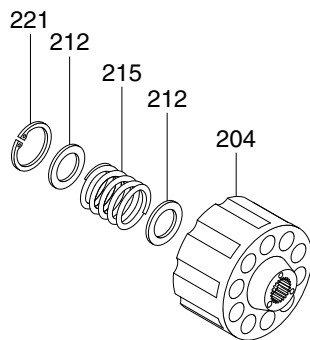
- ※ The small parts are easily dispersed, pay attention not to miss.
- The valve plate (205) is sometime attached, pay attention not to drop out.



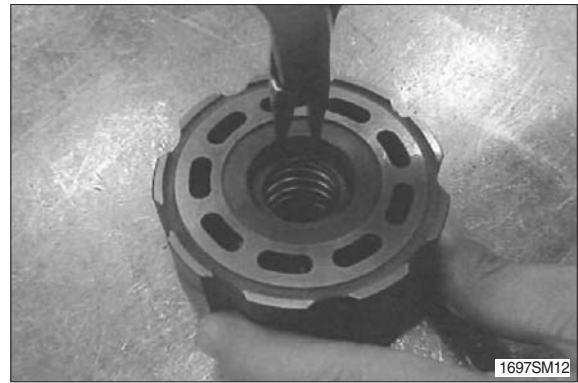
(8) Take out the piston (206) and the shoe (207) assembly, the shoe holder (208), the barrel holder (209) and the pin (213).



- (9) Take out the snap ring (221), the retainer (212) and the spring C (215).

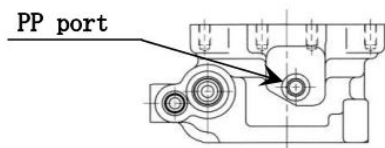


1697SM11

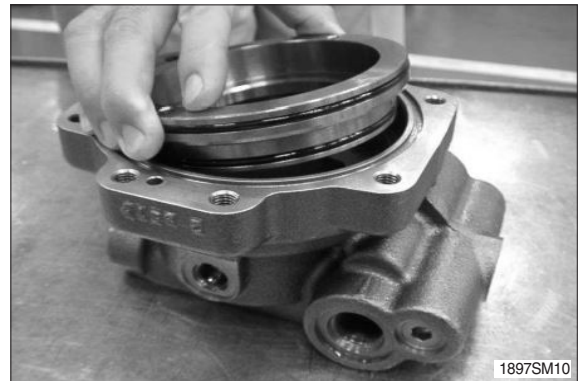


- (10) Take out the brake piston (231) and the O-ring (235, 236).

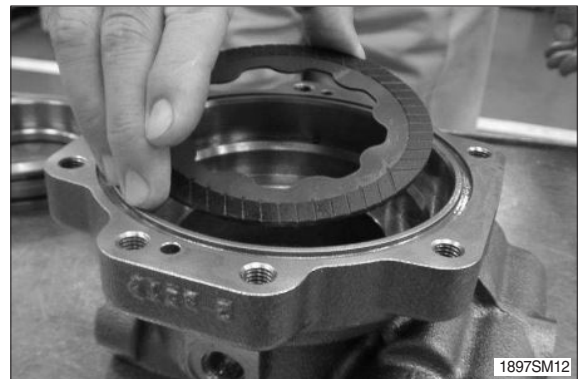
※ The brake piston is drawn out by the air blowing gradually from the PP port. Pay attention not to draw out the brake piston rapidly.



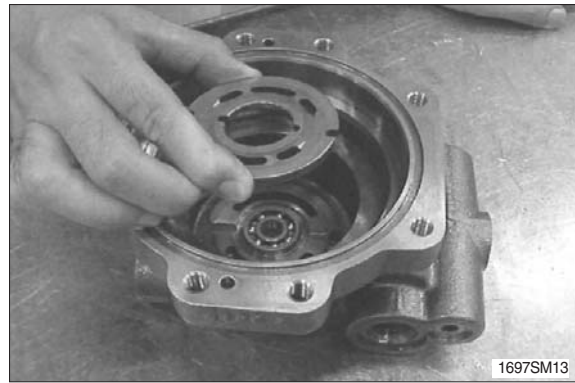
1897SM11



- (11) Take out the disk plate (233).

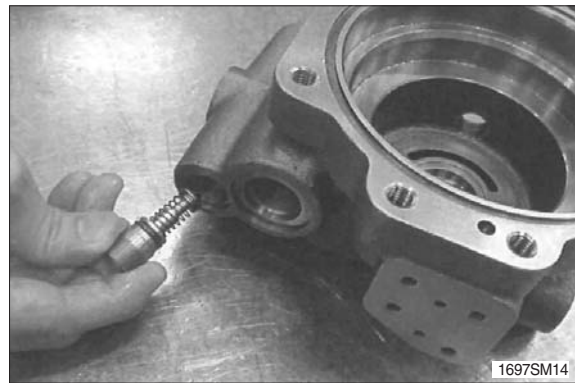


(12) Take out the valve plate (205).



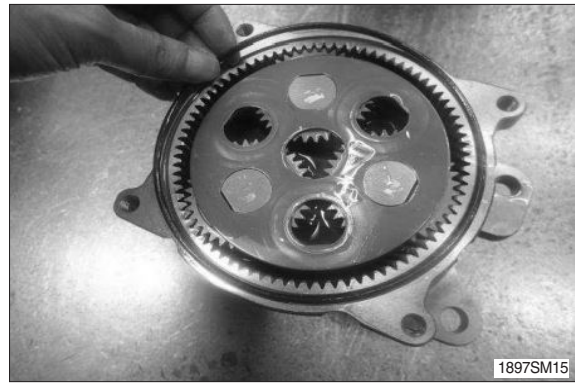
(13) Loose the plug (247), and take out the check valve (246) and the spring (248).
(2 locations)

- Tools required :
Hexagon bar wrench : 8 mm

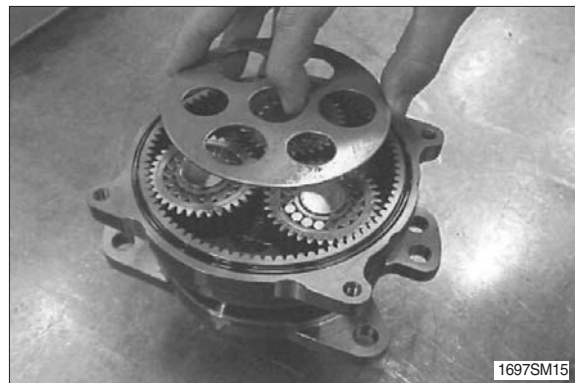


2) REDUCTION GEAR

(1) Take out the O-ring (114).



(2) Take out the thrust plate (131).



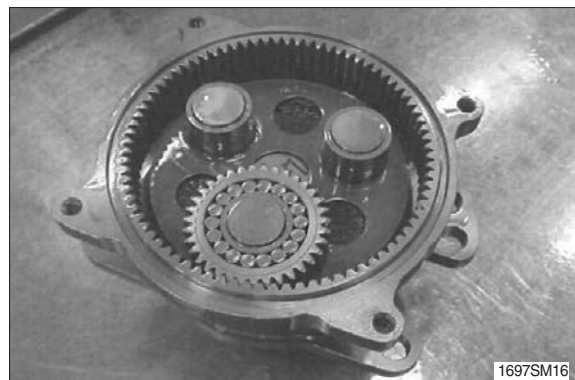
(3) Take out carrier 1 (102), the b1 gears (106), the needles (111) and the rings (129).

Needle (111) : 18 pcs / b1 gear 1pc

b1 gear (106) : 3 pcs

Ring (129) : 3 pcs

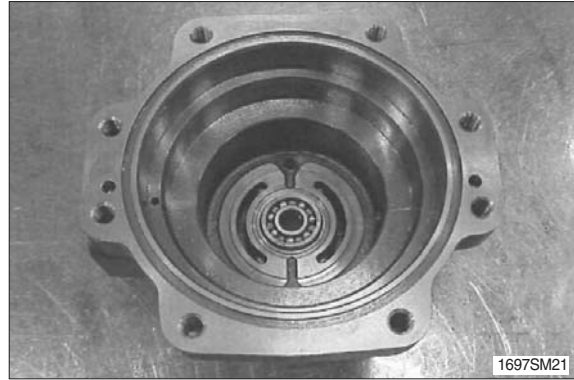
※ The small parts are easily dispersed.
Pay attention not to miss.



3. ASSEMBLY

1) HYDRAULIC MOTOR SECTION

- (1) Press-fit the bearing (217) and spring pin (224) into the body H (201).

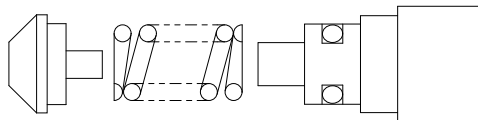
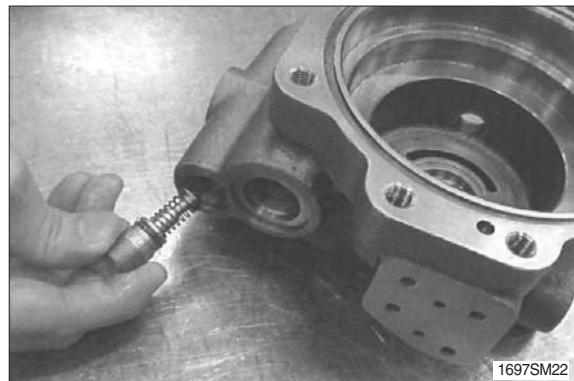


- (2) Insert the 2 check valves (246) (1 pc/side), 2 springs (248) (1 pc/side) and 2 plugs (247) (1 pc/side) with O-ring (249) in that order into the body H (201).

- Tools required :
Hexagon bar wrench : 8 mm
Torque wrench

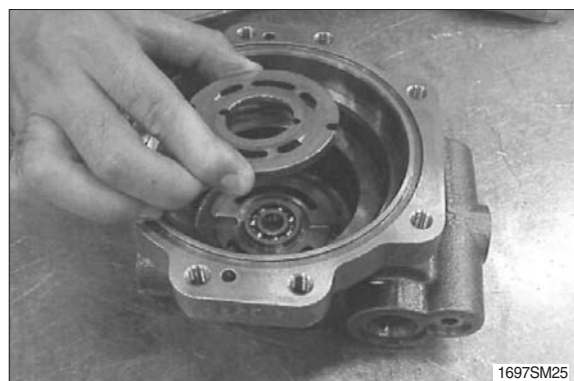
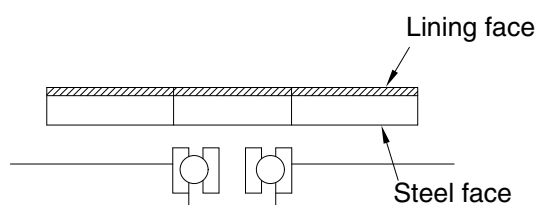
- ※ Apply grease slightly to the O-ring and assemble to pay attention not biting the seals.

- Plug tightening torque :
 $6 \pm 0.3 \text{ kgf} \cdot \text{m}$ ($43.4 \pm 2.17 \text{ lbf} \cdot \text{ft}$)



- (3) Place the valve plate (205) onto the body H.

- ※ The steel face of the valve plate should be downside and assemble.



(4) Assemble the disk plate (233).



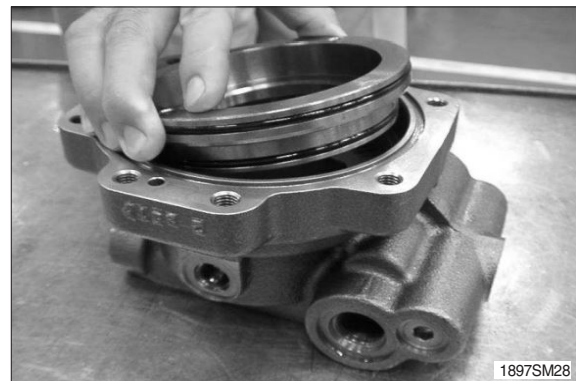
(5) Attach the O-ring (235, 236) to the brake piston (231), and make the brake piston assembly.



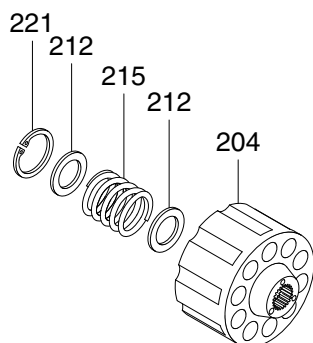
(6) Place the brake piston assembly onto the body H (201).

- ※ Set the brake piston assembly to the plate S which is attached 3 pcs of the parallel pins, and confirm there is no O-ring sticking out, flaw and dust, and assemble the brake piston assembly without inclination. In case of the brake piston assembly dropping out, apply grease to the plate S side.

After assembled, take out the plate S. Apply grease slightly to the O-ring and assemble to pay attention not biting the seals.



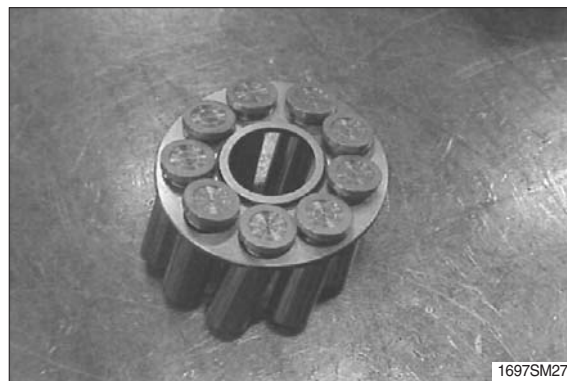
- (7) Place the retainer (212), spring C (215) and retainer (212) in that order into the cylinder barrel (204), and then secure them with the snap ring (221).



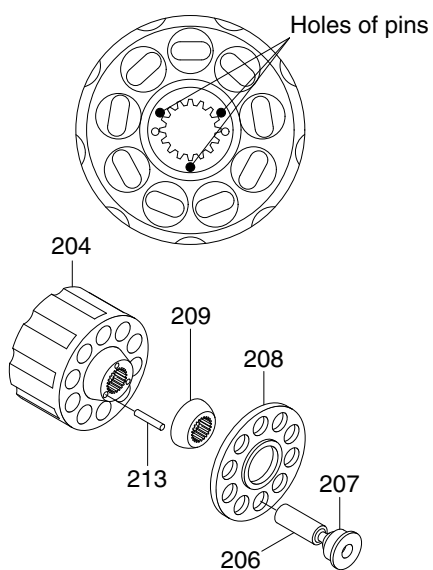
R27Z97SM38



- (8) Make the shoe holder assembly which has the 9 piston-shoe (206, 207) assemblies placed on the shoe holder (208).



- (9) Place the 3 pins (213), barrel holder (209) and the shoe holder assembly onto the cylinder barrel (204) to make up a cylinder barrel assembly.



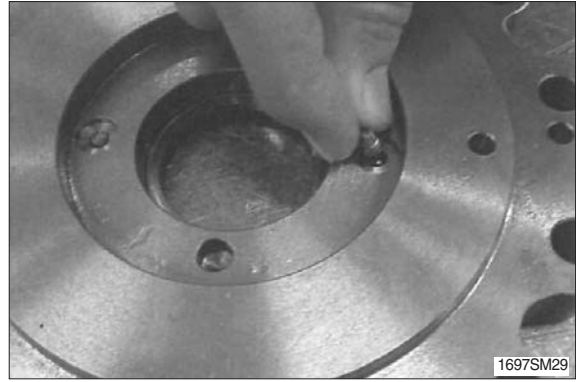
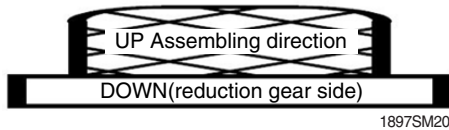
R27Z97SM41



- (10) Place the filters (214) and the parallel pins (225) into the plate S.

Filter (214) : 2 pcs

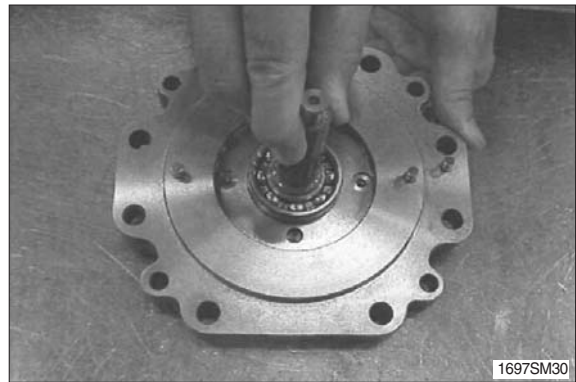
Parallel pin (225) : 3 pcs



Use a plastic hammer when it is tight.

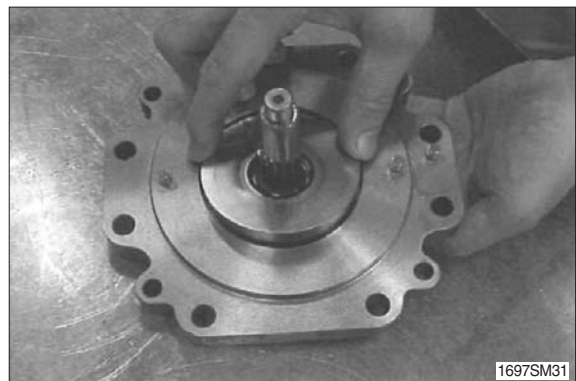
- ※ Pay attention height of pins are 8 mm from surface after installation.

- (11) Place the shaft assembly into the plate S.



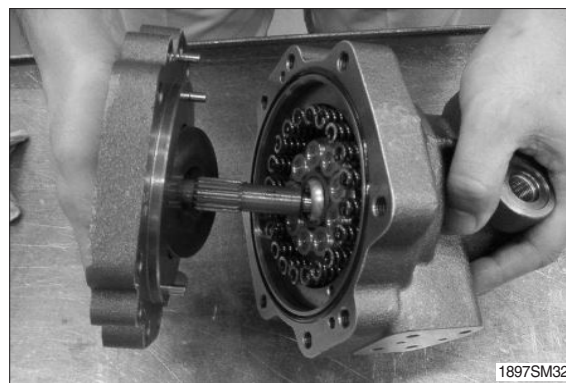
- (12) Place the swash plate onto the plate S.

- ※ In case the swash plate drops out, apply grease to the plate S side of it.



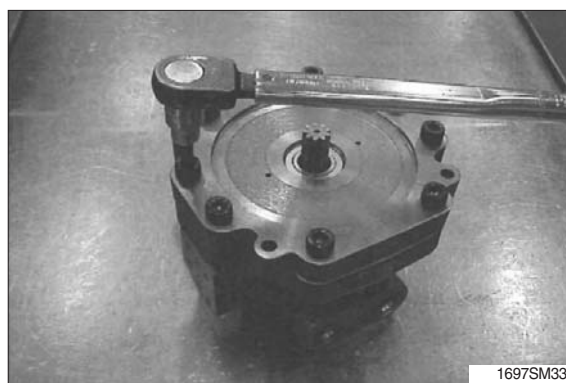
(13) Join the body H and the plate S.

- ※ Align the serration of the shaft which is assembled to the plate S to the serration of the cylinder barrel assembly which is assembled to the body H.



(14) Bolt the plate S (202) together with the 8 hexagon socket head cap bolts (223).

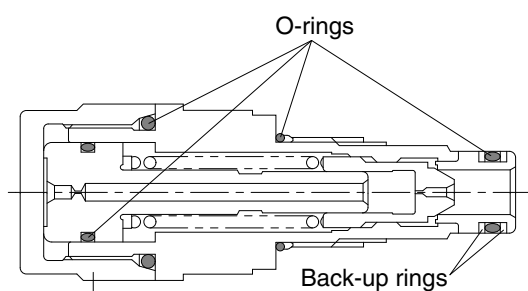
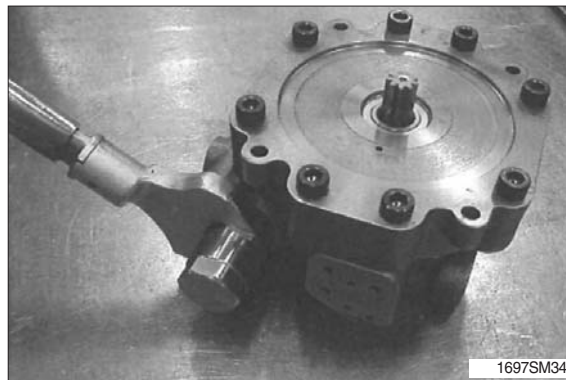
- Tools required :
Hexagon bar wrench : 8 mm
Torque wrench
- Plug tightening torque :
 $6 \pm 0.3 \text{ kgf} \cdot \text{m}$ ($43.4 \pm 2.17 \text{ lbf} \cdot \text{ft}$)



(15) Screw up the relief valve assembly (243).
(both side)

- Tools required :
Spanner : 36 mm
Torque wrench
- Plug tightening torque :
 $15 \pm 1.5 \text{ kgf} \cdot \text{m}$ ($108 \pm 10.8 \text{ lbf} \cdot \text{ft}$)

- ※ Once the relief valve is disassembled, replace the O-ring and the back up ring in the below, and screw the cap with the following torque.

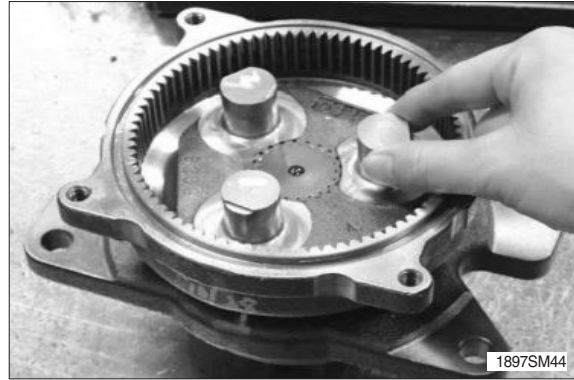


Plug tightening torque:
 $15 \pm 1.5 \text{ kgf} \cdot \text{m}$ ($108 \pm 10.8 \text{ lbf} \cdot \text{ft}$)

R27Z97SM54

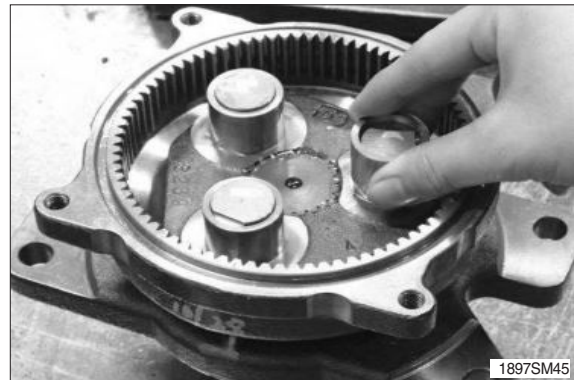
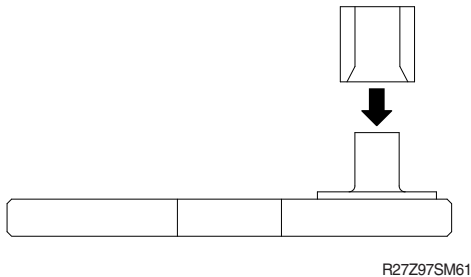
2) REDUCTION GEAR SECTION

- (1) Align the spline of the carrier 1 (102) to the pinion shaft (104) and place the carrier 1 (102) into the body.



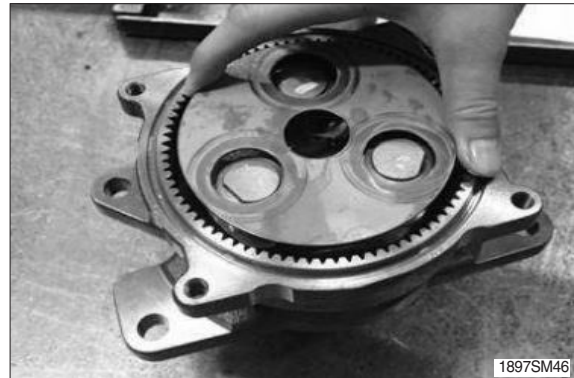
- (2) Place the 3 rings (129) (1 pc/pin) onto the 3 pins of the carrier 1 (102).

※ Pay attention to direction of the ring.
Beveling part of the ring should be down side.



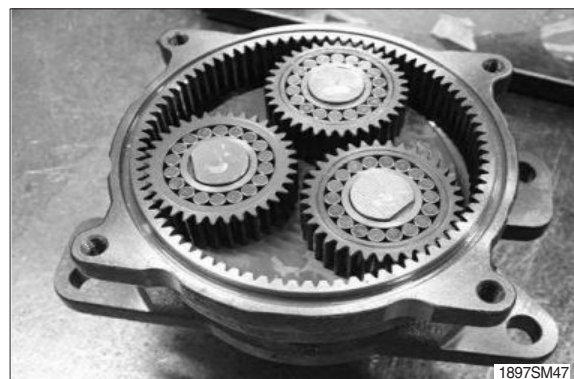
- (3) Place the thrust plate (130) onto the carrier 1.

※ Larger size holes are aligned to the pins.



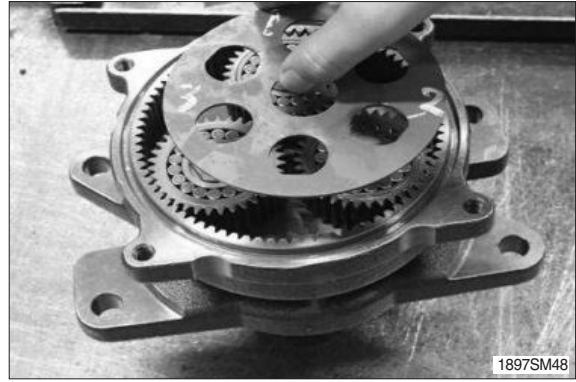
- (4) Place the 3 b1 gears (106) (1 pc/pin) and 54 needles (111) (18 pc/pin) in that order onto the 3 pins of the carrier 1.

※ Pay attention not to drop the needles in the body.



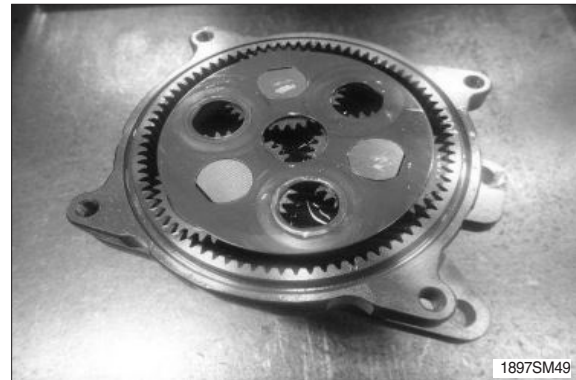
- (5) Place the thrust plate (131) onto the carrier 1.

※ Smaller size holes are aligned to the pins.

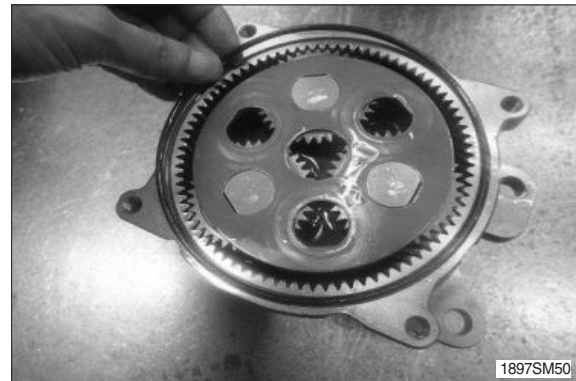


- (6) Fill the body with hydraulic oil.

※ Oil : ISO VG 46 or equivalent
Oil amount : 3 to 4 mm below the top thrust plate
Wipe the oil off the flange surface if it is spilled.



- (7) Place the O-ring (114) onto the body.



- (8) Join the hydraulic motor and the body, and then bolt them together with the 4 hexagon socket head cap bolts.

· Tools required :
Hexagon bar wrench : 6 mm
Torque wrench

※ Align the shaft of the motor to the b1 gears. Apply anti-loose adhesive to the screws.

· Plug tightening torque :
 $3 \pm 0.3 \text{ kgf} \cdot \text{m}$ ($21.7 \pm 2.17 \text{ lbf} \cdot \text{ft}$)



GROUP 6 TRAVEL DEVICE

1. REMOVAL AND INSTALL

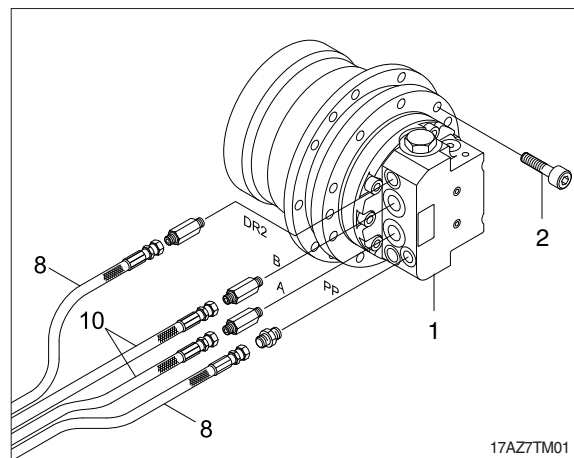
1) REMOVAL

- (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.

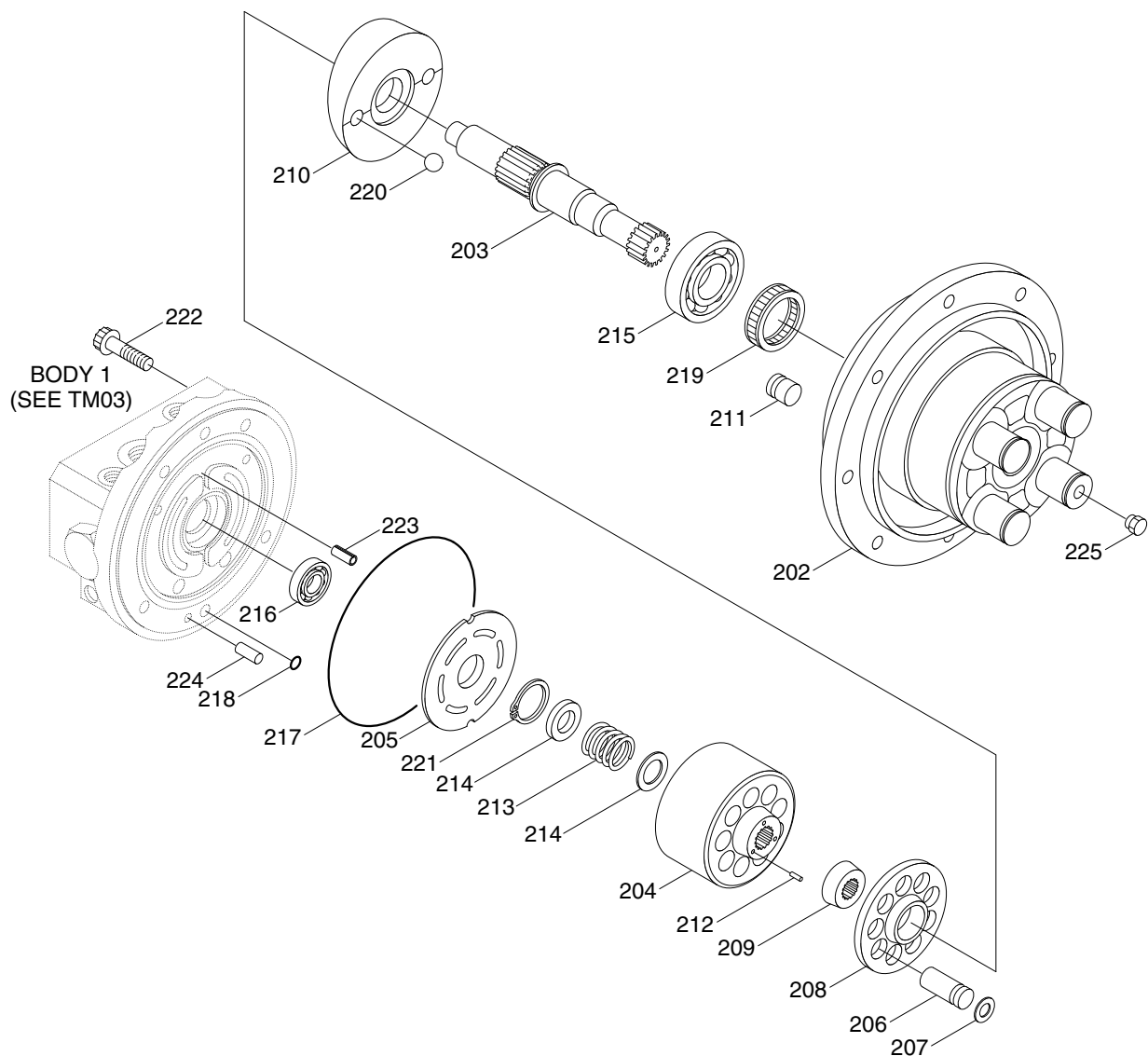
- (4) Remove the track shoe assembly.
For details, see removal of track shoe assembly.
- (5) Remove the cover.
- (6) Remove the hose (8, 10).
※ Fit blind plugs to the disconnected hoses.
- (7) Remove the bolts and the sprocket.
- (8) Sling travel device assembly (1).
- (9) Remove the mounting bolts (2), then remove the travel device assembly.
 - Weight : 18 kg (40 lb)
 - Tightening torque : 6.9 ± 1.4 kgf·m
(49.9 ± 10.1 lbf·ft)



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.

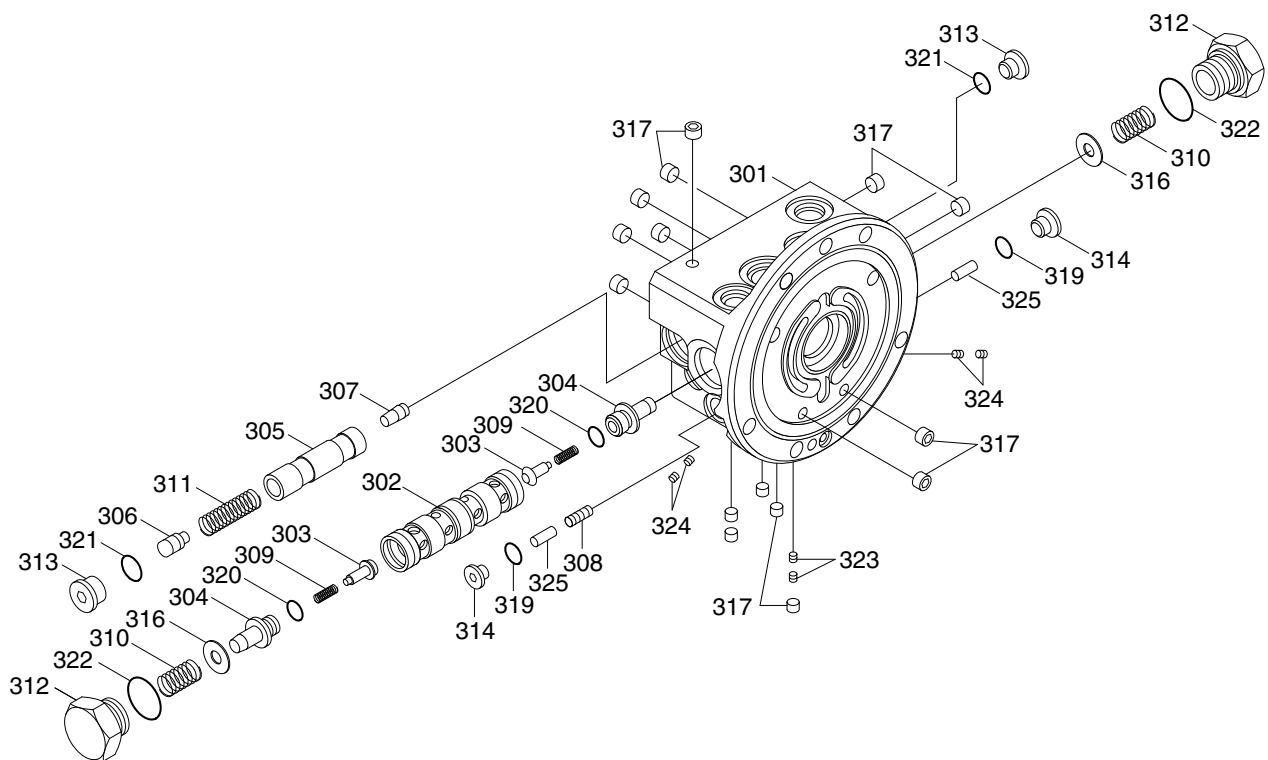
3) STRUCTURE (1/3)



17AZ2TM02

202	Body 2	210	Swash plate	218	O-ring
203	Shaft	211	Control piston	219	Oil seal
204	Cylinder barrel	212	Pin	220	Steel ball
205	Valve plate	213	Spring C	221	Snap ring
206	Piston	214	Retainer	222	Screw
207	Shoe	215	Bearing	223	Spring pin
208	Shoe holder	216	Bearing	224	Pin
209	Barrel holder	217	O-ring	225	Plug

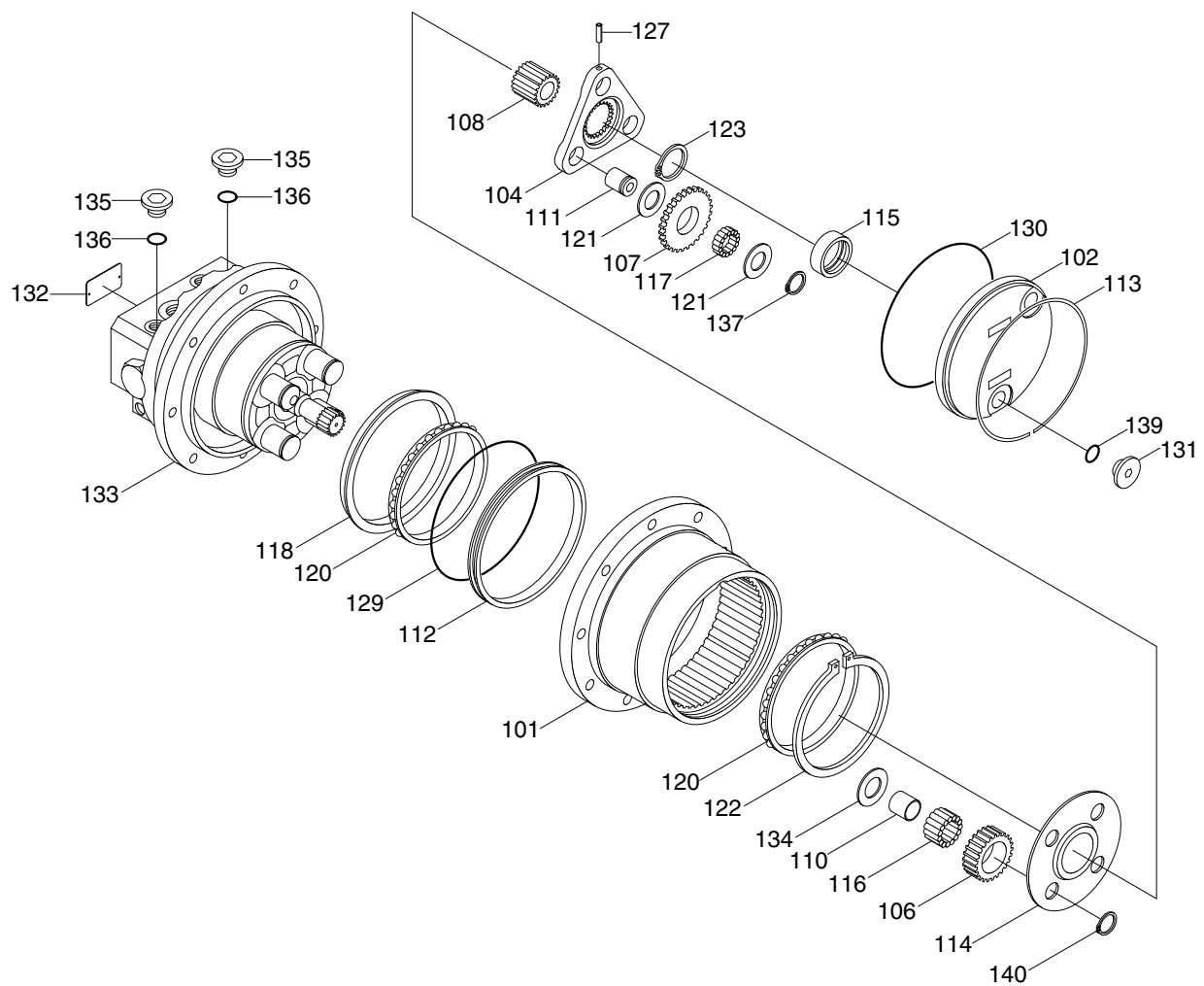
STRUCTURE (2/3)



17Z9A2TM03

301	Body 1	309	Spring V1	319	O-ring
302	Spool	310	Spring V2	320	O-ring
303	Check valve	311	Spring V3	321	O-ring
304	Spring guide	312	Plug	322	O-ring
305	Spool	313	Plug	323	Chock
306	Spool B	314	Ring	324	Chock
307	Spool C	316	Plug	325	Pin
308	Shuttle spool	317	Plug		

STRUCTURE (3/3)



17AZ2TM04

101 Body	112 Seal ring	121 Thrust washer	134 Thrust washer
102 Cover	113 Snap ring	122 Snap ring	135 Plug
104 Carrier 2	114 Thrust plate	123 Snap ring	136 O-ring
106 Gear B1	115 Slide ring	127 Spring pin	137 Snap ring
107 Gear B2	116 Needle bearing	129 O-ring	139 O-ring
108 Gear S1	117 Needle bearing	130 O-ring	140 Snap ring
110 Ring	118 Floating seat	131 Plug	
111 Pin B2	120 Bearing	133 Hydraulic motor	

4) MAINTENANCE INSTRUCTION

(1) Necessary tool to assemble

Tool name	Information
Torque wrench	12 N, 90 N and 180 N
Hexagon socket	Hexagon size : 5 mm, 6 mm and 8 mm
Socket wrenches	Hexagon size : 27 mm
Hexagon socket wrenches	Hexagon size : 5 mm, 6 mm and 8 mm
Screwdriver	Width : 6~10 mm
Snap ring pliers	Ø 24 mm for hole Ø 15 mm, Ø 18 mm, Ø 26 mm, Ø 90 mm for shaft
Plastic hammer	-
Others	Grease, Oil, Sand paper and C-clamps

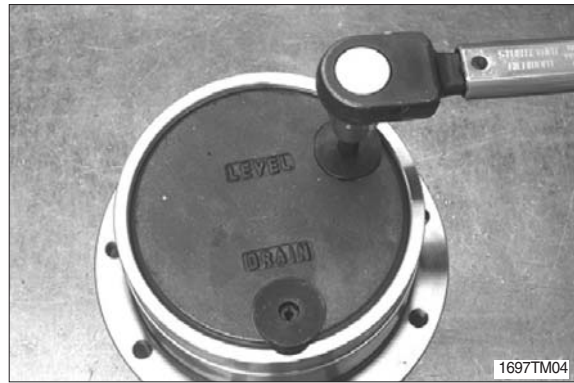
2. DISASSEMBLY

1) GENERAL PRECAUTIONS

- (1) Work at the clean area, and pay attention to clean each part from rubbish, peace of paint and prepare the clean case for disassembled parts.
- (2) Remove the rubbish from the outside of the track motor before disassembling, and remove of paint by wiring brush.
- (3) Put a mark on each part before disassembling for keeping the correct position at assembling.
- (4) Handle disassembled parts with special care.
- (5) Clean each part with cleaning solvents.
- (6) Check disassembled parts with no damage, and removes any burrs.
- (7) Use the new seal parts and snap rings.
- (8) The press-fitting parts (for example, bearing and pin) can not be disassembled.

2) REDUCTION GEAR SECTION

- (1) Remove the two plugs (PF3/8).
 - Hexagon size : 8 mm
- ※ Remove the plug of "LEVEL" side first.



- (2) Remove the snap ring.
- ※ Put the screwdriver into the notch of the body, and then pull the snap ring.



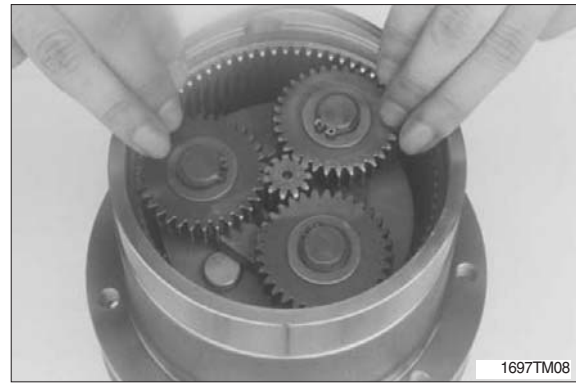
- (3) Remove the cover.



- (4) Remove the slide ring from the cover.



(5) Remove the O-ring from the body.

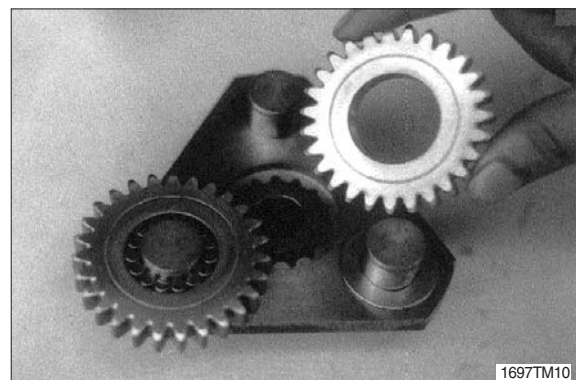


(6) Remove the carrier 2 kit from the body.

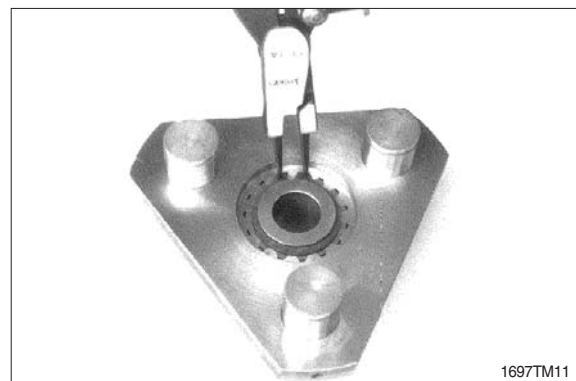


(7) Remove the three snap rings, three thrust washers, three b2 gears, thirty-nine needles and three thrust washers.

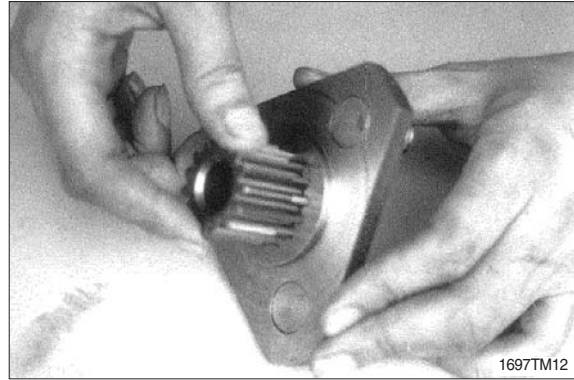
- ※ The thrust washers on both sides of the b2 gears are the same.
- ※ The b2 pins and spring pins are not able to disassemble, because they are press-fitted.
- ※ The needles are easily dispersed, pay attention not to lose.



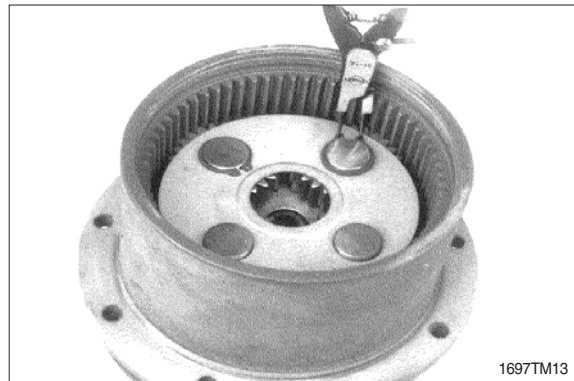
(8) Remove the snap ring from the carrier 2.



(9) Remove the s1 gear from the carrier 2.

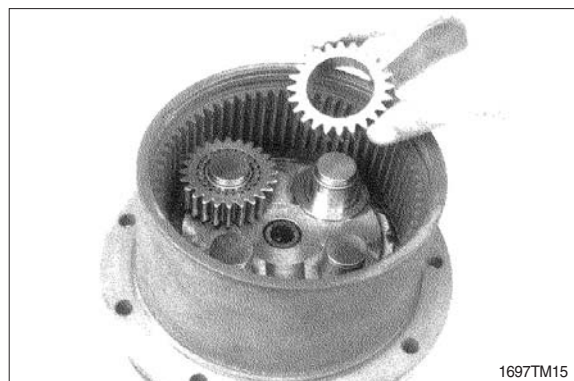
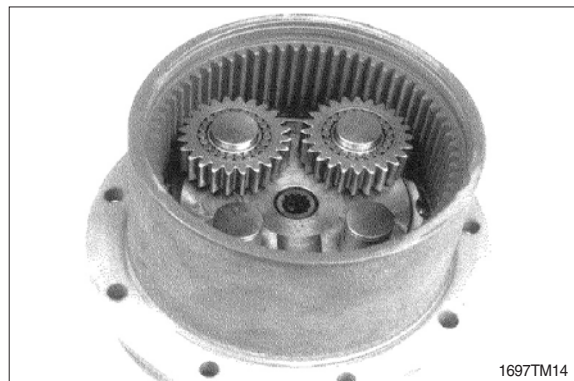


(10) Remove the four snap rings and the four thrust plates.



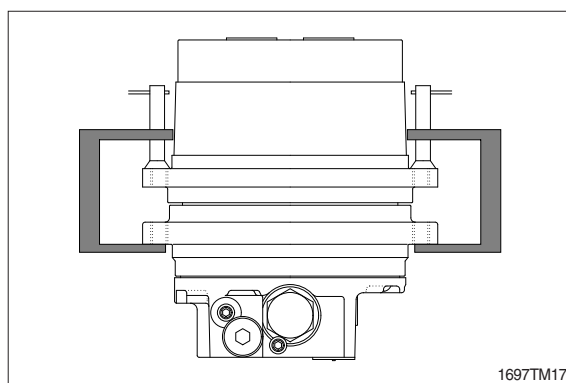
(11) Remove the four b1 gears, ninety-six needles, four thrust washers and four rings.

※ The needles are easily dispersed, pay attention not to lose.



(12) Remove the snap ring.

- ※ Tighten the speed reducer flange and the motor flange with C-clamps or a hydraulic press (see the illustration) to make it easy.



(13) Remove the speed reducer with the iron balls with retainer and the internal ring of bearing.



(14) Remove the iron balls with retainer from the speed reducer.

- ※ Pay attention not to lose the balls from retainer.

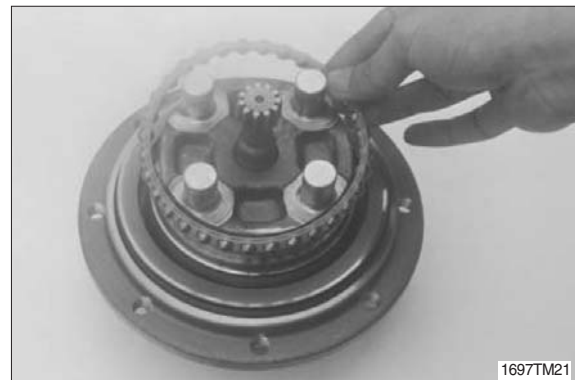


- (15) Remove the seal ring from the speed reducer.



- (16) Remove the iron balls with retainer and the internal ring of bearing from the hydraulic motor.

※ Pay attention not to lose the balls from retainer.

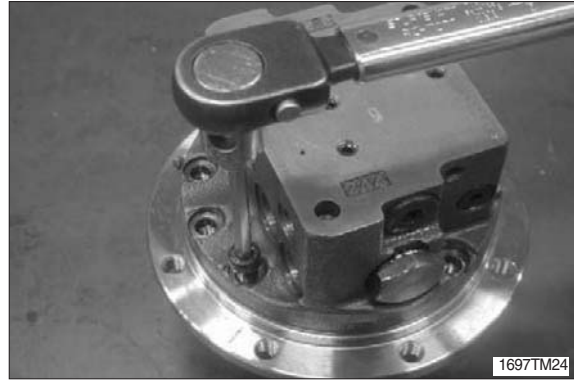


- (17) Remove the floating seat with O-ring from the hydraulic motor.

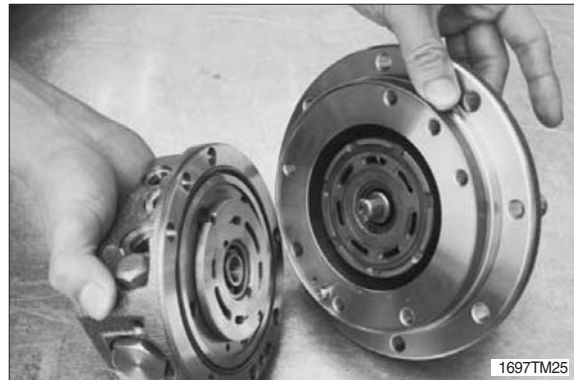


3) HYDRAULIC MOTOR SECTION

- (1) Remove the seven hexagon socket head cap bolts.
 - Hexagon size : 6 mm
- ※ If you fix the motor with a vice, protect it with aluminum plates or equivalent.



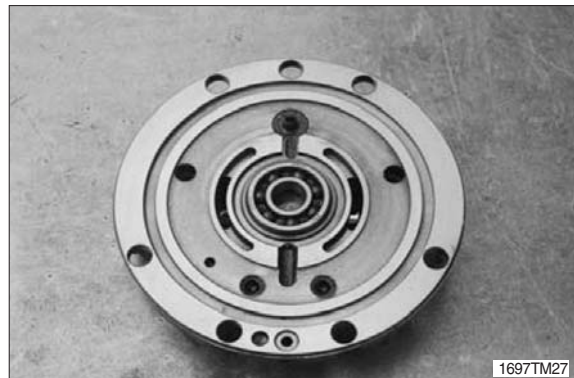
- (2) Remove the body 1 from the body 2.
- ※ Pay attention not to come off and damage the valve plate.



- (3) Remove the valve plate.

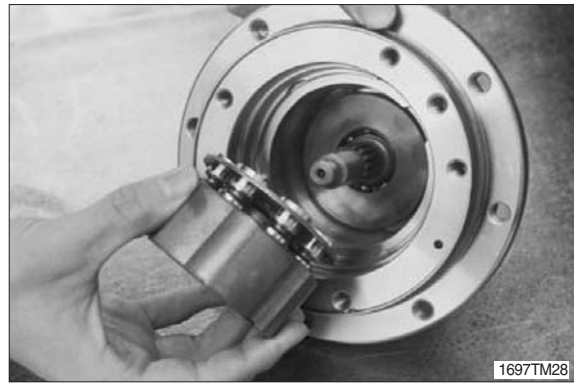


- (4) Remove the two O-rings from the body 1.
- ※ The bearing and spring pins are not able to disassemble, because they are press-fitted.

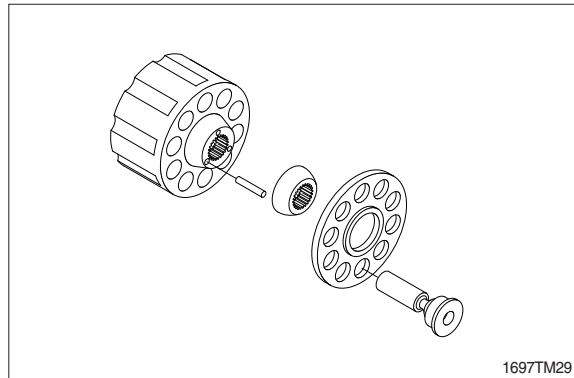


- (5) Remove the cylinder barrel assembly from the body 2.

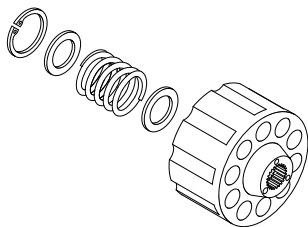
※ The small parts are easily dispersed, pay attention not to miss.



- (6) Remove the seven piston-shoe assemblies, shoe holder, barrel holder, three pins.



- (7) Remove the snap ring, retainer, spring-C and retainer.



- (8) Remove the swash plate and two balls from the body 2.



(9) Remove the shaft from the body 2.

※ The bearing is not able to disassemble,
because they are press-fitted.



(10) Remove the control piston from the body 2.



(11) Remove the oil seal from the body 2.

(12) Remove the pin from the body 2.



(13) Remove the two plugs with O-rings from
the body 1.

·Hexagon size : 27 mm



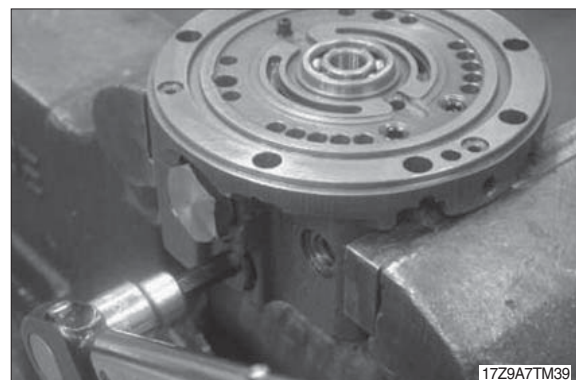
(14) Remove the two spring V2, two rings and spool assembly.

※ The spool assembly is not able to disassemble.



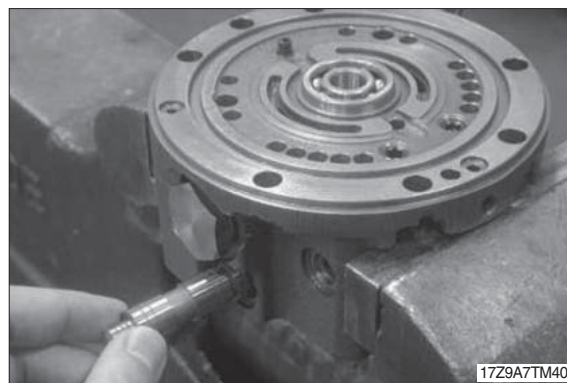
(15) Remove the two plugs with O-rings from the body 1.

·Hexagon size : 8 mm



(16) Remove the spring V3, two speed spool, spool B and spool C.

※ The small parts are easily dispersed, pay attention not to miss.

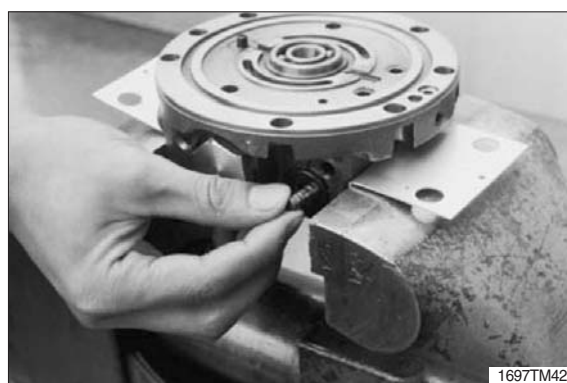


(17) Remove the two plugs with O-ring from the body 1.

·Hexagon size : 5 mm



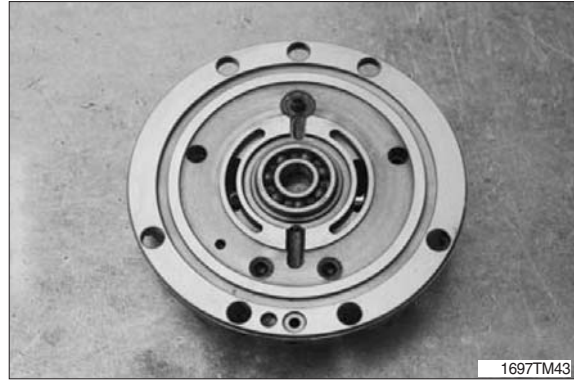
(18) Remove the two needles and shuttle spool.



3. ASSEMBLY

1) HYDRAULIC MOTOR SECTION

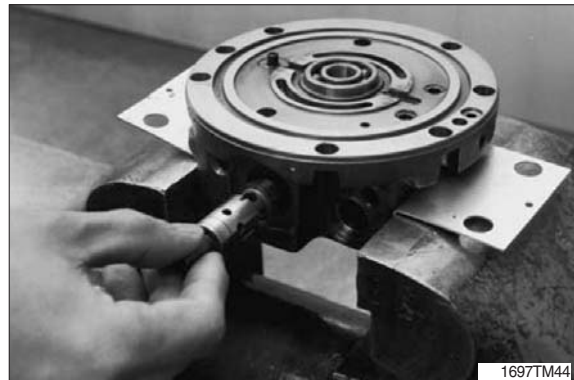
- (1) Press-fit the bearing and the spring pin into the body 1.



- (2) Insert the spool assembly, two rings (1pc/side) and two springs (1pc/side) in that order into the body 1, and then screw the two plugs (1pc/side) with two O-rings (1pc/side).

※ The spool assembly is not able to disassemble.

- Plugs tightening torque (both sides) :
13~17 kgf · m (94~123 lbf · ft)
- Hexagon size : 27 mm

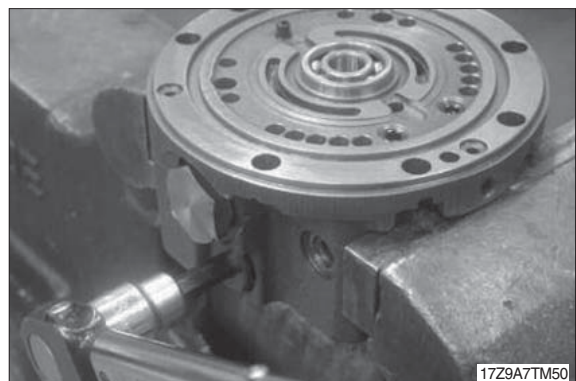
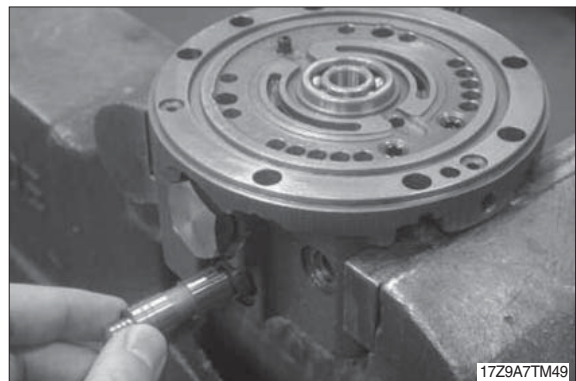




(3) Insert the spring V3, spool B and spool C into two speed spool. Insert its assembly into the body 1. Screw the two plugs (1pc/side) with two O-rings (1pc/side).

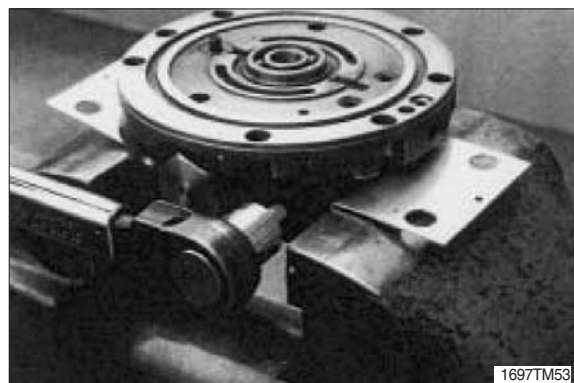
- Plugs tightening torque :
4.69~5.2 kgf · m (33.9~37.6 lbf · ft)
- Hexagon size : 8 mm

※ Pay attention to the direction of the spool.
(See drawings for the direction, page 7-58~60).



- (4) Insert the shuttle spool and two needles (1pc/side) into the body 1, and then screw them in with the two plugs with O-rings (1pc/side).

- Plugs tightening torque :
1.2~1.8 kgf · m
(8.7~13.0 lbf · ft, both sides)
- Hexagon size : 5 mm

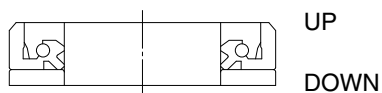


- (5) Place two O-rings onto the body 1.

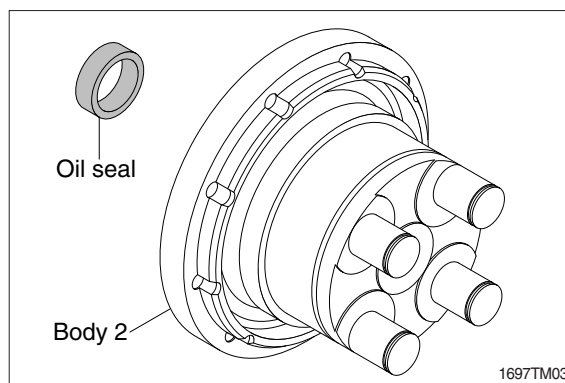


(6) Press-fit the oil seal into the body 2.

- ※ Apply grease to the periphery of the oil seal.
- ※ Pay attention to the direction of the oil seal, and do not slant it.



R27Z97TM52



(7) Place the pin into the body 2.



(8) Press-fit the bearing with the shaft.



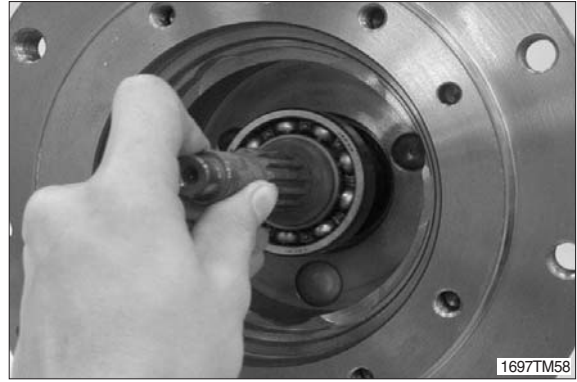
(9) Insert the control piston into the body 2.

- ※ Pay attention to the direction of the control piston.
- ※ Assemble the control piston, which shoe surface should be upper side (see drawings for the direction, page 7-58~60).



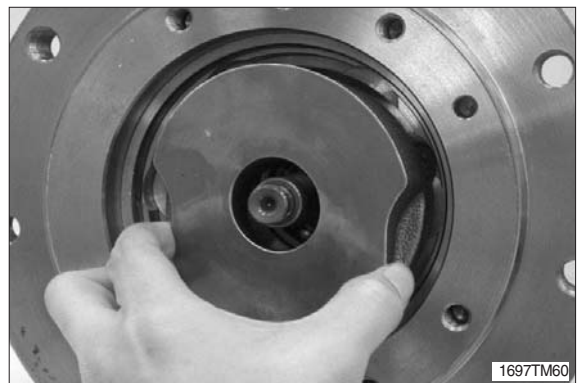
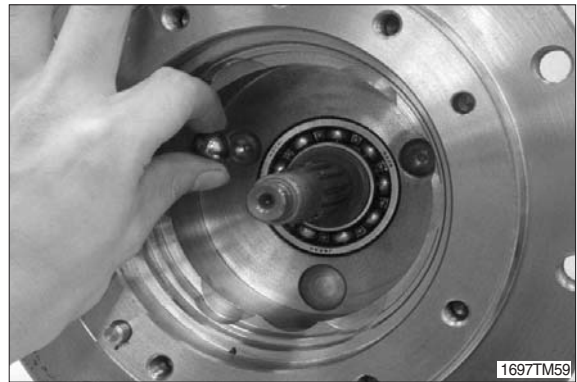
(10) Place the shaft into the body 2.

- ※ Pay attention not to damage the oil seal with the shaft.
- A oil which damaged should be replaced.



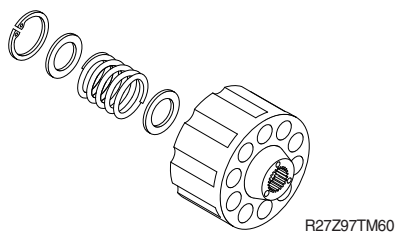
(11) Place the two balls and the swash plate onto the body 2.

- ※ Apply oil to the working face of the swash plate.
- ※ In case the swash plate drops out, apply grease to the back of it.



(12) Place the retainer, spring C and retainer in that order into the cylinder barrel, and then secure them with the snap ring.

- ※ Pay attention to the direction of the snap ring. The edge side should be uppermost.

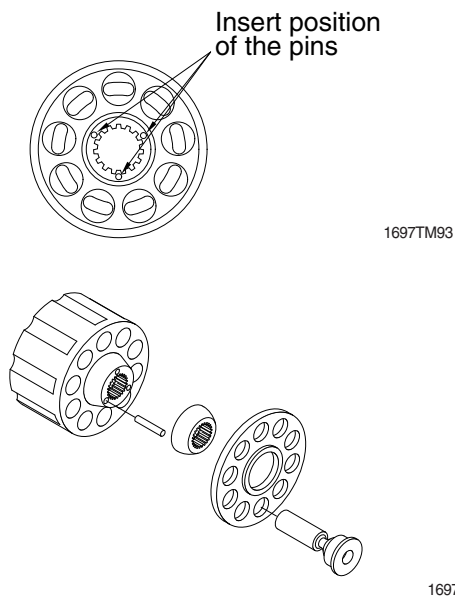


- (13) Place the piston-shoe assemblies into the shoe holder.



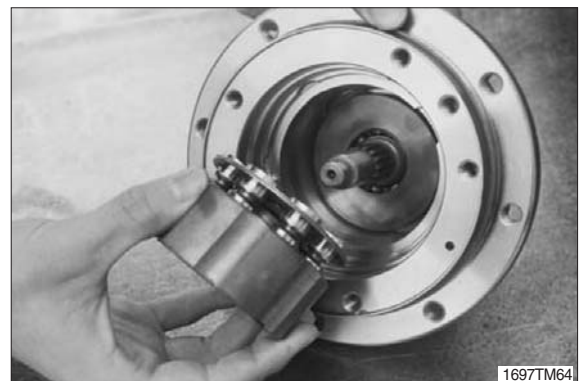
- (14) Place the three pins, barrel holder and piston-shoe assemblies in that order into the cylinder barrel.

- ※ Apply oil to the inside of the cylinders, then lower the pistons into the cylinder barrel.
- ※ Pay attention to the order of pins, barrel holder and piston-shoe assemblies.
(See drawing for the order, page 7-58~60)



- (15) Insert the cylinder barrel assembly into the body 2 so that the shoes contact the swash plate.

- ※ The small parts are easily dispersed, pay attention not to lose.



(16) Fill the body 2 with 0.1ℓ hydraulic oil for lubrication.

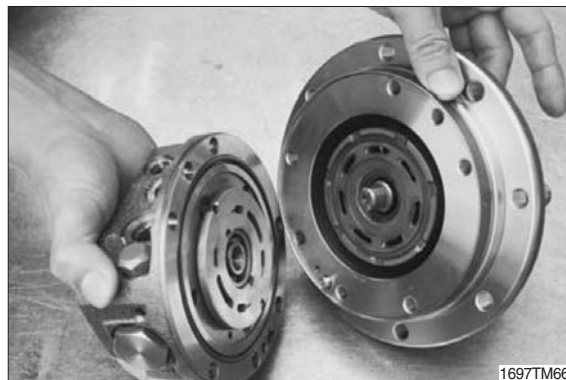
(17) Place the valve plate onto the body 1.

- ※ The copper face of the valve plate should be uppermost.
- ※ Apply oil to the copper face of the valve plate.
- ※ In case the valve plate drops out, apply grease to the steel face of it.



(18) Join the body 1 to the body 2.

- ※ The small parts are easily dispersed, pay attention not to miss.



(19) Bolt them with seven hexagon socket head cap bolts.

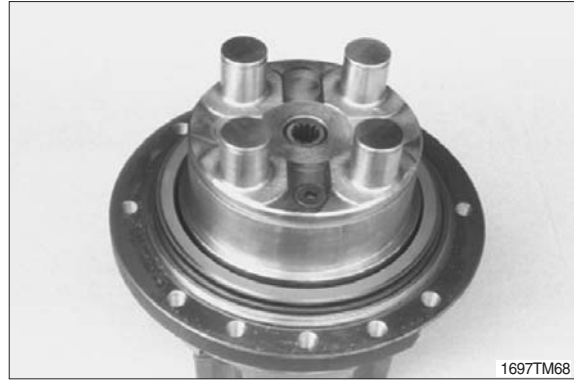
- Bolt tightening torque :
2.9~3.1 kgf · m (21.0~22.4 lbf · ft)
- Hexagon size : 6 mm

- ※ If you fix the motor with a vice, protect it with aluminum plates or equivalent.



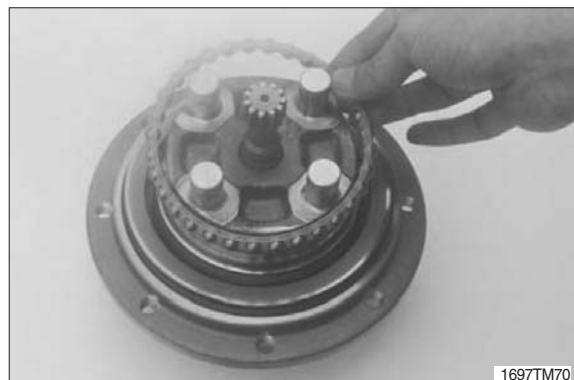
2) REDUCTION GEAR SECTION

- (1) Place the floating seal with O-ring into the hydraulic motor.



- (2) Place inner ring, retainer with balls of the bearing in that order, onto the hydraulic motor.

- ※ Pay attention to the direction of the inner ring and the retainer.
(See drawings for the direction, page 7-58~60)
- ※ Pay attention not to disassemble the balls from the retainer.



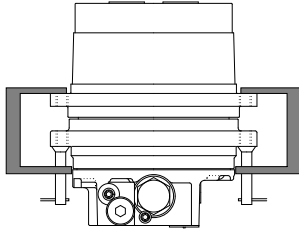
- (3) Put the seal ring with O-ring onto the body.

- ※ Apply grease to the O-ring to make it easy, and then wipe grease from the seal surface.

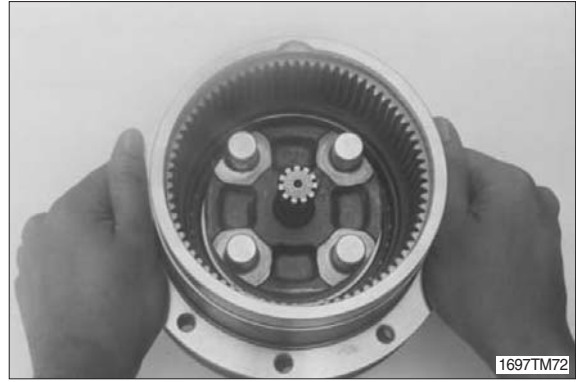


(4) Join the body to the motor.

- ※ Wipe grease from the seal surface.
- ※ Tighten the speed reducer flange and the motor flange with C-cramps or a hydraulic press.



1697TM95



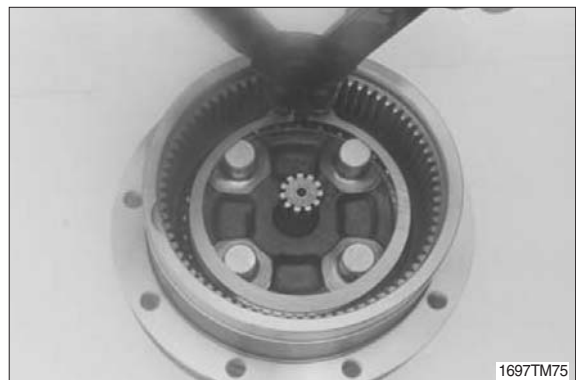
(5) Place retainer with balls, inner ring of the bearing in that order onto the hydraulic motor.

- ※ Pay attention to the direction of the inner ring and the retainer.
- ※ Pay attention not to disassemble the balls from retainer.
(See drawing for the direction.)



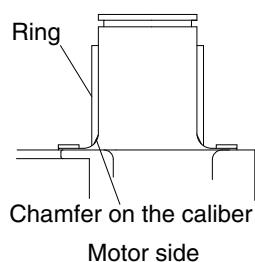
(6) Fix the bearing with the snap ring.

- ※ The pre-load for the bearings is adjusted by thickness of the snap ring.



(7) Place the four rings (1pc/1pin), four thrust washers (1pc/1pin), four b1 gears (1pc/1pin) and ninety-six needles (24pcs/1pin) in that order onto the body 2.

- ※ Pay attention to the direction of the ring.
The chamfer on the caliber of the ring direction is motor side.



1697TM94

- ※ The needles are easily dispersed, pay attention not to lose.



1697TM76



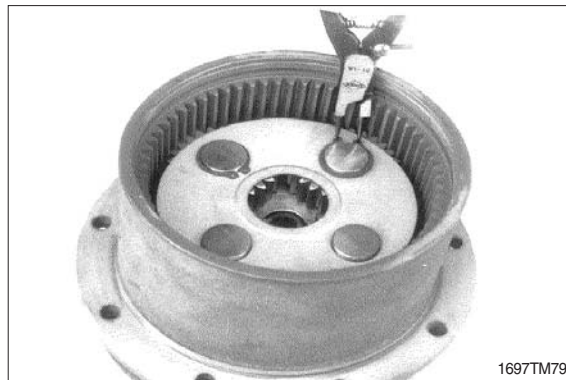
1697TM77



1697TM78

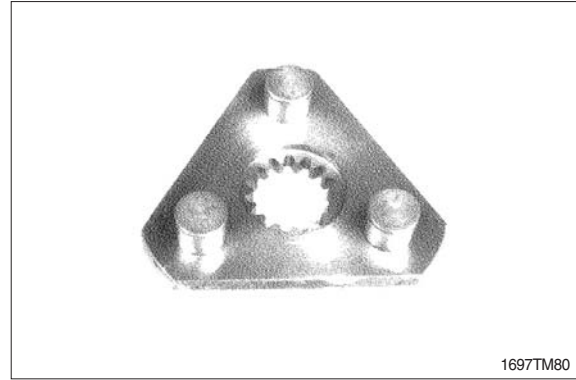
(8) Place thrust plate onto the gears and secure it with four snap rings.

- ※ Pay attention to the direction of the thrust plate. The convex side should be uppermost. (see drawings for the direction, page 7-58~60).
- ※ Pay attention to the direction of the snap ring. The edge side should be uppermost.
- ※ Pay attention not to open the snap ring too much. A snap ring which loses tension should be replaced.



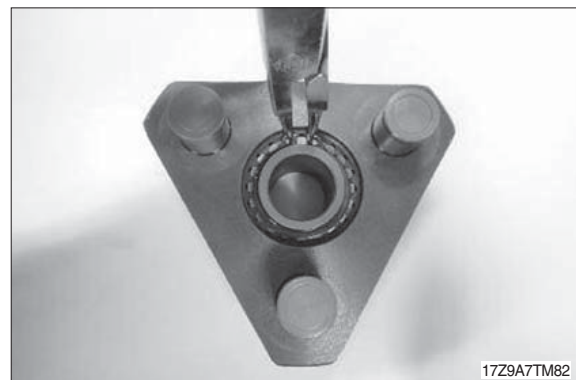
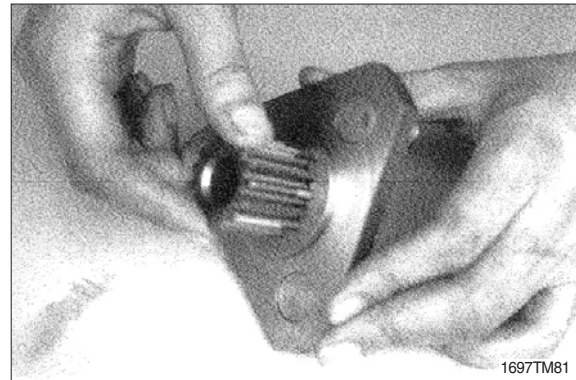
1697TM79

- (9) Press-fit the three b2 pins and three spring pins (1pc/pin) into the carrier 2.



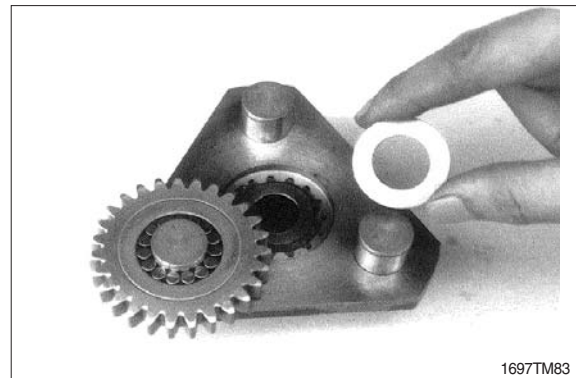
- (10) Put the S1 gear to the carrier 2, and then secure them with the snap ring.

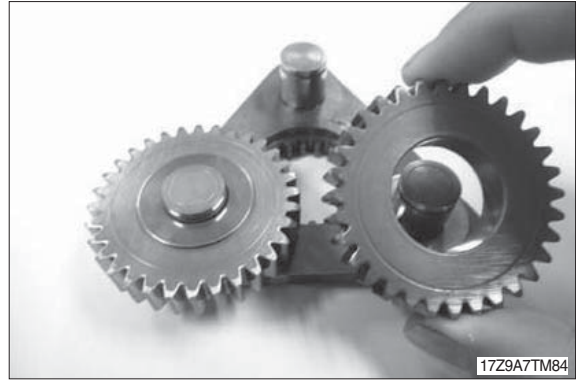
- ※ Pay attention to the direction of the snap ring. The edge side should be uppermost.
- ※ Pay attention not to open the snap ring too much. A snap ring which loses tension should be replaced.



- (11) Place the three thrust washers (1pc/1pin), three b2 gears (1pc/1pin), thirty-nine needles (13pcs/1pin) and the three thrust washers (1pc/1pin), in that order the carrier 2 and secure them with the three snap rings.

- ※ Pay attention to the direction of the snap ring. The edge side should be uppermost.
- ※ Pay attention not to open the snap ring too much. A snap ring which loses tension should be replaced.



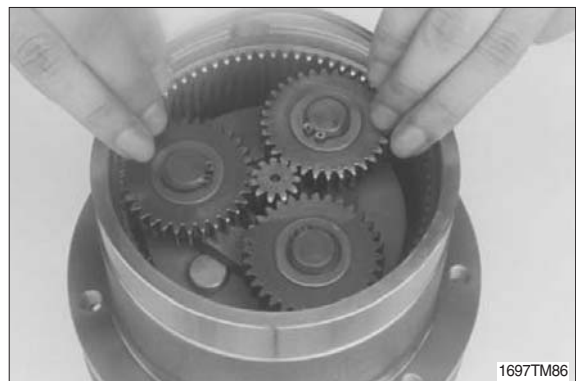


(12) Place the carrier 2 assembly into the body.



(13) Place the O-ring to the body.

- ※ Apply grease to the O-ring.
- ※ Pay attention not the rubbish in the O-ring groove.



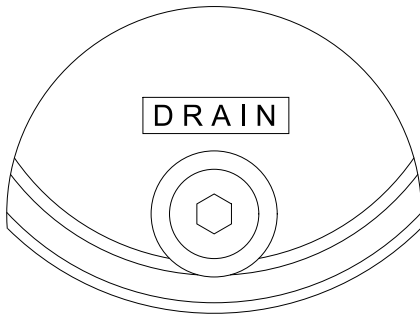
(14) Place the slide ring onto the cover.

- ※ Apply grease to the slide ring to prevent it dropping out.



(15) Fill 0.33 ℓ gear oil in the body and insert cover.

- ※ Pay attention not to damage the O-ring.
- ※ The "DRAIN" side tapped hole should be aligned with notches of the body.



1697TM89



1697TM88

(16) Put the snap ring into the groove of the body to secure the cover.

- ※ Put the flat blade-flared tip screwdriver to the end of the snap ring, and tap it in the direction of the circumference.



1697TM90



1697TM91

(17) Screw the two plugs (size : PF3/8) with O-rings (1pc/plug) to the cover.

- Plug tightening torque (PF3/8) :
4.69~5.2 kgf · m (33.9~37.6 lbf · ft)
- Hexagon size : 8 mm (PF3/8)

※ Screw the plug of "DRAIN" side first.



GROUP 7 RCV LEVER

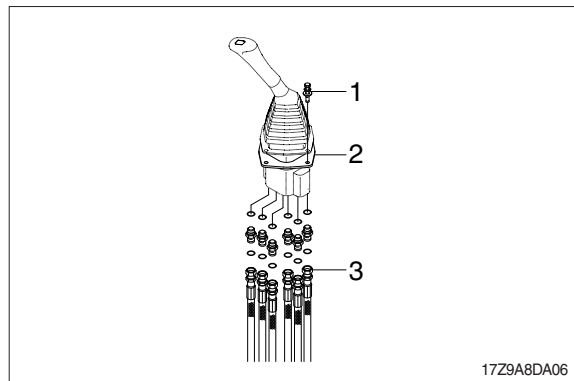
1. REMOVAL AND INSTALL

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 washer with 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.

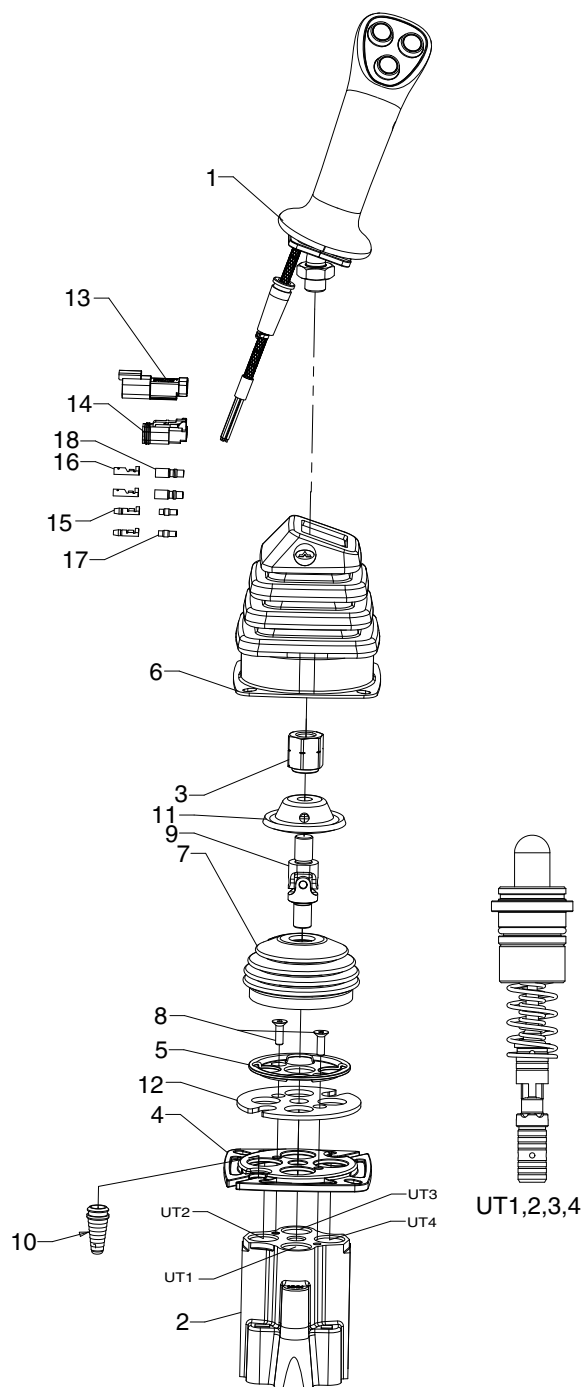


2) INSTALL

- (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. STRUCTURE

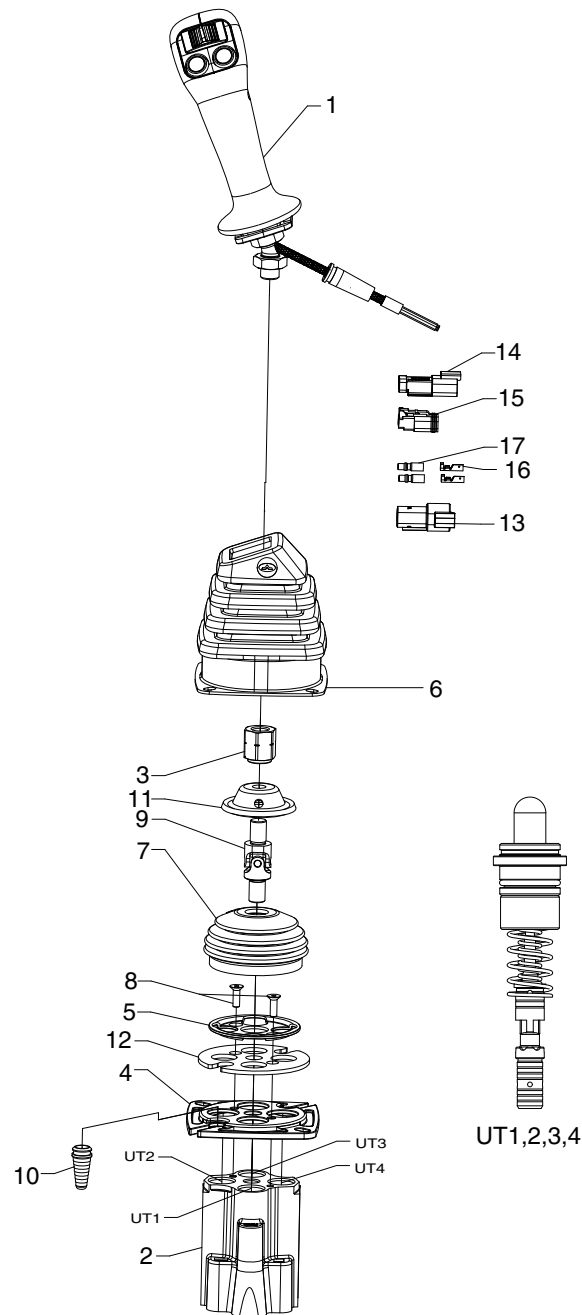
1) TYPE 1 (STANDARD)



17AZ2RL01

- | | | | | | |
|---|-------------|----|-------------------|----|-------------------|
| 1 | Handle assy | 7 | Boot | 13 | Harness connector |
| 2 | Case | 8 | Bolt | 14 | Harness connector |
| 3 | Connector | 9 | Joint assy | 15 | Harness sleeve |
| 4 | Plate | 10 | Harness connector | 16 | Harness sleeve |
| 5 | Plate | 11 | Swash plate | 17 | Harness pin |
| 6 | Boot | 12 | Plate | 18 | Harness pin |

2) TYPE 2 (PROPORTIONAL, OPTION)



17AZ2RL02

- | | | | | | |
|---|-------------|----|-------------------|----|-------------------|
| 1 | Handle assy | 7 | Boot | 13 | Harness connector |
| 2 | Case | 8 | Bolt | 14 | Harness connector |
| 3 | Connector | 9 | Joint assy | 15 | Harness connector |
| 4 | Plate | 10 | Harness connector | 16 | Harness sleeve |
| 5 | Plate | 11 | Swash plate | 17 | Harness pin |
| 6 | Boot | 12 | Plate | | |

GROUP 8 TURNING JOINT

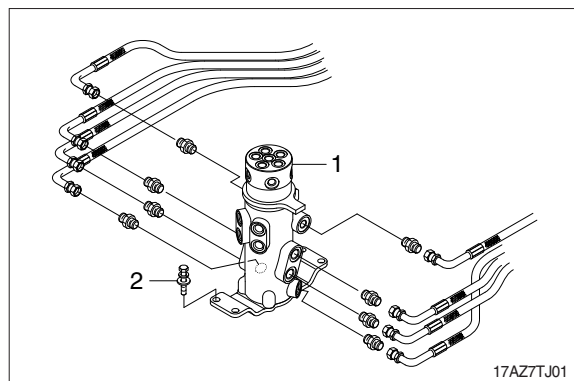
1. REMOVAL AND INSTALL

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.

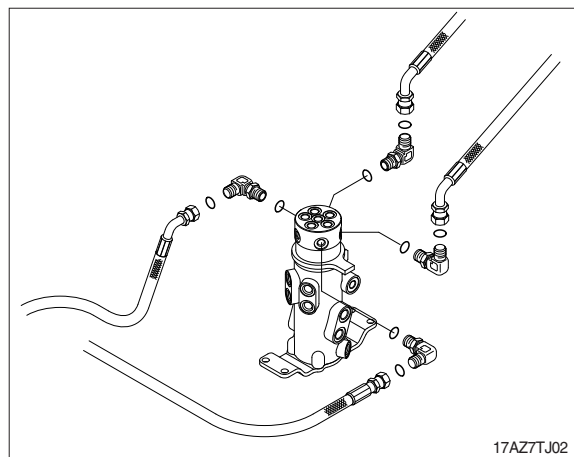
▲ **Escaping fluid under pressure can penetrate the skin causing serious injury.**

- ※ 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 : 14 kg (31 lb)
 - Tightening torque : 6.9 ± 1.4 kgf·m (49.9 ± 10.1 lbf·ft)
 - (6) Remove the turning joint assembly.
- ※ When removing the turning joint, check that all the hoses have been disconnected.



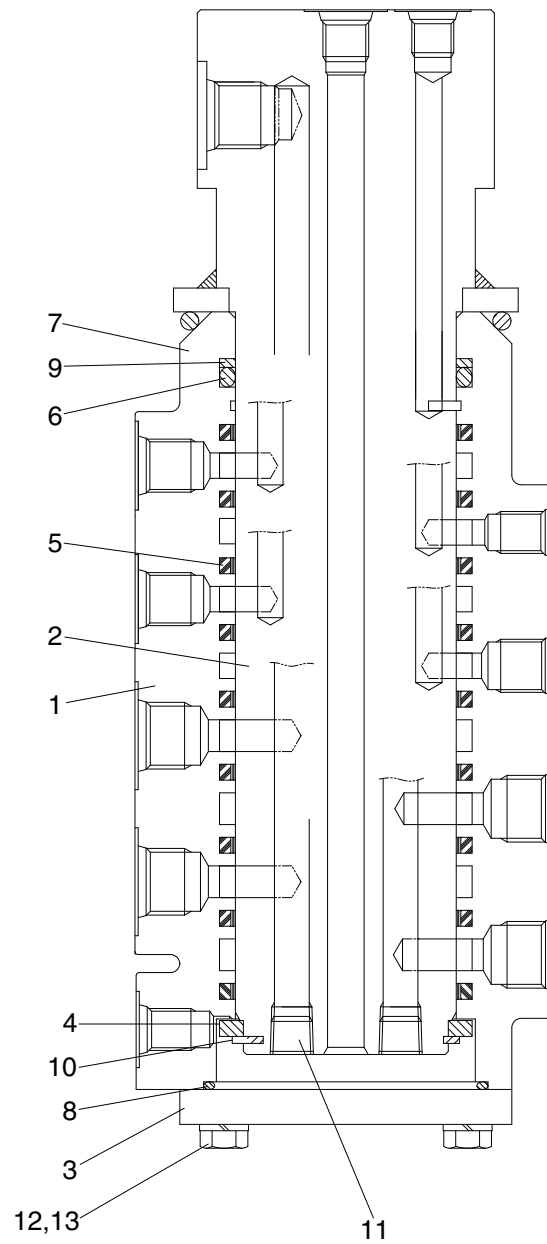
2) INSTALL

- (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



1697TJ02

- 1 Hub
- 2 Shaft
- 3 Cover
- 4 Spacer
- 5 Slipper seal

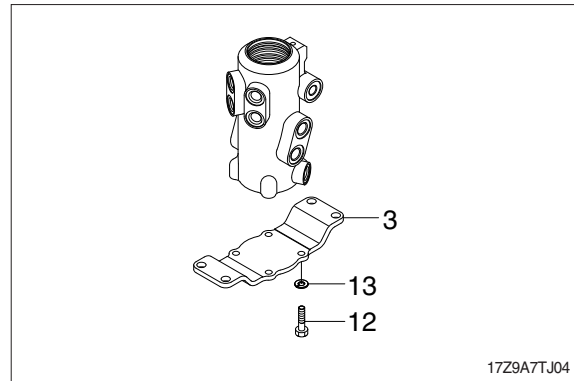
- 6 O-ring
- 7 O-ring
- 8 O-ring
- 9 Back-up ring
- 10 Retainer ring

- 11 Plug
- 12 Hexagon bolt
- 13 Spring washer

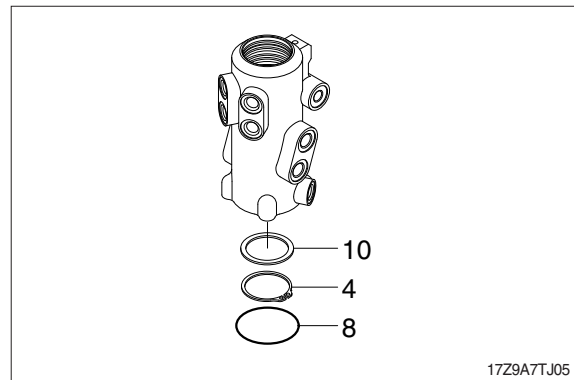
2) DISASSEMBLY

Before the disassembly, clean the turning joint.

- (1) Loosen bolts (12), spring washer (13) and remove cover (3).

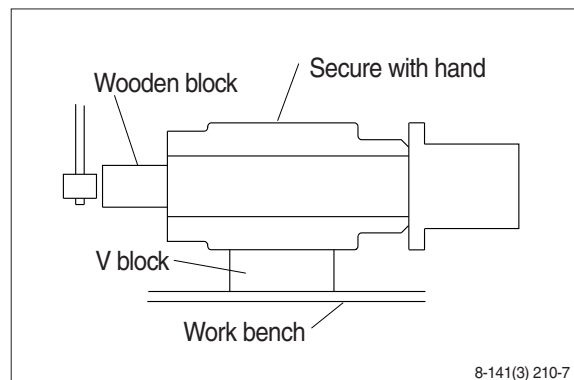


- (2) Remove O-ring (8).
- (3) Remove retainer ring (10) and spacer (4).

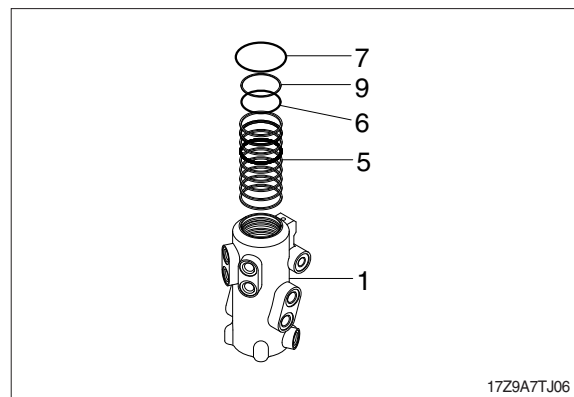


- (4) Place hub (1) on a V-block and by using a wood buffer at the shaft end, hit out shaft (2) to about 1/2 from the body with a hammer.

- ※ 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).



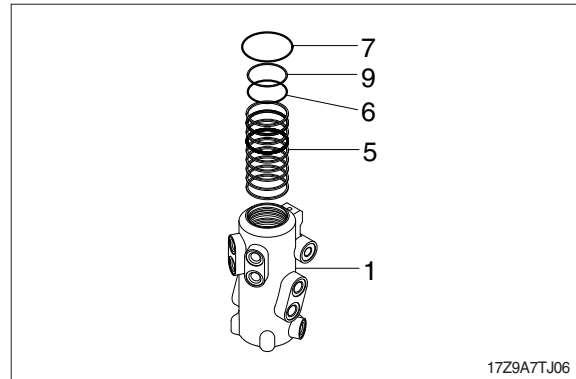
- (5) Remove nine slipper seals (5), O-ring (7), back-up ring (9), and O-ring (6) from hub (1).



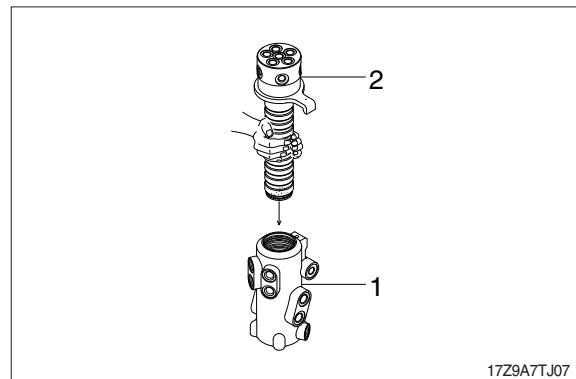
3) ASSEMBLY

- ※ 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 nine slipper seal (5) and O-ring (7), back-up ring (9) and O-ring (6) to hub (1).

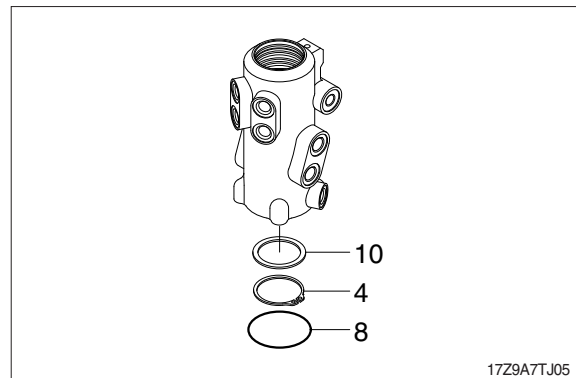


- (2) Set hub (1) on block, install shaft (2) into hub (1) by hand.

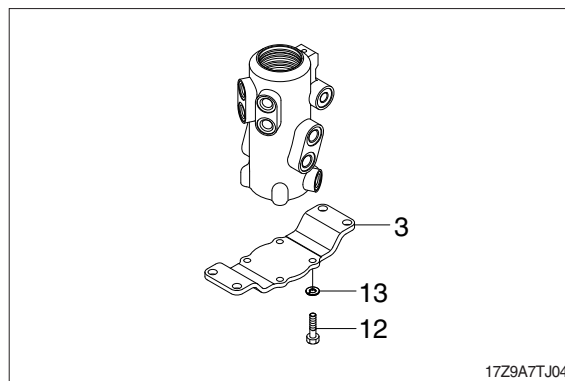


- (3) Fit spacer (4) and retainer ring (10) to shaft (2).

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



- (5) Install cover (3) to hub, tighten bolts (12) with spring washer (13).
- Tightening torque : 2.5~3.0 kgf-m
(18.1~21.7 lbf-ft)



GROUP 9 BOOM, ARM AND BUCKET CYLINDERS

1. REMOVAL AND INSTALL

1) BUCKET CYLINDER

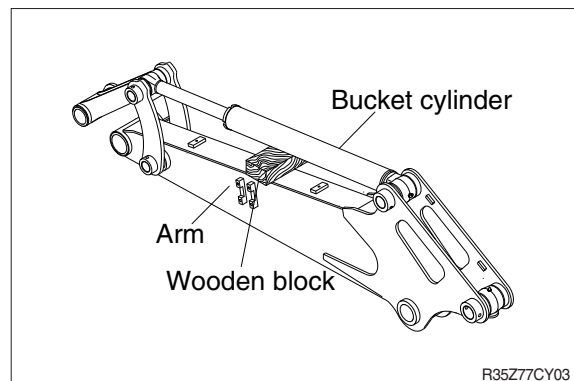
(1) Removal

- ※ 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.

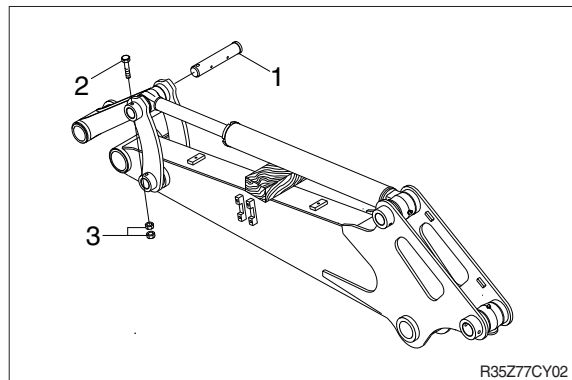
① Set block between bucket cylinder and arm.



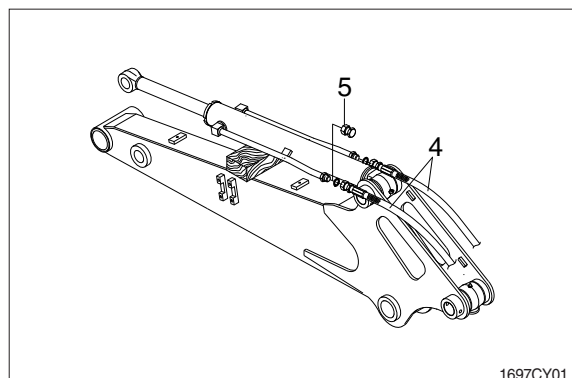
② Remove bolt (2), nut (3) and pull out pin (1).

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

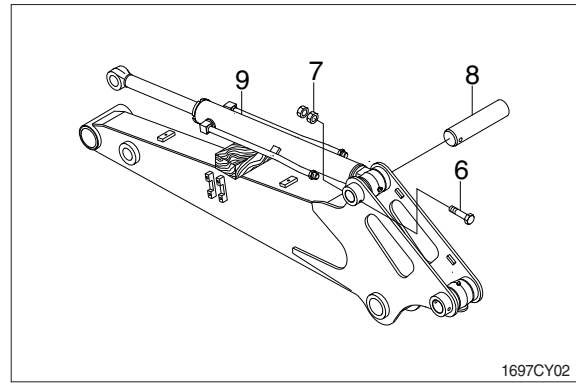
· Tightening torque : 6.9 ± 1.4 kgf·m
(49.9 ± 10.1 lbf·ft)



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 : 12 kg (25 lb)
 - Tightening torque : 6.9 ± 1.4 kgf·m
(49.9 ± 10.1 lbf·ft)



(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

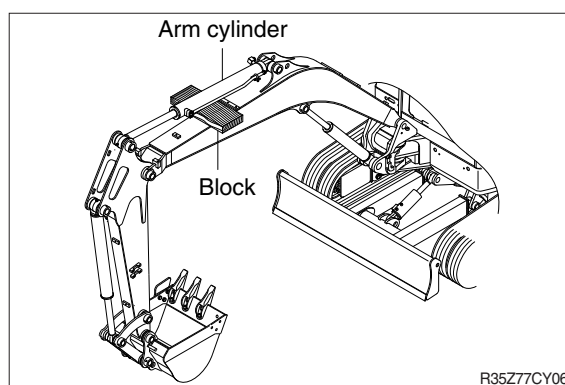
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

▲ 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.

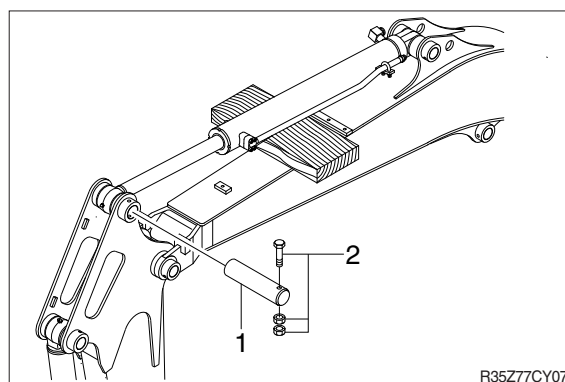
- ① Set block between arm cylinder and boom.



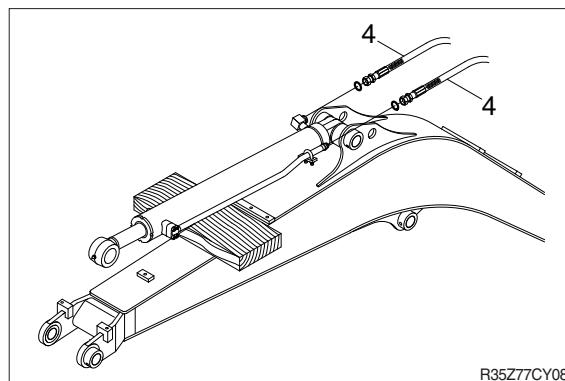
- ② Remove bolt and nut (2) and pull out pin (1).

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

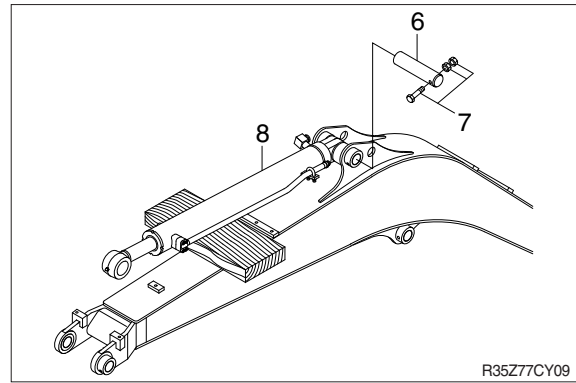
· Tightening torque : 6.9 ± 1.4 kgf·m
(49.9 ± 10.1 lbf·ft)



- 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 : 16 kg (34 lb)
 - Tightening torque : 6.9 ± 1.4 kgf·m
(49.9 ± 10.1 lbf·ft)



(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

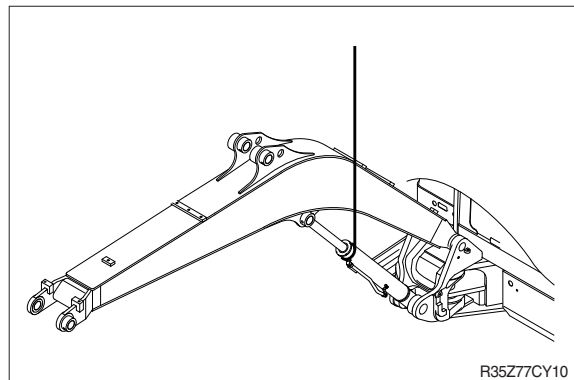
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

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

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

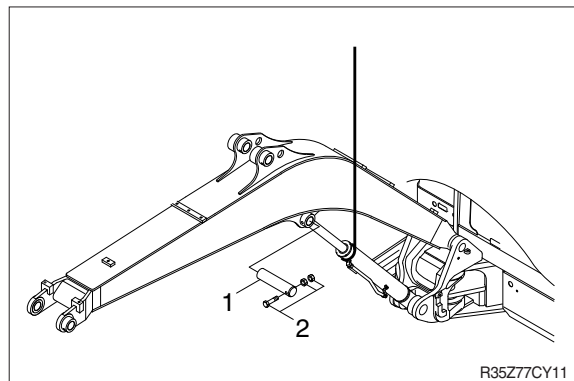
- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Sling boom cylinder assembly.

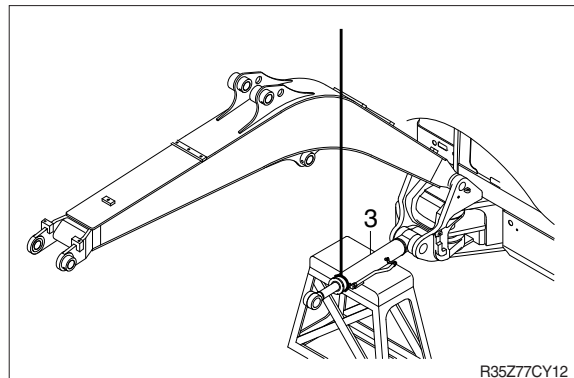


② Remove bolt and nut (2) and pull out pin (1).

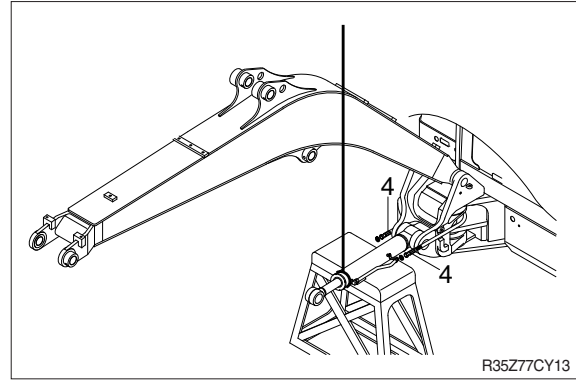
- ※ Tie the rod with wire to prevent it from coming out.
 - Tightening torque : 6.9 ± 1.4 kgf·m
(49.9 ± 10.1 lbf·ft)



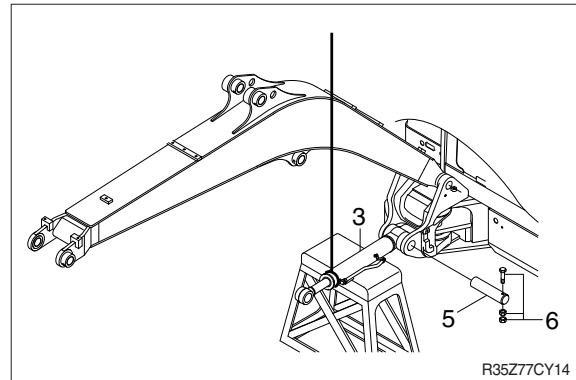
③ Lower the boom cylinder assembly (3) on a stand.



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



- ⑤ Remove bolt (6) and pull out pin (5).
⑥ Remove boom cylinder assembly (3).
· Weight : 16 kg (36 lb)
· Tightening torque : 6.9 ± 1.4 kgf·m
(49.9 ± 10.1 lbf·ft)



(2) Install

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

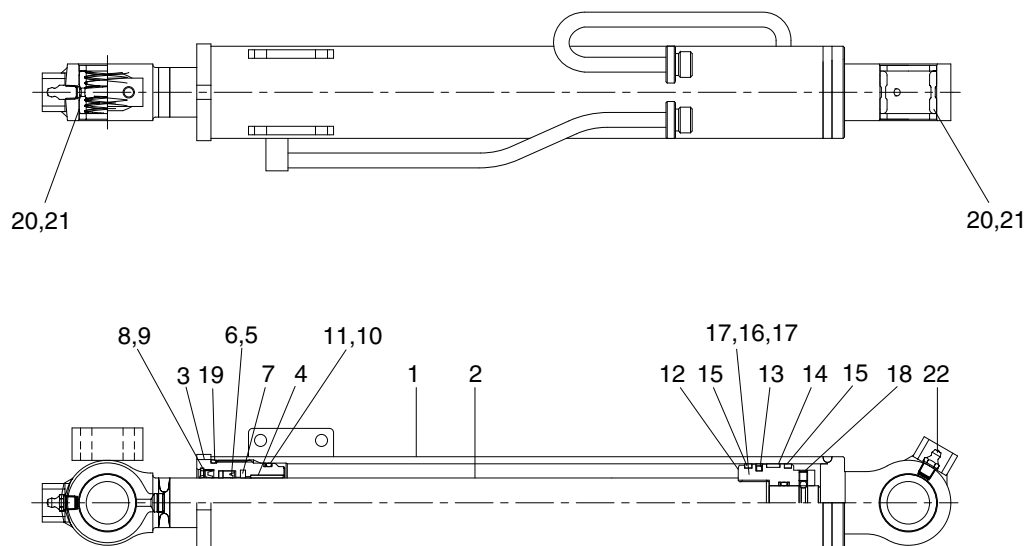
▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.

- ※ 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

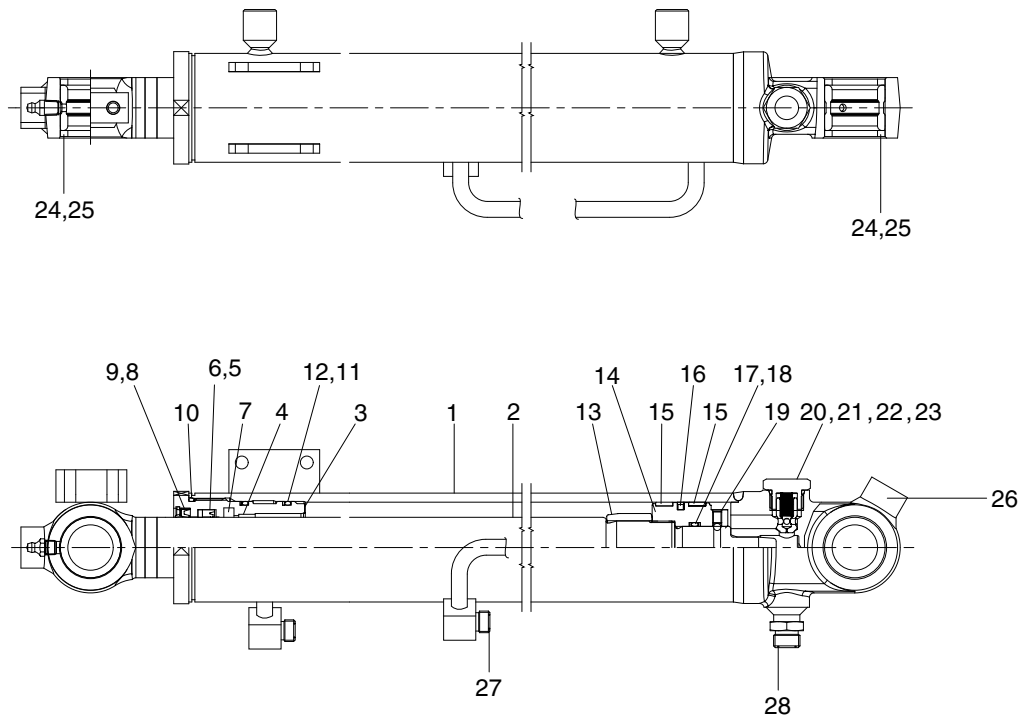
(1) Bucket cylinder



HCMM-50032

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

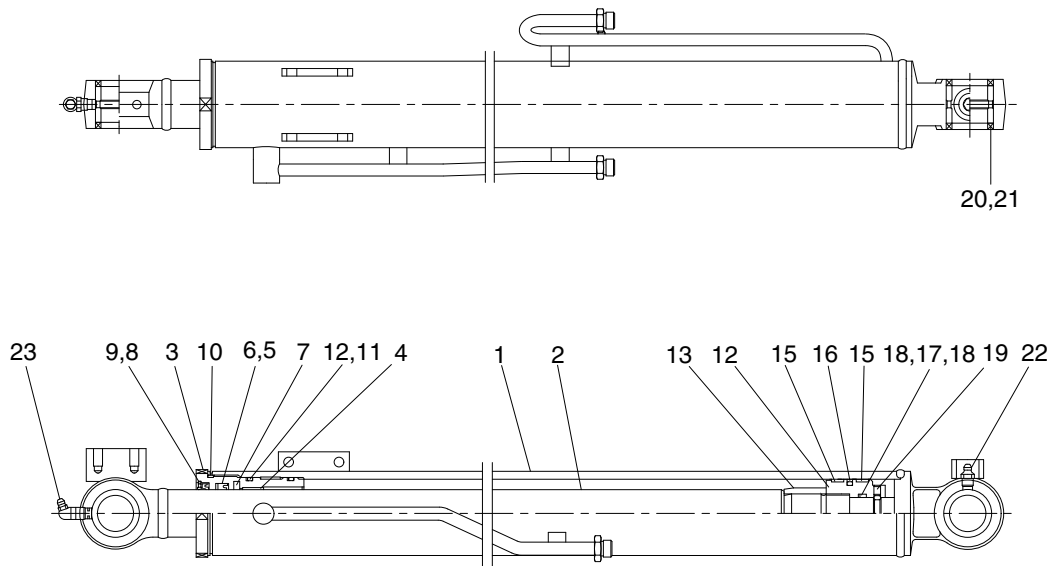
(2) Arm cylinder



HCMM-50022

1	Tube assembly	11	O-ring	21	Coil spring
2	Rod assembly	12	Back up ring	22	O-ring
3	Gland	13	Back up ring	23	Socket plug
4	DU bushing	14	Piston	24	Pin bushing
5	Rod seal	15	Wear ring	25	Dust seal
6	Back up ring	16	Piston seal	26	Grease nipple
7	Buffer ring	17	O-ring	27	O-ring
8	Dust wiper	18	Back up ring	28	O-ring
9	Snap ring	19	Set screw		
10	O-ring	20	Check valve		

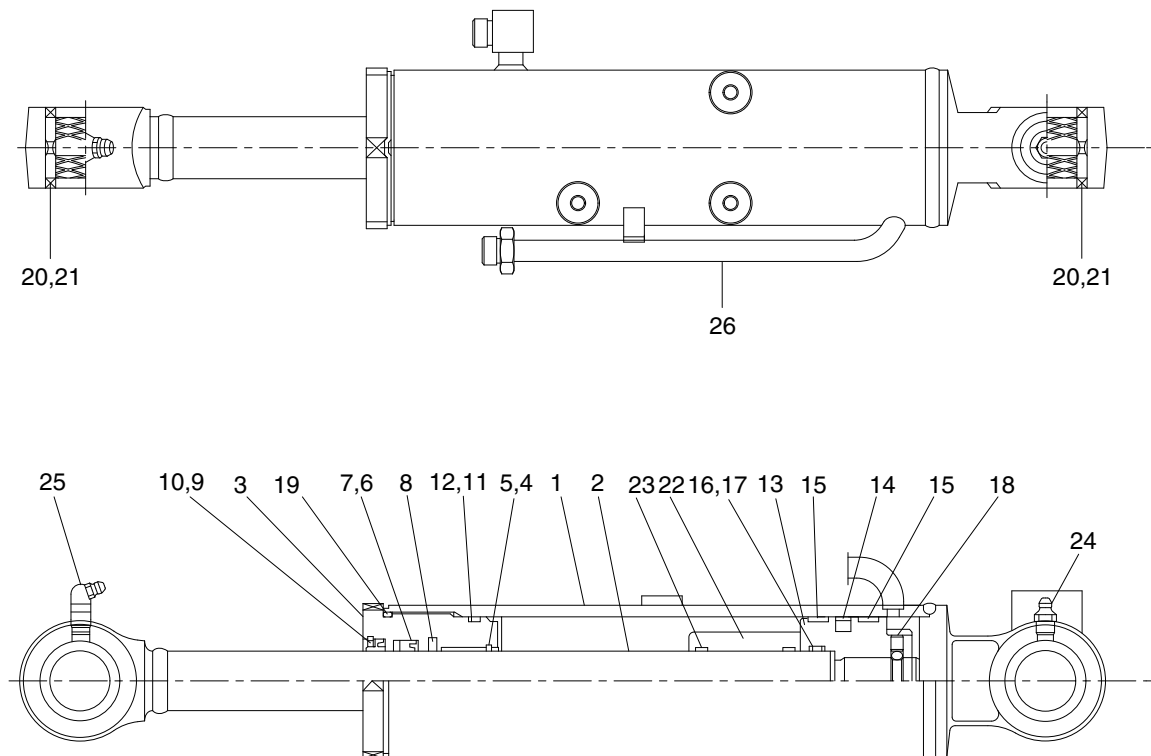
(3) Boom cylinder



HCMM-50212

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

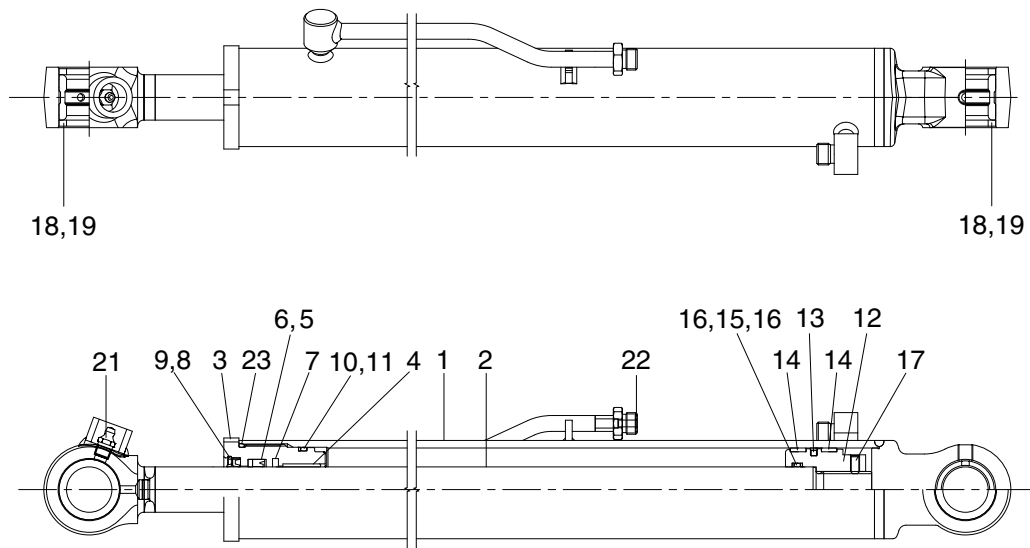
(4) Dozer cylinder



HCMM-40042

- | | | | | | |
|---|---------------|----|--------------|----|---------------|
| 1 | Tube assembly | 10 | Snap ring | 19 | O-ring |
| 2 | Rod assembly | 11 | O-ring | 20 | Pin bushing |
| 3 | Gland | 12 | Back up ring | 21 | Dust seal |
| 4 | DU bushing | 13 | Piston | 22 | Spacer |
| 5 | Snap ring | 14 | Piston seal | 23 | Wear ring |
| 6 | Rod seal | 15 | Wear ring | 24 | Grease nipple |
| 7 | Back up ring | 16 | O-ring | 25 | Grease nipple |
| 8 | Buffer ring | 17 | Back up ring | 26 | Pipe assy |
| 9 | Dust wiper | 18 | Set screw | 27 | O-ring |

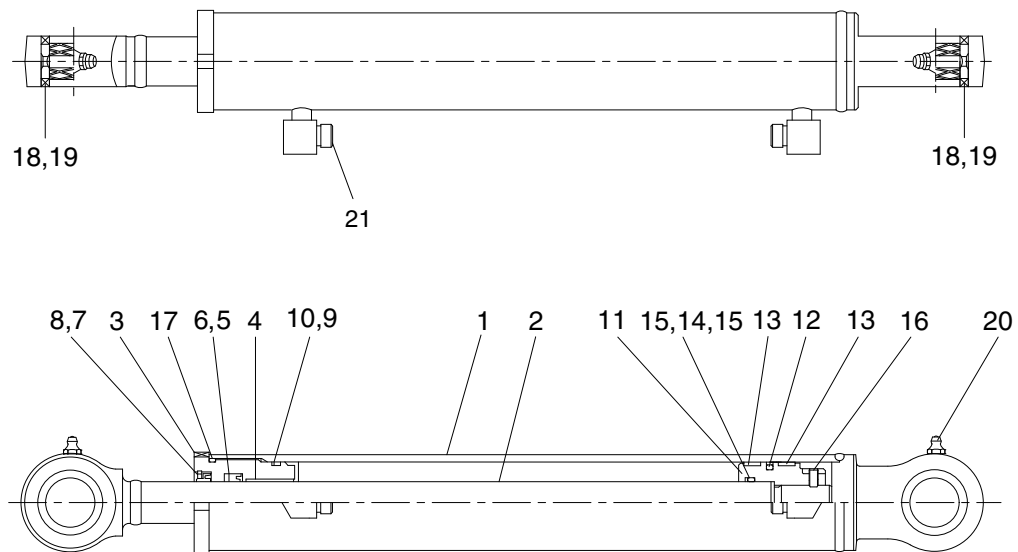
(5) Boom swing cylinder



HCMM-12311

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

(6) Extension cylinder

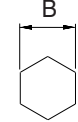


HCMM-40051

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

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	8	
	3	
Spanner	22	
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	M60	90 ± 9.0	651 ± 65.1
	Arm cylinder	3	M60	60 ± 6.0	434 ± 43.4
	Bucket cylinder	3	M75	60 ± 6.0	434 ± 43.4
	Dozer cylinder	3	M70	70 ± 7.0	506 ± 50.6
	Boom swing cylinder	3	M60	48 ± 4.8	347 ± 34.7
	Extension cylinder	3	M55	44 ± 4.5	318 ± 32.5
Piston	Boom cylinder	12	M29	80 ± 8.0	579 ± 57.9
	Arm cylinder	14	M34	90 ± 9.0	651 ± 65.1
	Bucket cylinder	12	M29	70 ± 7.0	506 ± 50.6
	Dozer cylinder	13	M25	60 ± 6.0	434 ± 43.4
	Boom swing cylinder	12	M24	60 ± 6.0	434 ± 43.4
	Extension cylinder	11	M20	50 ± 5.0	362 ± 36.2
Set screw	Boom cylinder	17	M8	1.7 ± 0.2	12.3 ± 1.45
	Arm cylinder	19	M6	1.7 ± 0.2	12.3 ± 1.45
	Bucket cylinder	18	M8	1.7 ± 0.2	12.3 ± 1.45
	Dozer cylinder	18	M8	2.7 ± 0.2	19.5 ± 1.45
	Boom swing cylinder	17	M8	1.7 ± 0.2	12.3 ± 1.45
	Extension cylinder	16	M6	0.8 ± 0.1	5.8 ± 0.72

3) DISASSEMBLY

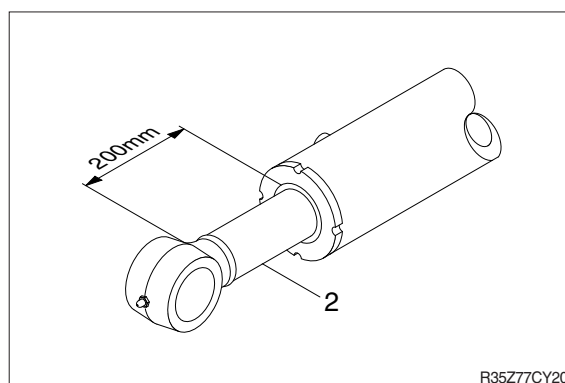
※ Procedures are based on the boom cylinder.

(1) Remove cylinder head and piston rod

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

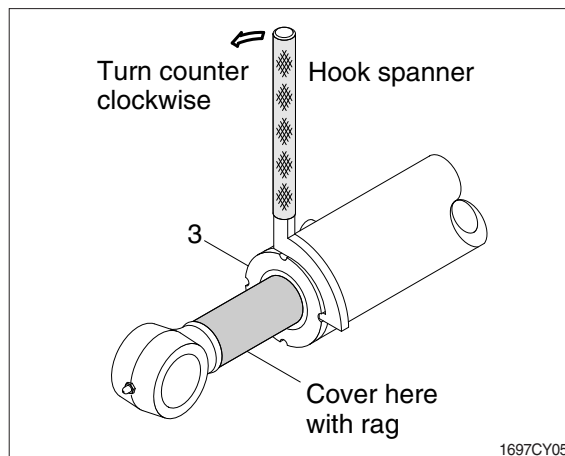
※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

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.



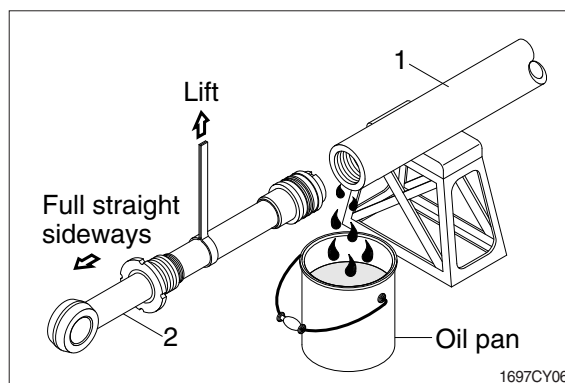
③ Loosen and remove the gland (3) by hook spanner.

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



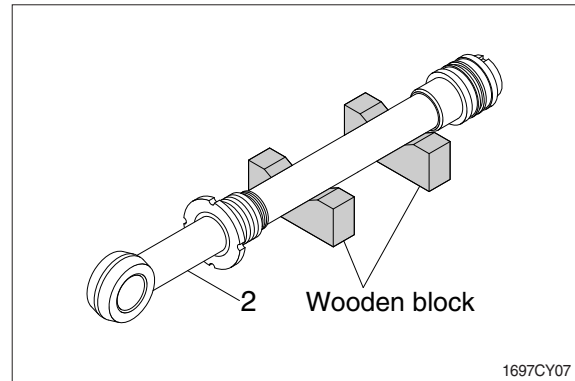
④ Draw out cylinder head and rod assembly together from tube assembly (1).

※ 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.



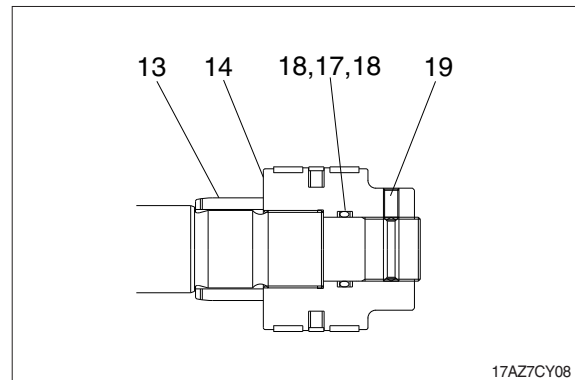
Note that the plated surface of rod assembly (2) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.

- ⑤ Place the removed rod assembly (2) on a wooden V-block that is set level.
- ※ Cover a V-block with soft rag.

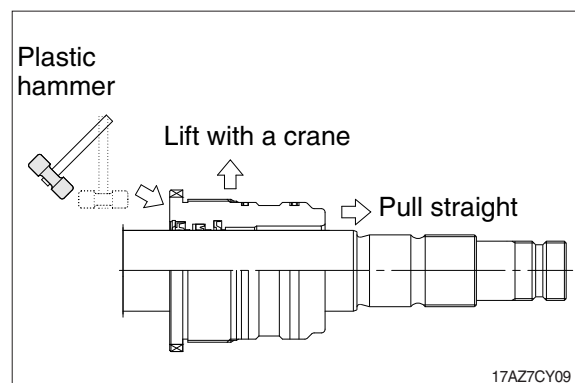


(2) Remove piston and gland

- ① Remove set screw (19).
- ② Remove piston assembly (14), back up ring (18), O-ring (17) and cushion ring (13).

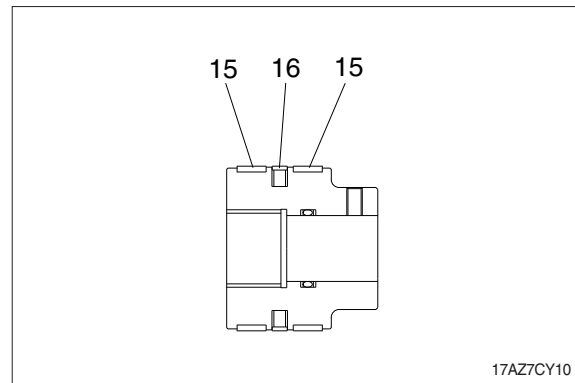


- ③ Remove the gland assembly from rod assembly (2).
 - ※ If it is too heavy to move, move it by striking the flanged part of gland with a plastic hammer.
 - ※ Pull it straight with gland assembly lifted with a crane.
- Exercise care so as not to damage the lip of packing (4, 5, 6, 7, 8, 9) by the threads of rod assembly (2).



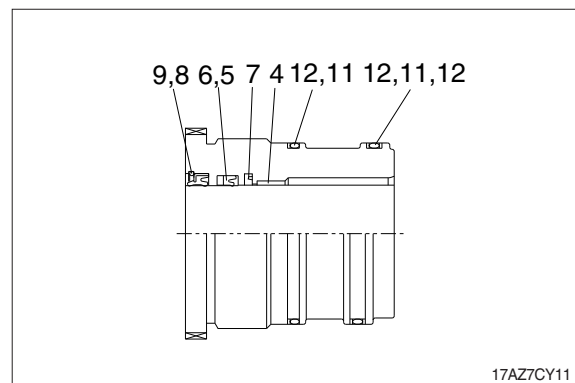
(3) Disassemble the piston assembly

- ① Remove wear ring (15).
 - ② Remove wear ring (15) and piston seal (16).
- ※ Exercise care in this operation not to damage the grooves.



(4) Disassemble gland assembly

- ① Remove back-up ring (12) and O-ring (11).
 - ② Remove snap ring (9), dust wiper (8).
 - ③ Remove back up ring (6), rod seal (5).
 - ④ Remove buffer ring (7).
 - ⑤ Remove the DU bushing (4).
- ※ Exercise care in this operation not to damage the grooves.
- ※ Do not remove seal and ring, if does not damaged.

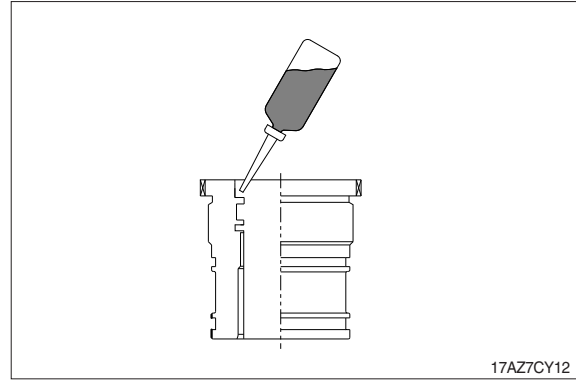


4) ASSEMBLY

(1) Assemble cylinder head assembly

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

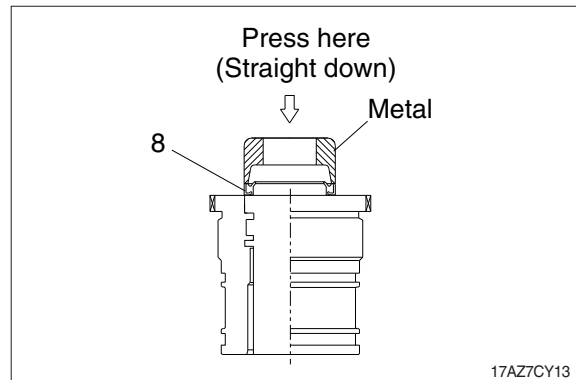
- ① Coat the inner face of gland (3) with hydraulic oil.



- ② Coat dust wiper (8) 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.

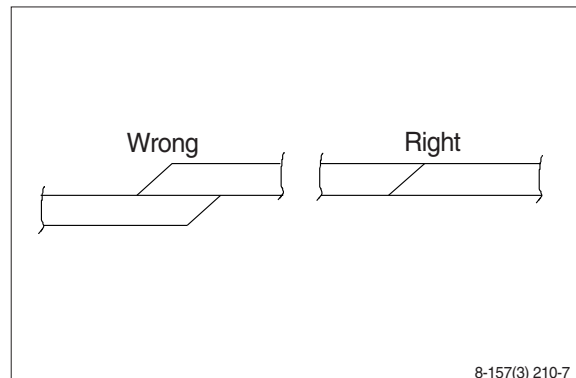
- ③ Fit retain ring (9) to the stop face.



- ④ Fit back up ring (6), rod seal (5) and buffer ring (7) to corresponding grooves, in that order.

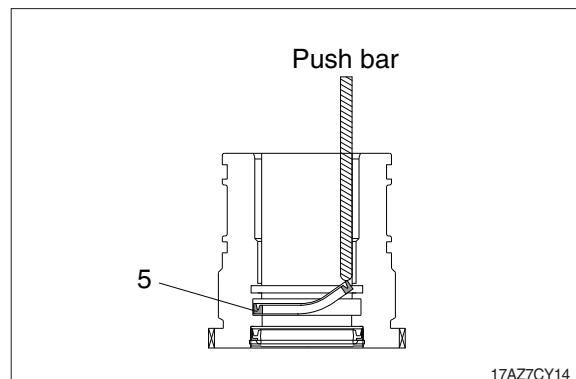
※ Coat each packing with hydraulic oil before fitting it.

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

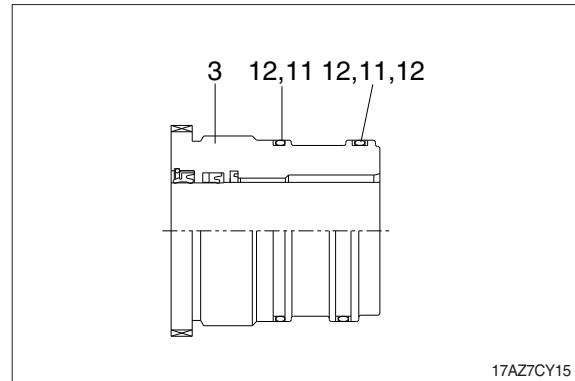


※ Rod seal (5) has its own fitting direction. Therefore, confirm it before fitting them.

※ Fitting rod seal (5) and buffer ring (7) upside down may damage its lip. Therefore check the correct direction that is shown in fig.

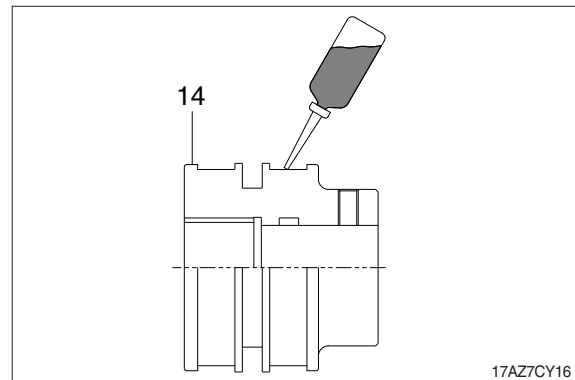


- ⑤ Fit back up ring (12) to gland (3).
- ※ Put the backup ring in the warm water of 30~50°C .
- ⑥ Fit O-ring (11) to gland (3).

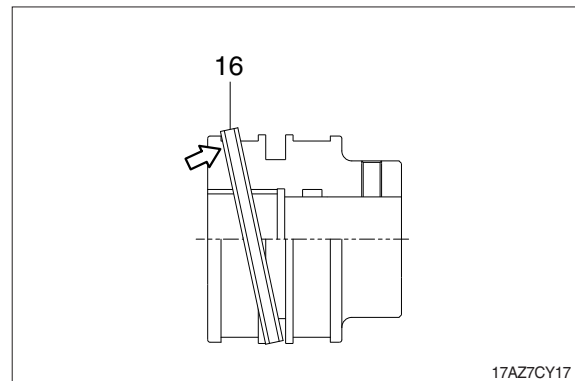


(2) Assemble piston assembly

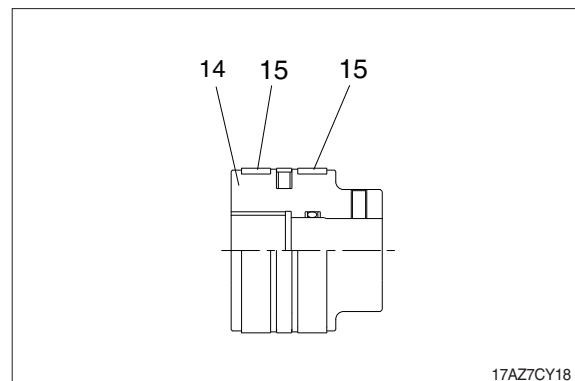
- ※ Check for scratches or rough surfaces.
If found smooth with an oil stone.
- ① Coat the outer face of piston (14) with hydraulic oil.



- ② Fit piston seal (16) 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.

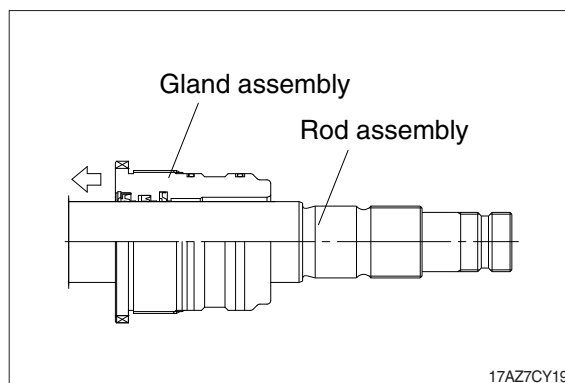


- ③ Fit wear ring (15) to piston (14).

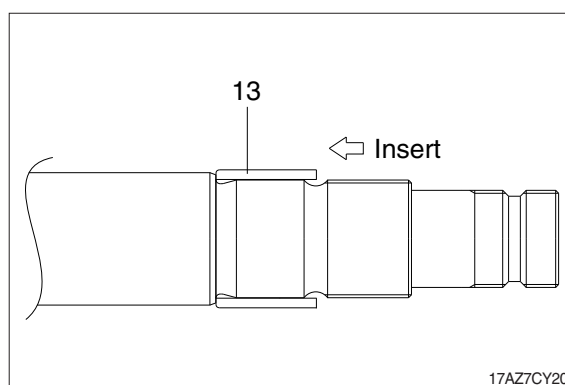


(3) Install piston and cylinder head

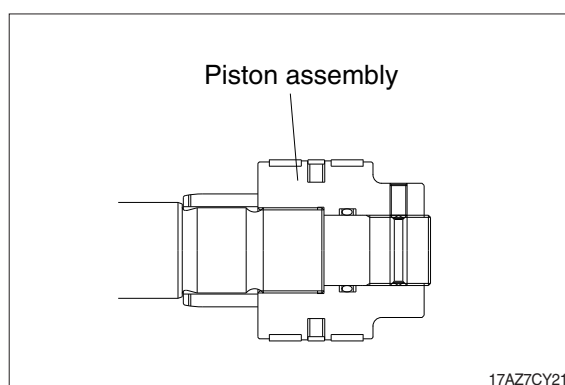
- ① Fix the rod assembly to the work bench.
- ② Apply hydraulic oil to the outer surface of rod assembly (2), the inner surface of piston and gland.
- ③ Insert gland assembly to rod assembly.



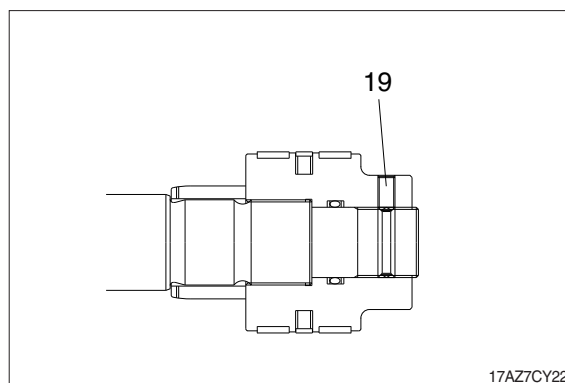
- ④ Insert cushion ring (13) to rod assembly.
- ※ Note that cushion ring (13) has a direction in which it should be fitted.



- ⑤ Fit piston assembly to rod assembly.
- Tightening torque : refer to page 7-110.

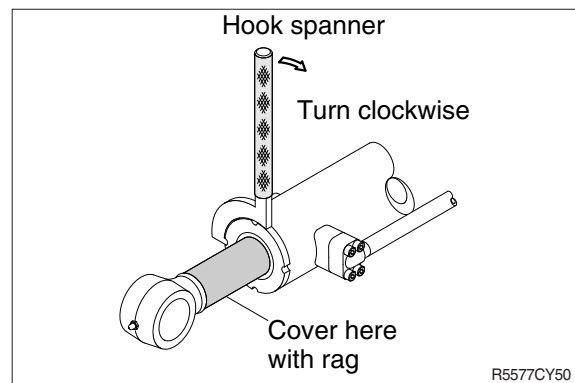
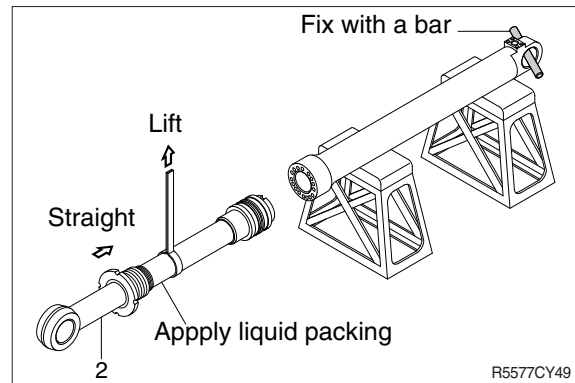


- ⑥ Fit set screw (19).
- Tightening torque : refer to page 7-110.



(4) 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 (2) with a crane.
 - ※ Be careful not to damage piston seal (16) by thread of tube assembly (1).
- 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.

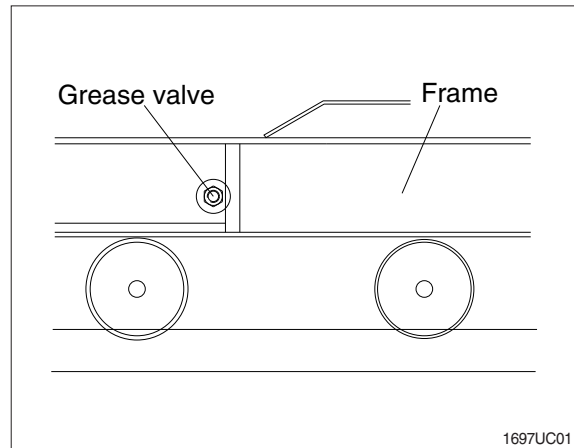


GROUP 10 UNDERCARRIAGE

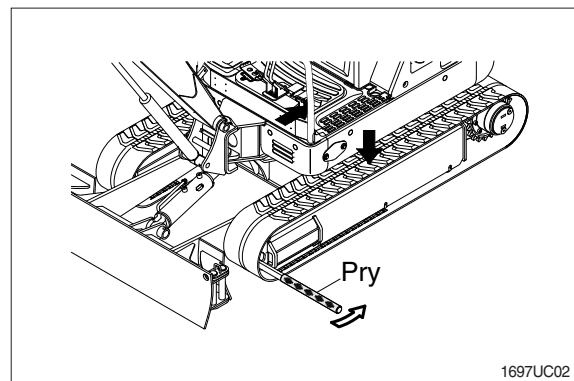
1. RUBBER TRACK

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.

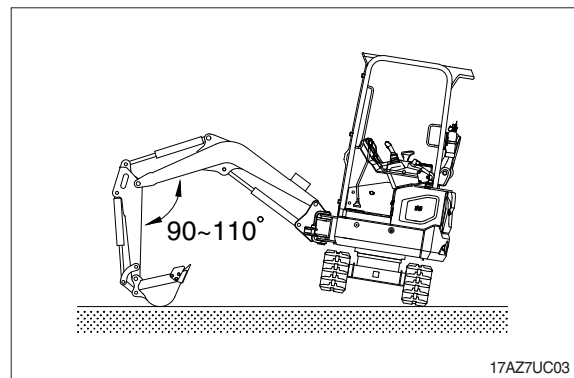


- (2) Remove the rubber track from lower frame using pry.



2) INSTALL

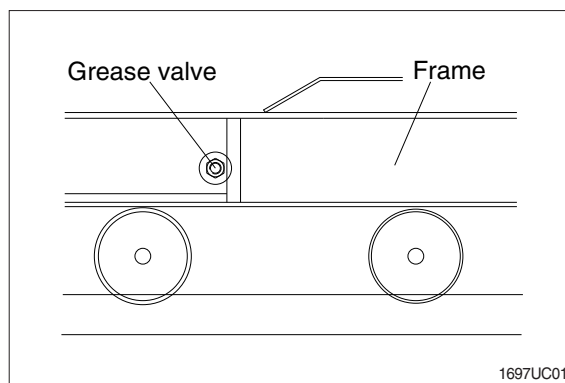
- (1) Carry out installation in the reverse order to removal.
 - ※ Adjust the tension of the rubber track.



2. TRACK ROLLER

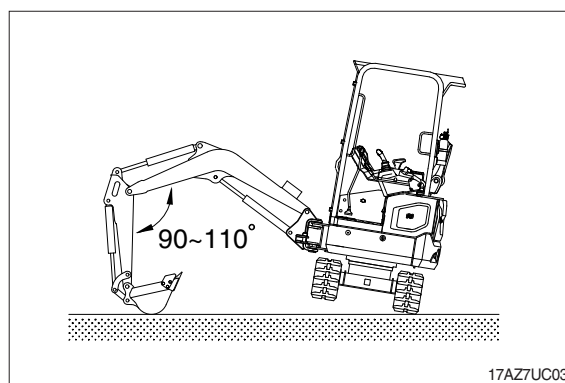
1) REMOVAL

- (1) Loosen tension of the rubber track.



- (2) Using the work equipment, push up track frame on side which is to be removed.

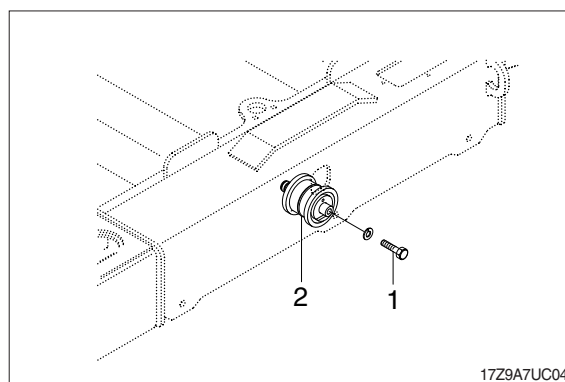
※ After jack up the machine, set a block under the unit.



- (3) Remove the mounting bolt (1) and draw out the track roller (2).

· Weight : 5 kg (11 lb)

· Tightening torque : $12.3 \pm 1.2 \text{ kgf} \cdot \text{m}$
($89 \pm 8.7 \text{ lbf} \cdot \text{ft}$)



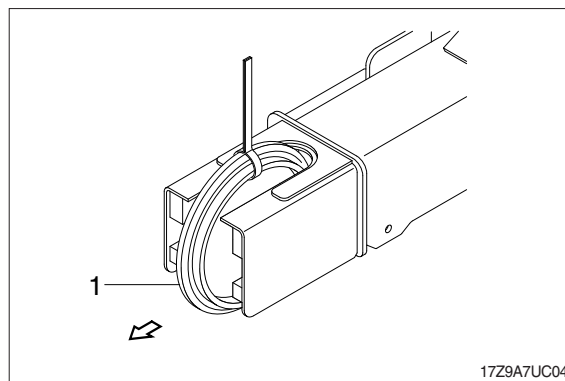
2) INSTALL

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

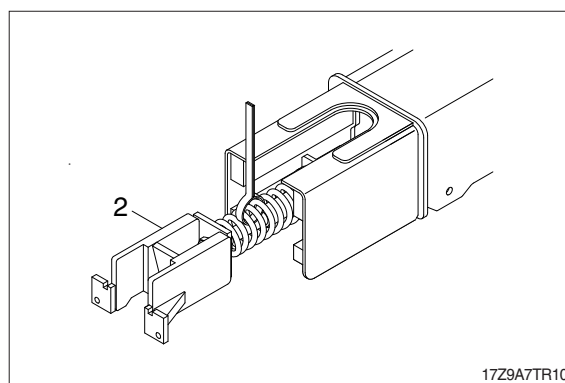
3. IDLER AND RECOIL SPRING

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 : 14 kg (32 lb)

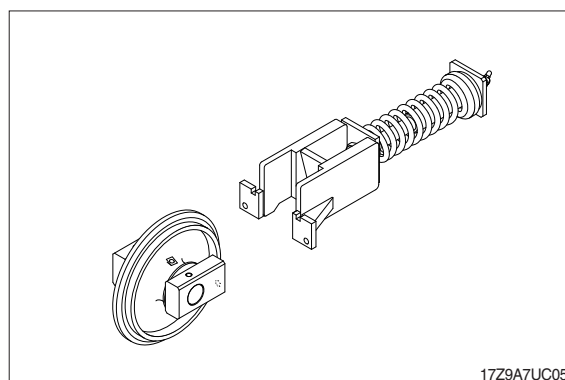


- (3) Pull out yoke and spring weld assembly from track frame, using a pry.
 - Weight : 11 kg (24 lb)



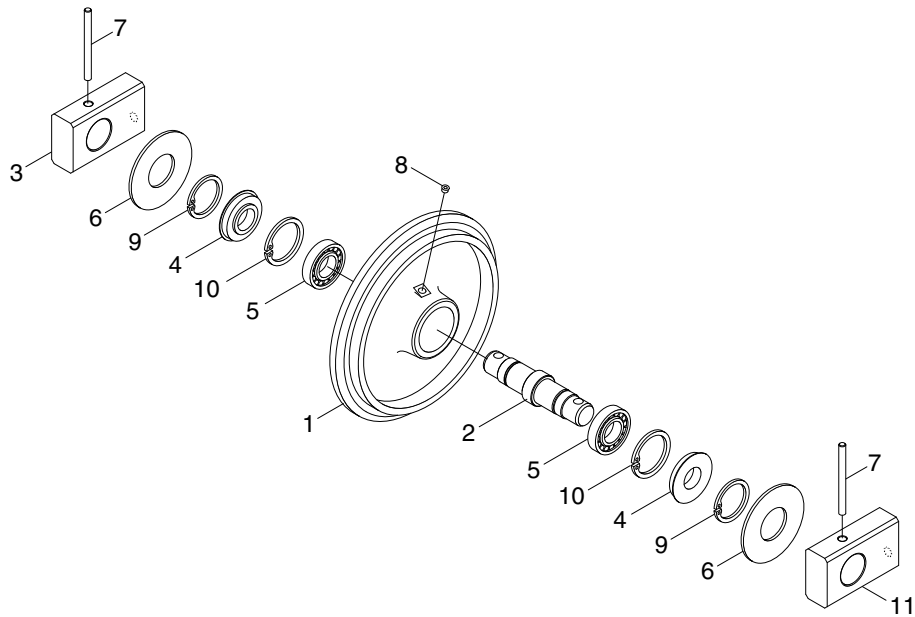
2) INSTALL

- (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

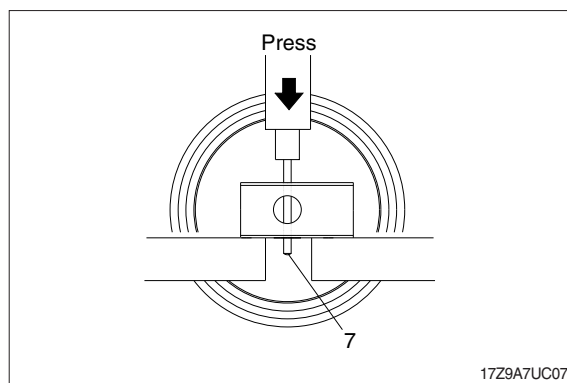


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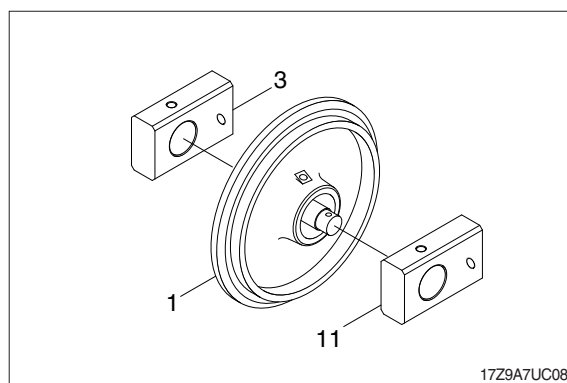
1	Idler shell	5	Ball bearing	9	Snap ring
2	Shaft	6	Lock plate	10	Snap ring
3	Collar-LH	7	Spring pin	11	Collar-RH
4	Oil seal	8	Plug		

(2) Disassembly

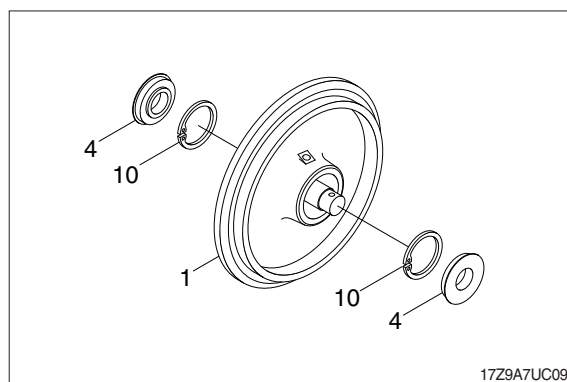
- ① Remove plug and drain oil.
- ② Draw out the spring pin (7), using a press.



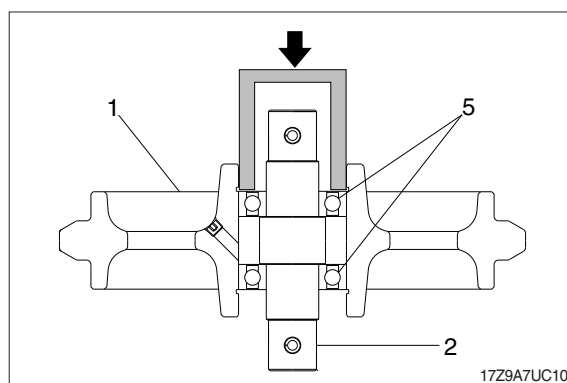
- ③ Remove collar (3, 11) from shaft.



- ④ Remove oil seal (4) from idler shell (1) by pry.
- ※ Do not reuse oil seal after removal.
- ⑤ Remove snap ring (10) from idler shell (1)



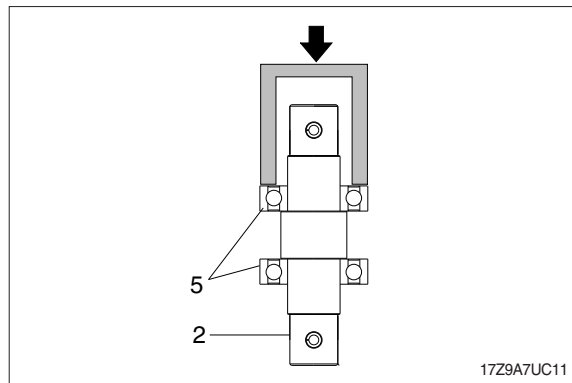
- ⑥ Draw out the ball bearing (5) with shaft (2) using press.
- ⑦ Remove the ball bearing (5) from shaft, using a special tool.
- ※ Only remove ball bearing if replacement is necessary.



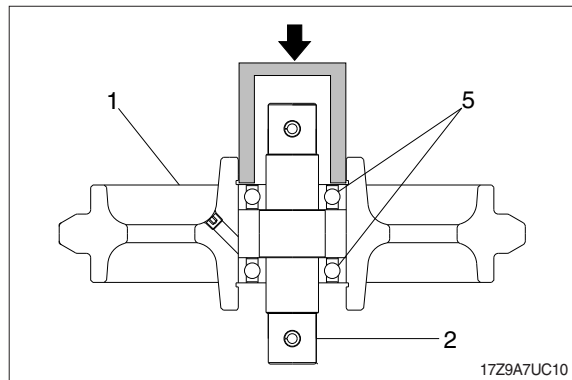
(3) Assembly

- ※ Before assembly, clean the parts.
- ※ Coat the sliding surfaces of all parts with oil.

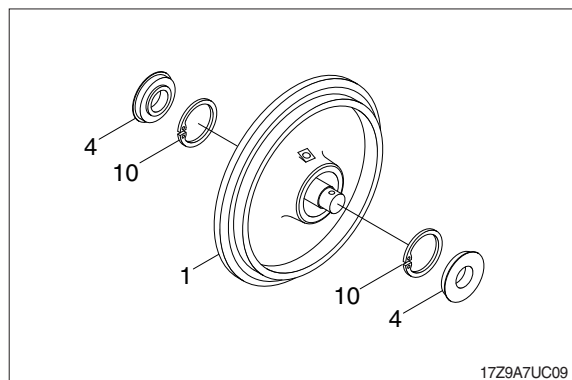
- ① Do not press it at the normal temperature, assemble ball bearing (5) to shaft (2) by press.



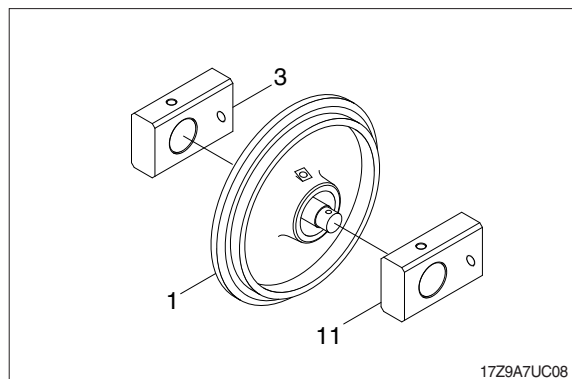
- ② Insert shaft (2) with ball bearing (5) assembly to idler shell (1).



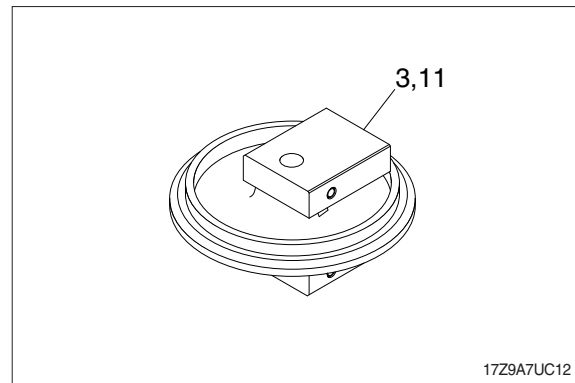
- ③ Assemble snap ring (10) and seal assembly (4).



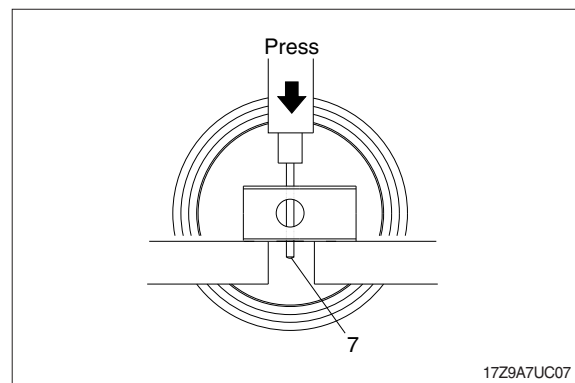
- ④ Assemble collar (3, 11) to idler shell (1).



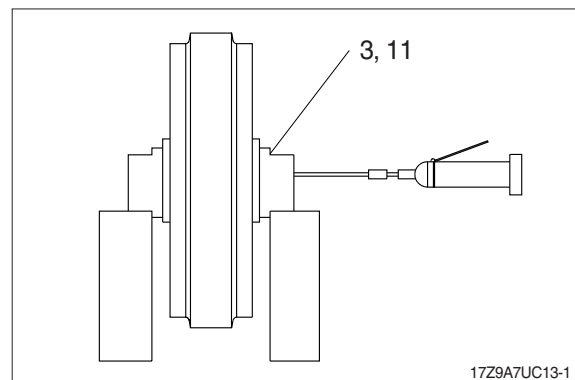
- ⑤ Install collar (3, 11) attached with oil seal (4).



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

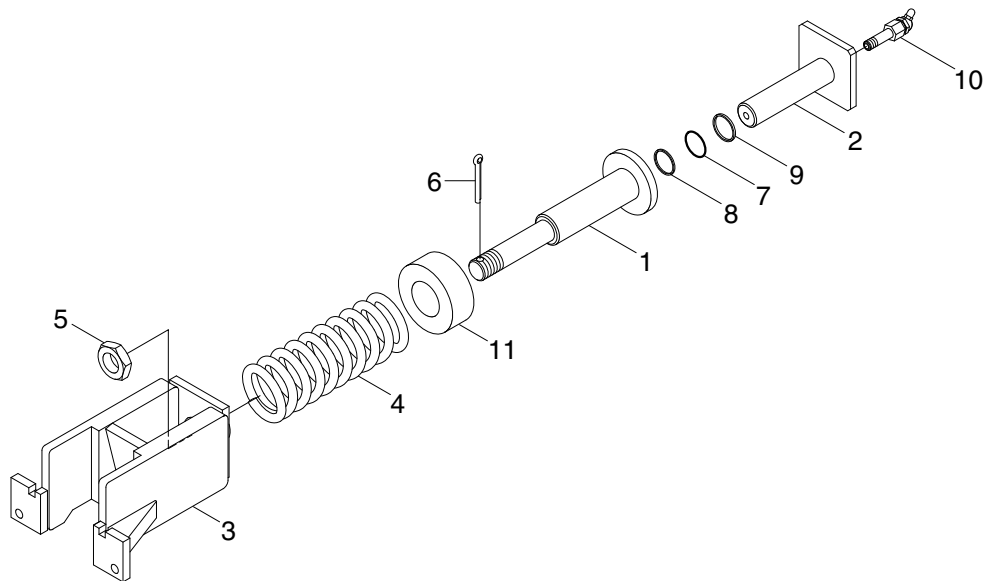


- ⑦ Lay collar (3, 11) on its side.
Supply engine oil to the specified level,
and tighten plug.



4) DISASSEMBLY AND ASSEMBLY OF RECOIL SPRING

(1) Structure



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- | | | | | | |
|---|--------------------|---|--------------|----|------------|
| 1 | Track tension body | 5 | Castle nut | 9 | Dust seal |
| 2 | Piston rod | 6 | Split pin | 10 | Valve assy |
| 3 | Bracket | 7 | O-ring | 11 | Spacer |
| 4 | Tension spring | 8 | Back-up ring | | |

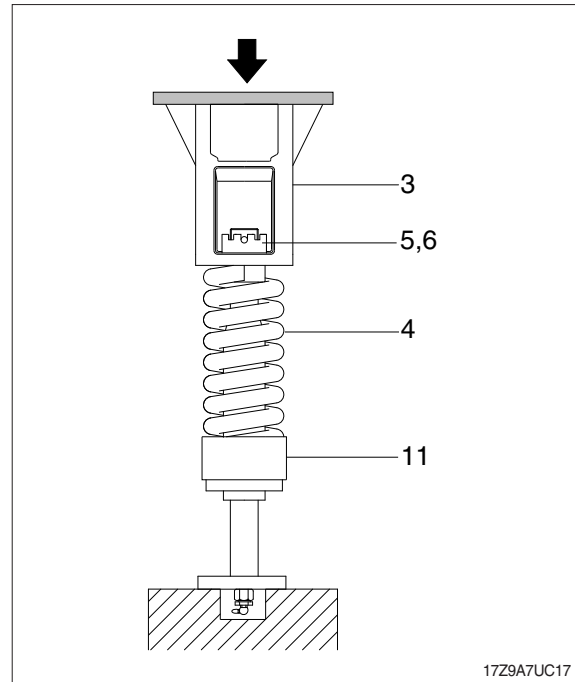
(2) Disassembly

- ① Apply pressure on bracket (3) with a press.

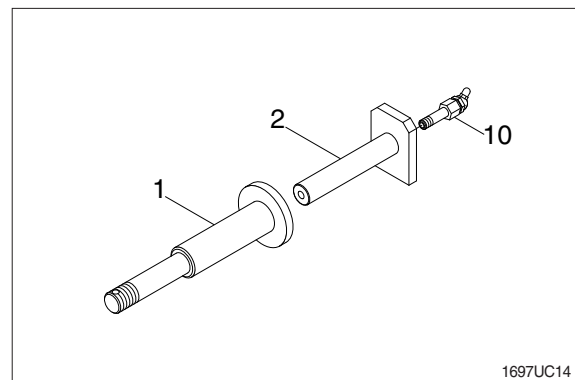
The spring is under a large installed load. This is dangerous, so be sure to set properly.

· Spring set load : 1785 kg (3940 lb)

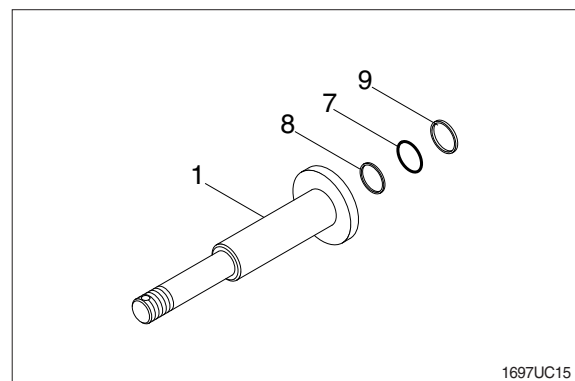
- ※ Remove split pin (6) and castle nut (5).
- ② Take enough notice so that the press which pushes down the spring, should not be slipped out in its operation.
 - ③ Lighten the press load slowly and remove bracket (3) and tension spring (4).



- ⑤ Remove piston rod (2) from track tension body (1).
- ⑥ Remove grease valve assy (10) from piston rod (2).

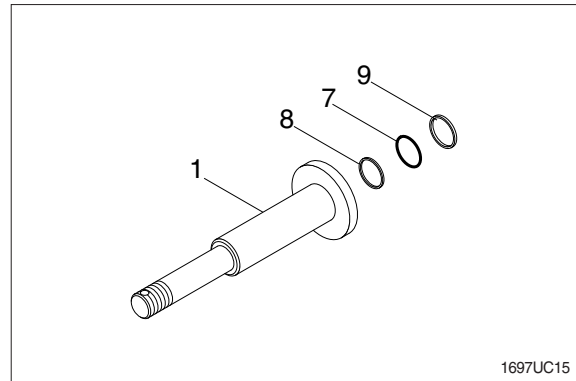


- ⑦ Remove dust seal (9), back-up ring (8) and O-ring (7) from track tension body (1).



(3) Assembly

- ① Install O-ring (7), back-up ring (8), and dust seal (9) to track tension body (1) .

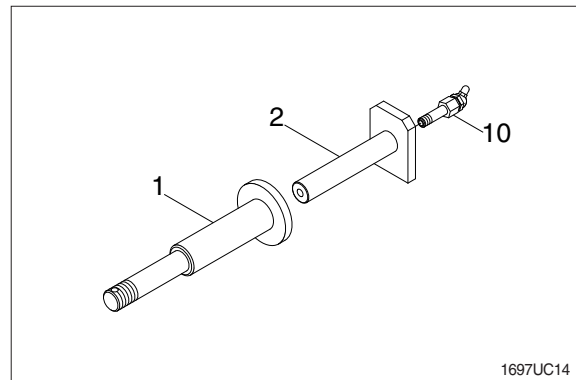


- ② Pour grease into track tension body (1), then push in piston rod (2) by hand.
After take grease out of grease valve mounting hole, let air out.

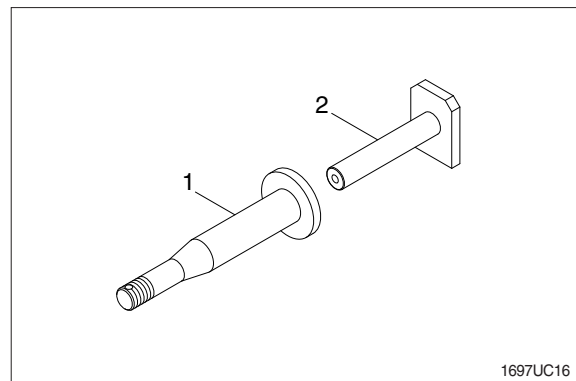
※ If air letting is not sufficient, it may be difficult to adjust the tension of crawler.

- ③ Fit grease valve assy (10) to piston rod (2).

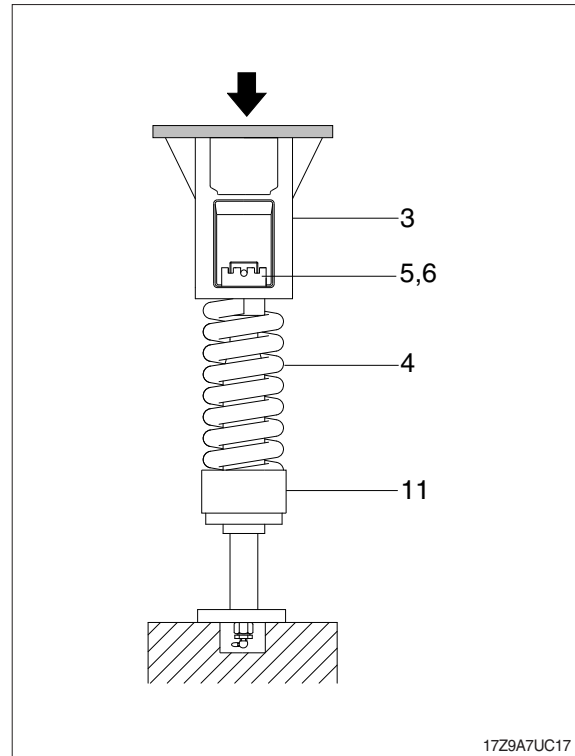
· Tightening torque : $10 \pm 0.5 \text{ kgf} \cdot \text{m}$
($72.4 \pm 3.6 \text{ lbf} \cdot \text{ft}$)



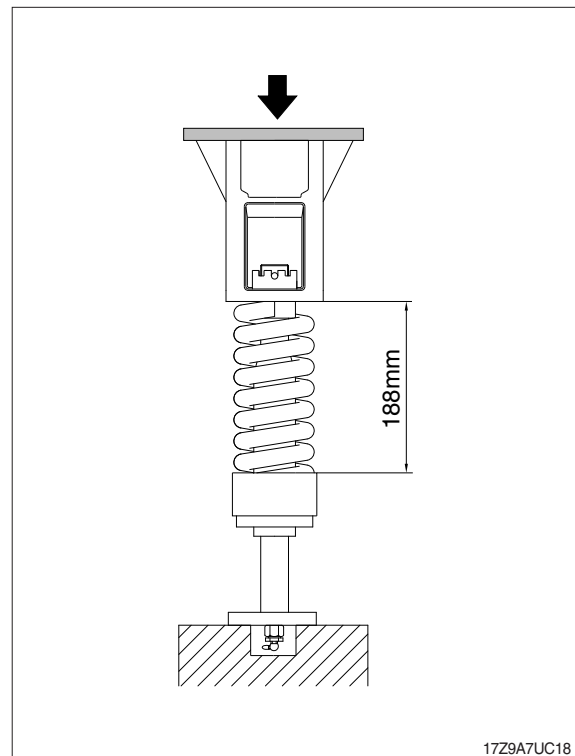
- ④ Install piston rod (2) to track tension body (1).



- ⑤ Install tension spring (4) and spacer (11) to track tension body (1).
- ⑥ Apply pressure to bracket (3) with a press and tighten nut (5).
- ※ During the operation, pay attention specially to prevent the press from slipping out.
- ⑦ Tighten castle nut (5) and insert split pin (6).

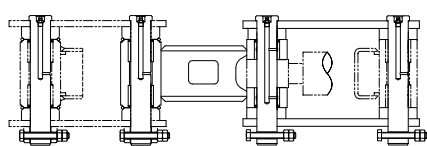
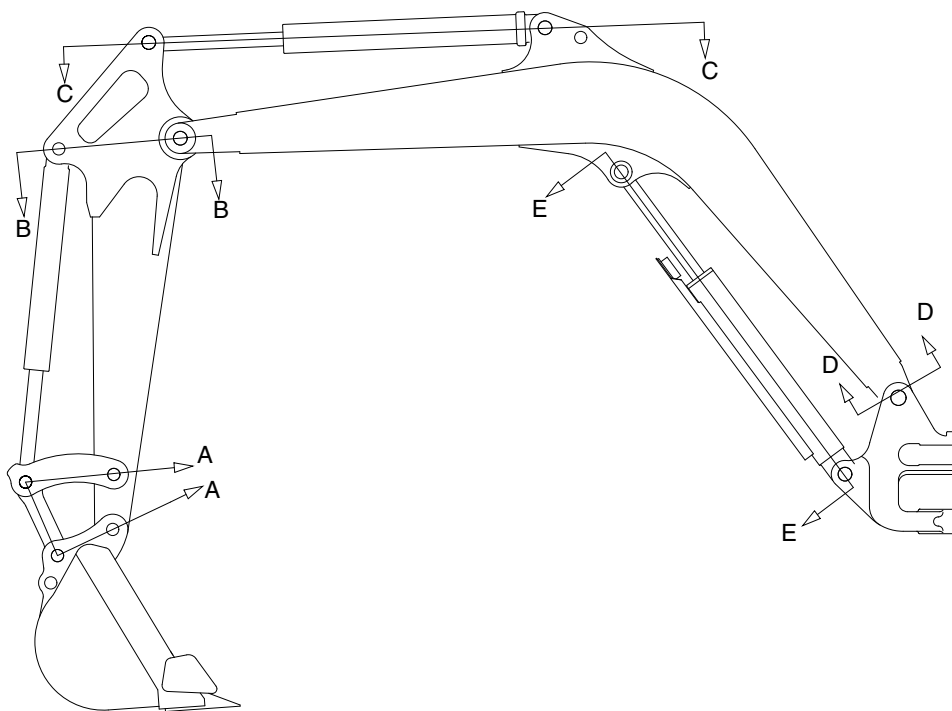


- ⑧ Lighten the press load and confirm the set length of tension spring (4).
 · Spring length : 188 mm (7.4")

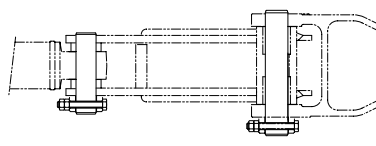


GROUP 11 WORK EQUIPMENT

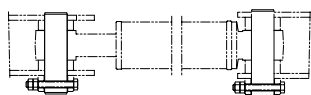
1. STRUCTURE



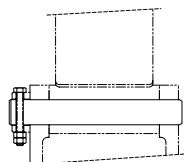
SECTION A-A



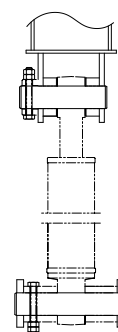
SECTION B-B



SECTION C-C



SECTION D-D



SECTION E-E

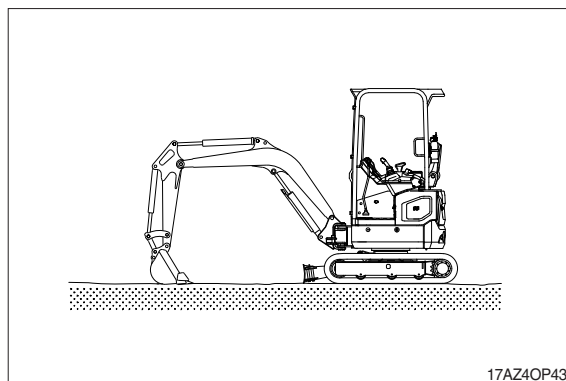
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2. REMOVAL AND INSTALL

1) BUCKET ASSEMBLY

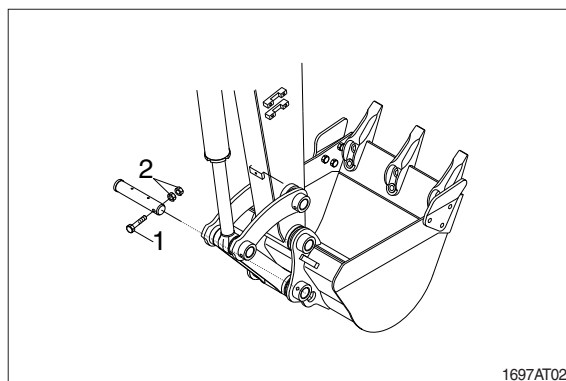
(1) Removal

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



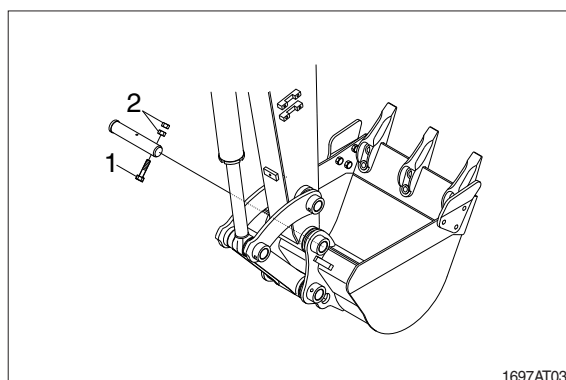
- ② Remove nut (1), bolt (2) and draw out the pin (4).

- Tightening torque : 6.9 ± 1.4 kgf-m
(49.9 ± 10.1 lbf-ft)



- ③ Remove nut (1), bolt (2) and draw out the pin (3) then remove the bucket assembly.

- Weight : 41 kg (90 lb)
- Tightening torque : 6.9 ± 1.4 kgf-m
(49.9 ± 10.1 lbf-ft)

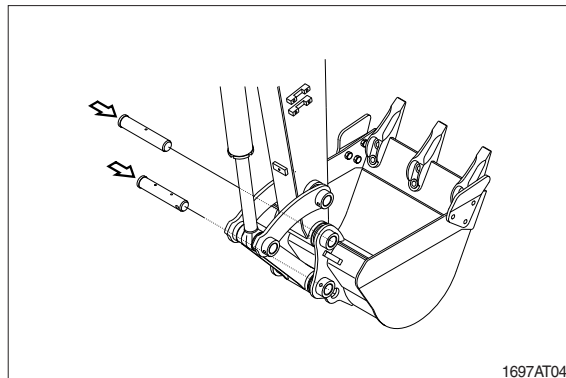


(2) Install

- 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.

▲ Fit blind plugs 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.

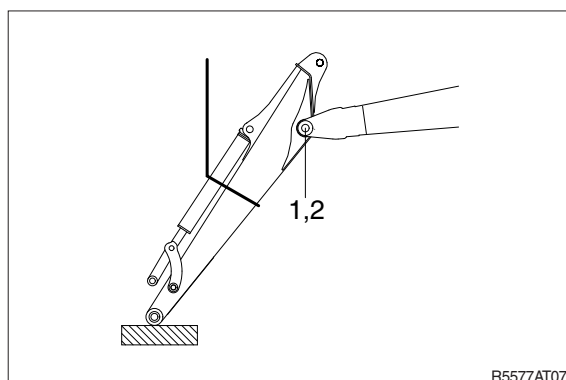
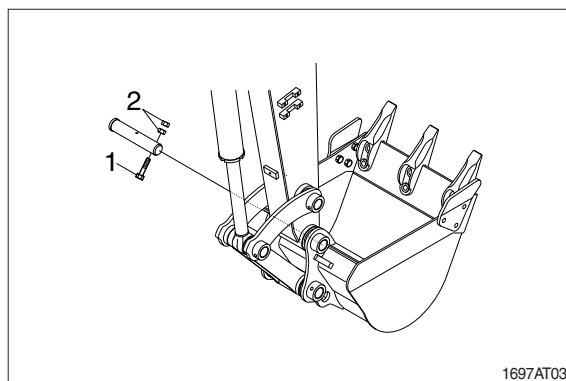
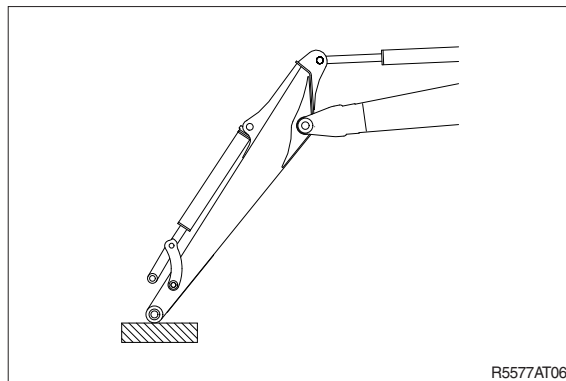
Place a wooden block under the cylinder and bring the cylinder down to it.

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

· Weight : 68 kg (150 lb)

· Tightening torque : 6.9 ± 1.4 kgf·m
(49.9 ± 10.1 lbf·ft)

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



(2) Install

① Carry out installation in the reverse order to removal.

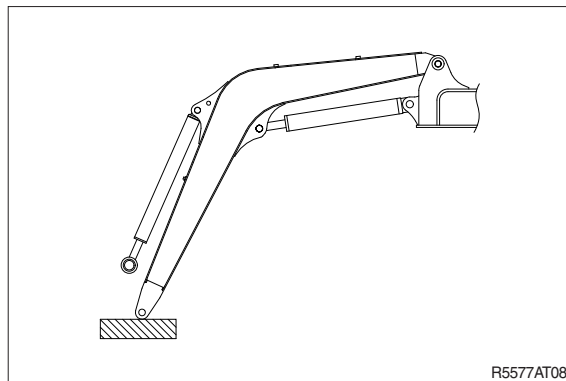
▲ When lifting the arm assembly, always lift the center of gravity.

※ Bleed the air from the cylinder.

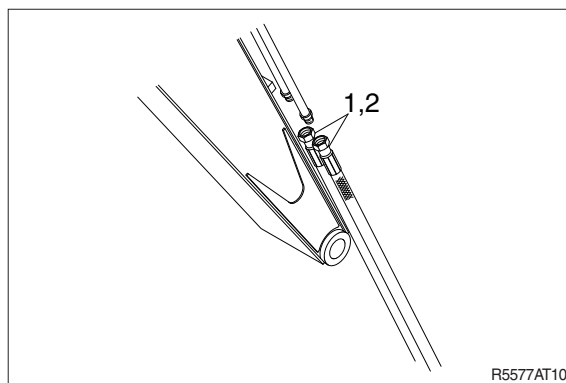
3) BOOM CYLINDER

(1) Removal

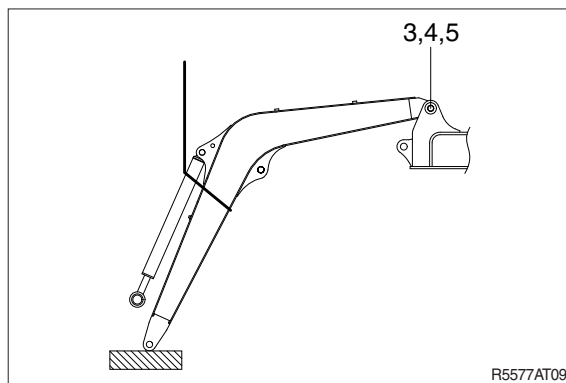
- ① Remove arm and bucket assembly.
For details, see removal of arm and bucket assembly.
- ② Remove boom cylinder assembly from boom.
For details, see removal of arm cylinder assembly.



- 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 : 105 kg (230 lb)
· Tightening torque : 6.9 ± 1.4 kgf·m
(49.9 ± 10.1 lbf·ft)
※ 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.

