SECTION 8 DISASSEMBLY AND ASSEMBLY

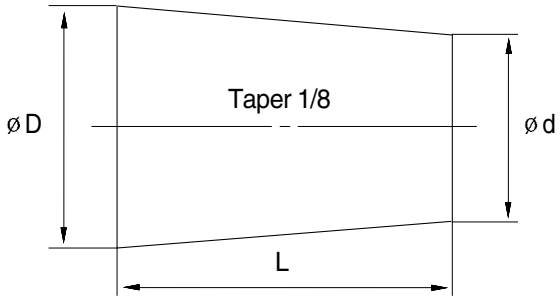
SECTION 8 DISASSEMBLY AND ASSEMBLY

GROUP 1 PRECAUTIONS

1. REMOVAL WORK

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

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



2. INSTALL WORK

1) Tighten all bolts and nuts(Sleeve nuts) to the specified torque.

2) Install the hoses without twisting or interference.

3) Replace all gaskets, O-rings, cotter pins, and lock plates with new parts.

4) Bend the cotter pin or lock plate securely.

5) When coating with adhesive, clean the part and remove all oil and grease, then coat the threaded portion with 2-3 drops of adhesive.

6) When coating with gasket sealant, clean the surface and remove all oil and grease, check that there is no dirt or damage, then coat uniformly with gasket sealant.

7) Clean all parts, and correct any damage, dents, burrs, or rust.

8) Coat rotating parts and sliding parts with engine oil.

9) When press fitting parts, coat the surface with antifriction compound(LM-P).

10) After installing snap rings, check that the snap ring is fitted securely in the ring groove(Check that the snap ring moves in the direction of rotation).

11) When connecting wiring connectors, clean the connector to remove all oil, dirt, or water, then connect securely.

12) When using eyebolts, check that there is no deformation or deterioration, and screw them in fully.

13) When tightening split flanges, tighten uniformly in turn to prevent excessive tightening on one side.

14) When operating the hydraulic cylinders for the first time after repairing and reassembling the hydraulic cylinders, pumps, or other hydraulic equipment or piping, always bleed the air from the hydraulic cylinders as follows:

(1) Start the engine and run at low idling.

(2) Operate the control lever and actuate the hydraulic cylinder 4-5 times, stopping 100㎜ 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 disulphied 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, nut(engine-bracket)	M16 × 2.0	29.7 ± 5.0	215 ± 36.2
2		Engine mounting bolt, nut(bracket-frame)	M22 × 2.5	69.8 ± 6.0	505 ± 43.3
3		Radiator mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
4		Coupling mounting socket bolt	M20 × 2.5	46.5 ± 2.5	336 ± 18.1
5		Main pump housing mounting bolt	M10 × 1.5	4.8 ± 0.3	35 ± 2.2
6	Hydraulic system	Main pump mounting bolt	M20 × 2.5	44 ± 6.6	318 ± 47.7
7		Main control valve mounting nut	M20 × 2.5	42 ± 4.5	304 ± 30.5
8		Fuel tank mounting bolt	M20 × 2.5	45 ± 5.1	325 ± 36.8
9		Hydraulic oil tank mounting bolt	M20 × 2.5	45 ± 5.1	325 ± 36.8
10		Turning joint mounting bolt, nut	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
11	Power train system	Swing motor mounting bolt	M20 × 2.5	58.4 ± 6.4	422 ± 46.2
12		Swing bearing upper part mounting bolt	M24 × 3.0	100 ± 10	723 ± 72.3
13		Swing bearing lower part mounting bolt	M24 × 3.0	100 ± 10	723 ± 72.3
14		Travel motor mounting bolt	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
15		Sprocket mounting bolt	M22 × 2.5	77.4 ± 7.5	560 ± 54.2
16	Under carriage	Carrier roller mounting bolt, nut	M16 × 2.0	29.7 ± 3.0	215 ± 21.7
17		Track roller mounting bolt	M24 × 3.0	100 ± 10	723 ± 72.3
18		Track tension cylinder mounting bolt	M22 × 1.5	87.2 ± 12.5	602 ± 90
18		Track shoe mounting bolt, nut	M24 × 1.5	140 ± 14	1012 ± 101
19		Track guard mounting bolt	M22 × 2.5	81.9 ± 16.1	592 ± 116
20	Others	Counterweight mounting bolt	M42 × 3.0	390 ± 40	2821 ± 289
21		Center frame support & lower track mounting	M33 × 3.5	220 ± 20	1591 ± 145
22		bolt	M12 × 1.75	12.2 ± 1.3	88.2 ± 9.4
23		Cab mounting bolt	M 8 × 1.25	2.5 ± 0.5	18.1 ± 3.6

※ For tightening torque of engine and hydraulic components, see engine maintenance guide and service manual.

2. TORQUE CHART

Use following table for unspecified torque.

1) BOLT AND NUT - 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 ~ 60.0
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 × 2.0	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

Thread size	Width across flat(mm)	kgf · m	lbf · ft
1/4"	19	3	21.7
3/8"	22	4	28.9
1/2"	27	5	36.2
3/4"	36	12	86.8
1"	41	14	101

3) 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	6	43.4
3/4"	36	13	94.0
1"	41	15	109

GROUP 3 PUMP DEVICE

1. REMOVAL AND INSTALL

1) REMOVAL

(1) Lower the work equipment to the ground and stop the engine.

(2) Loosen the breather slowly to release the pressure inside the hydraulic tank.

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

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

· Hydraulic tank quantity : 250 ℓ

(4) Remove socket bolts(5) and disconnect hose (1,2).

(5) Disconnect pilot line hoses(4, 5, 6, 7, 8, 9, 10, 11).

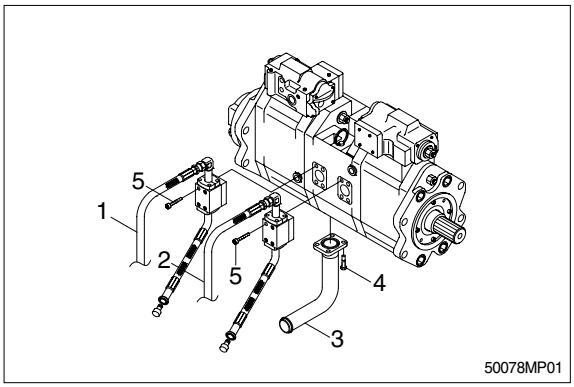
(6) Remove bolts(4) and disconnect pump suction tube (3).

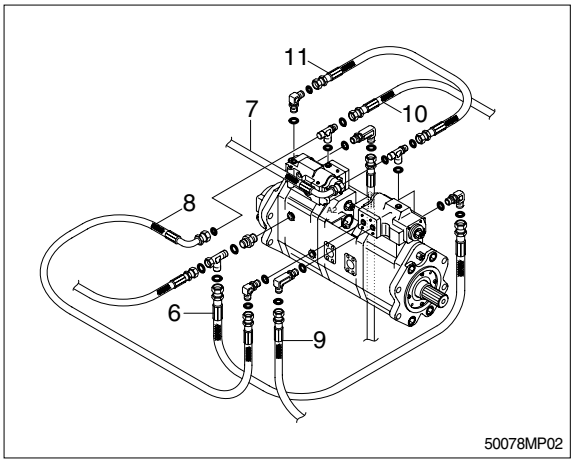
※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.

(7) Sling the pump assembly and remove the pump mounting bolts.

· Weight : 180kg(400lb)

※ 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 the return filter with a new one.

(4) Remove breather and clean it.

(5) After adding oil to the hydraulic tank to the specified level.

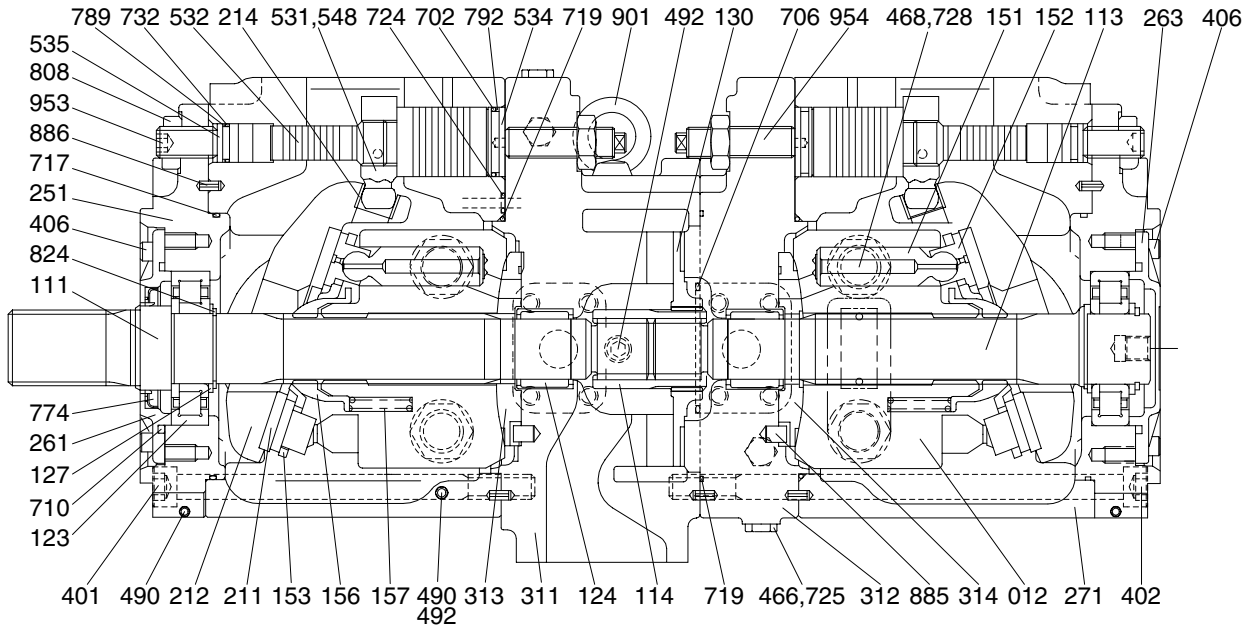
(6) Bleed the air from the hydraulic pump.
① Remove the air vent plug(2EA)
② Tighten plug lightly
③ Start the engine, run at low idling, and check oil come out from plug.
④ Tighten plug.

(7) Start the engine, run at low idling(3~5 minutes) to circulate the oil through the system.

(8) Confirmed the hydraulic oil level and check the hydraulic oil leaks or not.

2. MAIN PUMP(1/2)

1) STRUCTURE



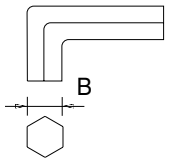
470072MP02

012	Cylinder block	271	Pump casing	710	O-ring
111	Drive shaft(F)	311	Valve cover(F)	717	O-ring
113	Driven shaft(R)	312	Valve cover(R)	719	O-ring
114	Coupling	313	Valve plate(R)	724	O-ring
123	Roller bearing	314	Valve plate(L)	725	O-ring
124	Needle bearing	401	Hexagon socket bolt	728	O-ring
127	Spacer	402	Hexagon socket bolt	732	O-ring
130	Booster	406	Hexagon socket bolt	774	Oil seal
151	Piston	466	VP Plug	789	Back up ring
152	Shoe	468	VP Plug	792	Back up ring
153	Plate	490	VP Plug	808	Hexagon head nut
156	Bushing	492	VP Plug	824	Snap ring
157	Cylinder spring	531	Tilting pin	885	Pin
211	Shoe plate	532	Servo piston	886	Spring pin
212	Swash plate	534	Stopper(L)	901	Eye bolt
214	Bushing	535	Stopper(S)	953	Set screw
251	Support plate	548	Feed back pin	954	Set screw
261	Seal cover(F)	702	O-ring		
263	Seal cover(R)	706	O-ring		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

The tools necessary to disassemble/reassemble the pump are shown in the follow list.

<table>
<tr><th colspan="2">Tool name & size</th><th colspan="5">Part name</th></tr>
<tr><td rowspan="6">Allen wrench
 
</td><td>B</td><td>Hexagon socket head bolt</td><td>PT plug (PT thread)</td><td>PO plug (PF thread)</td><td>Hexagon socket head setscrew</td></tr>
<tr><td>4</td><td>M 5</td><td>BP-1/16</td><td>-</td><td>M 8</td></tr>
<tr><td>5</td><td>M 6</td><td>BP1/ 8</td><td>-</td><td>M10</td></tr>
<tr><td>6</td><td>M 8</td><td>BP-1/ 4</td><td>PO-1/4</td><td>M12, M14</td></tr>
<tr><td>8</td><td>M10</td><td>BP-3/ 8</td><td>PO-3/8</td><td>M16, M18</td></tr>
<tr><td>17</td><td>M20, M22</td><td>BP-1</td><td>PO-1, 1 1/4, 1 1/2</td><td>-</td></tr>
<tr><td rowspan="6">Double ring spanner, socket wrench, double(Single) open end spanner
 
</td><td>-</td><td colspan="2">Hexagon head bolt</td><td colspan="2">Hexagon head bolt</td><td>VP plug (PF thread)</td></tr>
<tr><td>19</td><td colspan="2">M12</td><td colspan="2">M12</td><td>VP-1/4</td></tr>
<tr><td>24</td><td colspan="2">M16</td><td colspan="2">M16</td><td>-</td></tr>
<tr><td>27</td><td colspan="2">M18</td><td colspan="2">M18</td><td>VP-1/2</td></tr>
<tr><td>30</td><td colspan="2">M20</td><td colspan="2">M20</td><td>-</td></tr>
<tr><td>36</td><td colspan="2">-</td><td colspan="2">-</td><td>VP-3/4</td></tr>
<tr><td colspan="2">Adjustable angle wrench</td><td colspan="5">Medium size, 1 set</td></tr>
<tr><td colspan="2">Screw driver</td><td colspan="5">Minus type screw driver, Medium size, 2 sets</td></tr>
<tr><td colspan="2">Hammer</td><td colspan="5">Plastic hammer, 1 set</td></tr>
<tr><td colspan="2">Pliers</td><td colspan="5">For snap ring, TSR-160</td></tr>
<tr><td colspan="2">Steel bar</td><td colspan="5">Steel bar of key material approx. 10 × 8 × 200</td></tr>
<tr><td colspan="2">Torque wrench</td><td colspan="5">Capable of tightening with the specified torques</td></tr>
</table>

(2) Tightening torque

Part name	Bolt size	Torque		Wrench size	
		kgf · m	lbf · ft	in	mm
Hexagon socket head bolt (Material : SCM435)	M 5	0.7	5.1	0.16	4
	M 6	1.2	8.7	0.20	5
	M 8	3.0	21.7	0.24	6
	M10	5.8	42.0	0.31	8
	M12	10.0	72.3	0.39	10
	M14	16.0	115.7	0.47	12
	M16	24.0	173.6	0.55	14
	M18	34.0	245.9	0.55	14
	M20	44.0	318.3	0.67	17
	M22	64.0	462.9	0.67	17
PT plug(Material : S45C) ※ Wind a seal tape 1 1/2 to 2 turns round the plug	PT 1/16	0.7	5.1	0.16	4
	PT 1/ 8	1.05	7.59	0.20	5
	PT 1/ 4	1.75	12.66	0.24	6
	PT 3/ 8	3.5	25.3	0.31	8
	PT 1/ 2	5.0	36.2	0.39	10
PF plug(Material : S45C)	PF 1/ 4	3.0	21.7	0.24	6
	PF 1/ 2	10.0	72.3	0.39	10
	PF 3/ 4	15.0	108.5	0.55	14
	PF 1	19.0	137.4	0.67	17
	PF 1 1/4	27.0	195.3	0.67	17
	PF 1 1/2	28.0	202.5	0.67	17

3) DISASSEMBLY

(1) Select place suitable to disassembling.

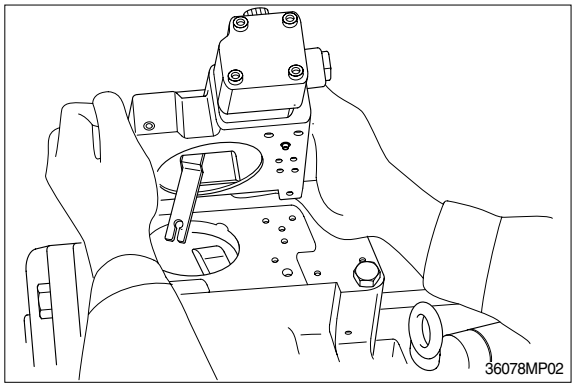
※ Select clean place.

※ Spread rubber sheet, cloth or so on on overhaul workbench top to prevent parts from being damaged.

(2) Remove dust, rust, etc, from pump surfaces with cleaning oil or so on.

(3) Remove drain port plug(468) and let oil out of pump casing(Front and rear pump).

(4) Remove hexagon socket head bolts(412, 413) and remove regulator.



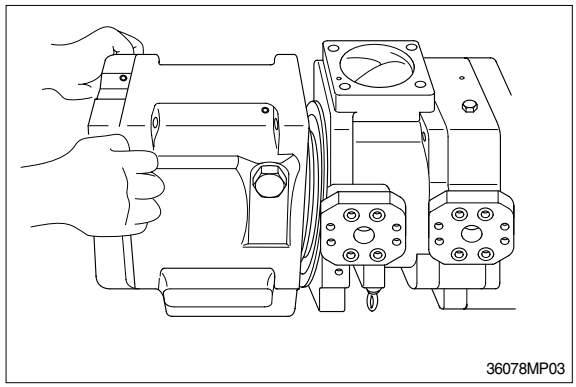
(5) Loosen hexagon socket head bolts(401) which tighten swash plate support(251), pump casing(271) and valve cover(F, 311).

※ If gear pump and so on are fitted to rear face of pump, remove them before starting this work.

(6) Loosen hexagon socket head bolts(402) which tighten swash plate support(251), pump casing(271) and valve cover(R, 312).

(7) Place pump horizontally on workbench with its regulator-fitting surface down, and separate pump casing(271) from valve cover(F, 311).

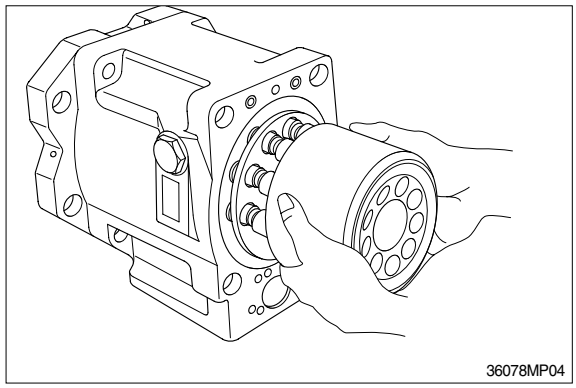
※ Before bringing this surface down, spread rubber sheet on workbench without fail to prevent this surface from being damaged.



(8) Separate valve cover(F, 311) from valve cover(R, 312) and pull out booster(130), spline coupling(114).

(9) Separate valve cover(R, 312) from pump casing and then pull out the cylinder block(012) of pump casing(271) straightly over drive shaft(R, 113). Pull out also pistons(151), set plate(153), spherical bush(156) and cylinder springs (157) simultaneously.

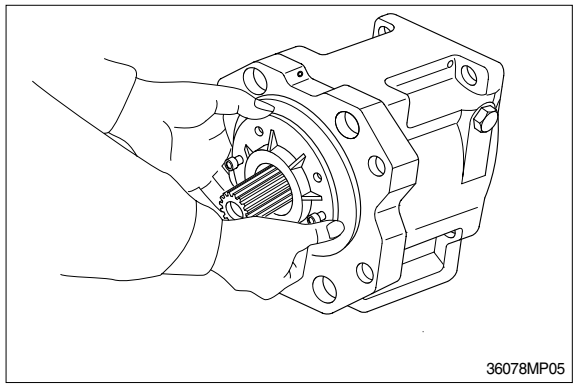
※ Take care not to damage sliding surfaces of cylinder, spherical bushing, shoes, swash plate, etc.



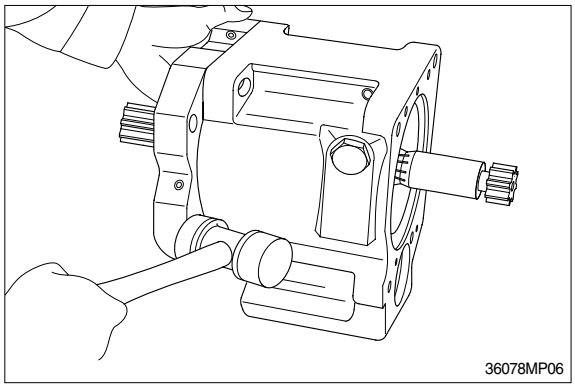
(10) Remove hexagon socket head bolts(406) and then seal cover(F, 261).

※ Fit bolt into pulling-out tapped hole of seal cover(F), and cover can be removed easily.

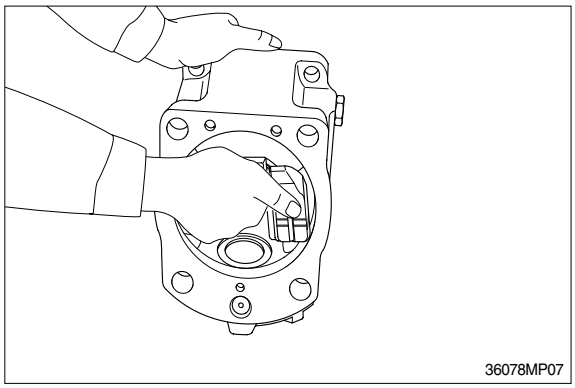
※ Since oil seal is fitted on seal cover(F), take care not to damage it when removing cover.



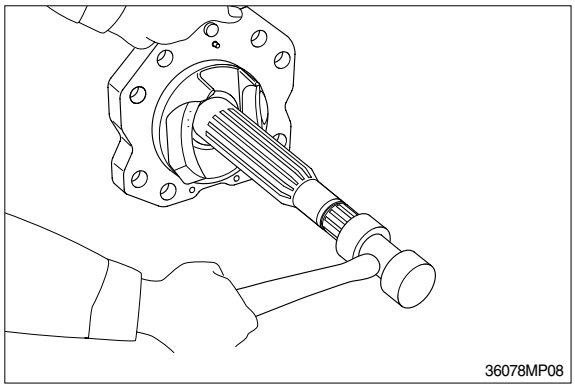
(11) Tapping lightly fitting flange section of swash plate support(251) on its pump casing side, separate swash plate support from pump casing.



(12) Remove shoe plate(211) and swash plate(212) from pump casing(271).

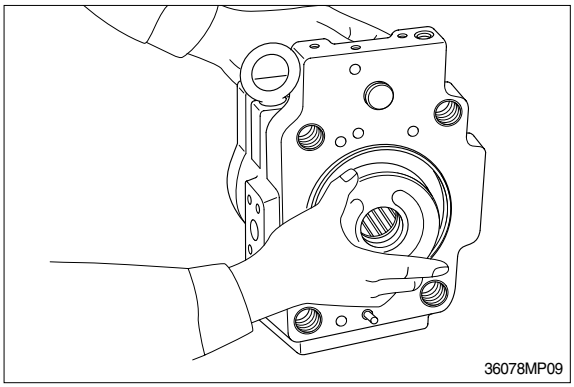


(13) Tapping lightly shaft ends of drive shafts(111, 113) with plastic hammer, take out drive shafts from swash plate supports.



(14) Remove valve plates(313, 314) from valve cover(311, 312).

※ These may be removed in work 7, 9.



(15) If necessary, remove stopper (L, 534), stopper(S, 535), servo piston(532) and tilting pin(531) from pump casing(271), and needle bearing(124) from valve cover(311, 312).

※ In removing tilting pin, use a protector to prevent pin head from being damaged.

※ Since loctite is applied to fitting areas of tilting pin and servo piston, take care not to damage servo piston.

※ Do not remove needle bearing as far as possible, except when it is considered to be out of its life span.

※ Do not loosen hexagon nuts of valve cover and swash plate support.
If loosened, flow setting will be changed.

(16) This is the end of disassembling procedures.

4) ASSEMBLY

(1) For reassembling reverse the disassembling procedures, paying attention to the following items.

① Do not fail to repair the parts damaged during disassembling, and prepare replacement parts in advance.

② Clean each part fully with cleaning oil and dry it with compressed air.

③ Do not fail to apply clean working oil to sliding sections, bearings, etc. before assembling them.

④ In principle, replace seal parts, such as O-rings, oil seals, etc.

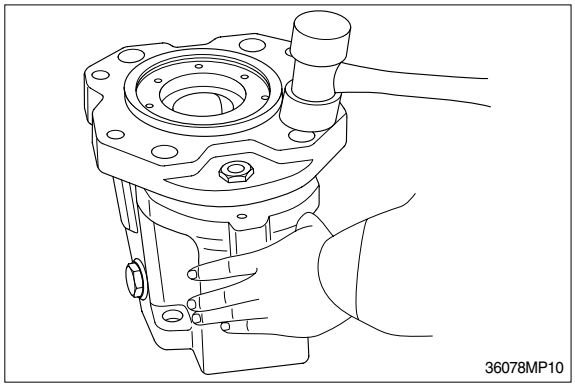
⑤ For fitting bolts, plug, etc., prepare a torque wrench or so on, and tighten them with torques shown in page 8-11, 12.

⑥ For the double-pump, take care not to mix up parts of the front pump with those of the rear pump.

(2) Fit swash plate support(251) to pump casing(271), tapping the former lightly with a hammer.

※ After servo piston, tilting pin, stopper(L) and stopper(S) are removed, fit them soon to pump casing in advance for reassembling.

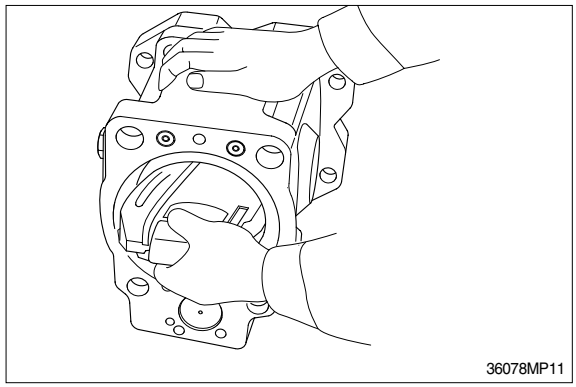
※ In tightening servo piston and tilting pin, use a protector to prevent tilting pin head and feedback pin from being damaged. In addition, apply loctite(Medium strength) to their threaded sections.



(3) Place pump casing with its regulator fitting surface down, fit tilting bush of swash plate to tilting pin(531) and fit swash plate (212) to swash plate support(251) correctly.

※ Confirm with fingers of both hands that swash plate can be removed smoothly.

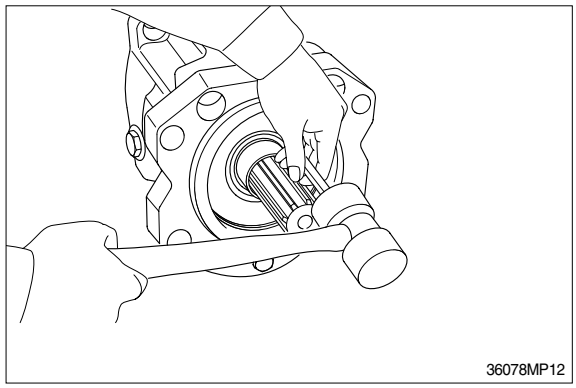
※ Apply grease to sliding sections of swash plate and swash plate support, and drive shaft can be fitted easily.



(4) To swash plate support(251), fit drive shaft(111) set with bearing(123), bearing spacer(127) and snap ring(824).

※ Do not tap drive shaft with hammer or so on.

※ Assemble them into support, tapping outer race of bearing lightly with plastic hammer.
Fit them fully, using steel bar or so on.

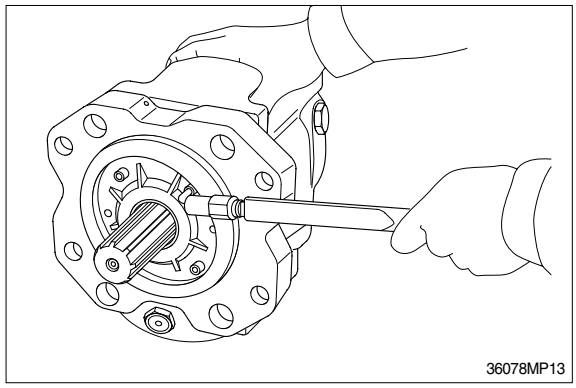


(5) Assemble seal cover(F, 261) to pump casing(271) and fix it with hexagon socket head bolts(406).

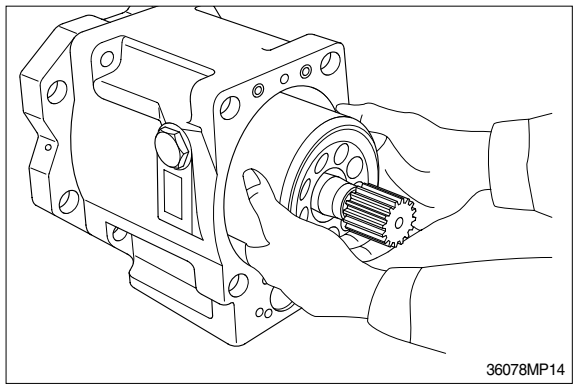
※ Apply grease lightly to oil seal in seal cover(F).

※ Assemble oil seal, taking full care not to damage it.

※ For tandem type pump, fit rear cover(263) and seal cover(262) similarly.

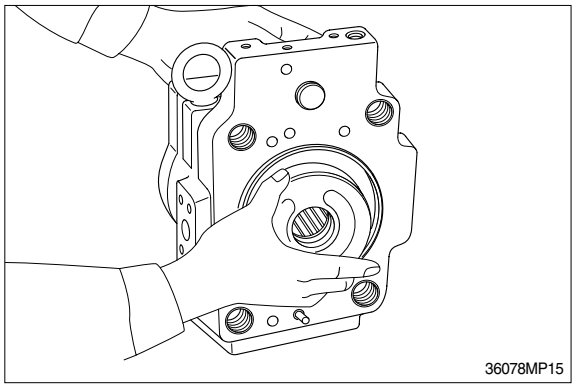


(6) Assemble piston cylinder subassembly 〔cylinder block(012), piston subassembly (151, 152), set plate(153), spherical bushing(156) and cylinder spring (157)〕.
Fit spline phases of retainer and cylinder.
Then, insert piston cylinder subassembly into pump casing(271).



(7) Fit valve plate(313) to valve cover(F, 311), and fit valve plate(314) to valve cover(R, 312), entering pin into pin hole.

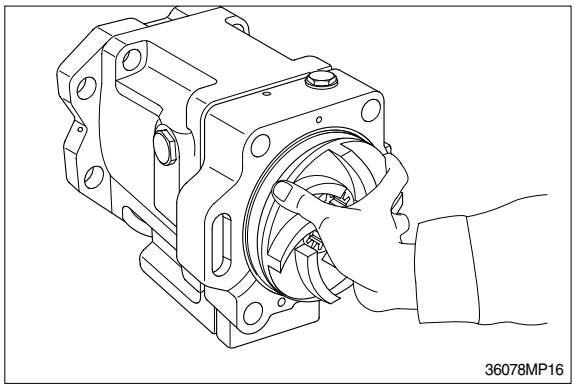
※ Take care not to mistake suction / delivery directions of valve plate.



(8) Fit valve block(R, 312) to pump casing (271) and fit spline coupling(114) and booster(130) to shaft(R, 113).

※ Take care not to mistake direction of valve cover.
Fit valve cover with regulator up and with delivery flange left, viewed from front side.

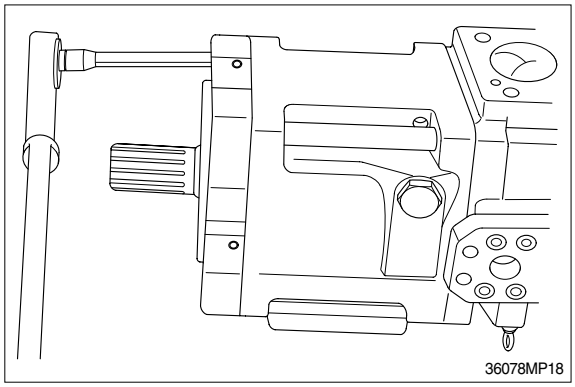
※ Take care not to mistake direction of booster(130).
(Refer to the sectional drawing)



(9) Fit valve cover(F, 311) to valve cover(R) and tighten hexagon socket head bolts(402).

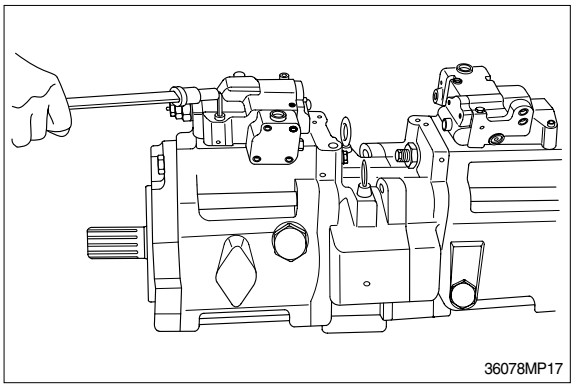
(10) Fit pump casing(271) with shaft(F, 111) to valve cover(F, 311) and tighten hexagon socket head bolts(401).

※ Mate spline phases of shaft(F) and spline coupling, with shaft(F) been rotating.



(11) Putting feedback pin of tilting pin into feedback lever of regulator, fit regulator and tighten hexagon socket head bolts(412,413).

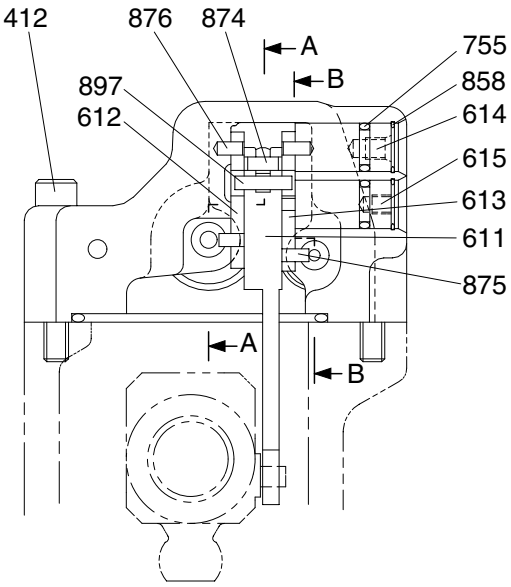
※ Take care not to mistake regulator of front pump for that of rear pump.

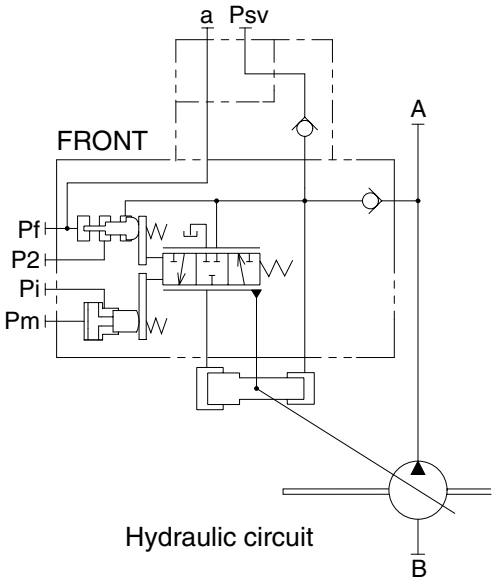


(12) Fit drain port plug(468).

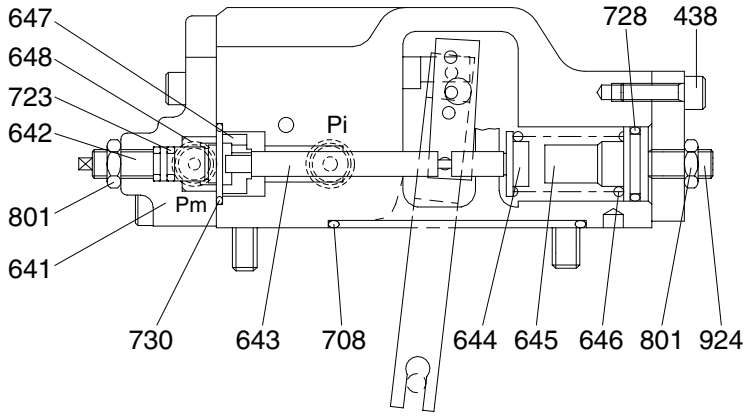
This is the end of reassembling procedures.

5) REGULATOR(1/2)

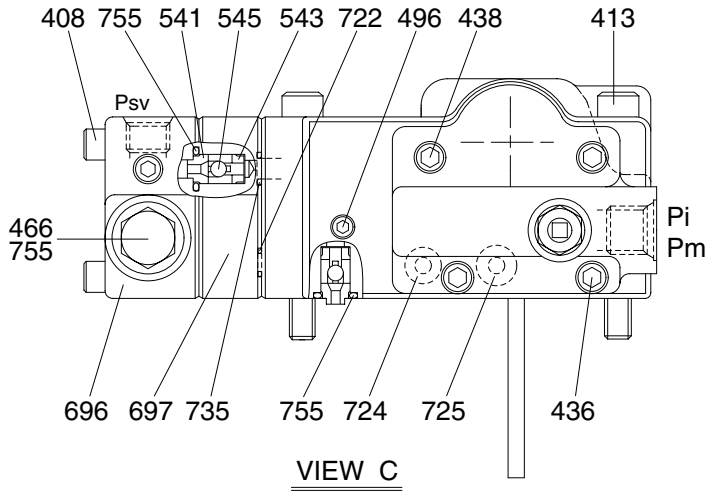




Hydraulic circuit



SECTION B-B

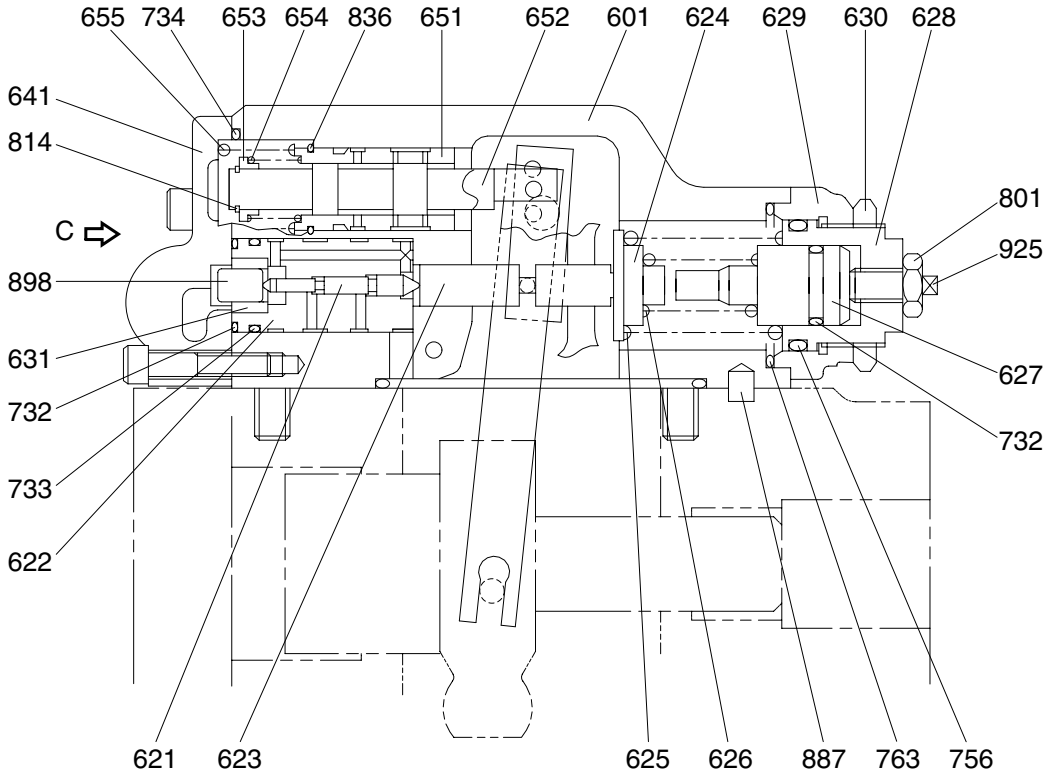


VIEW C

470072RG01

Port	Port name	Port size
Pi	Pilot port	PF 1/4 - 15
Psv	Servo assist port	PF 1/4 - 15
P2	Companion delivery port	-
Pf	Powershift port	-
a	Gauge port	PF 1/4 - 15

REGULATOR(2/2)



SECTION A-A

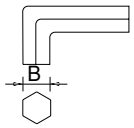
470072RG02

408	Hexagon socket screw	628	Adjust screw(C)	725	O-ring
412	Hexagon socket screw	629	Cover(C)	728	O-ring
413	Hexagon socket screw	630	Lock nut	730	O-ring
436	Hexagon socket screw	631	Sleeve, pf	732	O-ring
438	Hexagon socket screw	641	Pilot cover	733	O-ring
466	Plug	642	Adjust screw(QMC)	734	O-ring
496	Plug	643	Pilot piston	735	O-ring
541	Seat	644	Spring seat(Q)	755	O-ring
543	Stopper	645	Adjust stem(Q)	756	O-ring
545	Steel ball	646	Pilot spring	763	O-ring
601	Casing	647	Stopper	801	Nut
611	Feed back lever	648	Piston(QMC)	814	Snap ring
612	Lever(1)	651	Sleeve	836	Snap ring
613	Lever(2)	652	Spool(A)	858	Snap ring
614	Center plug	653	Spring seat	874	Spring pin
615	Adjust plug	654	Return spring	875	Pin
621	Compensator piston	655	Set spring	876	Pin
622	Piston case	696	Port cover	878	Pin
623	Compensator rod	697	Check valve plate	887	Pin
624	Spring seat(C)	708	O-ring	897	Pin
625	Outer spring	722	O-ring	898	Pin
626	Inner spring	723	O-ring	924	Set screw
627	Adjust stem(C)	724	O-ring	925	Adjust screw(QI)

6) TOOLS AND TIGHTENING TORQUE

(1) Tools

The tools necessary to disassemble/reassemble the pump are shown in the follow list.

<table>
<tr><td colspan="2">Tool name & size</td><td colspan="5">Part name</td></tr>
<tr><td>Name</td><td>B</td><td>Hexagon socket head bolt</td><td>PT plug (PT thread)</td><td>PO plug (PF thread)</td><td colspan="2">Hexagon socket head setscrew</td></tr>
<tr><td rowspan="3">Allen wrench  </td><td>4</td><td>M 5</td><td>BP-1/16</td><td>-</td><td colspan="2">M 8</td></tr>
<tr><td>5</td><td>M 6</td><td>BP-1/8</td><td>-</td><td colspan="2">M10</td></tr>
<tr><td>6</td><td>M 8</td><td>BP-1/4</td><td>PO-1/4</td><td colspan="2">M12, M14</td></tr>
<tr><td rowspan="2">Double ring spanner, socket wrench, double(Single) open end spanner  </td><td>-</td><td colspan="2">Hexagon head bolt</td><td colspan="2">Hexagon nut</td><td>VP plug (PF thread)</td></tr>
<tr><td>6</td><td colspan="2">M 8</td><td colspan="2">M 8</td><td>-</td></tr>
<tr><td colspan="2">Adjustable angle wrench</td><td colspan="5">Small size, Max 36㎜</td></tr>
<tr><td colspan="2">Screw driver</td><td colspan="5">Minus type screw driver, Medium size, 2 sets</td></tr>
<tr><td colspan="2">Hammer</td><td colspan="5">Plastic hammer, 1 set</td></tr>
<tr><td colspan="2">Pliers</td><td colspan="5">For snap ring, TSR-160</td></tr>
<tr><td colspan="2">Steel bar</td><td colspan="5">4×100㎜</td></tr>
<tr><td colspan="2">Torque wrench</td><td colspan="5">Capable of tightening with the specified torques</td></tr>
<tr><td colspan="2">Pincers</td><td colspan="5">-</td></tr>
<tr><td colspan="2">Bolt</td><td colspan="5">M4, Length : 50㎜</td></tr>
</table>

(2) Tightening torque

Part name	Bolt size	Torque		Wrench size	
		kgf · m	lbf · ft	in	mm
Hexagon socket head bolt Material : SCM435)	M 5	0.7	5.1	0.16	4
	M 6	1.2	8.7	0.20	5
	M 8	3.0	21.7	0.24	6
	M10	5.8	42.0	0.31	8
	M12	10.0	72.3	0.39	10
	M14	16.0	116	0.47	12
	M16	24.0	174	0.55	14
	M18	34.0	246	0.55	14
	M20	44.0	318	0.67	17
PT Plut(Materal : S45C) ※Wind a seal tape 1 1/2 to 2 turns round the plug	PT1/16	0.7	5.1	0.16	4
	PT 1/8	1.05	7.59	0.20	5
	PT 1/4	1.75	12.7	0.24	6
	PT 3/8	3.5	25.3	0.31	8
	PT 1/2	5.0	36.2	0.39	10
PF Plut(Materal : S35C)	PF 1/4	3.0	21.7	0.24	6
	PF 1/2	10.0	72.3	0.39	10
	PF 3/4	15.0	109	0.55	14
	PF 1	19.0	137	0.67	17
	PF 1 1/4	27.0	195	0.67	17
	PF 1 1/2	28.0	203	0.67	17

3) DISASSEMBLY

Since the regulator consists of small precision finished parts, disassembly and assembly are rather complicated.

For this reason, replacement of a regulator assembly is recommended, unless there is a special reason, but in case disassembly is necessary for an unavoidable reason, read through this manual to the end before starting disassembly.

(1) Choose a place for disassembly.

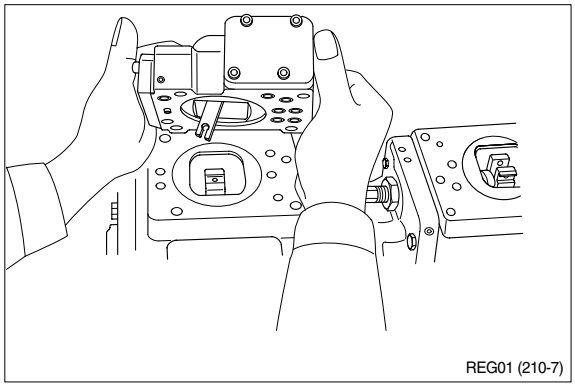
※ Choose a clean place.

※ Spread rubber sheet, cloth, or so on on top of work-bench to prevent parts from being damaged.

(2) Remove dust, rust, etc. from surfaces of regulator with clean oil.

(3) Remove hexagon socket head screw (412, 413) and remove regulator main body from pump main body.

※ Take care not to lose O-ring.



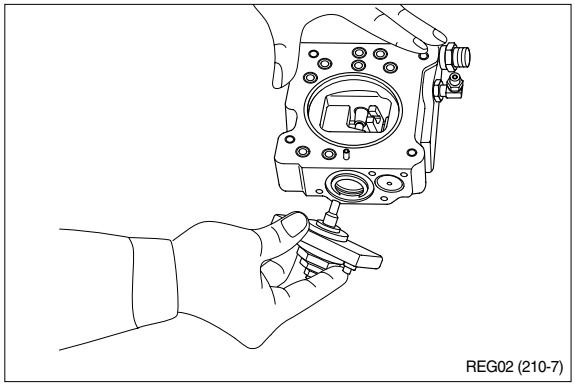
REG01 (210-7)

(4) Remove hexagon socket head screw (438) and remove cover(C,629)

※ Cover(C) is fitted with adjusting screw (C,QI) (628, 925), adjusting ring(C, 627), lock nut(630), hexagon nut(801) and adjusting screw(924).

Do not loosen these screws and nuts.

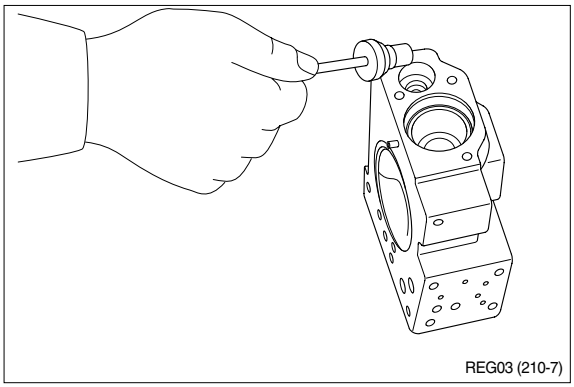
If they are loosened, adjusted pressure-flow setting will vary.



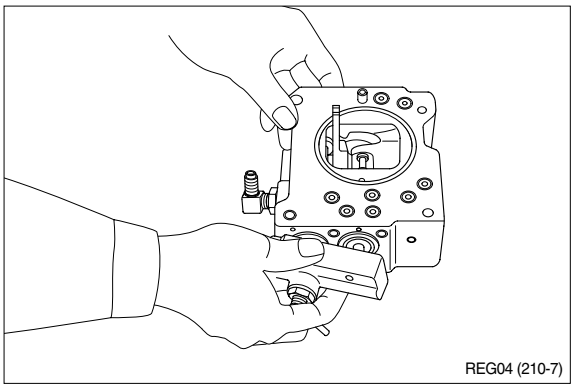
REG02 (210-7)

(5) After removing cover(C, 629) subassembly, take out outer spring(625), inner spring (626) and spring seat(C, 624) from compensating section.
Then draw out adjusting ring(Q, 645), pilot spring(646) and spring seat(644) from pilot section.

※ Adjusting ring(Q,645) can easily be drawn out with M4 bolt.


REG03 (210-7)

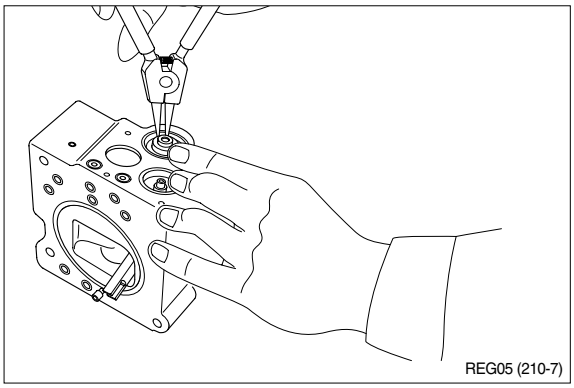
(6) Remove hexagon socket head screws (436, 438) and remove pilot cover(641).
After removing pilot cover, take out set spring(655) from pilot section.


REG04 (210-7)

(7) Remove snap ring(814) and take out spring seat(653), return spring(654) and sleeve(651).

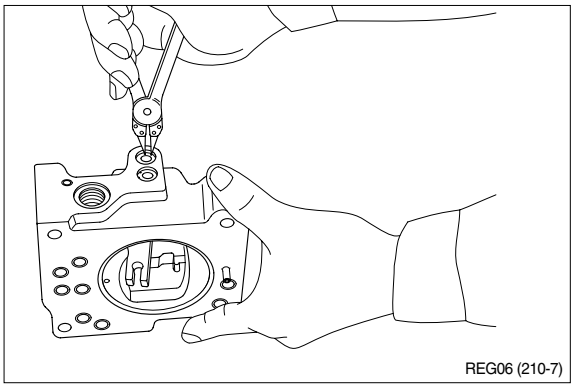
※ Sleeve(651) is fitted with snap ring(836).

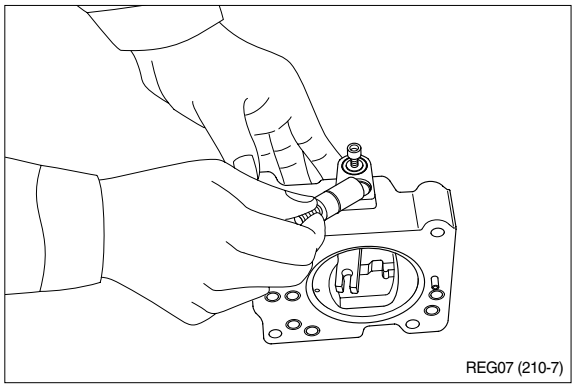
※ When removing snap ring(814), return spring(654) may pop out.
Take care not to lose it.


REG05 (210-7)

(8) Remove locking ring(858) and take out fulcrum plug(614) and adjusting plug (615).

※ Fulcrum plug(614) and adjusting plug (615) can easily be taken out with M6 bolt.

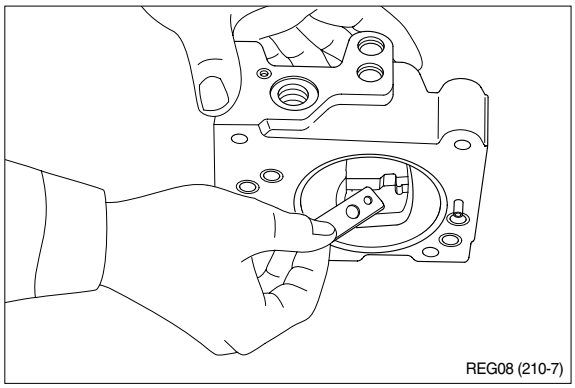

REG06 (210-7)



REG07 (210-7)

(9) Remove lever(2, 613). Do not draw out pin(875).

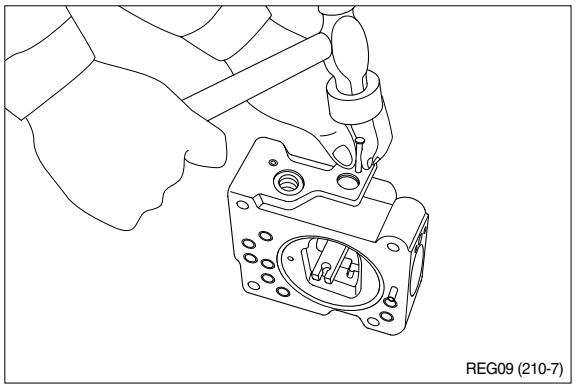
※ Work will be promoted by using pincers or so on.



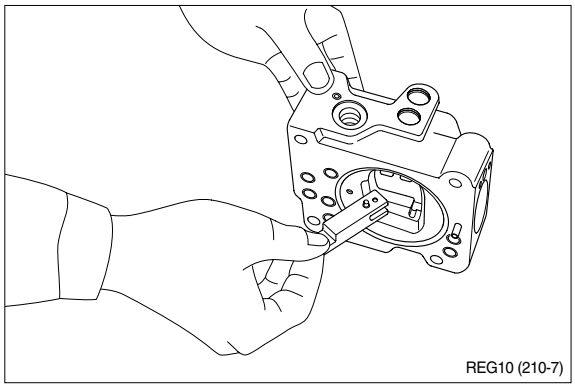
REG08 (210-7)

(10) Draw out pin(874) and remove feedback lever(611).

Push out pin(874, 4㎜ in dia.) from above with slender steel bar so that it may not interfere with lever(1, 612).



REG09 (210-7)



REG10 (210-7)

(11) Remove lever(1, 612). Do not draw out pin(875).

(12) Draw out pilot piston(643) and spool(652).

(13) Draw out piston case(622), compensating piston(621) and compensating rod(623).

※ Piston case(622) can be taken out by pushing compensating rod(623) at opposite side of piston case.

This completes disassembly.

4) ASSEMBLY

(1) For assembly, reverse disassembly procedures, but pay attention to the following items.

① Always repair parts that were scored at disassembly.

② Get replacement parts ready beforehand.

Mixing of foreign matter will cause malfunction.

Therefore, wash parts well with cleaning oil, let them dry with jet air and handle

③ them in clean place.

Always tighten bolts, plugs, etc. to their

④ specified torques.

Do not fail to coat sliding surfaces with

⑤ clean hydraulic oil before assembly.

Replace seals such as O-ring with new ones as a rule.

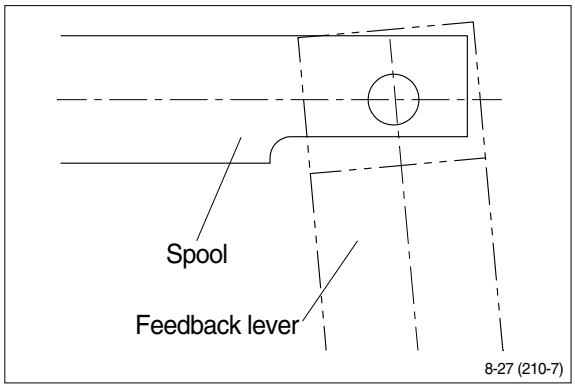
(2) Put compensating rod(623) into compensating hole of casing(601).

(3) Put pin force-fitted in lever(1, 612) into groove of compensating rod and fit lever (1) to pin force-fitted in casing.

(4) Fit spool(652) and sleeve(651) into hole in spool of casing.

※ Confirm that spool and sleeve slide smoothly in casing without binding.

※ Pay attention to orientation of spool.

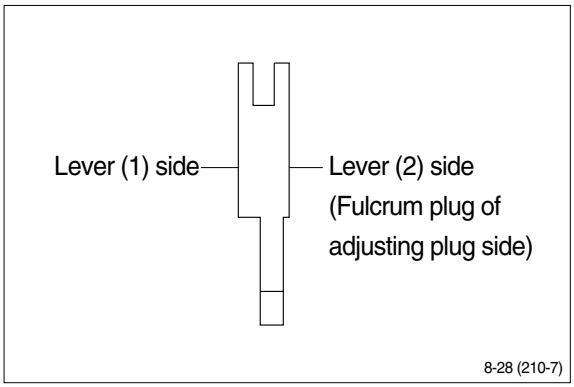


8-27 (210-7)

(5) Fit feedback lever(611), matching its pin hole with pin hole in spool.
Then insert pin(874).

※ Insert pin in feedback lever a little to ease operation.

※ Take care not to mistake direction of feedback lever.

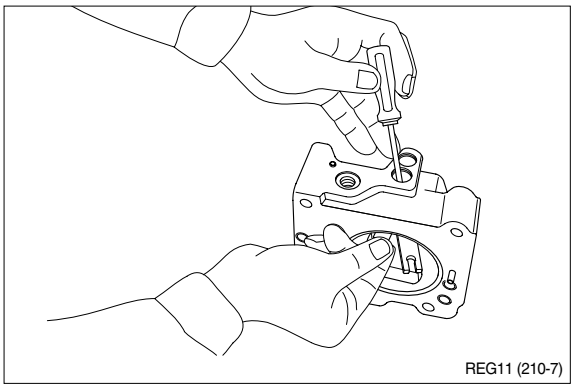


8-28 (210-7)

(6) Put pilot piston(643) into pilot hole of casing.

※ Confirm that pilot piston slides smoothly without binding.

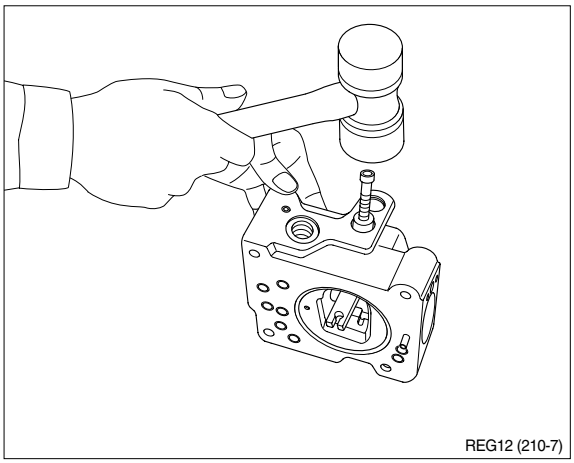
(7) Put pin force-fitted in lever(2, 613) into groove of pilot piston.
Then fix lever(2).


REG11 (210-7)

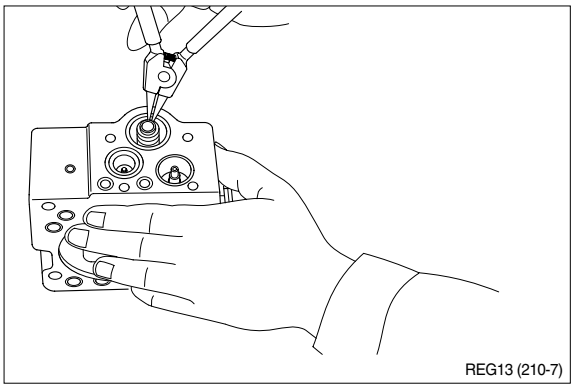
(8) Fit fulcrum plug(614) so that pin force-fitted in fulcrum plug(614) can be put into pin hole of lever(2).
Then fix locking ring(858).

(9) Insert adjusting plug(615) and fit locking ring.

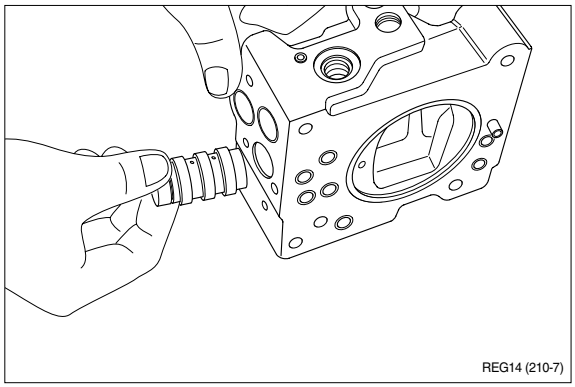
※ Take care not to mistake inserting holes for fulcrum plug and adjusting plug.
At this point in time move feedback lever to confirm that it has no large play and is free from binding.


REG12 (210-7)

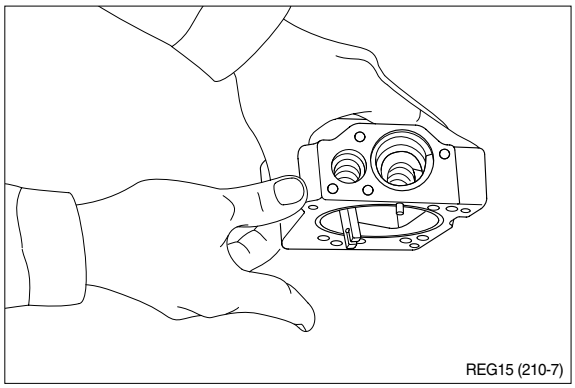
(10) Fit return spring(654) and spring seat (653) into spool hole and attach snap ring (814).


REG13 (210-7)

(11) Fit set spring(655) to spool hole and put compensating piston(621) and piston case(622) into compensating hole.
Fit pilot cover(641) and tighten it with hexagonal socket head screws(436, 438).

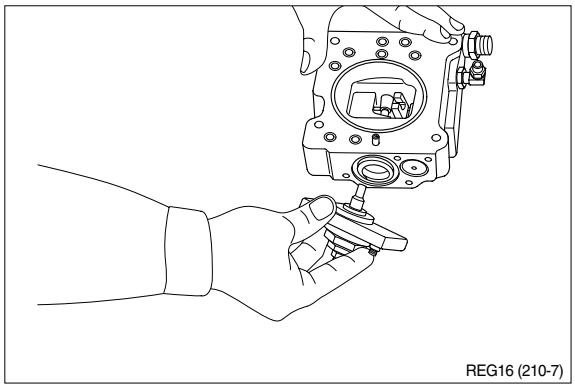

REG14 (210-7)

(12) Put spring seat(644), pilot spring(646) and adjusting ring(Q, 645) into pilot hole.
Then fix spring seat(624), inner spring (626) and outer spring(625) into compensating hole.
※ When fitting spring seat, take care not to mistake direction of spring seat.


REG15 (210-7)

(13) Install cover(C, 629) fitted with adjusting screws(628, 925), adjusting ring(C, 627), lock nut(630), hexagon nut(801) and adjusting screw(924).
Then tighten them with hexagonal socket head screws(438).

This completes assembly.


REG16 (210-7)

GROUP 4 MAIN CONTROL VALVE

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) Remove bolts and disconnect pipe.

(5) Disconnect pilot line hoses.

(6) Disconnect pilot piping.

(7) Sling the control valve assembly and remove the control valve mounting bolt.
- Weight : 420kg(930lb)

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

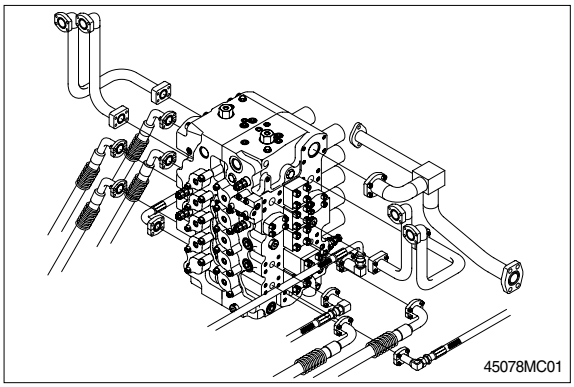
2) INSTALL

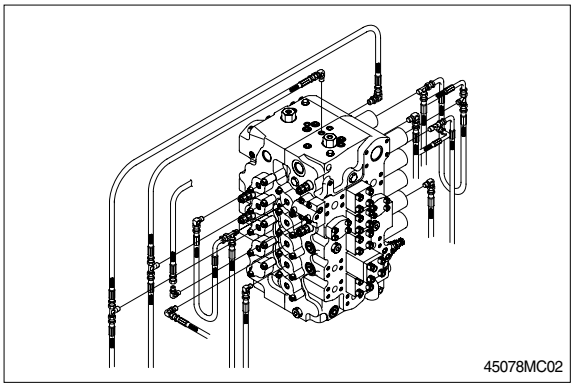
(1) Carry out installation in the reverse order to removal.

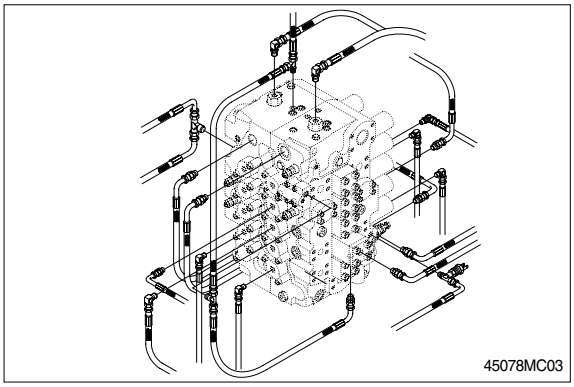
(2) Bleed the air from below items.
① Cylinder(Boom, arm, bucket)
② Swing motor
③ Travel motor
※ See each item removal and install.

(3) Confirm the hydraulic oil level and recheck the hydraulic oil leak or not.

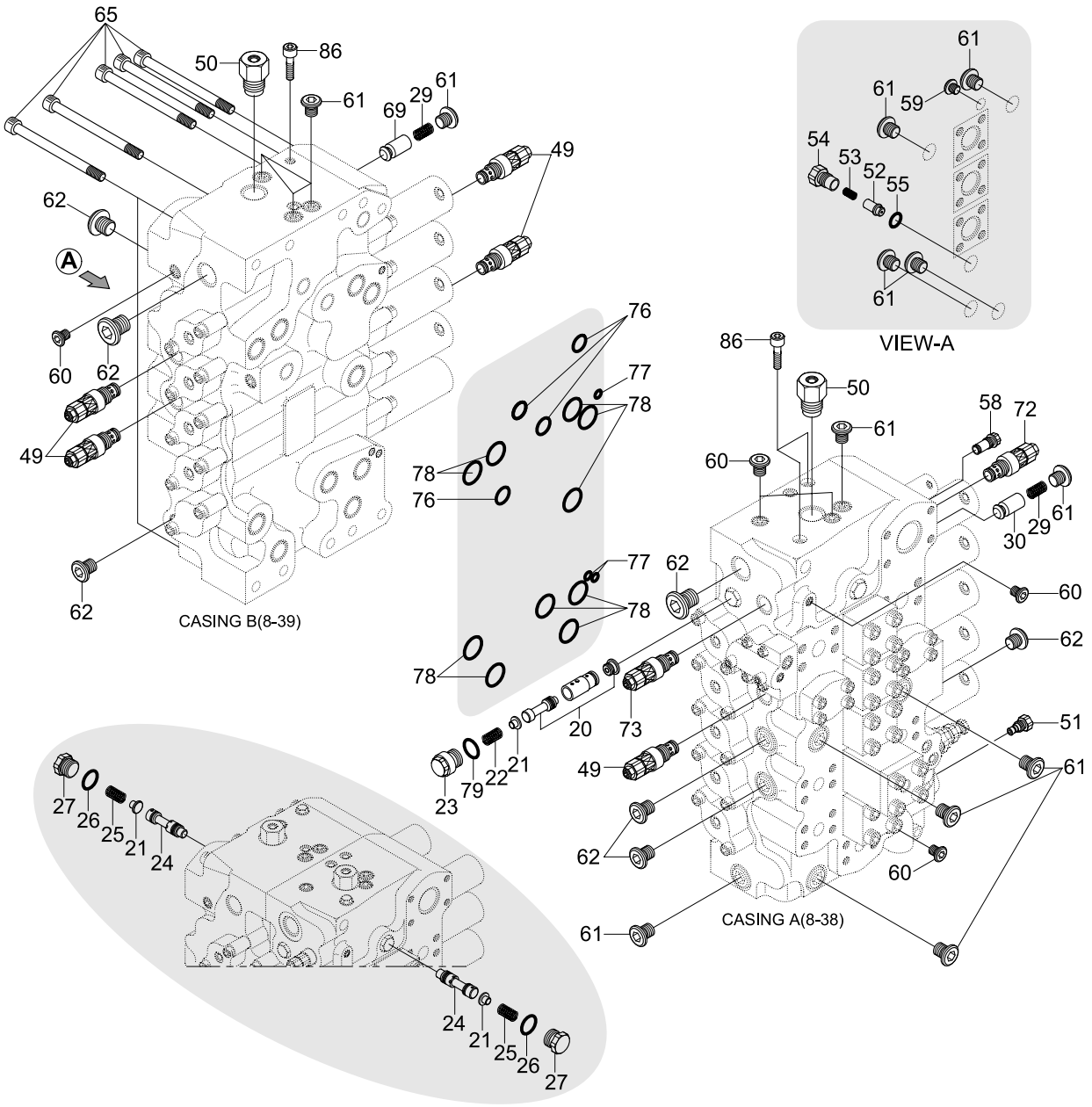

13031GE18


45078MC01


45078MC02

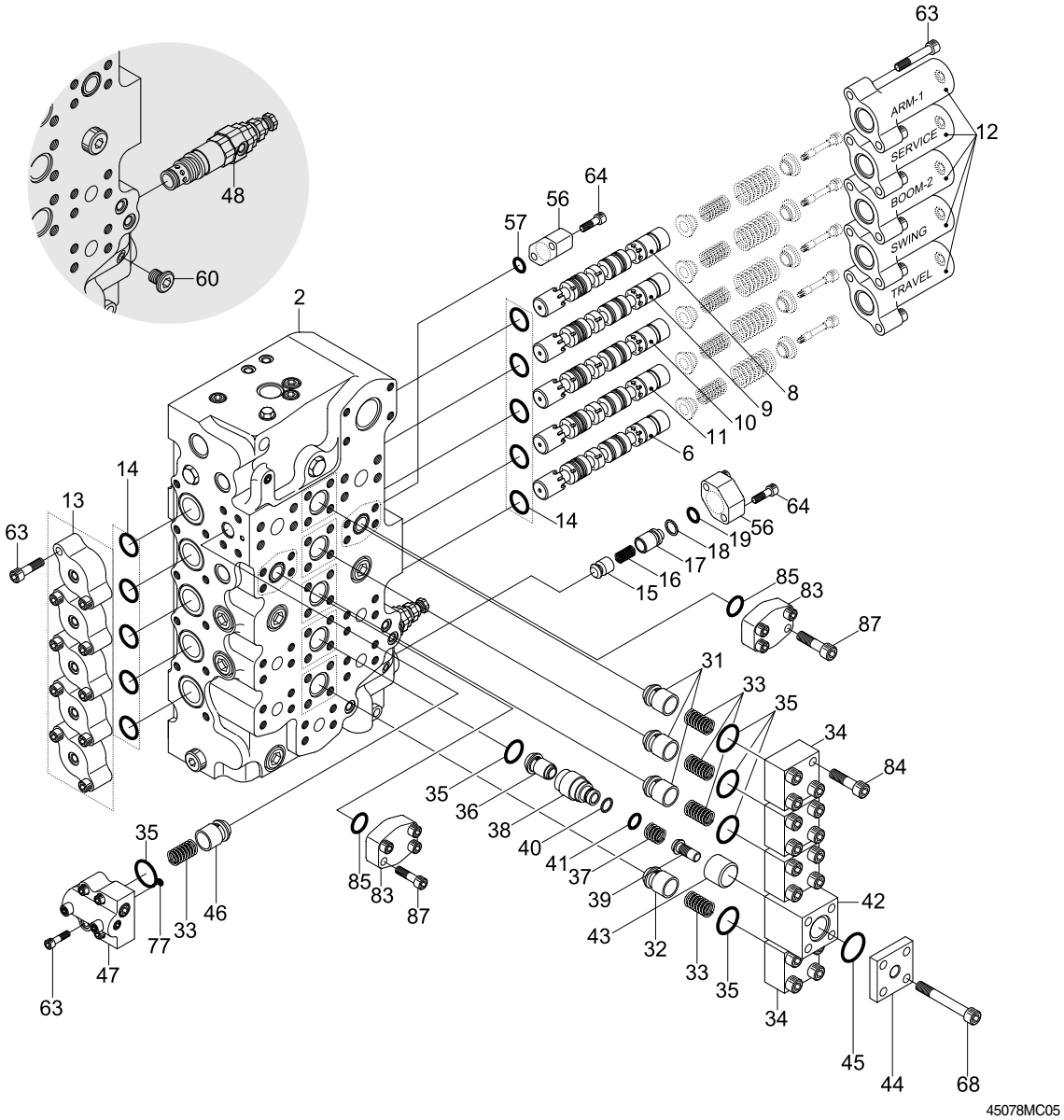

45078MC03

2. STRUCTURE(1/3)



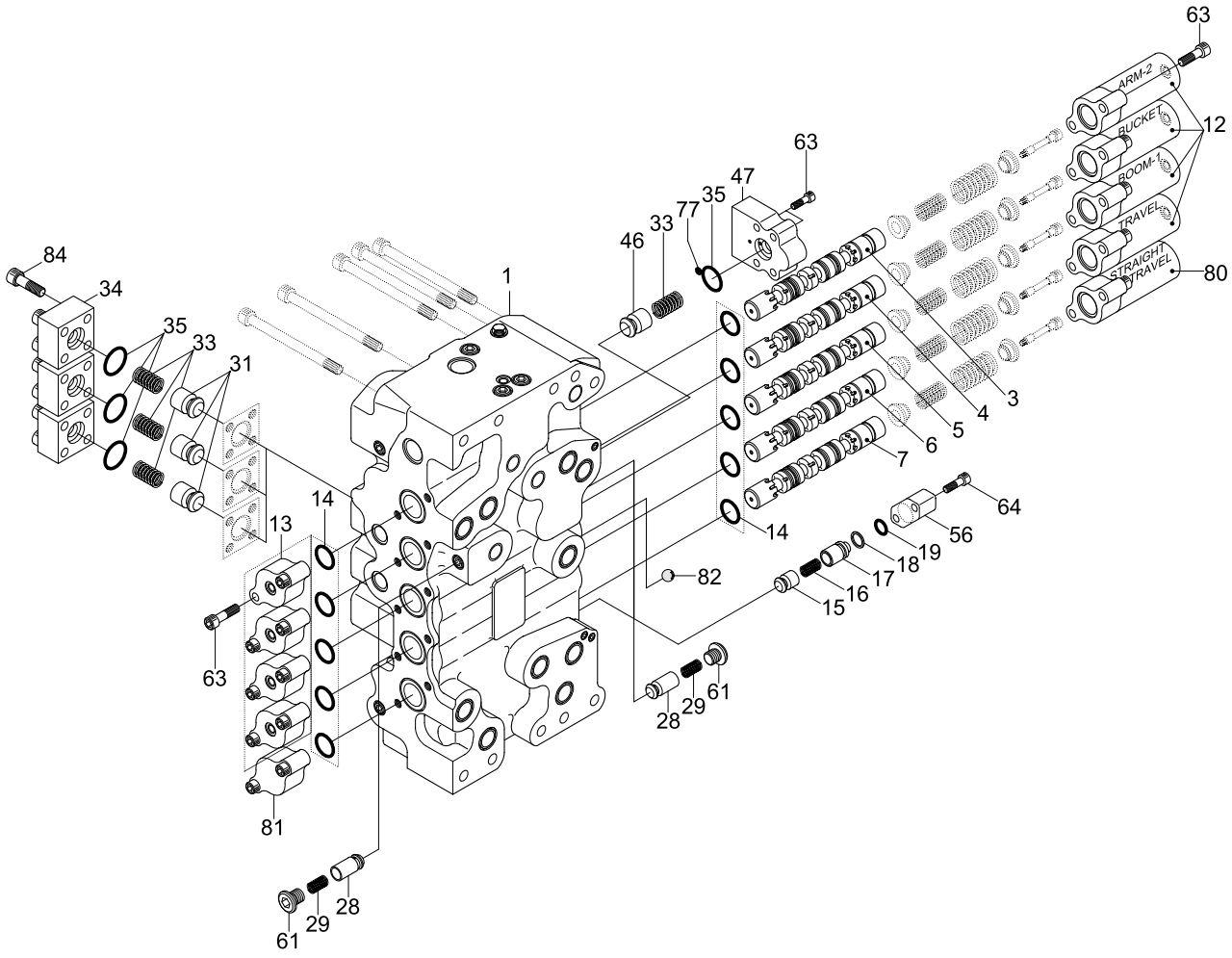
20	Spool assy	50	Relief valve assy	62	Plug assy
21	Spring seat	51	Plug assy	65	Bolt
22	Spring	52	Poppet	69	Poppet
23	Plug	53	Spring	72	Relief valve kit
24	Spool assy	54	Plug	73	Relief valve kit
25	Spring	55	O-ring	76	O-ring
26	O-ring	58	Plug assy	77	O-ring
27	Plug	59	Plug assy	78	O-ring
29	Spring	60	Plug assy	79	O-ring
30	Poppet	61	Plug assy	86	Socket head bolt
49	Relief valve kit				

STRUCTURE(2/3)



2	Housing	32	Poppet	46	Poppet
6	Spool assy	33	Spring	47	Body assy
8	Spool assy	34	Flange	48	Relief valve assy
9	Spool assy	35	O-ring	56	Flange
10	Spool assy	36	Poppet assy	57	O-ring
11	Spool assy	37	Spring	60	Plug assy
12	Cap	38	Sleeve	63	Bolt
13	Cap	39	Piston	64	Bolt
14	O-ring	40	O-ring	68	Bolt
15	Poppet	41	Back up ring	77	O-ring
16	Spring	42	Body	83	Flange
17	Spacer	43	Piston	84	Bolt
18	O-ring	44	Flange	85	O-ring
19	Back up ring	45	O-ring	87	Bolt
31	Poppet				

STRUCTURE(3/3)

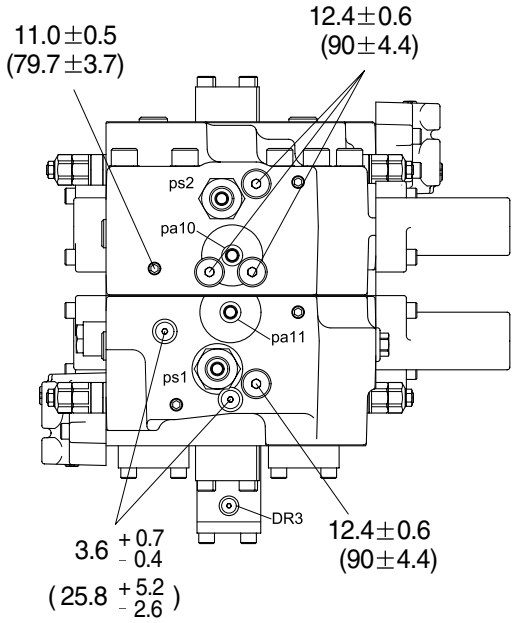


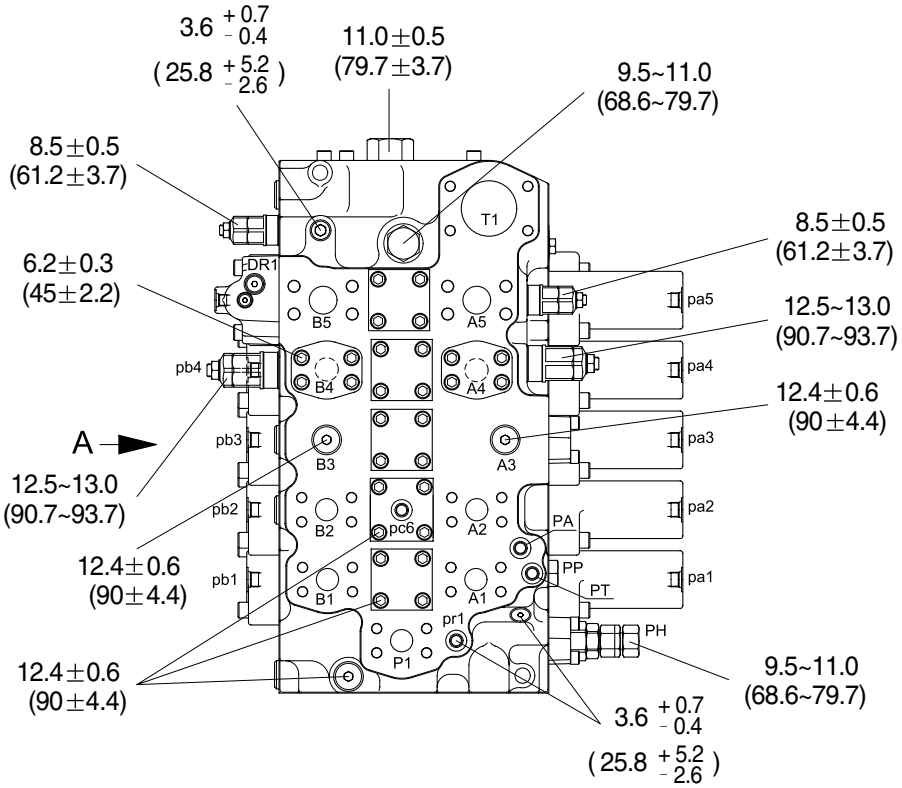
45078MC06

1	Housing	17	Spacer	47	Body assy
3	Spool assy	18	O-ring	56	Flange
4	Spool assy	19	Back up ring	61	Plug assy
5	Spool assy	28	Poppet	63	Bolt
6	Spool assy	29	Spring	64	Bolt
7	Spool assy	31	Poppet	77	O-ring
12	Cap	33	Spring	80	Cap
13	Cap	34	Flange	81	Cap
14	O-ring	35	O-ring	82	Steel ball
15	Poppet	46	Poppet	84	Bolt
16	Spring				

3. TIGHTENING TORQUE(1/2)

※ **Unit : kgf · m (lbf · ft)**

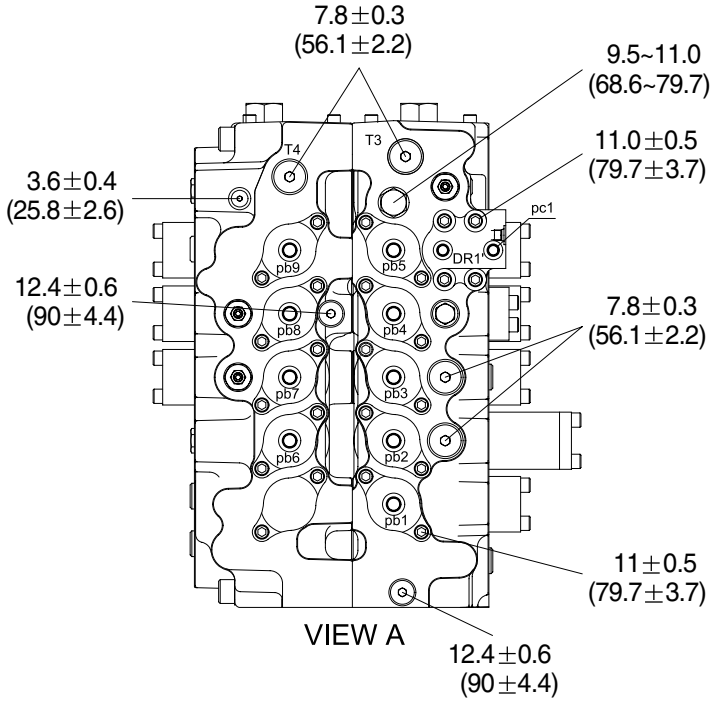


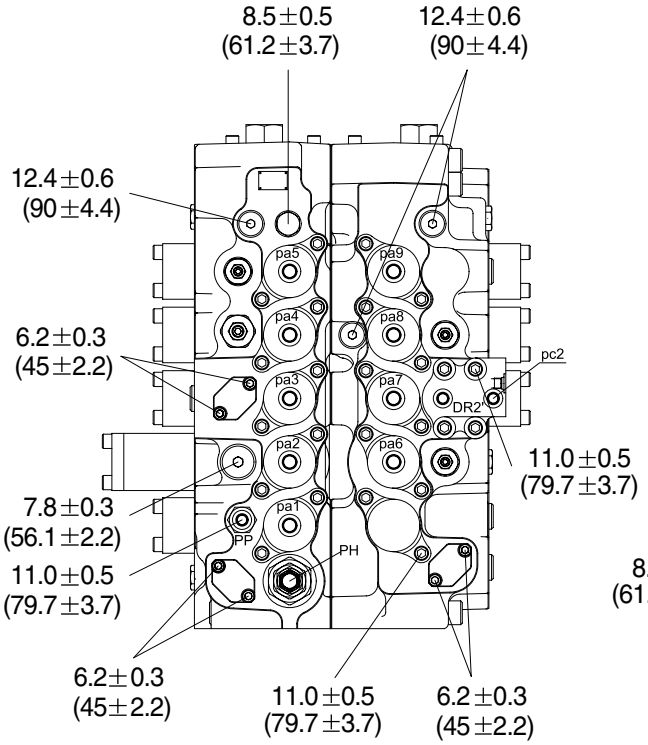


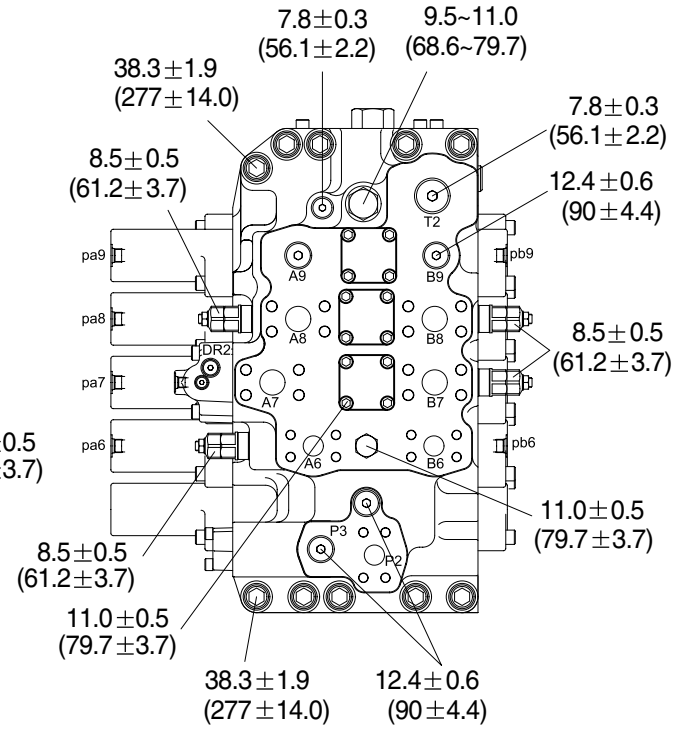
45078MC00

TIGHTENING TORQUE(2/2)

※ **Unit : kgf · m (lbf · ft)**







45078MC30

4. DISASSEMBLY AND ASSEMBLY

1) GENERAL PRECAUTIONS

(1) All hydraulic components are manufactured to a high precision. Consequently, before disassembling and assembling them, it is essential to select an especially clean place.

(2) In handling a control valve, pay full attention to prevent dust, sand, etc. from entering into it.

(3) When a control valve is to be remove from the machine, apply caps and masking seals to all ports. Before disassembling the valve, recheck that these caps and masking seals are fitted completely, and then clean the outside of the assembly. Use a proper bench for working. Spread paper or a rubber mat on the bench, and disassemble the valve on it.

(4) Support the body section carefully when carrying or transferring the control valve. Do not lift by the exposed spool, end cover section etc.

(5) After disassembling and assembling of the component it is desired to carry out various tests(For the relief characteristics, leakage, flow resistance, etc.), but hydraulic test equipment is necessary for these tests. Therefore, even when its disassembling can be carried out technically, do not disassemble such components that cannot be tested, adjusted, and so on. Additionally one should always prepare clean cleaning oil, hydraulic oil, grease, etc. beforehand.

2) DISASSEMBLY

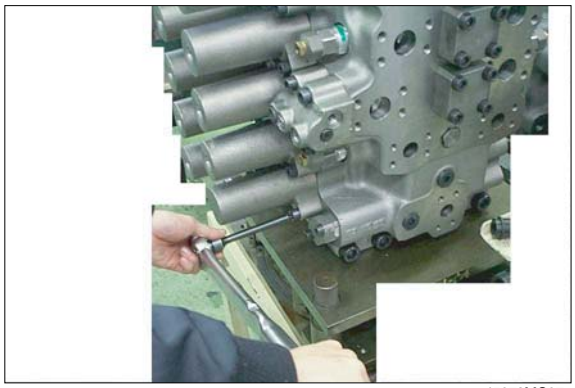
The figure in ( ) shown after the part name in explanation sentence shows its number in the construction figures.

(1) Place control valve on working bench.

※ Disassemble the valve in a clean and dry environment and pay careful attention not to damage the sealing flange faces.

(2) Main spool

① Loosen socket head bolts(63) and remove the lock cap(12, 80).
Pull out O-ring(14) from valve housing.



45078MC07

② Remove all spool(3~11) of subassembly itself from valve housing.

※ Be careful not to be damaged while pulling out spools. Identify them with a tag to prevent from being mistaken at disassembly.

45078MC08

③ Spools sub assy(3, 4, 6, 7, 9, 10, 11).

45078MC10

④ Spool sub assy(5).

45078MC11

⑤ Spool sub assy(8).

※ When disassemble the spool assembly, fix the spool with vise. On this occasion attach wood between vise blades to prevent the spool from damaging.

※ Heat the outer race of spool with industrial drier and then loosen easily . (Temperature : 200~250℃)

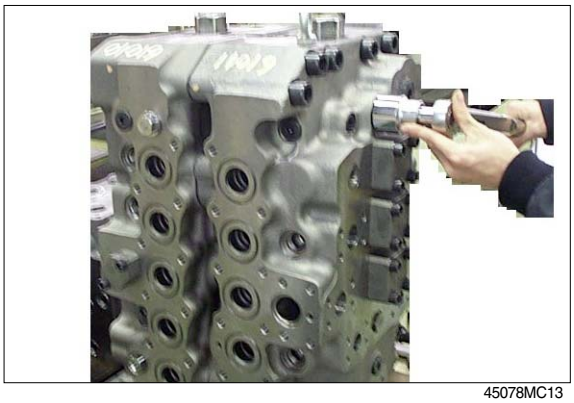
45078MC12

⑥ Loosen the socket head bolt(63) and remove the short cap(13, 81).
Pull out O-ring(14) from valve housing.

45078MC09

(3) Center bypass cut spool assy(24)

① Loosen the plug(27) and remove spring(25), spring seat(21) and the spool(24).

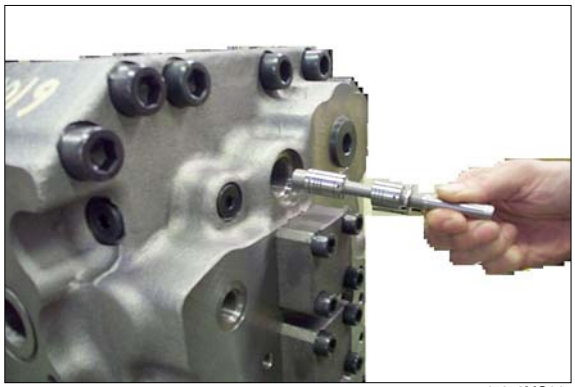


45078MC13

② Pull out O-ring(20).

※ When disassemble the spool assembly, fix the spool with vise. On this occasion attach wood between vise blades to prevent the spool from damaging.

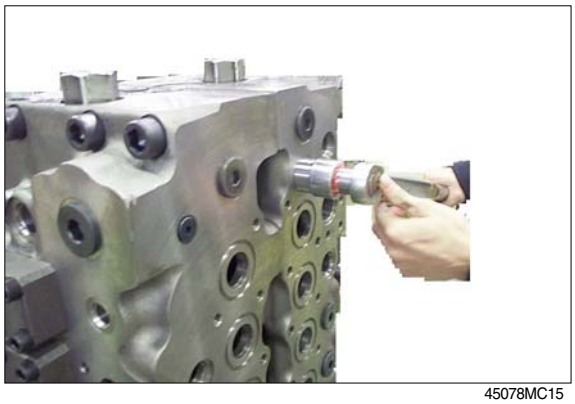
※ Heat the outer race of spool with industrial drier and then loosen easily . (Temperature : 200~250°C)



45078MC14

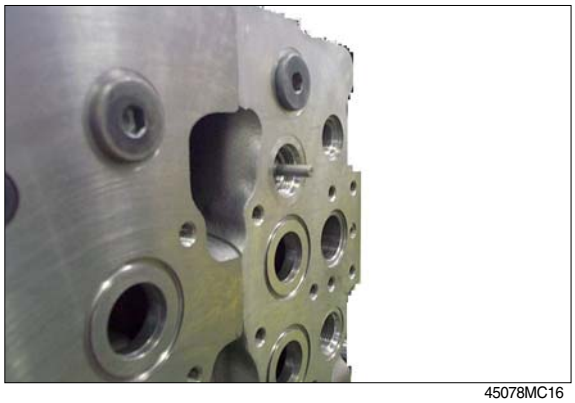
(4) Arm1 regeneration spool assy(20)

① Loosen the plug(23) and pull out O-ring(79).



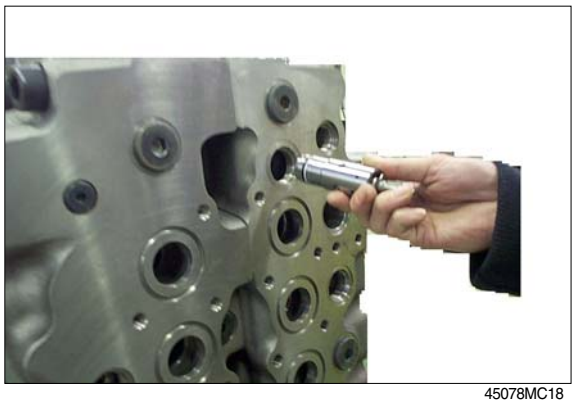
45078MC15

② Disassemble spring(22), spring seat(21) and spool(20).



45078MC16

③ Pull out sleeve of hole inside at same time, disassemble sleeve and piston.



45078MC18

(5) Inspection after disassembly

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

① Control valve

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

② Relief valve

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

3) ASSEMBLY

(1) General comments

① In this assembly section, explanation only is shown.
For further understanding, please refer to the figures and photographs shown in the previous disassembly section.

② Figure in ( ) shown after the part name in the explanation refers to the reference identity number shown on the construction figure shown in the spares section.

③ **Cautions in assembling seal**

a. Pay close attention to keeping all seals free from handling damage and inspect carefully for damage before using them.

b. Apply clean grease or hydraulic oil to the seal so as to ensure it is fully lubricated before assembly.

c. Do not stretch seals so much as to deform them permanently.

d. In fitting O-rings, pay close attention not to roll them into their final position in addition, a twisted O-ring cannot easily untwist itself naturally and could thereby cause inadequate sealing and thereby both internal and external oil leakage.

e. Tighten fitting bolts for all sections with a torque wrench adjusted to the respective tightening torque as shown on the corss section drawings of the spares section.

(2) Main spool

① Apply loctite to thread of spools(3, 4, 6, 7, 9, 10, 11) and assemble spring seat, spring and spool end. Assemble spool end to spool after fixing spool with a vise attached wood.

※ Be careful not to applying loctite too much.

· Tightening torque : 2.4 ~ 2.6 kgf · m(17.4 ~ 18.8lbf · ft)

Fit O-ring into housing and assemble spools(3, 4, 6, 7, 9, 10, 11) into housing.

Assemble lock cap on housing and tighten hex socket bolt.

· Tightening torque : 11 ±0.5 kgf · m(79.7 ±3.7lbf · ft)

② Insert poppet, spring into spool(5) and then apply loctite to thread of spool.

Fit O-ring and backup ring on the plug and then tighten plug.

Assemble spring seat, spring, and spool end and then assemble spool end sub assy to spool after fixing spool with a vise attached wood.

· Tightening torque : 2.4 ~ 2.6 kgf · m(17.4 ~ 18.8lbf · ft)

Fit O-ring into housing and assemble spool(5) into housing.

Assemble lock cap on housing and tighten hex socket bolt.

· Tightening torque : 11 ±0.5 kgf · m(79.7 ±3.7lbf · ft)

③ Insert poppet, spring into spool(8) and then apply loctite to thread for spool.

Fit O-ring and backup ring on the plug and then tighten plug.

Assemble spring seat, spring, and spool end and then assemble spool end sub assy to spool after fixing spool with a vise attached wood.

· Tightening torque : 2.4 ~ 2.6 kgf · m(17.4 ~ 18.8lbf · ft)

Fit O-ring into housing and assemble spool(8) into housing.

Assemble lock cap on housing and tighten hex socket bolt.

· Tightening torque : 11 ±0.5 kgf · m(79.7 ±3.7lbf · ft)

④ Assemble short cap on housing and tighten hex socket bolt.

· Tightening torque : 11 ±0.5 kgf · m(79.7 ±3.7lbf · ft)

(3) Center bypass cut spool assy(24)

① Apply loctite to thread of spool, assemble spool end to spool.
※ Be careful not to appling loctite too much.
② Assemble spool assy, spring seat, spring and tighten plug with O-ring.
· Tightening torque : 9.5 ~ 11.0 kgf · m(68.6 ~ 79.7lbf · ft)

(4) Arm1 regeneration spool assy(20)

① Assemble backup rings and O-rings to sleeve respectively.
② Assemble piston to sleeve which seal is assemble, and insert spool into sleeve.
③ Assemble spool assy, spring seat, spring and tighten plug with O-ring.
· Tightening torque : 9.5 ~ 11.0 kgf · m(68.6 ~ 79.7lbf · ft)

GROUP 5 SWING DEVICE (TYPE 1)

1. REMOVAL AND INSTALL OF MOTOR

1) REMOVAL

(1) Lower the work equipment to the ground and stop the engine.

(2) Loosen the breather slowly to release the pressure inside the hydraulic tank.

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

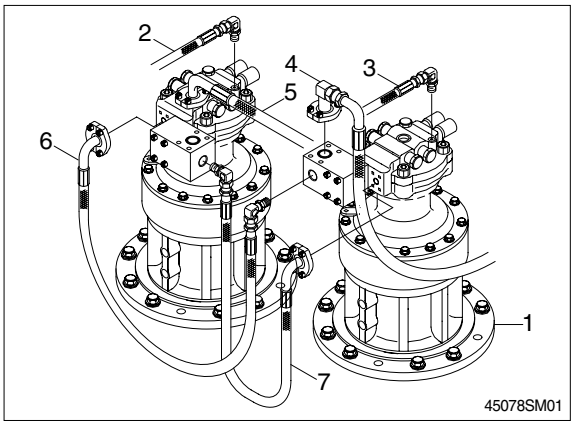
※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

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

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

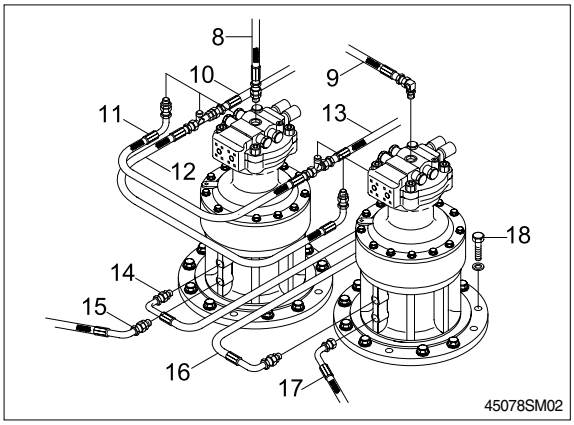
(5) Sling the swing motor assembly(1)and remove the swing motor mounting bolts(18).

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



(6) Remove the swing motor assembly.

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



2) INSTALL

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

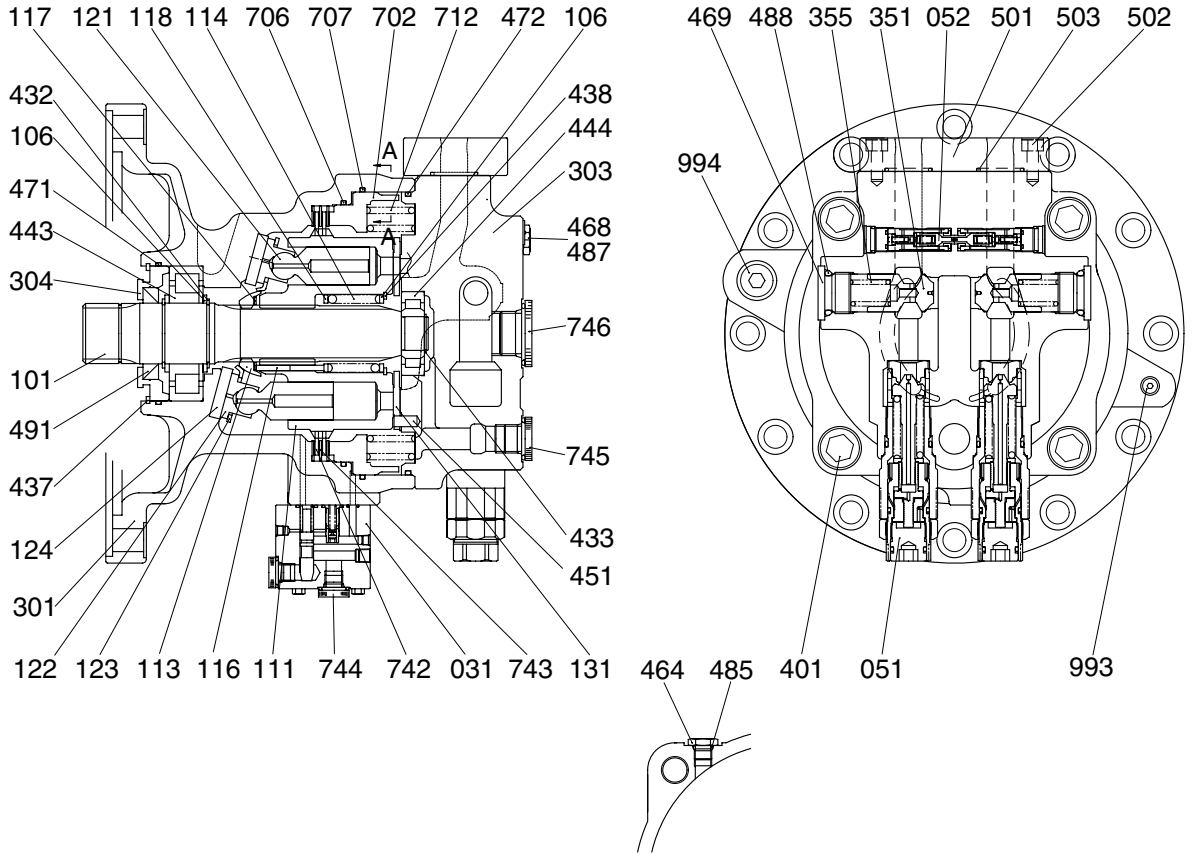
(2) Bleed the air from the swing motor.

① Remove the air vent plug.
② Pour in hydraulic oil until it over flows from the port.
③ Tighten plug lightly.
④ Start the engine, run at low idling, and check oil come out from plug.
⑤ Tighten plug fully.

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

2. SWING MOTOR

1) STRUCTURE



SECTION A - A

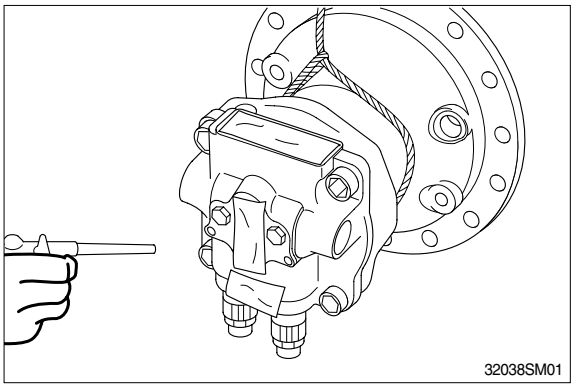
50072SM02

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

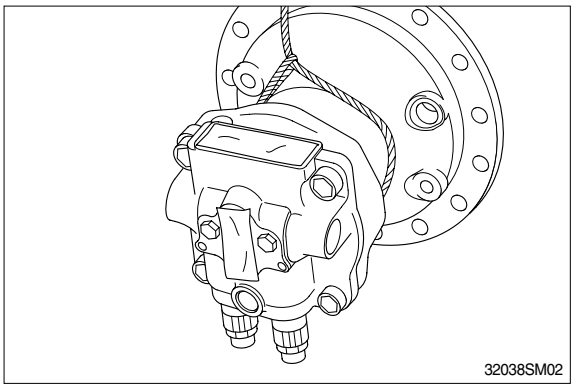
2) DISASSEMBLY

(1) Lift the motor out. Clean the motor in kerosene and dry with compressed air.

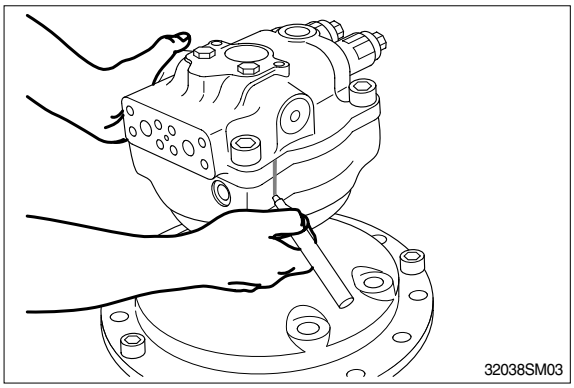
※ To avoid dust inside the motor, mask all the ports of the motor with tapes.



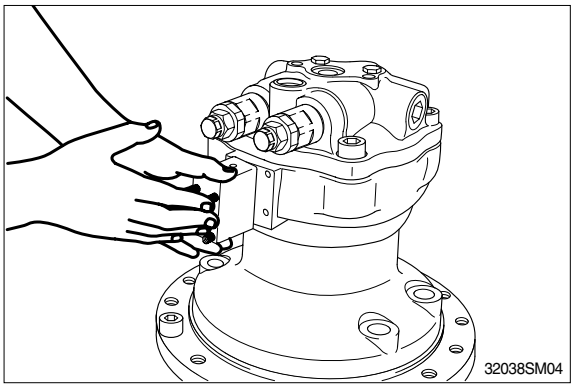
(2) Loosen the drain plug to discharge oil in the casing(301).



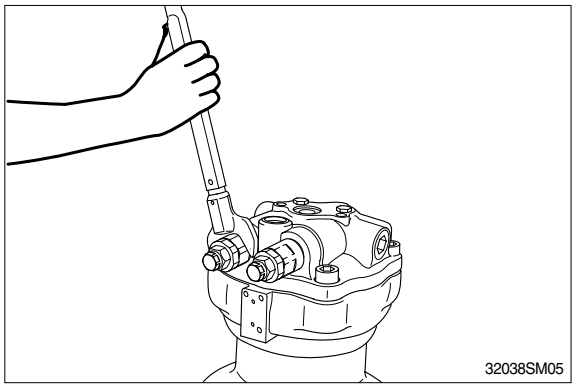
(3) Fix the drive shaft(101) on the workbench with the end of output shaft down. Put matching marks on casing (301) and valve casing(303) for easy reassembly.



(4) Remove the valve(052).

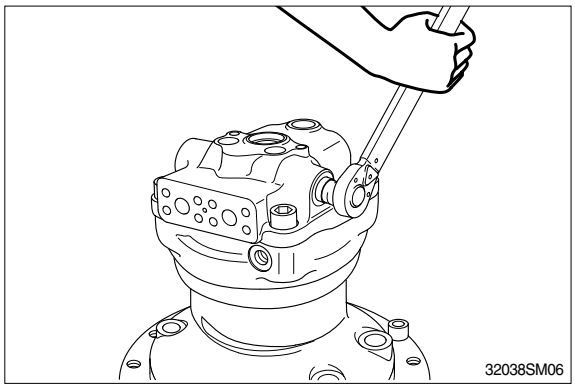


(5) Remove the relief valve(051) from valve casing(303).

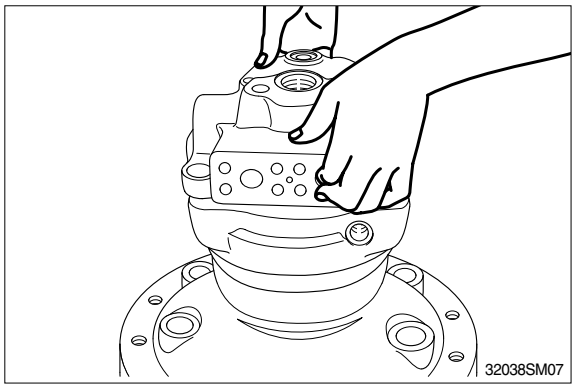


(6) Remove plug(469) from valve casing (303) and spring(355), plunger(351).

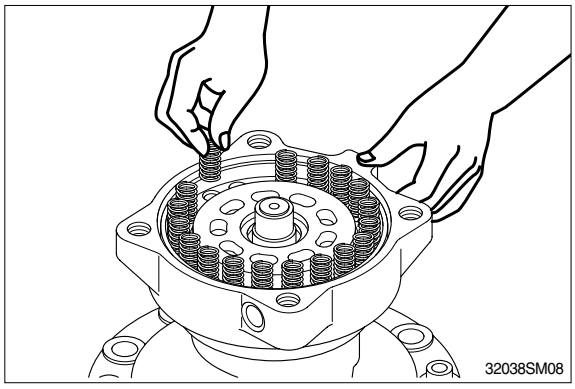
※ Be careful not to damage the plunger seat assembly.



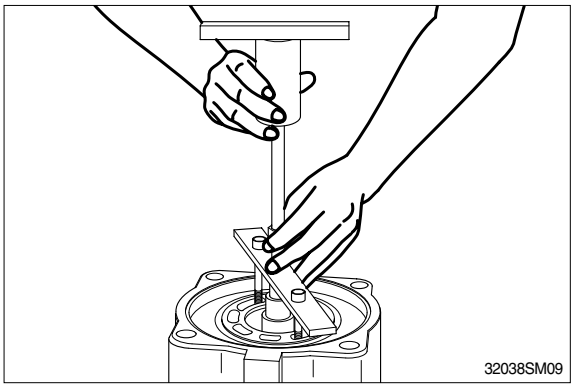
(7) Remove valve casing(303) from casing (301). Then, remove the valve plate(131) from valve casing(303) with care.



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

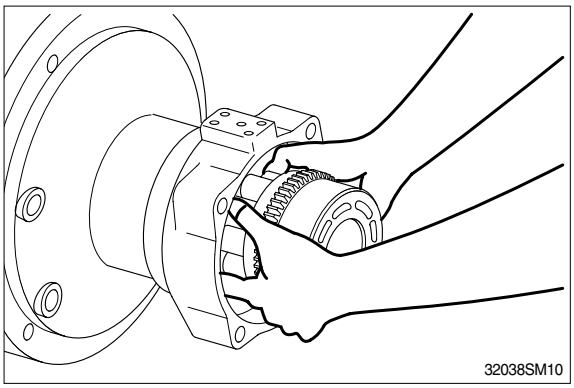


(9) Remove brake piston(702) from casing (301).

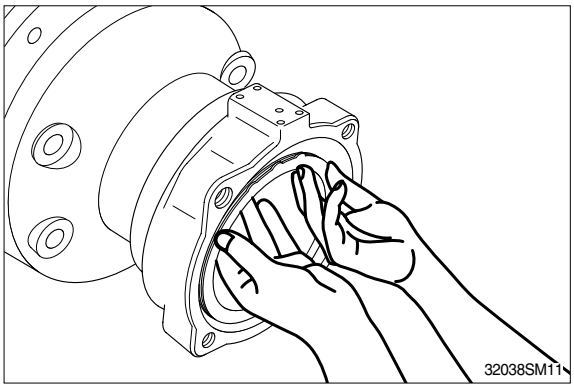


(10) Remove the cylinder(111) from the output shaft (101) with the motor positioned horizontally. Remove piston(121), retainer(123), spherical bushing(113), spacer (117) and shoe plate(124).

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

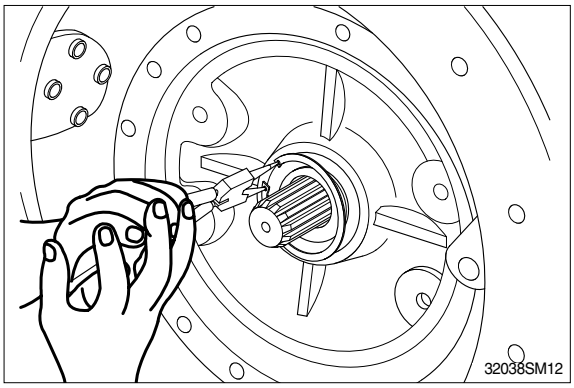


(11) Remove friction plate(742) and separate plate(743) from casing(301).

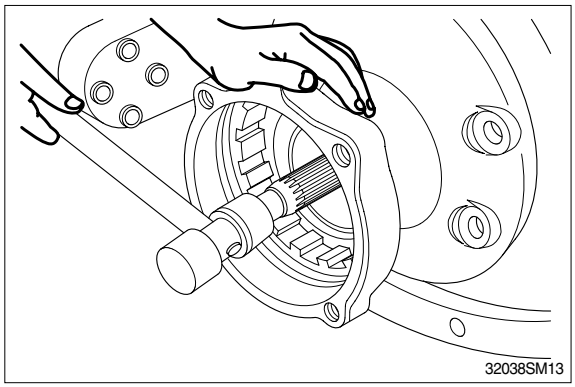


(12) Remove snap ring(437) with plier and remove the front cover(304) from casing(301).

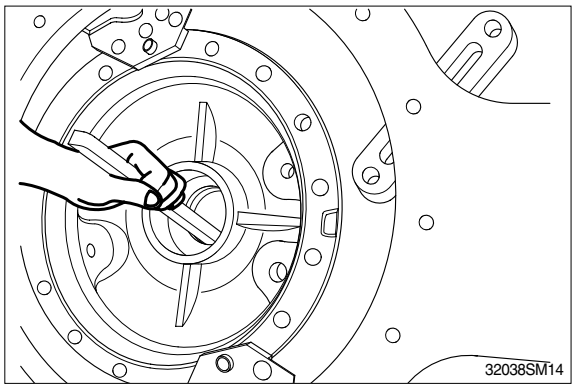
※ Front cover could be removed with sliding shaft if necessary.



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



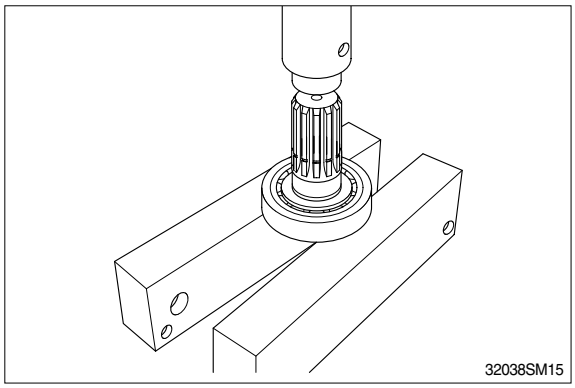
(14) Remove the shoe plate(124) from casing (301).

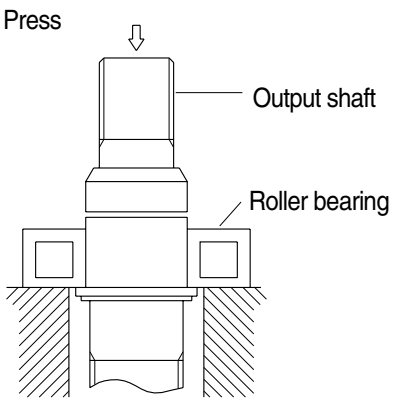


(15) Proceed with following job only when necessary.

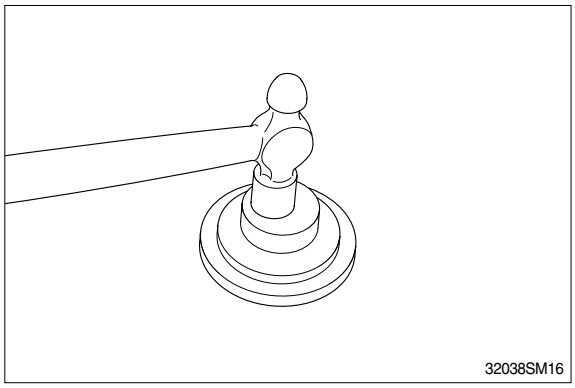
① Remove the snap ring(432), spacer(106) from drive shaft(101) and remove the cone of roller bearing(443) by press.

※ Do not reuse bearings.

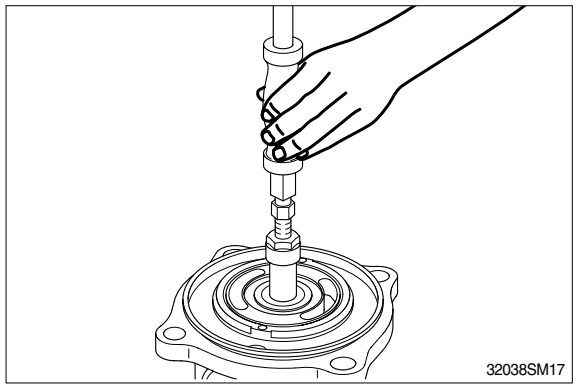




② Remove oil seal(491) from front cover (304).

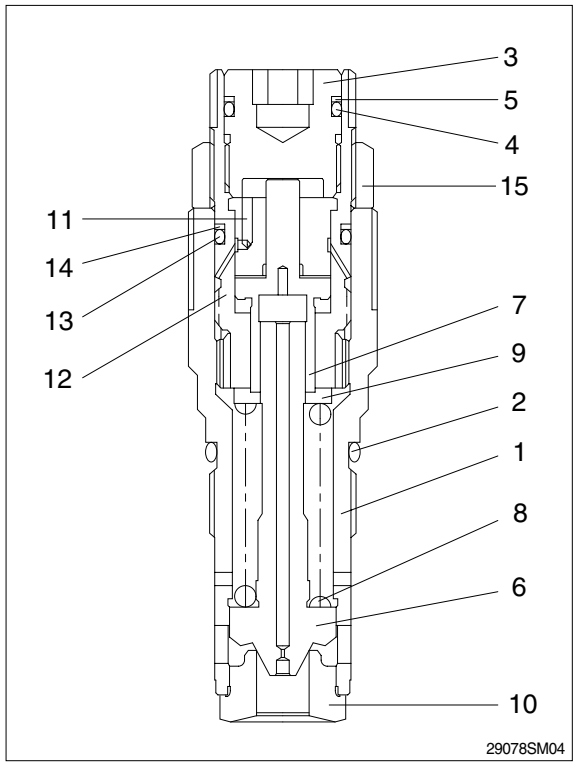


③ Remove the roller bearing(444) from the valve casing(303) by using slide hammer bearing puller.



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

※ Do not release the lock nut(15).

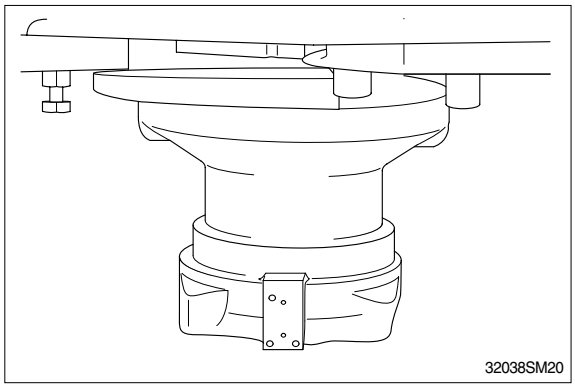


This completes disassembly.

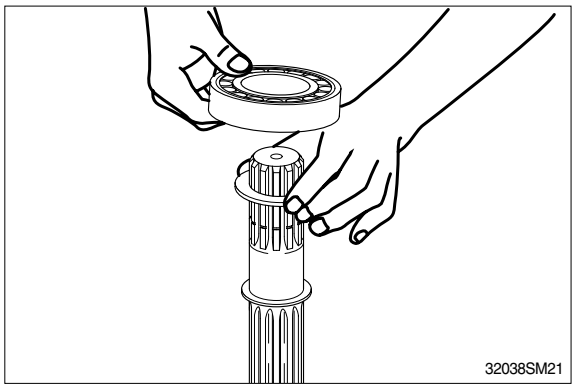
3) ASSEMBLY

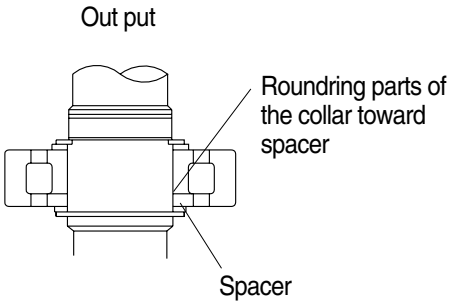
Do the reassembly in the reverse procedure of the disassembly.

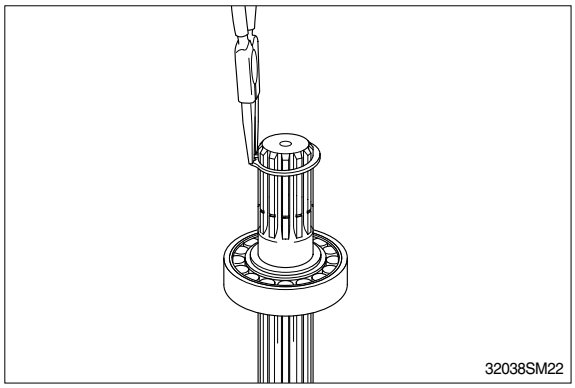
(1) Place the casing(301) on the workbench with the valve casing(303) downward.



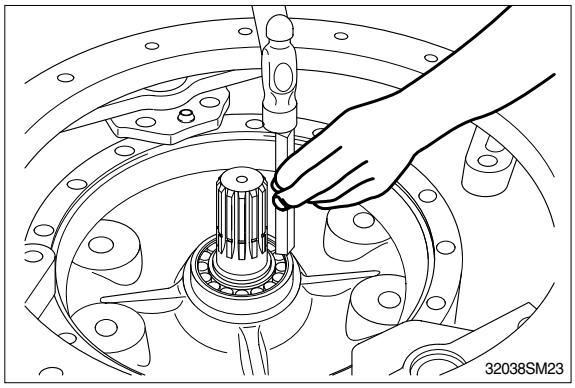
(2) When reassembling the roller bearing, install the snap ring(432), and spacer(106) to the drive shaft(101). Insert the collar and cone of the roller bearing(443). Install the spacer(106) and snap ring(432). Install snap ring(433) to the output shaft (101) by heating the cone of the roller bearing(444).



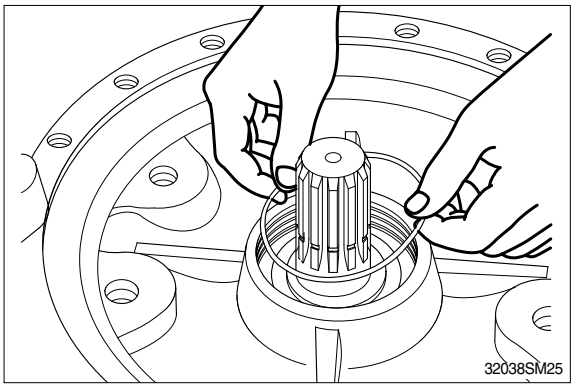




(3) Insert the drive shaft(101) into the casing (301) with the end of output shaft upward and tap the outer race of roller bearing with the hammer.

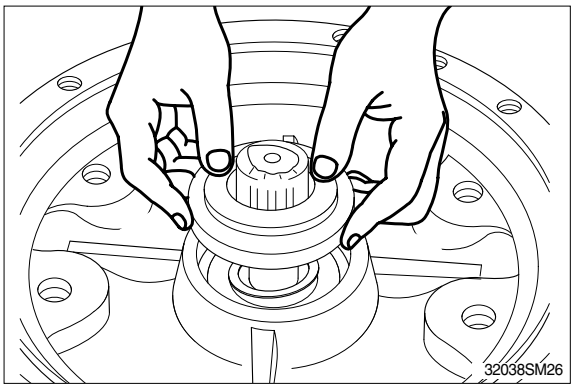


(4) Tack O-ring(471) to the casing(301).

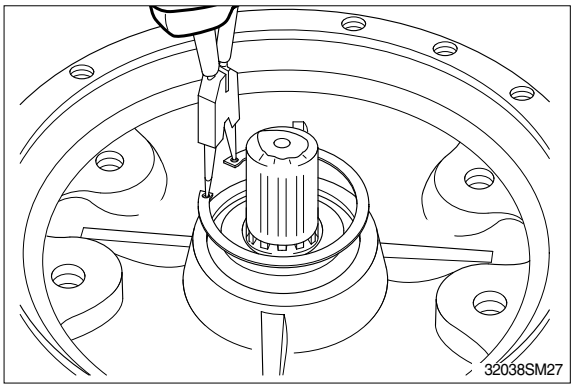


(5) Reassemble the front cover(304) to the casing(301).

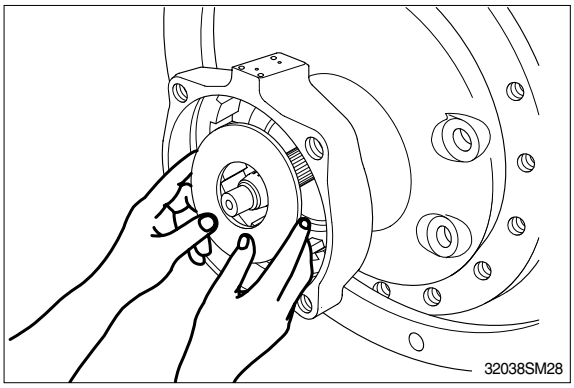
※ Apply grease to the rib of oil seal to avoid damage to the rib.



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

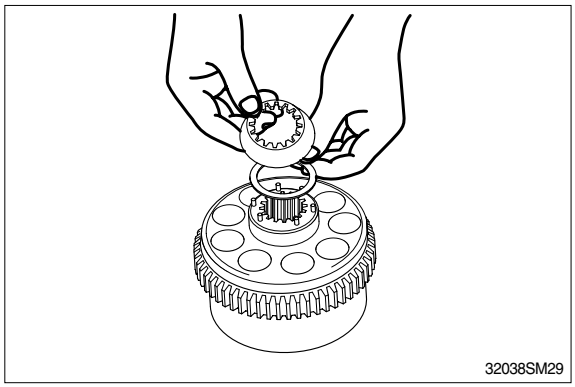


(7) Insert the shoe plate(124) with the casing (301) position horizontally.

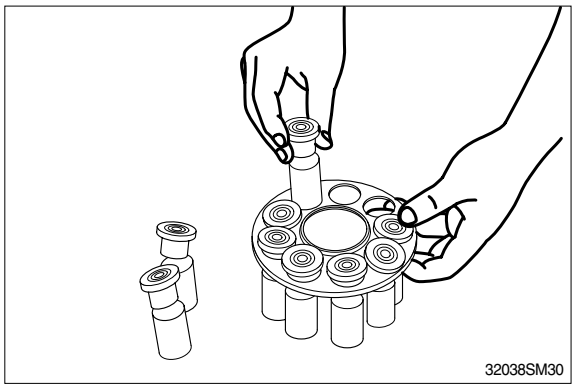


(8) Insert the push rod(116) into the cylinder (111). Place the spherical bushing(113) assembled with spacer(117) onto the cylinder.

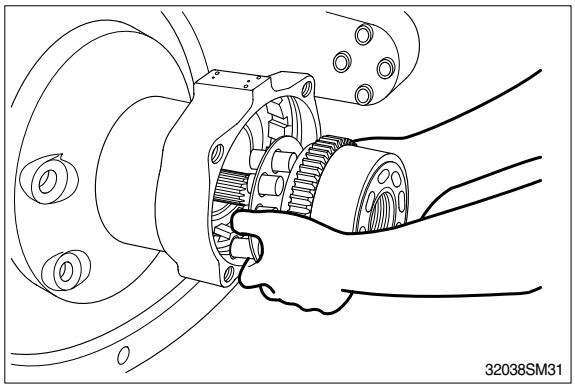
※ Insert two push rods in each hole.



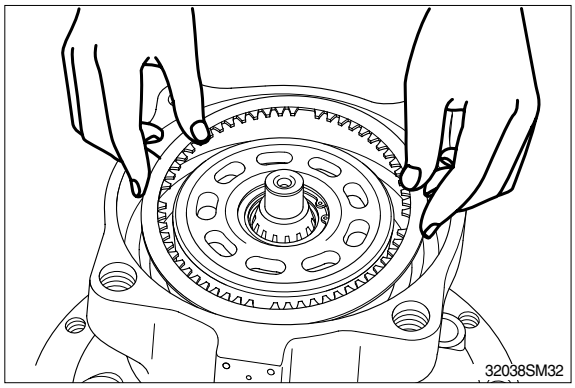
(9) Install the piston sub-assembly(121, 122) to the retainer(123).



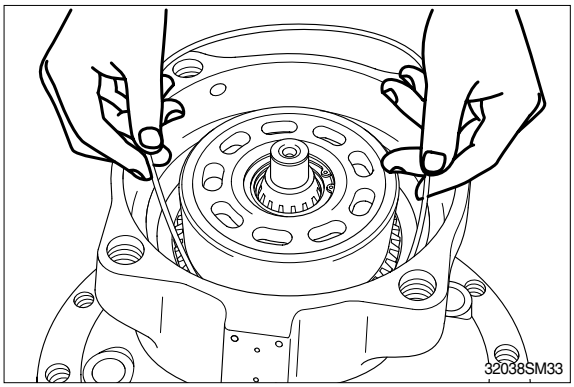
(10) Reassemble the piston assembly(121, 122) to the cylinder(111).



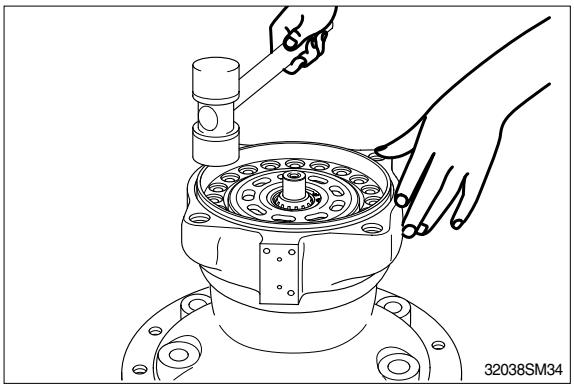
(11) Place the casing(301) under the front cover(304) and reassemble 3 sheets of separate plate(743) and then 2 sheets of friction plate(742) to the casing(301).



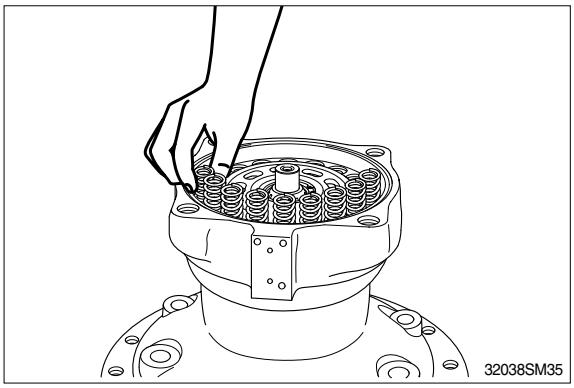
(12) Insert O-ring(706, 707) inside the casing (301).



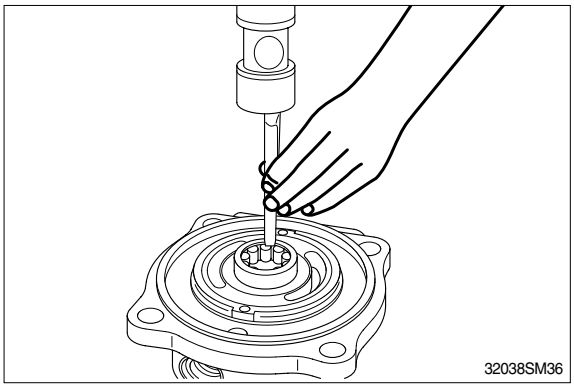
(13) Reassemble brake piston(702) to the casing(301).



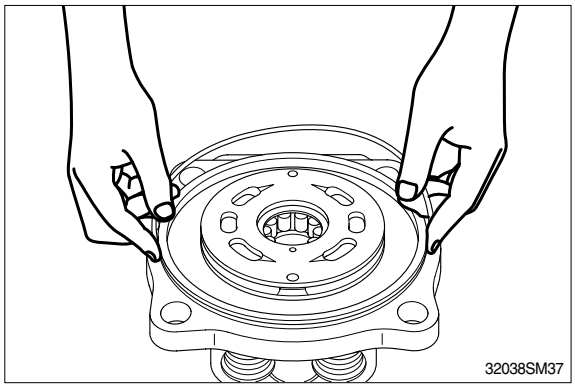
(14) Reassemble brake spring(712) to the brake piston(702).



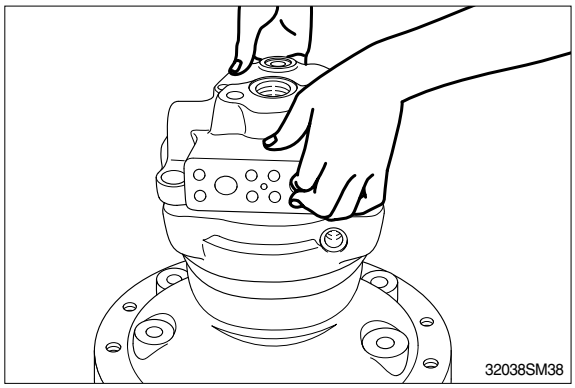
(15) When assembling the roller bearing(444), insert the roller bearing(444) into valve casing(303) by hammering.



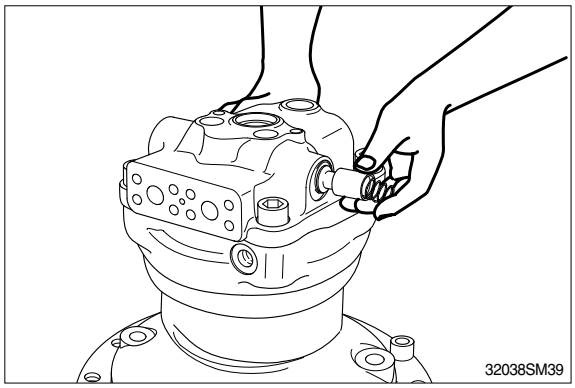
(16) Reassemble valve plate(131) to the valve casing(303) and reassemble O-ring(472).



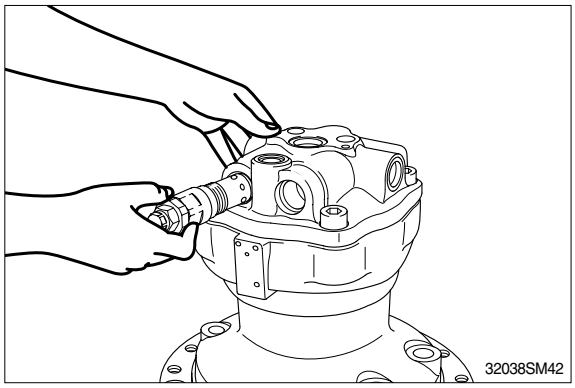
(17) Connect the valve casing(303) with the casing(301) and tighten the hexagon socket bolt(401).



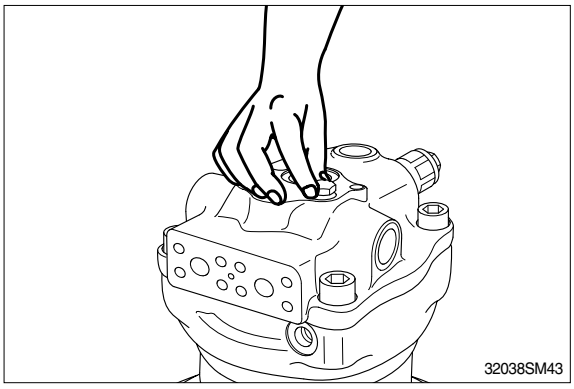
(18) Insert plunger(351) and spring(355) in the valve casing and install O-ring(488). Tighten plug(469) to the valve casing.



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



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



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

This completes assembly.

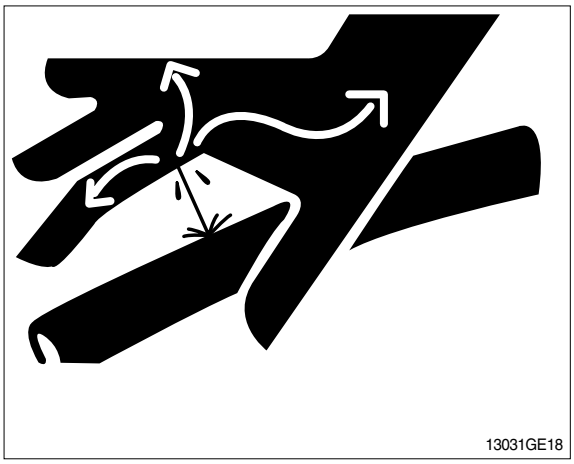
3. REMOVAL AND INSTALL OF REDUCTION GEAR

1) REMOVAL

(1) Remove the swing motor assembly.
For details, see **removal of swing motor assembly**.

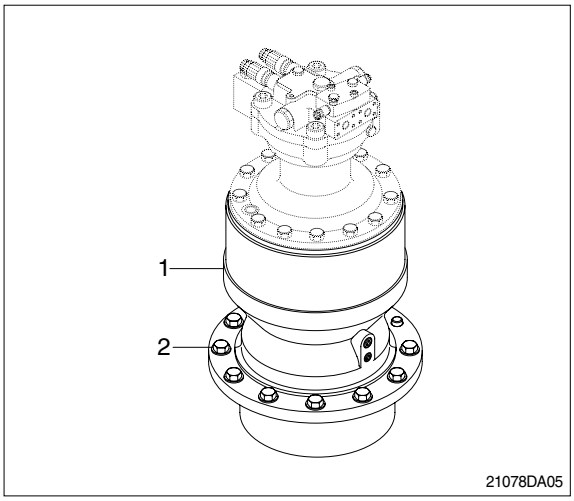
(2) Sling reduction gear assembly(1) and remove mounting bolts(2).

(3) Remove the reduction gear assembly.
· Reduction gear device weight : 180kg (396lb)



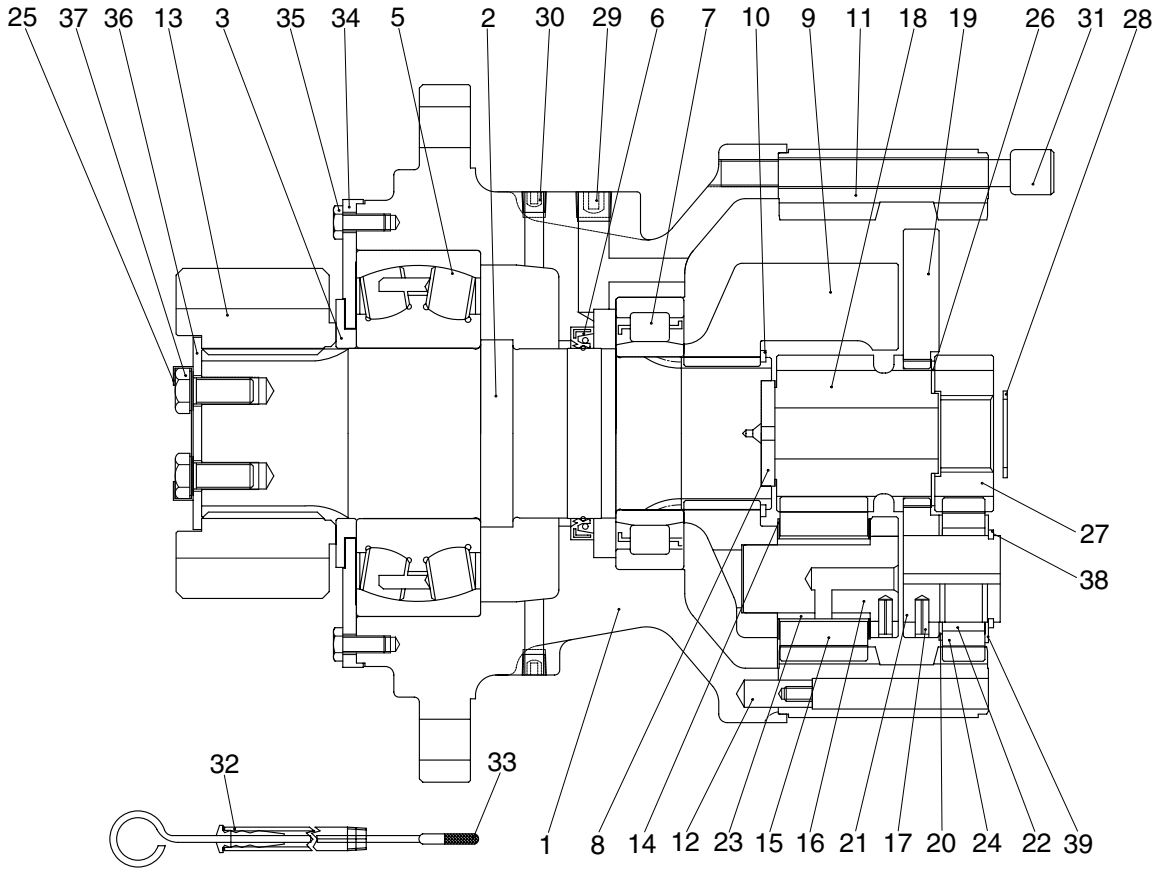
2) INSTALL

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



4. REDUCTION GEAR

1) STRUCTURE



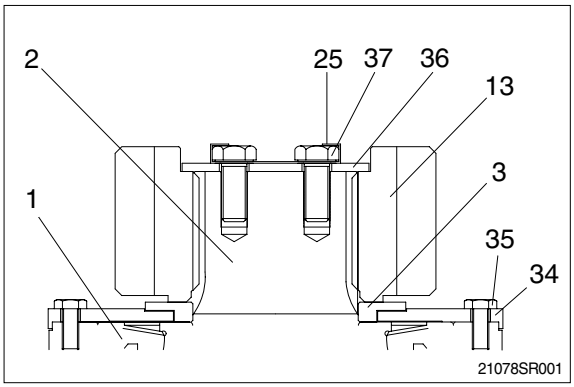
50072SM03

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

2) DISASSEMBLY

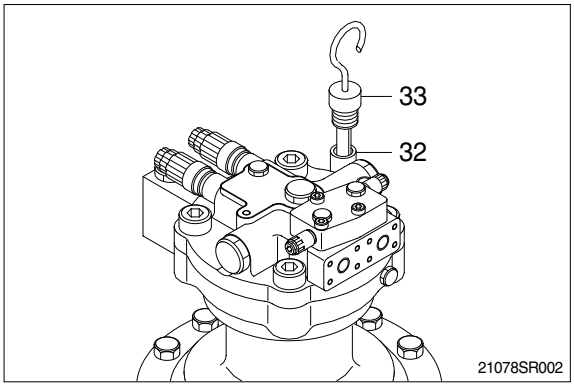
(1) Spread off the 4 corners of lock washer (25) with a tool.

※ Do not reuse lock washer(25).
Loosen the hexagon bolts(37) and then remove lock washer(25) and lock plate (36) from the pinion gear(13).
Remove pinion gear(13) and spacer(3) from the drive shaft(2).
Remove cover plate(34) from the casing (1) by loosening the hexagon socket bolts (35).

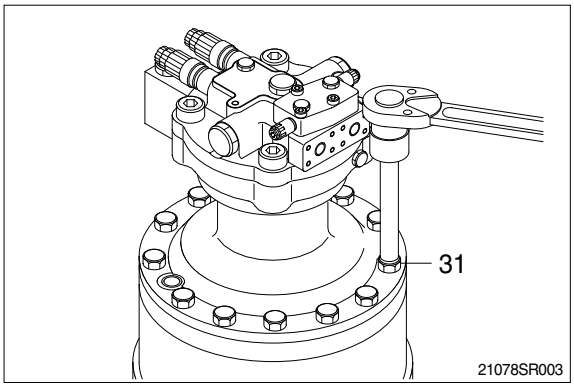


(2) Remove gauge bar(33) and gauge pipe (32) from the swing motor casing.

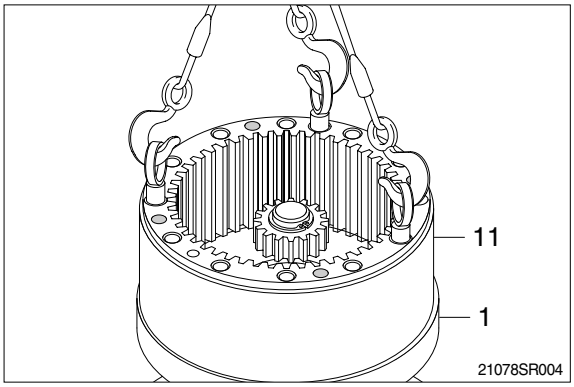
※ Pour the gear oil out of reduction gear into the clean bowl to check out the friction decrease.



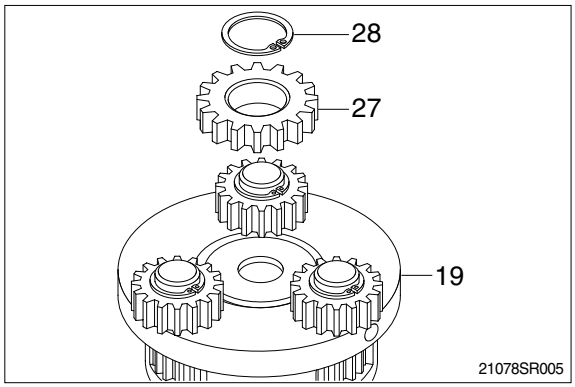
(3) Loosen the socket bolts(31) to separate swing motor from reduction gear.



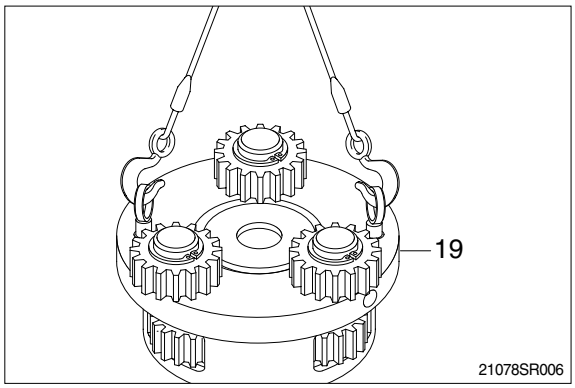
(4) Tighten 3 M16 eye bolts to the ring gear (11) and then lift the ring gear(11) out of the casing(1).



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



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



(7) Disassembling carrier1(19) assembly.

① Remove stop ring(38).

② Remove side plate2(39), planet gear1 (24), needle cage(22), side plate1(20) and side plate3(26) from the carrier.

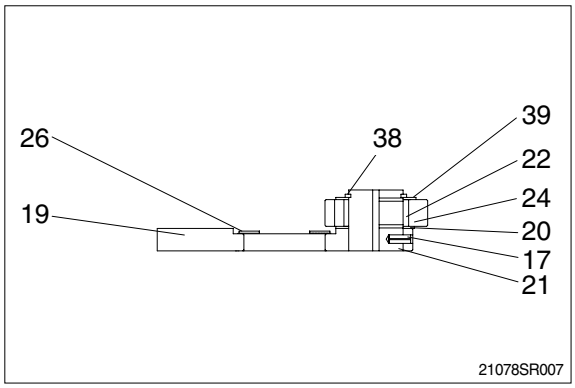
③ Using M8 solid drill, crush spring pin(17) so that the pin1(21) can be removed by hammering.

④ Remove side plate3(26) from carrier1(19).

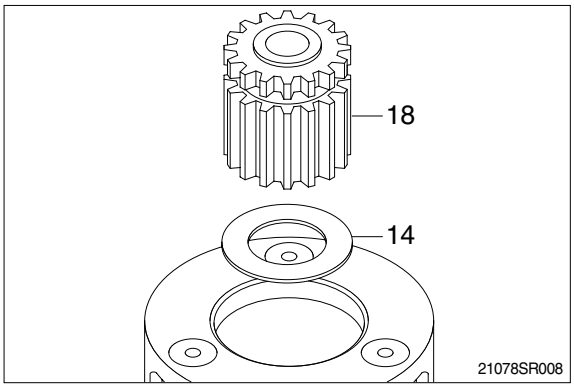
※ Do not reuse spring pin(17).

※ Do not remove pin1(21), carrier1(19) and spring pin(17) but in case of replacement.

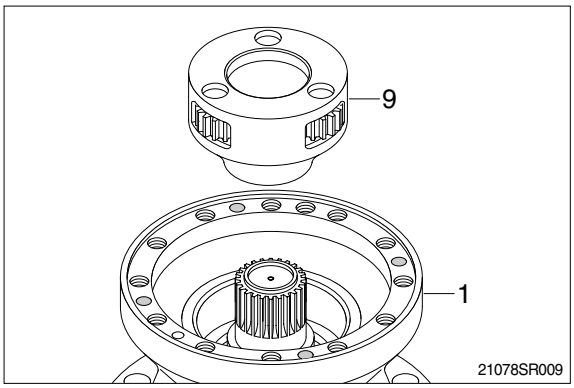
※ Put matching marks on the planet gear1 (24) and the pin1(21) for easy reassembly.



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



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



(10) Disassembling carrier2(9) assembly

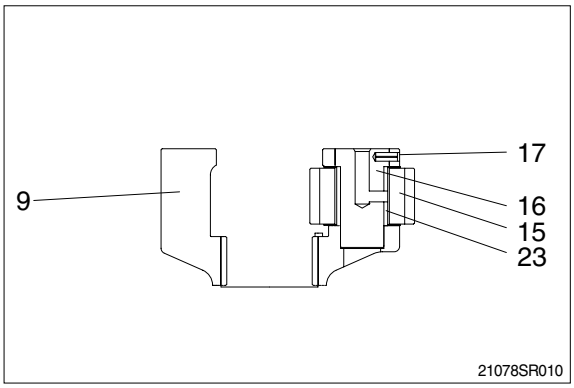
① Using M8 solid drill, crush spring pin(17) so that the pin2(16) can be removed.

※ Do not reuse spring pin(17).

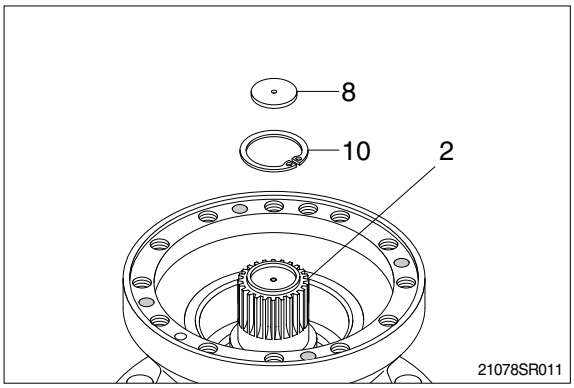
② Remove pin2(16), planet gear2(15) and bush2(23) from the carrier2(9).

※ Put matching marks on the planet gear2 (15) and the pin2(16) for easy reassembly.

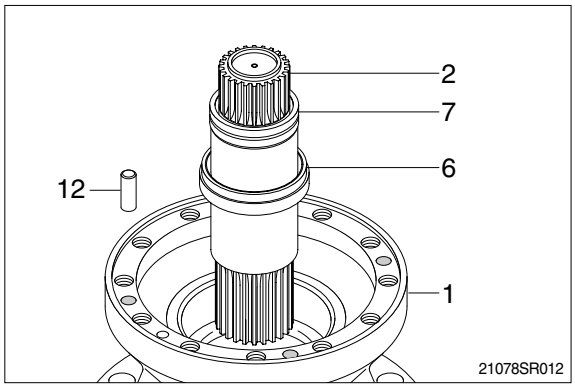
※ Do not disassemble pin2(16), carrier2(9) and spring pin(17) but in case of replacement.



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

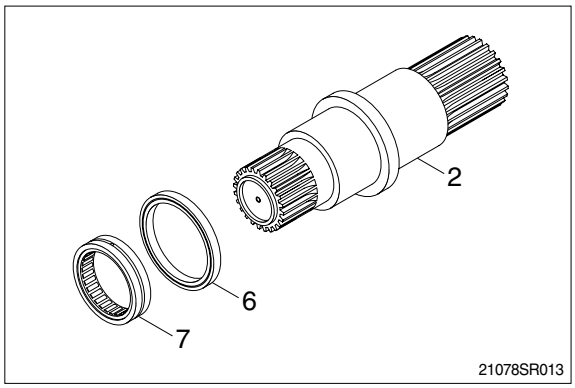


(12) Remove drive shaft(2) with roller bearing(7) and oil seal(6) assembled.
Remove knock pin(12) from the casing(1).

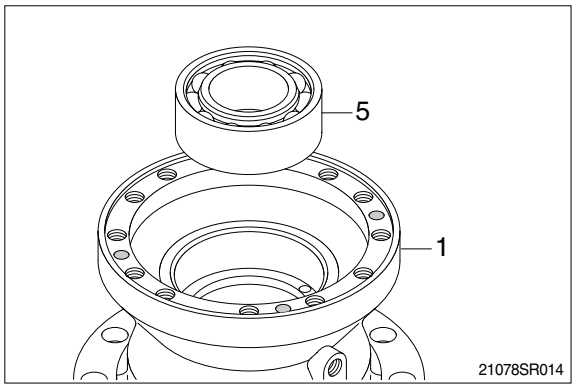


(13) Remove roller bearing(7) and oil seal(6) from the drive shaft(2).

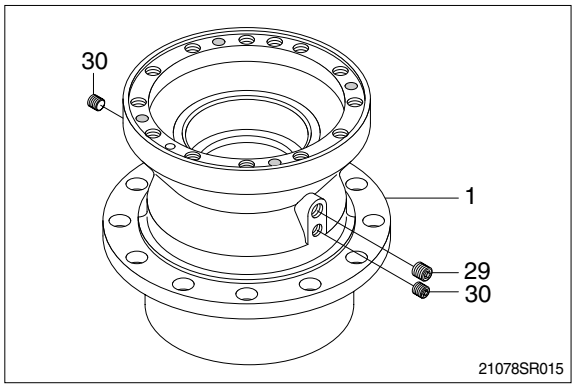
※ Do not reuse oil seal(6) once removed.



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

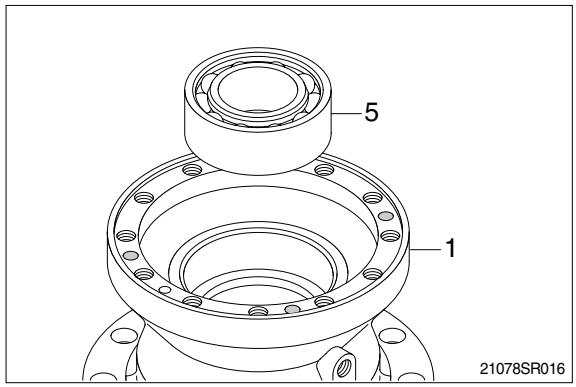


(15) Remove plugs(29, 30) from the casing(1).

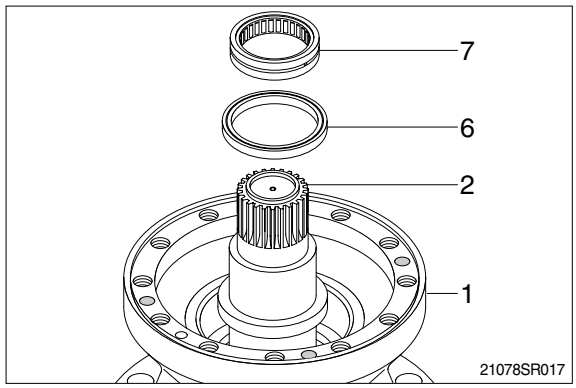


3) ASSEMBLY

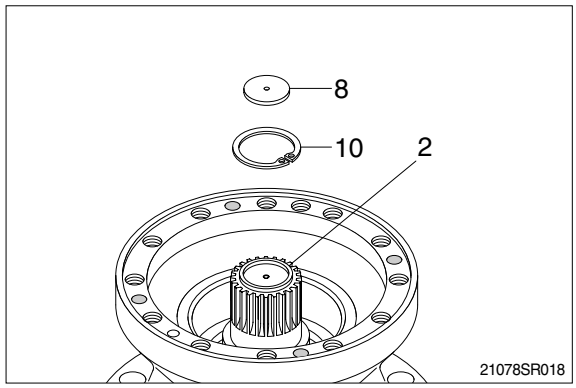
(1) Assemble roller bearing(5) inside the casing(1).



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



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



(4) Assembling carrier2(9) assembly.

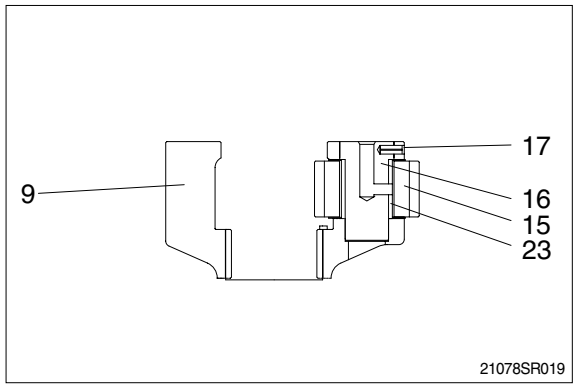
① Install thrust washer(14) inside the carrier2 (9).

② Install bush2(23) inside the planet gear2 (15) and then assemble them to the carrier2(9).

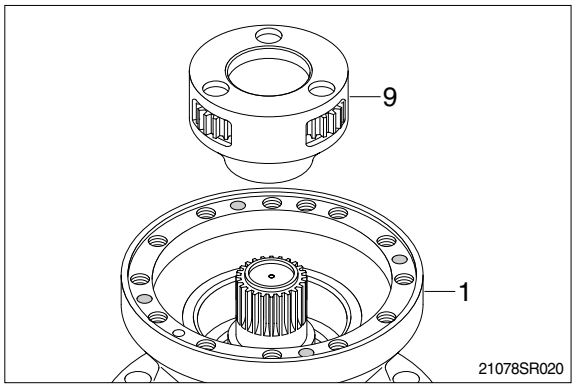
③ Assemble the pin2(16) to the carrier2(9) and then press the spring pin(17) by hammering.

④ Punch 2 points of the spring pin(17) lip.

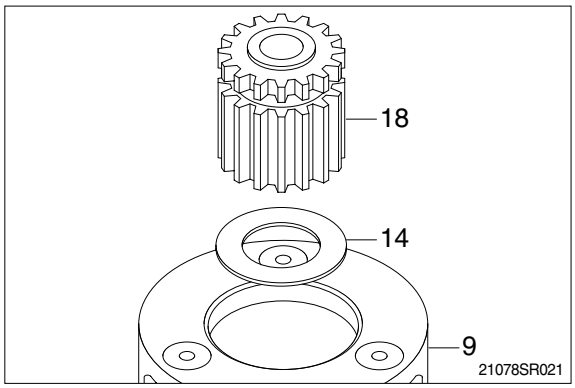
※ Take care not to mistake the matching marks of each part.



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



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



(7) Assembling carrier1(19) assembly.

① Assemble the pin1(21) to the carrier1(19) and then press the spring pin(17) by hammering.

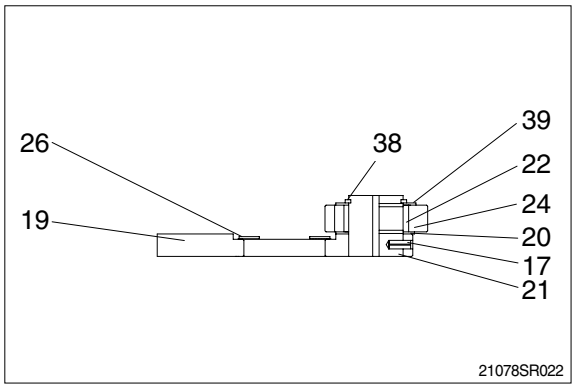
② Punch 2 points of the spring pin's(17) lip.

③ Install side plate3(26) onto the center of carrier1(19).

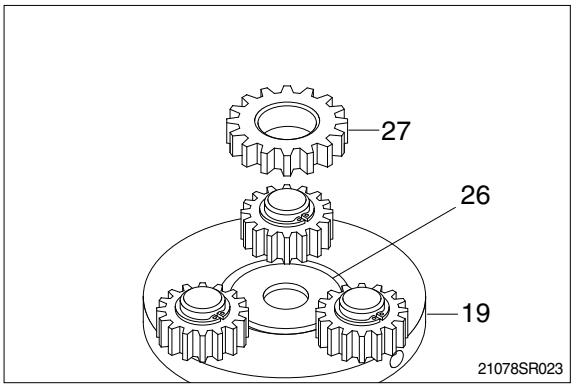
④ Install needle cage(22) into the planet gear1(24).

⑤ Assemble side plate(20), planet gear1 (24), side plate2(39) and then stop ring (38) to the pin1(21).

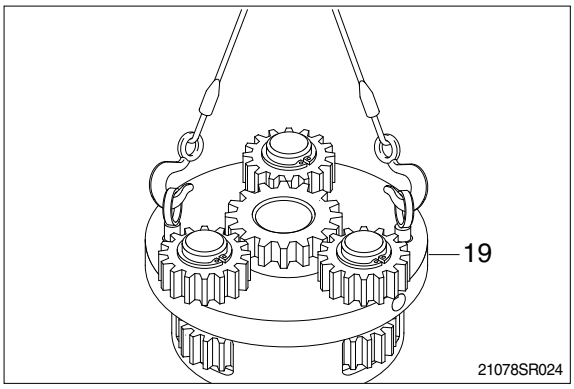
※ Take care not to mistake the matching marks of each part.



(8) Install sun gear1(27) onto the side plate3 (26).



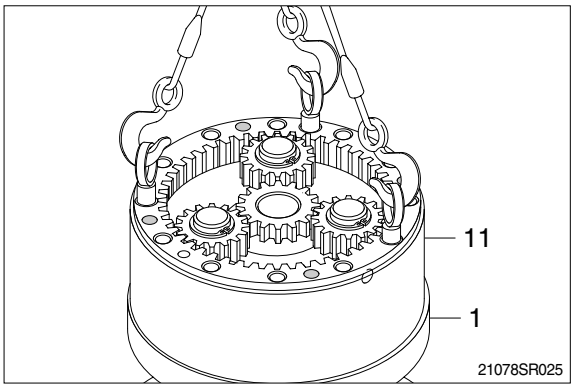
(9) Assemble carrier1(19) assembly onto the carrier2(9) assembly.



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

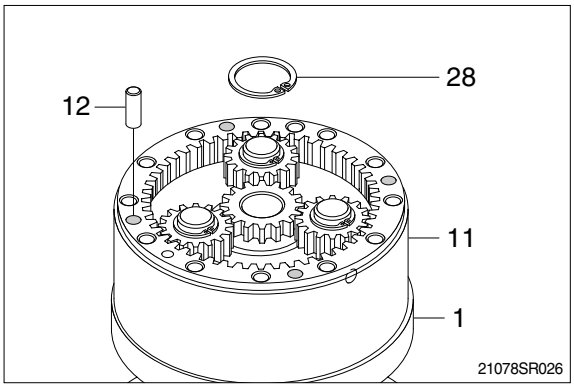
(11) Tighten 3 M16 eye bolts to the ring gear(11) and lift up and then assemble it onto the casing(1).

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



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

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

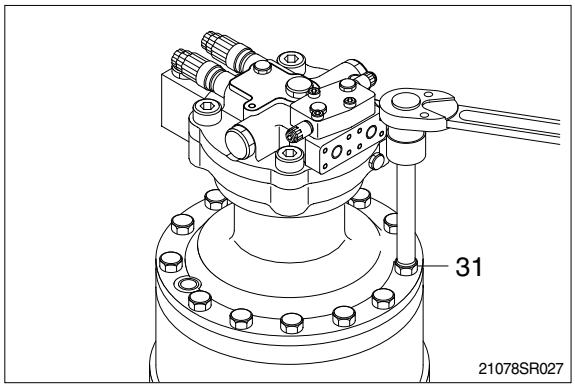


(14) Apply loctite to the tapped holes of the ring gear(11) and then mount swing motor onto the ring gear(11).

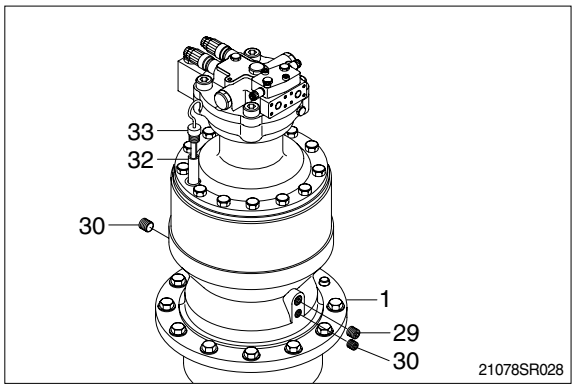
※ Don't fail to coincide the gauge bar(33) hole.

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

· Tightening torque : 25±2.5kgf · m
(181±18lbf · ft)

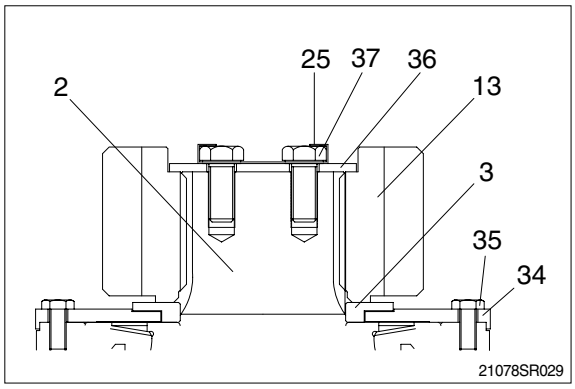


(16) Assemble plugs(29, 30), gauge bar(33) and gauge pipe(32).



(17) Turn the swing motor assembly upside down and assemble cover plate(34) by tightening the hexagon socket bolts(35).
Install spacer(3) and pinion gear(13) to the drive shaft(2).
Assemble lock plate(36) on the pinion gear(13).
Assemble 2 lock washers(25) on the lock plate(36) with their 2 hole coincided individually to the tapped holes of drive shaft(2).
Tighten hexagon socket bolts(37) to the drive shaft(2) and then fold all the lock washer(25) corners over the hexagon bolts(37).

· Tightening torque : 25±2.5kgf · m
(181±18lbf · ft)



(18) Inject oil into the reduction gear.

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.

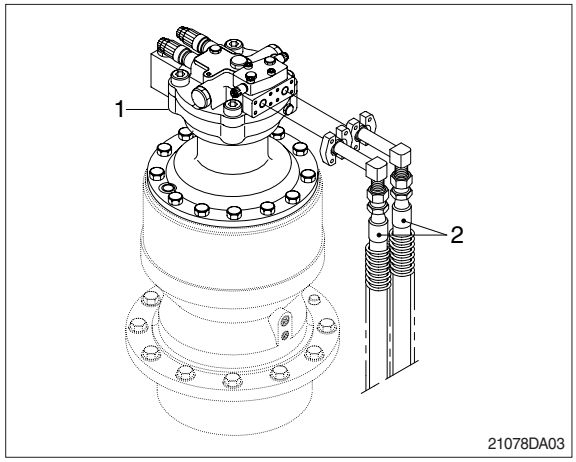
(4) Disconnect hose assembly (2).

(5) Disconnect pilot line hoses (3, 4, 5, 6, 7).

(6) Sling the swing motor assembly (1) and remove the swing motor mounting bolts (8).
·Motor device weight : 61 kgf·m (135 lbf·ft)

(7) Remove the swing motor assembly.

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

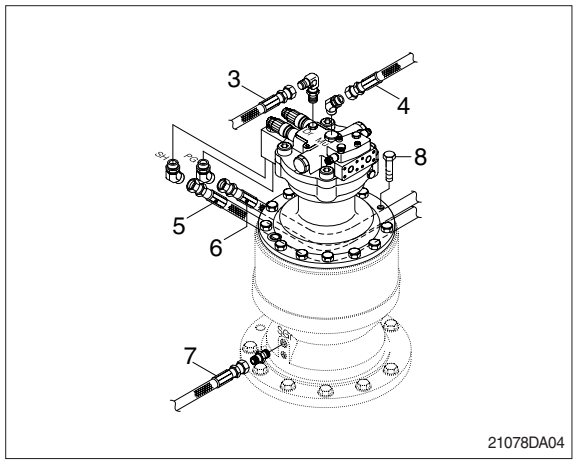


2) INSTALL

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

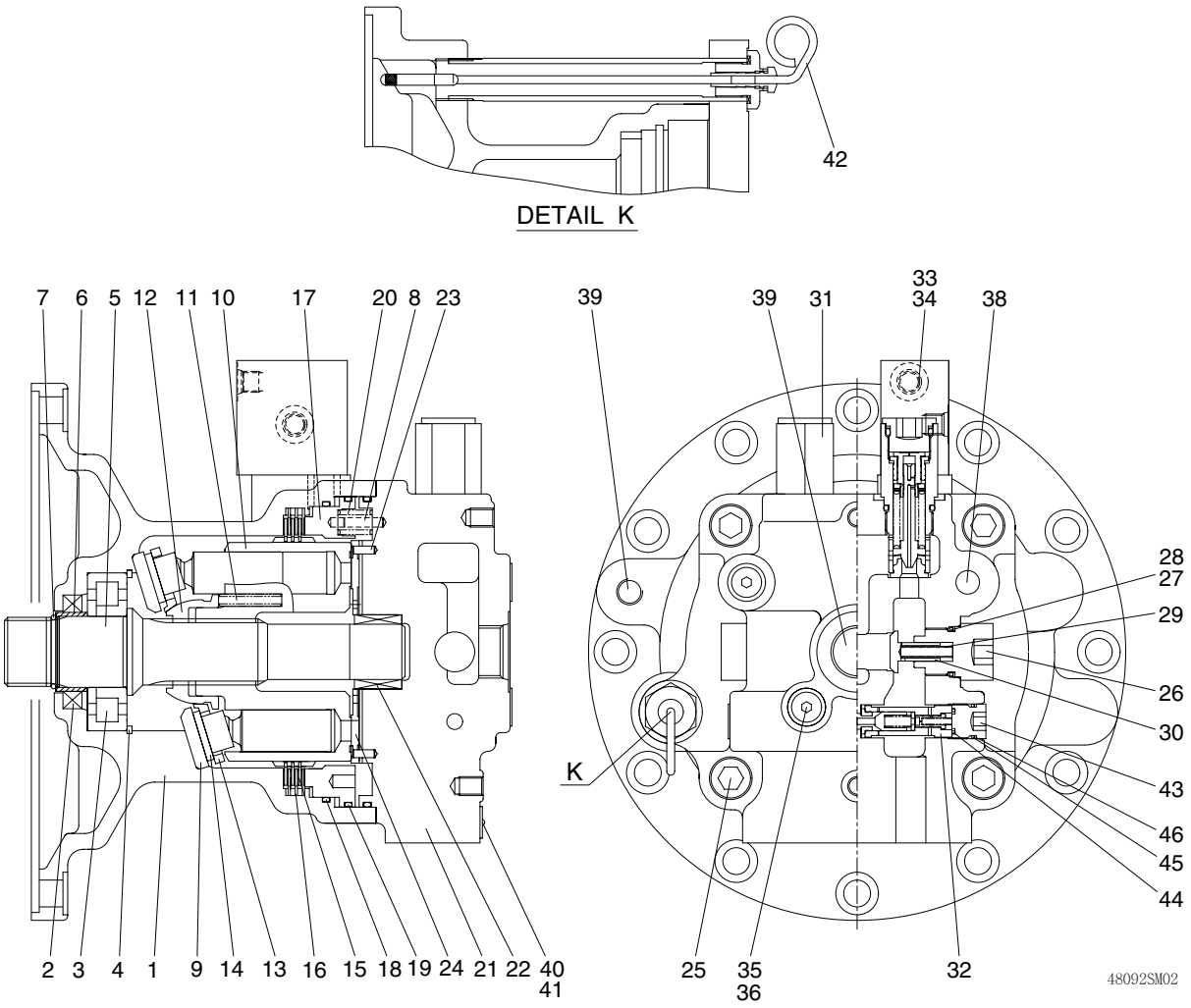
(2) Bleed the air from the swing motor.
① Remove the air vent plug.
② Pour in hydraulic oil until it overflows from the port.
③ Tighten plug lightly.
④ Start the engine, run at low idling and check oil come out from plug.
⑤ Tighten plug fully.

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



2. DISASSEMBLY AND ASSEMBLY OF SWING MOTOR

1) STRUCTURE

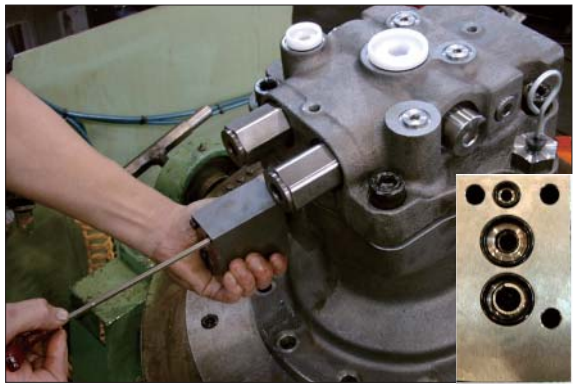


1	Body	17	Brake piston	33	Time delay valve
2	Oil seal	18	O-ring	34	Wrench bolt
3	Roller bearing	19	O-ring	35	Plug
4	Snap ring	20	Spring	36	O-ring
5	Shaft	21	Rear cover	37	Plug
6	Bushing	22	Needle bearing	38	Plug
7	Stop ring	23	Pin	39	Plug
8	Pin	24	Valve plate	40	Name plate
9	Shoe plate	25	Wrench bolt	41	Rivet
10	Cylinder block	26	Plug	42	Level gauge
11	Spring	27	Back up ring	43	Plug
12	Ball guide	28	O-ring	44	O-ring
13	Set plate	29	Spring	45	O-ring
14	Piston assy	30	Check	46	Back up ring
15	Friction plate	31	Relief valve		
16	Plate	32	Anti-inversion valve		

2) DISASSEMBLING

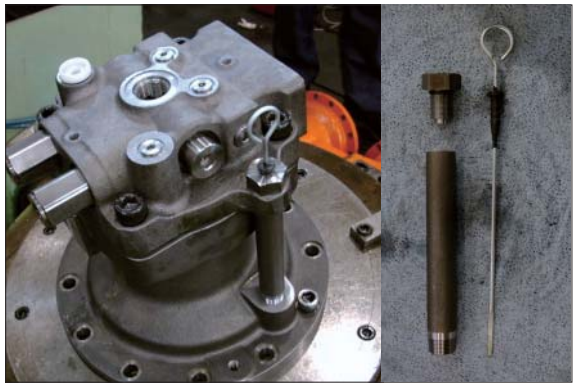
(1) Disassembly the sub of a TURNING AXIS

① Unloosing wrench bolt and disassemble time delay valve assy (35) from rear cover (21).



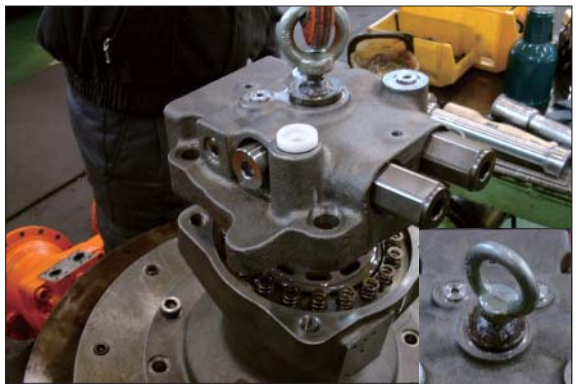
14078SM201/201A

② Disassemble level gauge (42) from body (1).



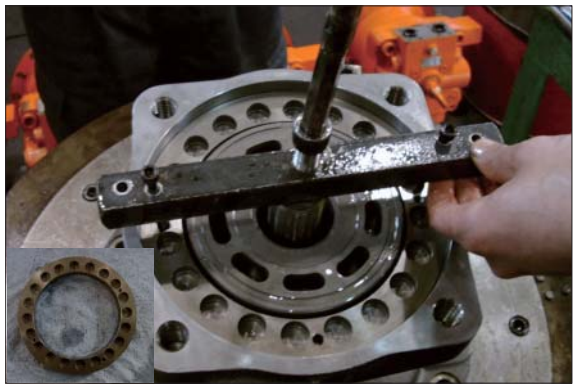
14078SM202/202A

③ Hang rear cover (21) on hoist, unloose wrench bolt (25) and disassemble from body (1).



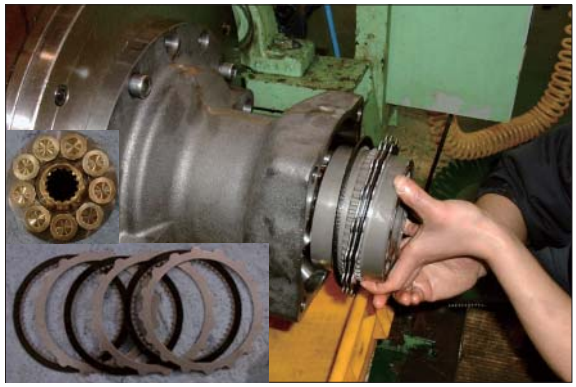
14078SM203/203A

④ Using a jig, disassemble break piston (17) from body (1).



14078SM204/204A

⑤ Disassemble respectively cylinder block assy, fricktion plate (15), plate (16) from body (1).



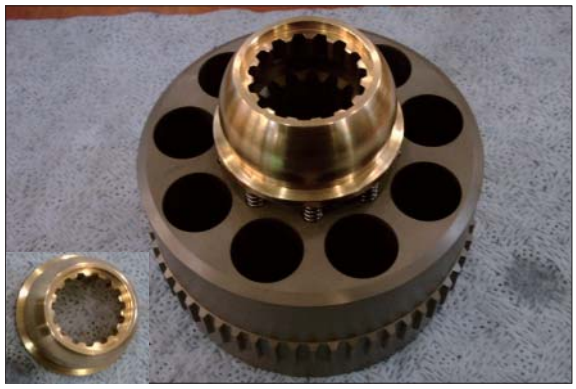
14078SM205/205A/B

(2) Disassemble cylinder block assy sub

① Disassemble pistion assy (14), set plate (13) from cylinder block assy.

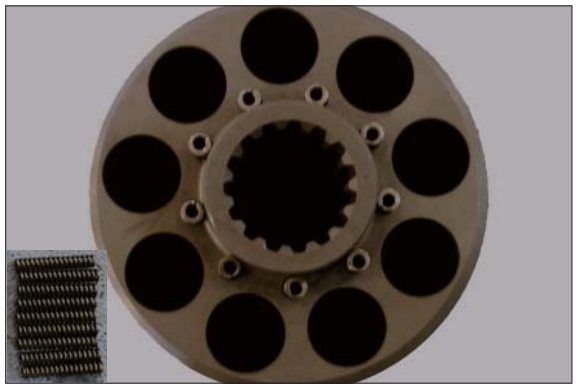
14078SM206/205B

② Disassemble ball guide (12) from cylinder block (10).



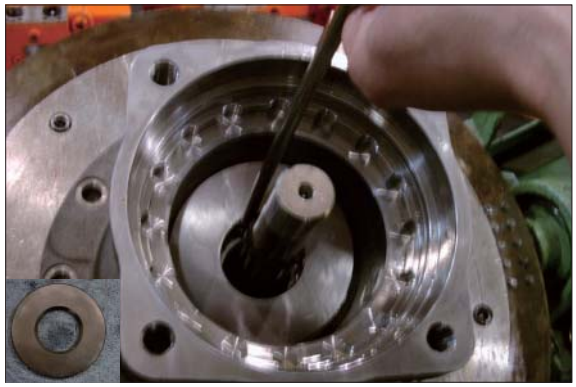
14078SM207/207A

③ Disassemble spring (11) from cylinder block (10).



14078SM208/208A

④ Disassemble shoe plate (9) from body (1).

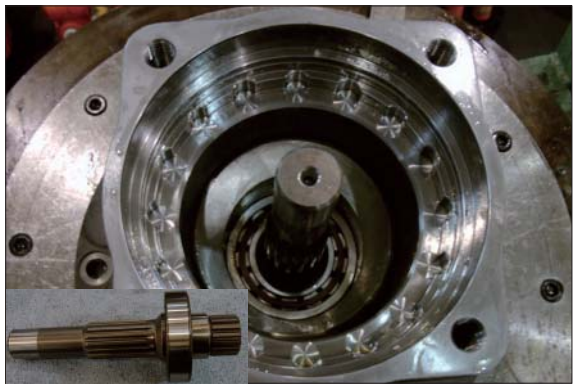


14078SM209/209A

⑤ Using a plier jig, disassemble snap ring (4) from shaft (5).

14078SM210/210A

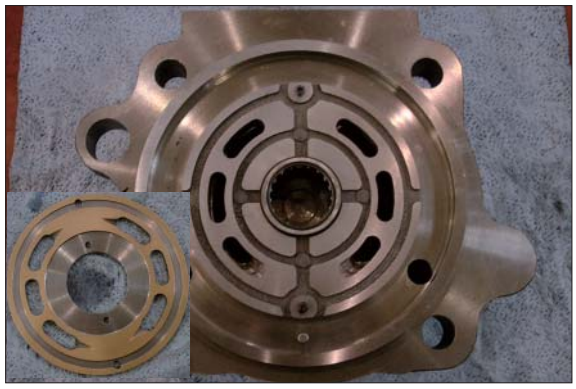
⑥ Disassemble shaft assy from body (1).



14078SM211/211A

(3) Disassemble rear cover assy sub

① Disassemble pin (8, 23), valve plate (24) from rear cover (21).

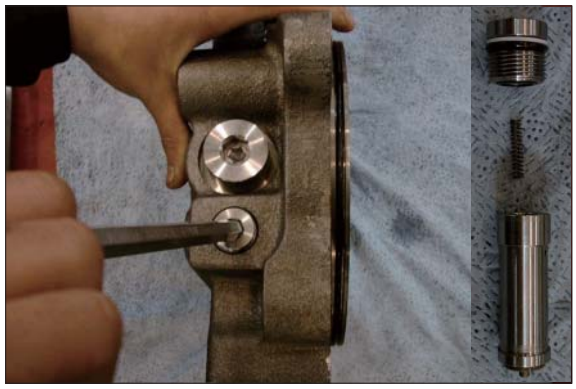


14078SM212/212A

② Using a torque wrench, disassemble relief valve assy (31) 2 set from rear cover (21).

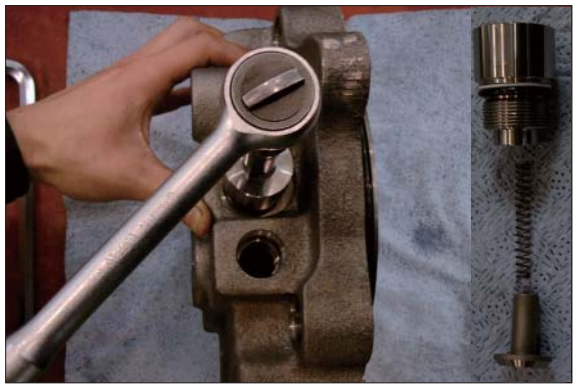
14078SM213/213A

③ After disassembling plug with a L-wrench from rear cover (21), disassemble respectively back up ring, O-ring, O-ring, spring, anti-inversion valve assy (32)



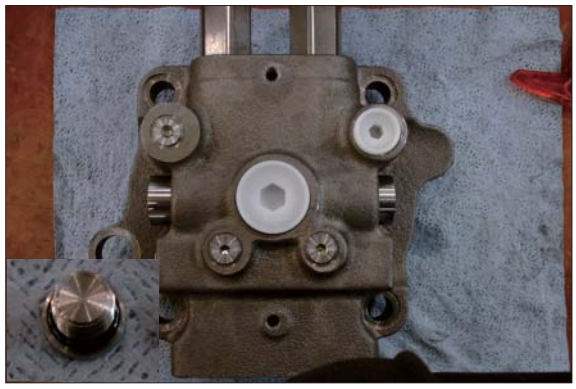
14078SM214/214A

④ Disassemble make up check valve assy with a torque wrench from rear cover (21).



14078SM215/215A

⑤ Disassemble respectively plug (35, 38, 39), with a L-wrench from rear cover (21).

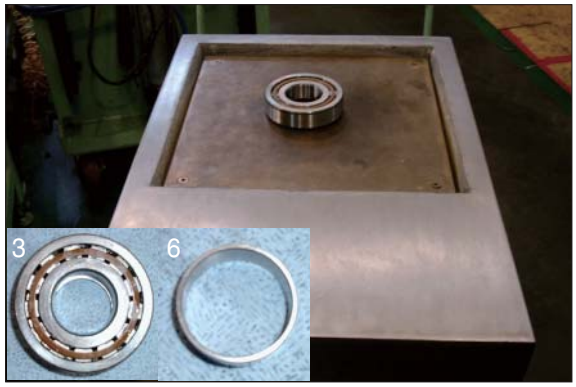


14078SM216/216A

3) ASSEMBLING

(1) Assemble the sub of a turning axls

① Put roller bearing (3), bushing (6) on pre-heater and provide heat to inner wheel (compressing temp : 290˚C for 2minutes)
- Roller bearing ×1EA
- Bushing× 1EA

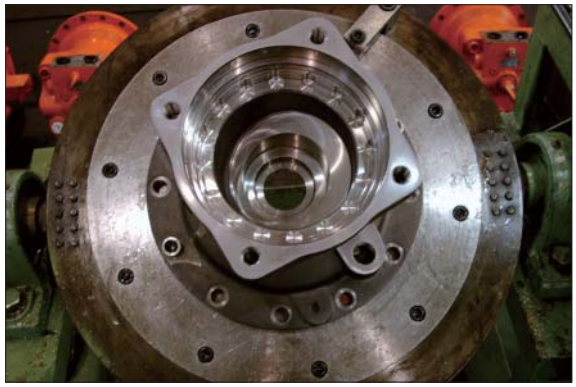


14078SM217/217A/B

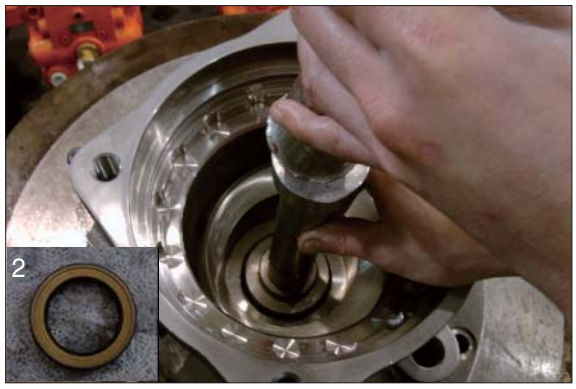
② After assembling and compressing preheated roller bearing (3), bushing (6) into shaft (5).
- Stop ring ×1EA
- Shaft× 1EA

14078SM218/218A/B

③ Put body (1) on a assembling jig, fix it with bolts to prohibit moving.

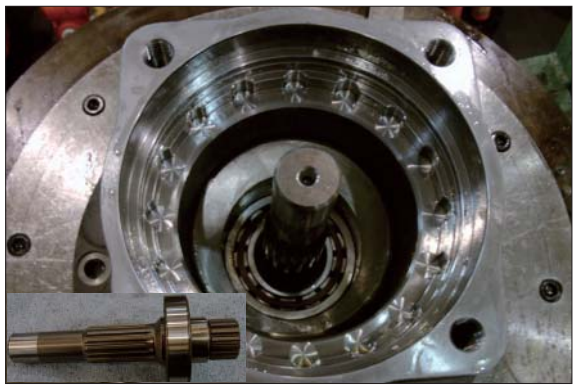

14078SM219

④ Using a compressing tool and steel stick, assemble oil seal (2) into body (1).
- Oil seal ×1EA



14078SM220/220A

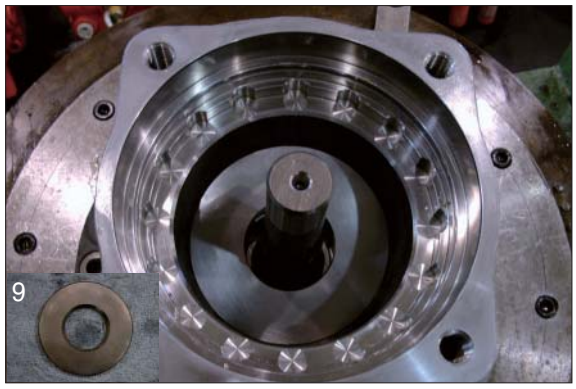
⑤ Insert above shaft sub into body (1) and assemble it with a steel stick.


14078SM211/211A

⑥ Fix snap ring (4) to shaft with a plier jig.
- Snap ring ×1EA

14078SM210/210A

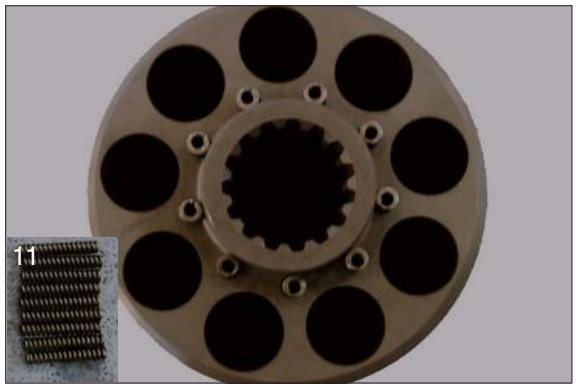
⑦ Spread grease on shoe plate (9) and assemble on the body.
- Shoe plate ×1EA



14078SM222/209A

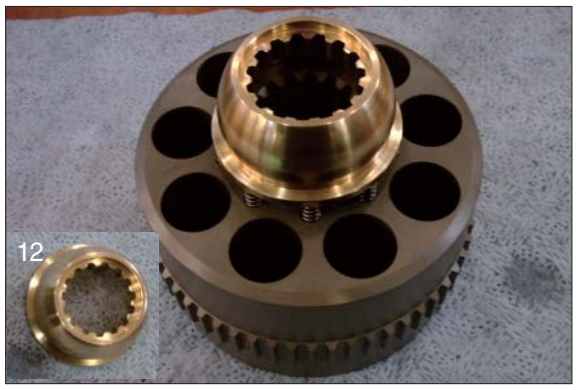
(2) Assemble the sub of cylinder block assy

① Assemble spring (11) 9 set into cylinder block (10).
- Spring ×9EA



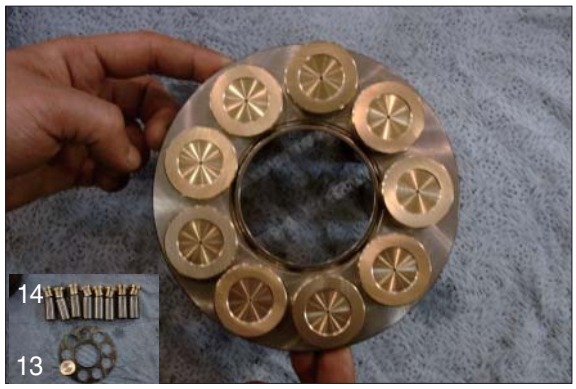
14078SM208/208A

② Assemble ball guide (12) into cylinder.
- Ball guide ×1EA



14078SM207/207A

③ Assemble piston assy (14) 9 set into set plate (13).
- Piston assy ×9EA
- SET plate ×1EA

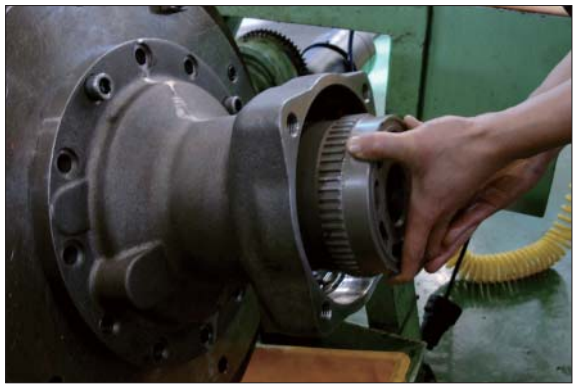


14078SM223/223A

④ Assemble above item ② and ③.

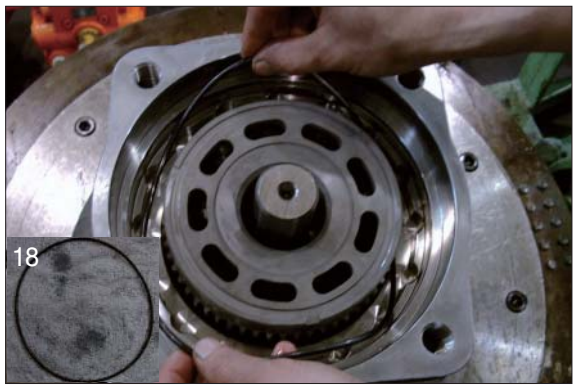
14078SM224

⑤ Assemble cylinder block assy into body (1).



14078SM225

⑥ Assemble O-ring (18) into body (1).
- O-ring ×1EA



14078SM226/226A

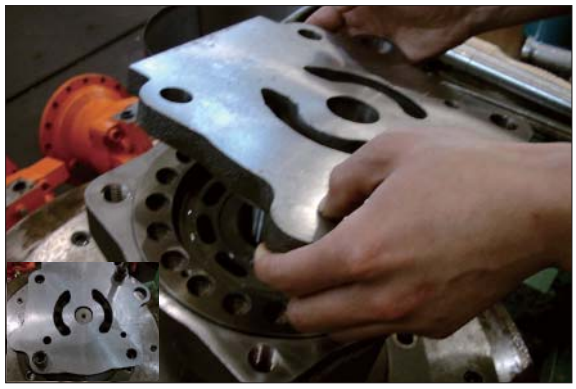
⑦ Assemble 3 set of plate (16), friction plate (15) respectively into body.
- Plate ×3EA
- Friction plate ×3EA

14078SM227/205A

⑧ Assemble O-ring (19) into break piston (17).
- O-ring ×2EA

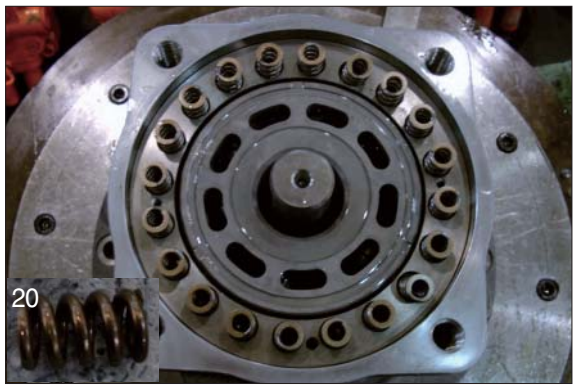
14078SM228/226A

⑨ Insert break piston assy into body (1) and compress it with a jig and hammer.



14078SM229/229A

⑩ Assemble spring (20) (20EA) into break piston (17).
- Spring ×20EA



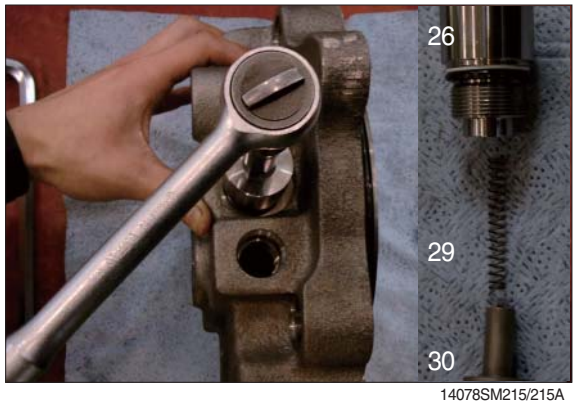
14078SM230/230A

(3) Assemble the sub of rear cover assy sub

① Assemble the sub of make up check valve assy.
Assemble O-ring (28), back up ring (27) into plug (26) with a O-ring assembling jig.
- Plug×1EA
- Back up ring×1EA
- O-ring×1EA

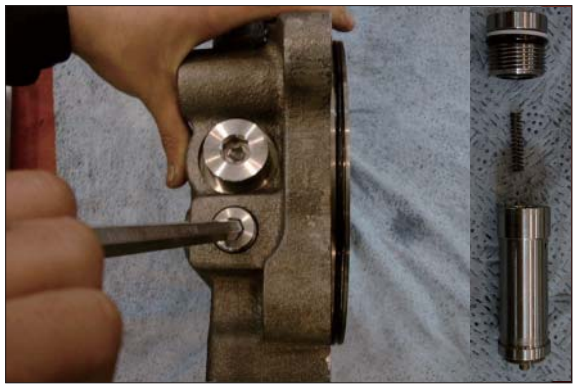
14078SM231/231A/B

② Assemble respectively make up check valve assy spring (29), check (30), plug (26) into rear cover (21) after then screw it torque wrench.
- Make up check sub ×2set
- Spring ×2EA
- Check ×3EA



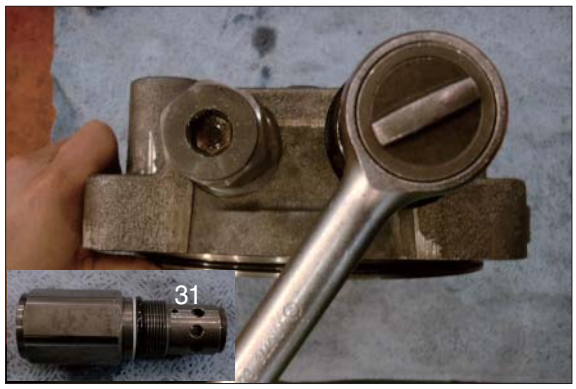
14078SM215/215A

③ Assemble respectively plug (43), back up ring, O-ring, O-ring, spring, anti-rotating valve assy (32) into rear cover (21). (Bilateral symmetry assembling)
- Anti-Inversion v/v assy × 2set
- O-ring (P12) × 2EA
- O-ring (P18) × 2EA
- Back up ring (P18) × 2EA



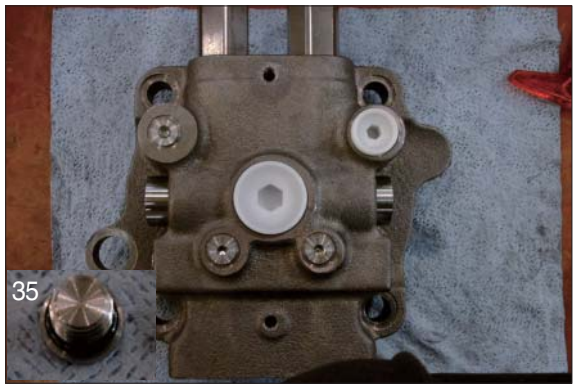
14078SM214/214A

④ Assemble relief valve assy (31) 2set into rear cover (21) with a torque wrench. (Bilateral symmetry assembling)



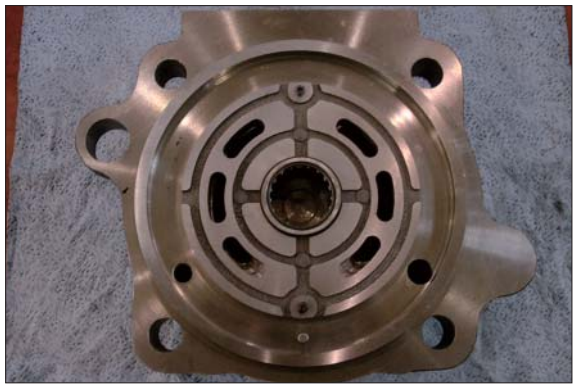
14078SM213/213A

⑤ Assemble plug (35), plug (37, 38) into rear cover (21) with a L-wrench.
* Plug × 3EA (PF1/4)



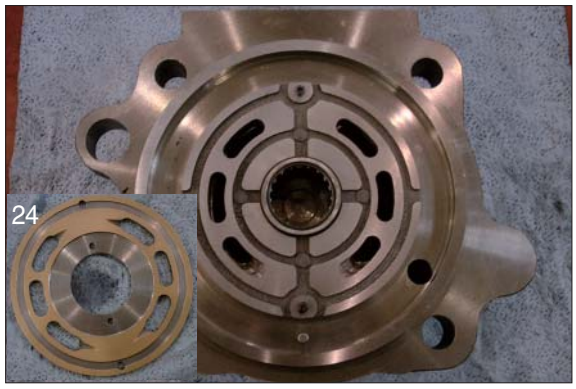
14078SM216/216A

⑥ After assembling needle bearing (22) into rear cover (21), with a hammer assemble pin (8, 23).
* Pin × 1EA
* Pin × 2EA



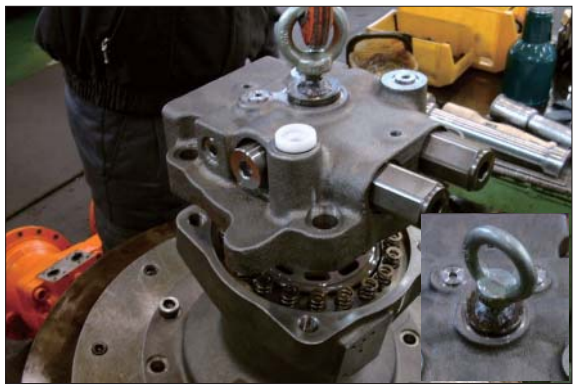
14078SM212

⑦ Spreading grease on valve plate (24), assemble into rear cover (21).
- Valve plate × 1EA

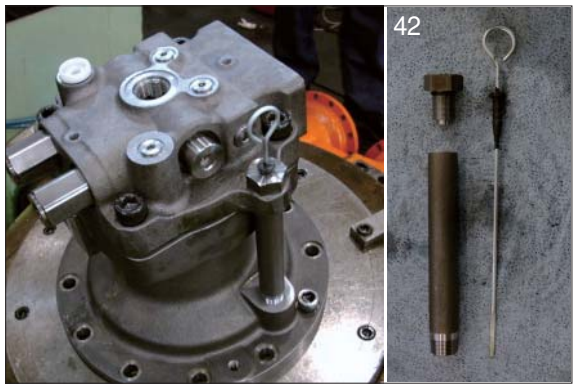


14078SM212/212A

⑧ Lift up rear cover assy on body (1) by a crane and assemble it with a wrench bolt (25).

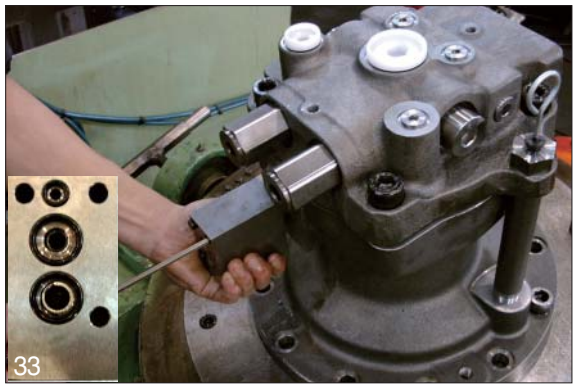

14078SM203/203A

⑨ Assemble level gauge (42) into body (1).



14078SM202/202A

⑩ Assemble time delay valve assy (33) into rear cover (21) with a wrench bolt (34).



14078SM01/201A

(4) Air pressing test

Be sure of leakage, after press air into assembled motor

14078SM232

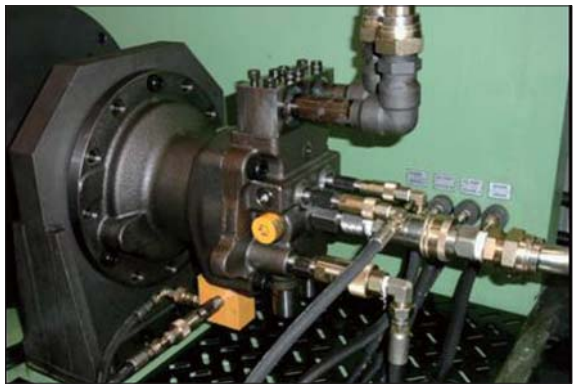
(5) Leakage check

After cleaning motor by color check No.1, paint No.3 and be sure of leakage.

14078SM233/233A

(6) Mount test bench

Mounting motor test bench, test the availability of each part.



220078SM14

3. REMOVAL AND INSTALL OF REDUCTION GEAR

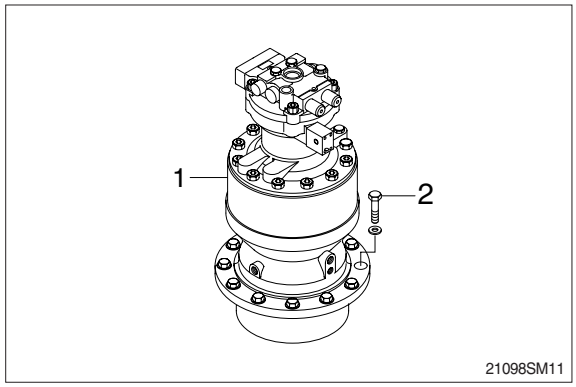
1) REMOVAL

(1) Remove the swing motor assembly.
For details, see removal of swing motor assembly.

(2) Sling reduction gear assembly (1) and remove mounting bolts (2).

(3) Remove the reduction gear assembly.
- Reduction gear device weight : 180 kgf · m (396 lbf · ft)

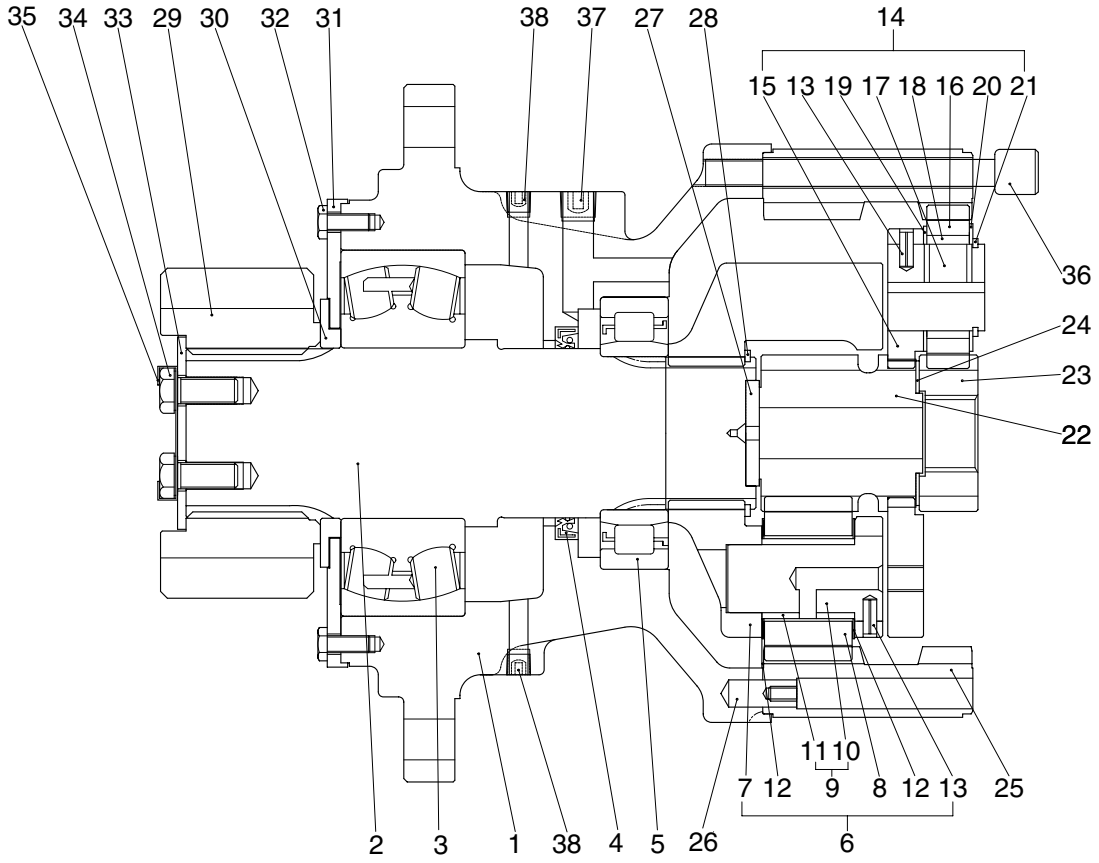
2) INSTALL



(1) Carry out installation in the reverse order to removal.
- Tightening torque : 58.4±6.4 kgf · m (422±46.3 lbf · ft)

4. DISASSEMBLY AND ASSEMBLY OF REDUCTION GEAR

1) STRUCTURE



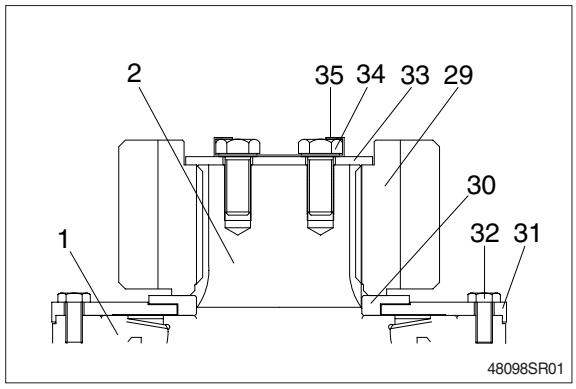
48092SM03

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

2) DISASSEMBLY

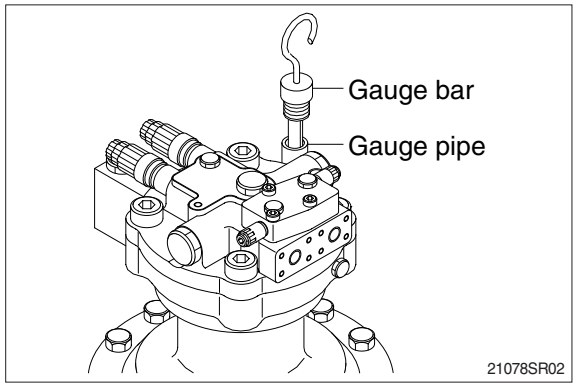
(1) Spread off the 4 corners of lock washer (35) with a tool.

※ Do not reuse lock washer (35).
Loosen the bolts (34) and then remove lock washer (35) and lock plate (33) from the pinion gear (29).
Remove pinion gear (29) and spacer (30) from the drive shaft (2).
Remove cover plate (31) from the casing (1) by loosening the hexagon bolts (32).

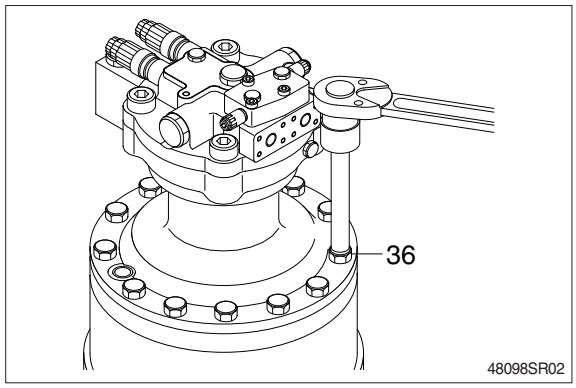


(2) Remove gauge bar and gauge pipe from the swing motor casing.

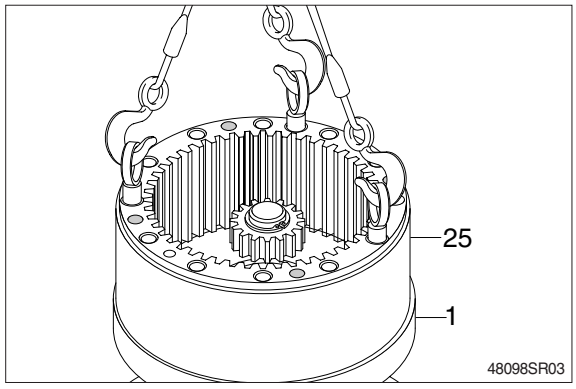
※ Pour the gear oil out of reduction gear into the clean bowl to check out the friction decrease.



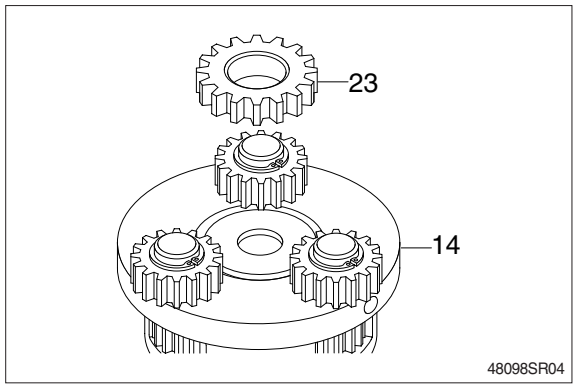
(3) Loosen the socket bolts (36) to separate swing motor from reduction gear.



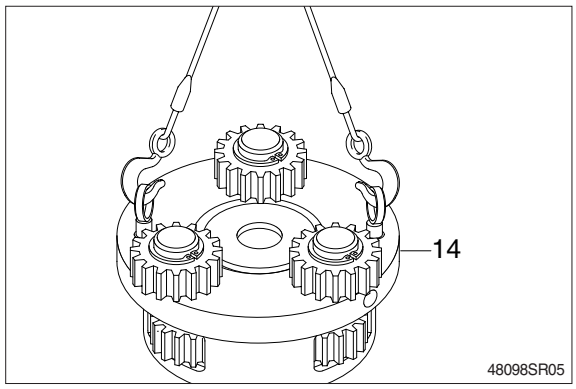
(4) Tighten 3 M16 eye bolts to the ring gear (25) and then lift the ring gear (25) out of the casing (1).



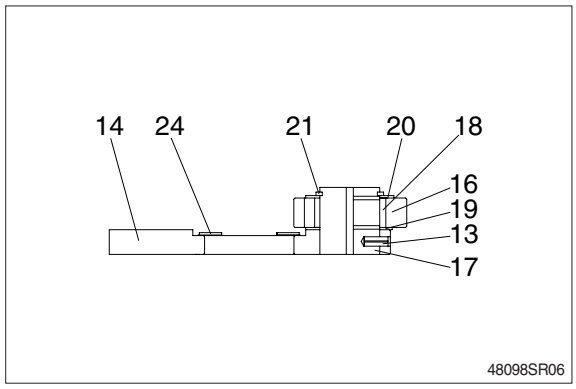
(5) Remove sun gear1 (23).



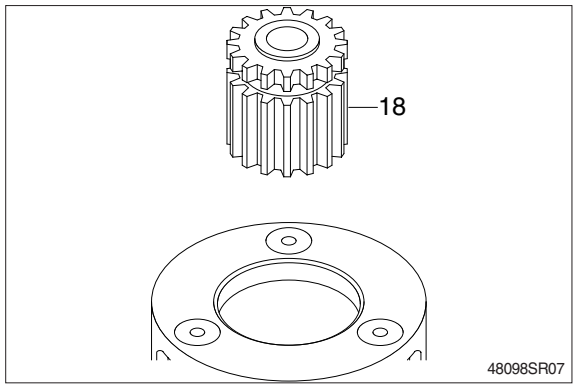
(6) Tighten two M10 eye bolts to carrier1 (14) and lift up and remove carrier1 (14) as subassembly.



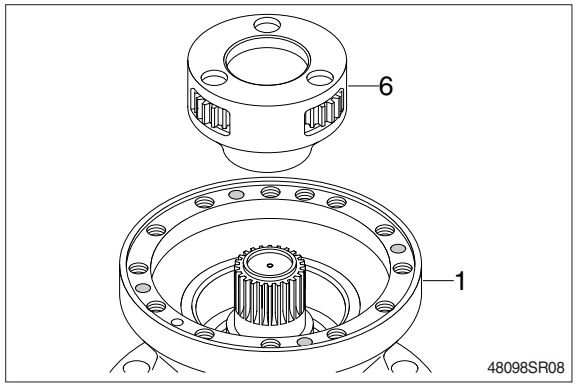
(7) Disassembling carrier1 (14) assembly.
① Remove stop ring (21).
② Remove side plate2 (20), planet gear1 (16), needle cage (18), side plate1 (19) and side plate3 (24) from the carrier.
③ Using M8 solid drill, crush spring pin (13) so that the pin1 (17) can be removed by hammering.
④ Remove side plate3 (24) from carrier1 (14).
※ Do not reuse spring pin (13).
※ Do not remove pin1 (17), carrier1 (14) and spring pin (13) but in case of replacement.
※ Put matching marks on the planet gear1 (16) and the pin1 (38) for easy reassembly.



(8) Remove sun gear2 (22).



(9) Remove carrier2 (6) assembly from casing (1).



(10) Disassembling carrier 2 (6) assembly

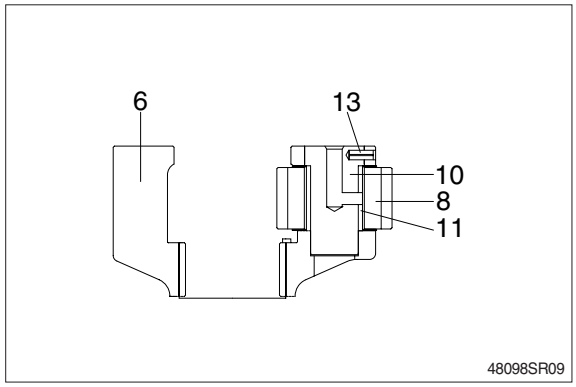
① Using M8 solid drill, crush spring pin (13) so that the pin & bushing (10) can be removed.

※ Do not reuse spring pin (13).

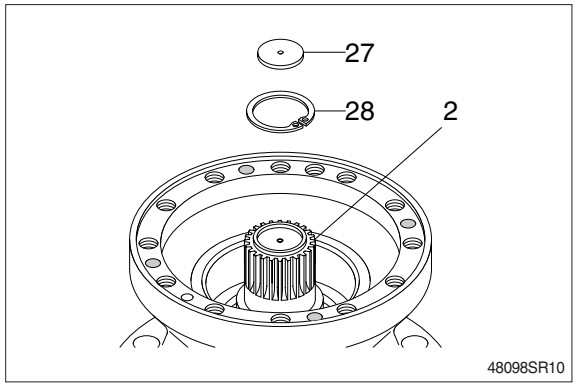
② Remove pin & bushing (10), planet gear 2 (8) and bushing 2 (11) from the carrier 2 (9).

※ Put matching marks on the planet gear 2 (8) and the pin & bushing (10) for easy reassembly.

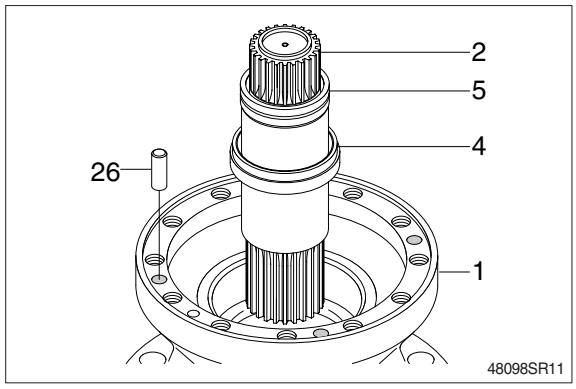
※ Do not disassemble pin & bushing (10), carrier 2 (6) and spring pin (13) but in case of replacement.



(11) Remove thrust plate (27) and stop ring (28) from the drive shaft (2).

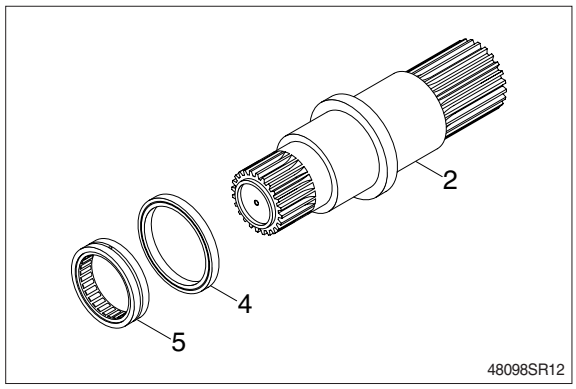


(12) Remove drive shaft (2) with roller bearing (5) and oil seal (4) assembled.
Remove knock pin (26) from the casing (1).

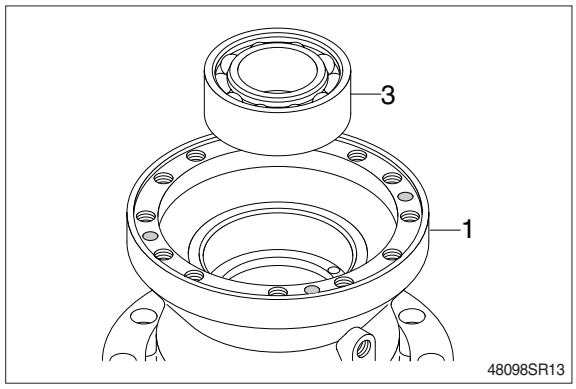


(13) Remove roller bearing (5) and oil seal (4) from the drive shaft (2).

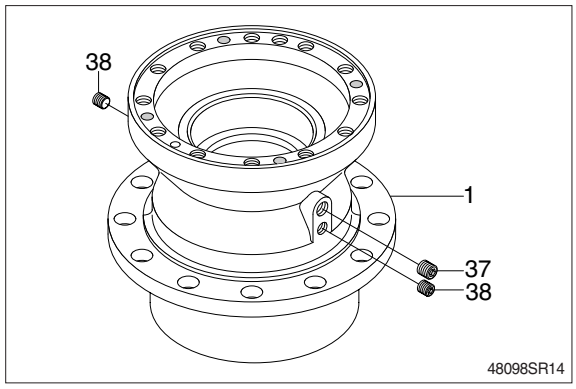
※ Do not reuse oil seal (4) once removed.



(14) Using the bearing disassembly tool, remove roller bearing (3).

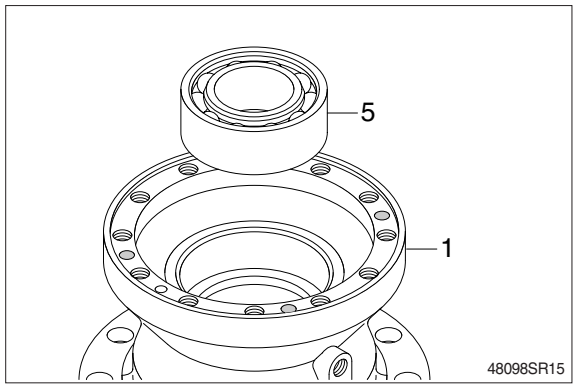


(15) Remove plugs (37, 38) from the casing (1).

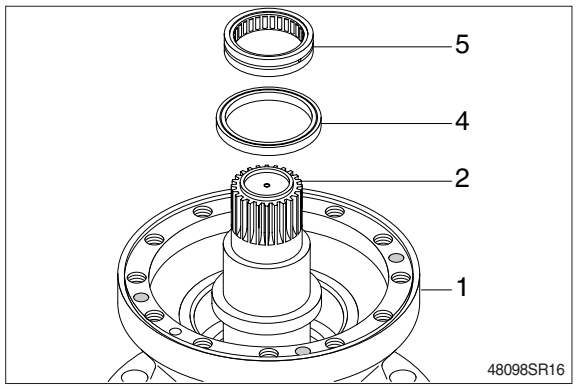


3) ASSEMBLY

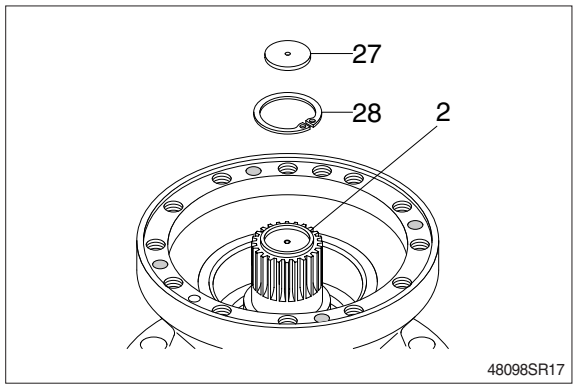
(1) Assemble roller bearing (3) inside the casing (1).



(2) Assemble the drive shaft (2) into the casing (1) and then install oil seal (4) and roller bearing (5).



(3) Install stop ring (28) and thrust plate (27) on top of drive shaft (2).



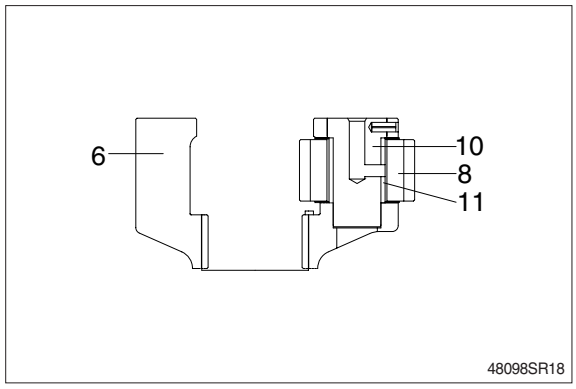
(4) Assembling carrier2 (6) assembly.

① Install bushing 2 (11) inside the planet gear 2 (8) and then assemble them to the carrier 2 (6).

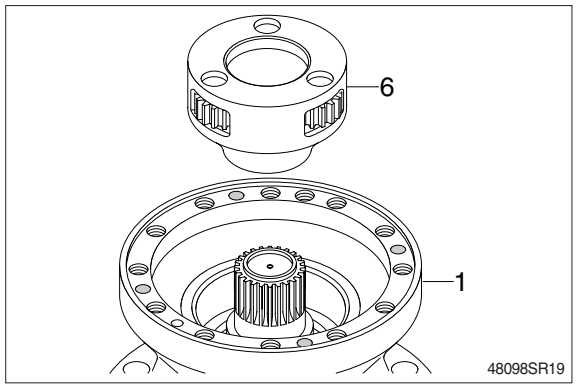
② Assemble the pin & bushing (10) to the carrier 2 (6) and then press the spring pin (13) by hammering.

③ Punch 2 points of the spring pin (13) lip.

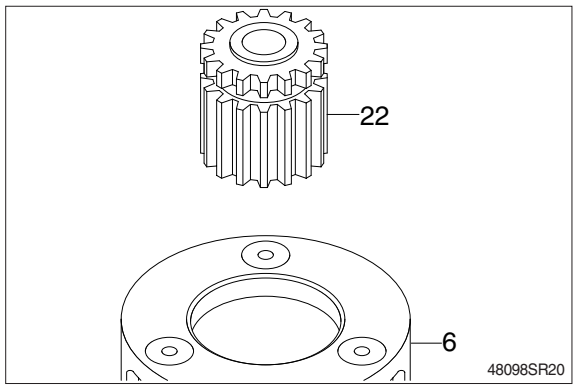
※ Take care not to mistake the matching marks of each part.



(5) Assemble carrier 2 (6) assembly correctly to the drive shaft (2).



(6) Assemble sun gear2 (22) to the center of the carrier2 (6) assembly.



(7) Assembling carrier1 (14) assembly.

① Assemble the pin1 (38) to the carrier1 (14) and then press the spring pin (13) by hammering.

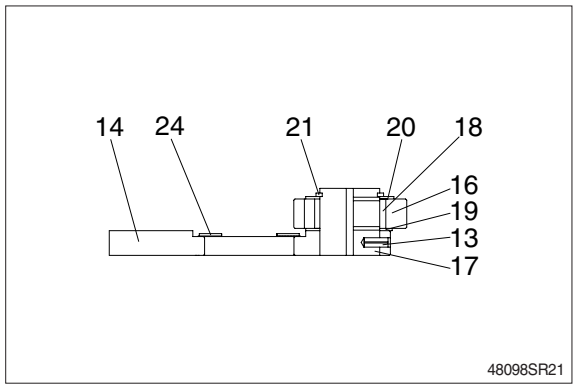
② Punch 2 points of the spring pin's (13) lip.

③ Install side plate3 (24) onto the center of carrier1 (14).

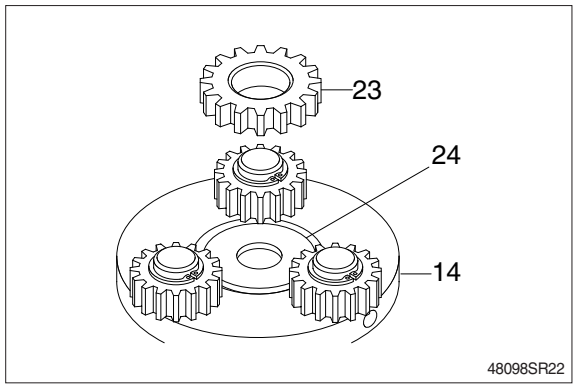
④ Install needle cage (18) into the planet gear1 (16).

⑤ Assemble side plate (19), planet gear1 (16), side plate2 (20) and then stop ring (21) to the pin1 (17).

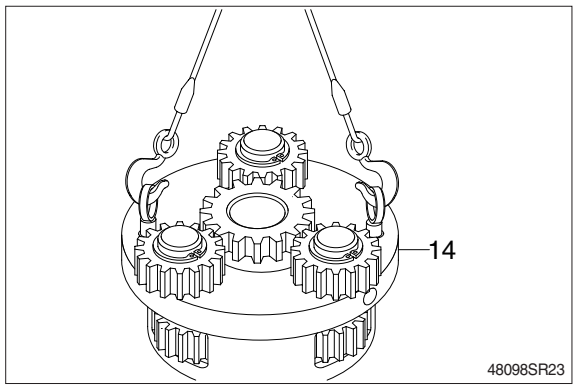
※ Take care not to mistake the matching marks of each part.



(8) Install sun gear1 (23) onto the side plate3 (24).



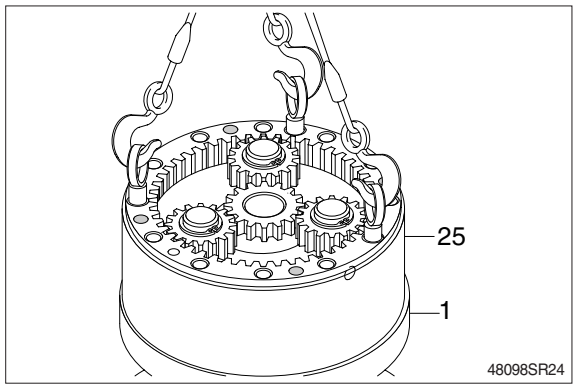
(9) Assemble carrier 1 (14) assembly onto the carrier2 assembly.



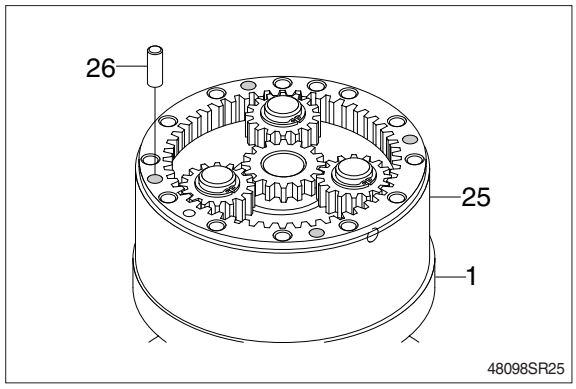
(10) Apply loctite to the tapped holes of casing (1).

(11) Tighten 3 M16 eye bolts to the ring gear (25) and lift up and then assemble it onto the casing (1).

※ Don't fail to coincide the knock pin (26) holes.



(12) Hammer 4 knock pins (26) around the ring gear (25).

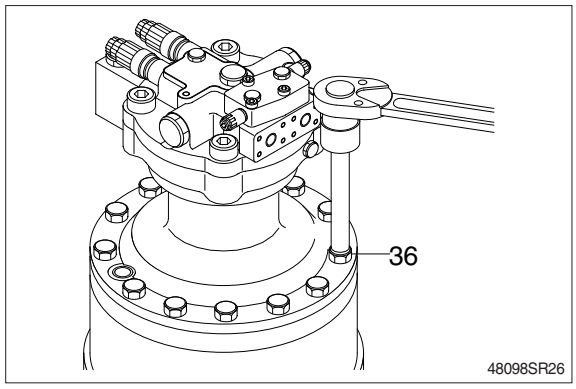


(13) Apply loctite to the tapped holes of the ring gear (25) and then mount swing motor onto the ring gear (25).

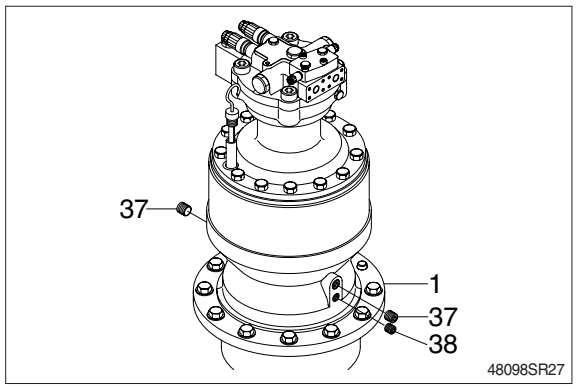
※ Don't fail to coincide the gauge bar (42) hole.

(14) Tighten socket bolts (36) around the swing motor assembly.

· Tightening torque : 24 kgf · m (173 lbf · ft)



(15) Assemble plugs (37, 38).



(16) Turn the swing motor assembly upside down and assemble cover plate (31) by tightening the hexagon bolts (32).

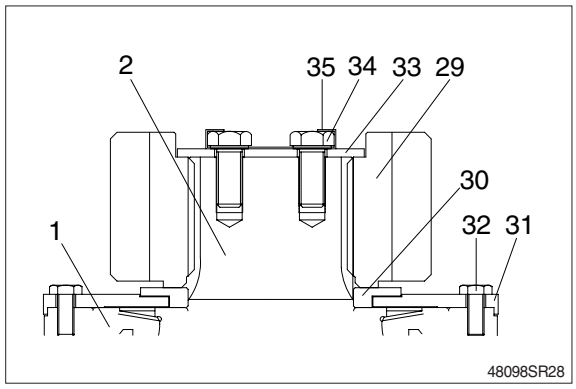
Install spacer (30) and pinion gear (29) to the drive shaft (2).

Assemble lock plate (33) on the pinion gear (29).

Assemble 2 lock washers (35) on the lock plate (33) with their 2 hole coincided individually to the tapped holes of drive shaft (2).

Tighten hexagon bolts (34) to the drive shaft (2) and then fold all the lock washer (35) corners over the hexagon bolts (34).

· Tightening torque : 24 kgf · m (173 lbf · ft)



(17) Inject oil into the reduction gear.

1. REMOVAL AND INSTALL

1) REMOVAL

(1) Swing the work equipment 90° and lower it completely to the ground.

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

(3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

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

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

(4) Remove the track shoe assembly.
For details, see removal of track shoe assembly.

(5) Remove the cover.

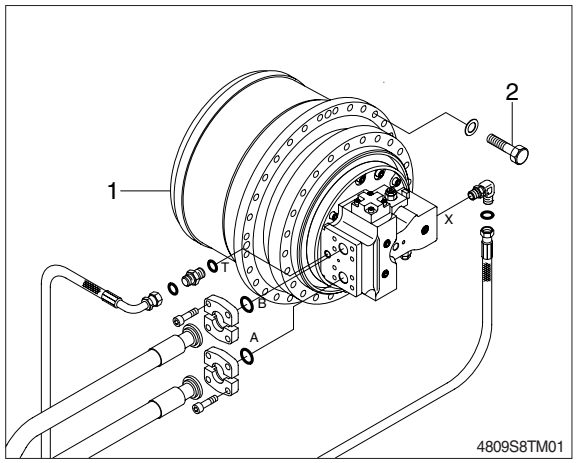
(6) Remove the hoses.

※ Fit blind plugs to the disconnected hoses.

(7) Remove the bolts and the sprocket.

(8) Sling travel device assembly (1).

(9) Remove the mounting bolts (2), then remove the travel device assembly.
· Weight : 440 ㎏ (970 ㏪)



2) INSTALL

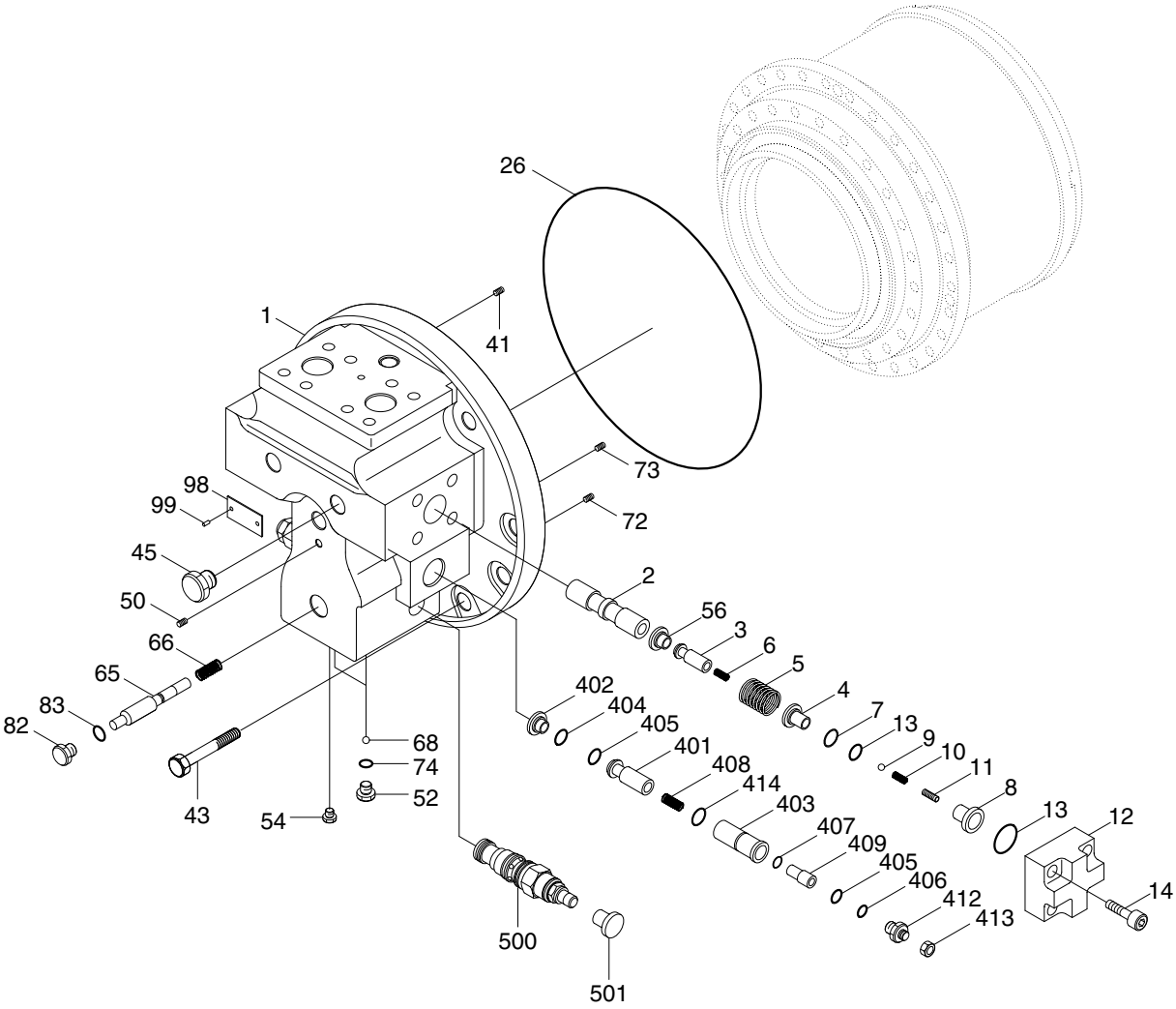
(1) Carry out installation in the reverse order to removal.

(2) Bleed the air from the travel motor.
① Remove the air vent plug.
② Pour in hydraulic oil until it overflows from the port.
③ Tighten plug lightly.
④ Start the engine, run at low idling, and check oil come out from plug.
⑤ Tighten plug fully.

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

2. TRAVEL MOTOR

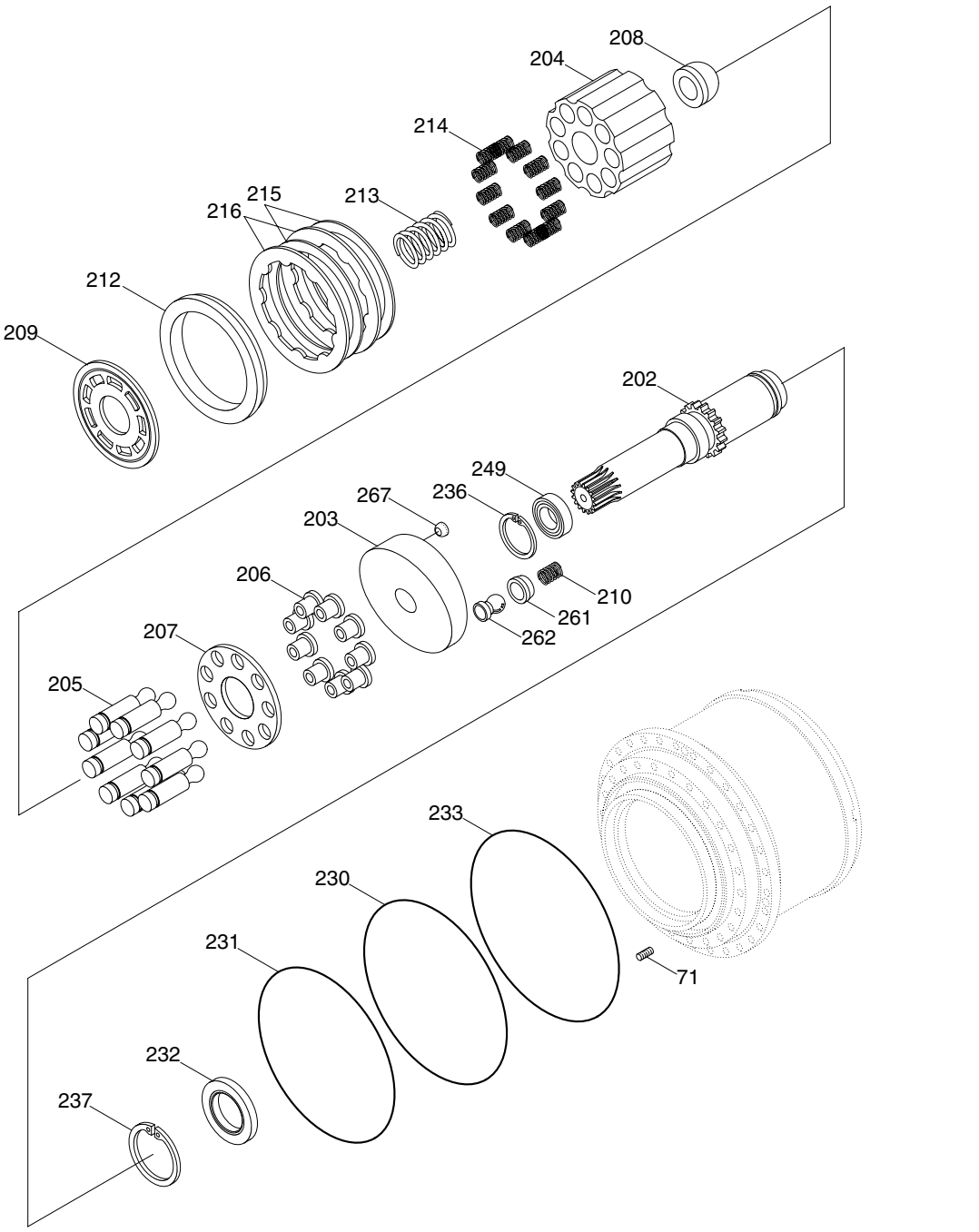
1) STRUCTURE (1/2)



4809S2TM02

1	Rear flange	43	Socket bolt	401	Plunger
2	Spool	45	PT Plug	402	Seat
3	Poppet	50	Needle bearing	403	Body
4	Plug	52	RO Plug	404	Back up ring
5	Check spring	54	Plug	405	O-ring
6	Main spring	56	Plug	406	O-ring
7	Washer	65	Spool	407	Retainer
8	Seat	66	Spring	408	Spring
9	Steel ball	68	Steel ball	409	Piston
10	Spring	72	Orifice	412	Adjust plug
11	Screw	73	Orifice	413	Lock nut
12	Cover	74	O-ring	414	Shim
13	O-ring	82	Plug	500	Reducing valve
14	Socket bolt	83	O-ring	501	Cover
26	O-ring	98	Name plate		
41	Valve plate pin	99	Rivet screw		

STRUCTURE (2/2)

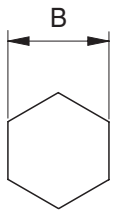


480H2TM03

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

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

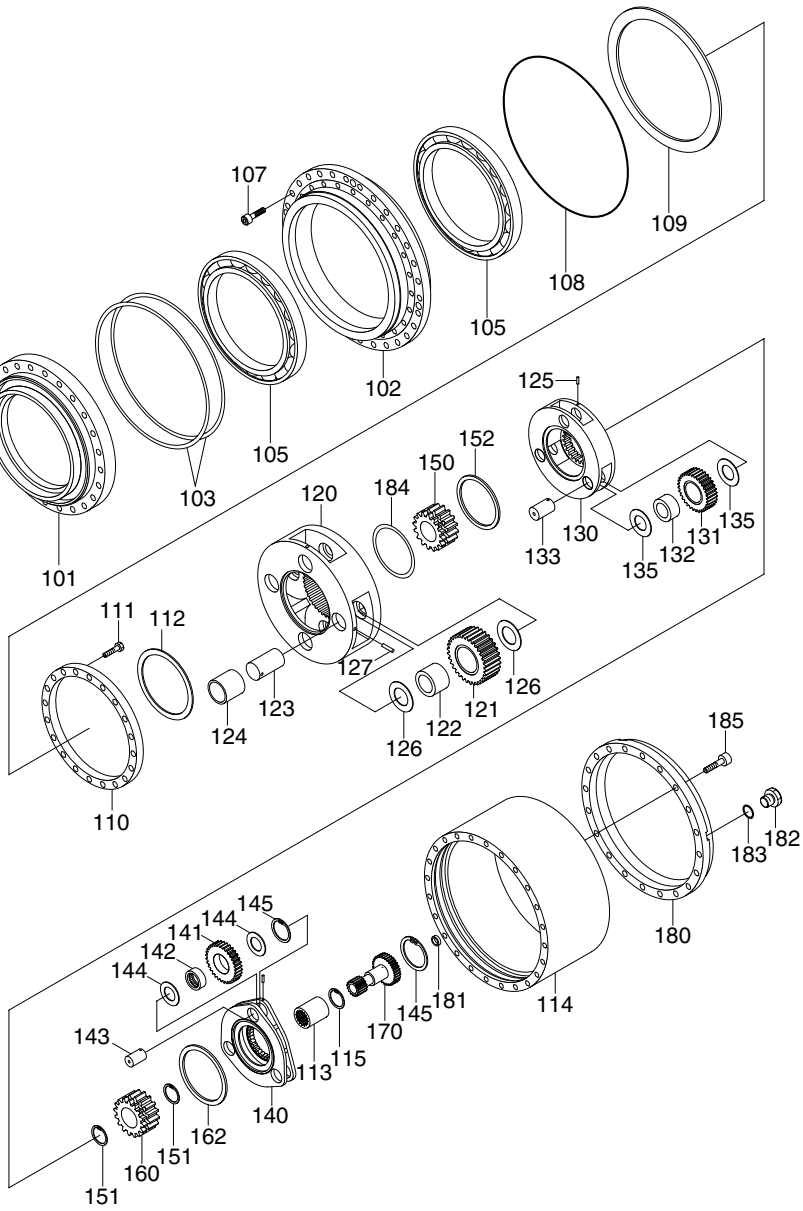
Tool name	Remark	
Allen wrench	2	
	4	
	6	
	10	
	17	
Socket for socket wrench, spanner	19	
	22.4	
	41	
Torque wrench	Capable of tightening with the specified torques.	
Plier (For hole, TPR-90)	For snap ring (236)	
Plier (For shaft)	For snap ring (237)	
(-) Driver	-	
Plastic hammer	Wooden hammer allowed.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

(2) Tightening torque

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

3. TRAVEL REDUCTION GEAR

1) STRUCTURE

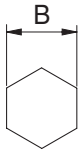


480H2TM04

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

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

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

(2) Tightening torque

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

4. DISASSEMBLING

1) GENERAL PRECAUTIONS

(1) Pay attention to not damaging contact surfaces for O-rings, oil seals, etc. and contact/sliding surfaces for gears, pins, bearings, etc.

(2) This motor can be disassembled even in a state on the reduction gear.
However, in that case, pay full attention to preventing mud, dust, etc. from entering in it.

(3) The numerical in parentheses following each part name indicates its part number shown in the attached **assembly drawings.**

(4) The piping side of the motor is referred to as the rear side, and the output side as the front side.

2) DISASSEMBLY OF REDUCTION GEAR

(1) Select a disassembling place.
※ Select a clean place.
※ Spread rubber sheet or cloth on work bench to prevent parts from being damaged.

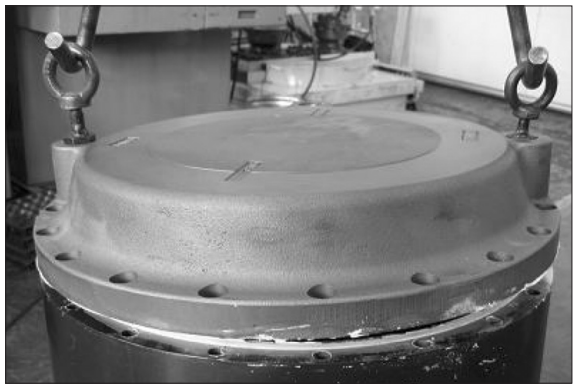
(2) Remove dust, mud, etc. from reduction gear surfaces with washing oil or so.

(3) Place reduction gear with its gear oil drain port or level gauge at the lowest position, and drain reduction gear oil.
※ Receive gear oil with clean vessel and check it for abnormalities.
Renew gear oil.

(4) Place reduction gear with its side cover (180) upward, than remove socket bolt (185).
※ Don't reuse thrust washer (181) in cover.

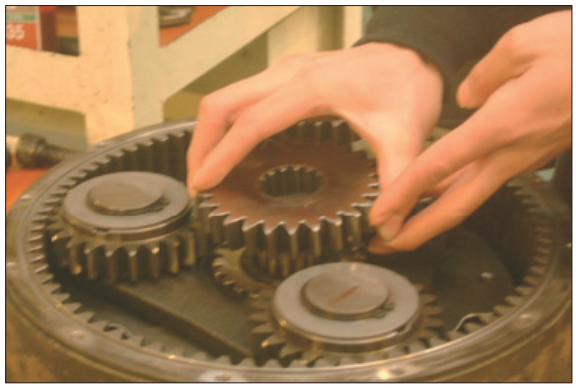
480H8TM01

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



480H8TM02

(6) Remove drive gear (170).



370078TM02

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

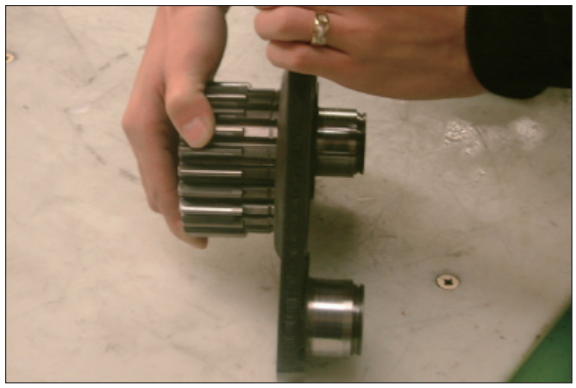
370078TM03

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

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

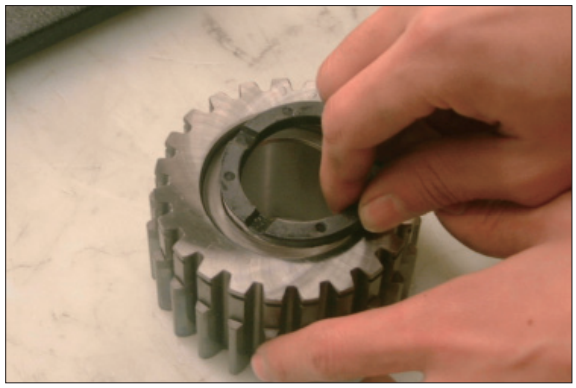
370078TM04

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



370078TM05

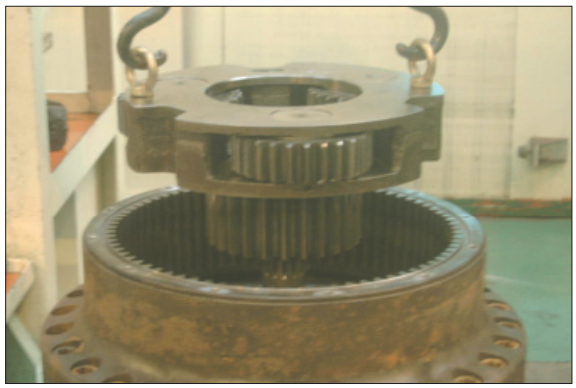
(10) Remove thrust ring (151).



370078TM06

(11) Remove carrier 2 (130).

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

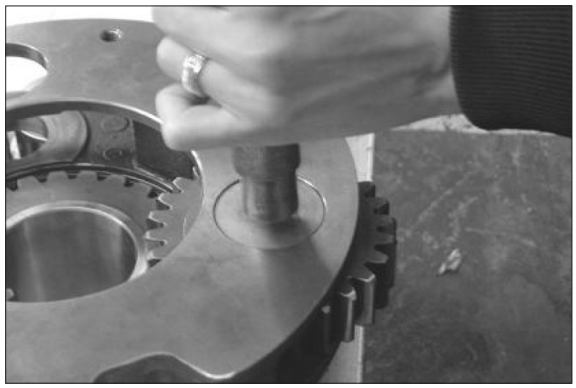


370078TM07

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

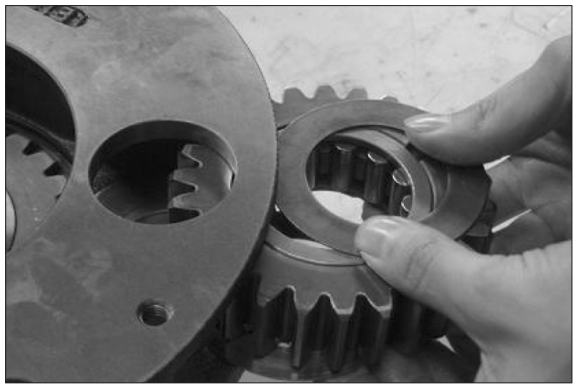
※ Carry out the following check in advance. If any abnormality should be found, carry out disassembling.

- Is there any crevice, crack or pitting on tooth surface of planetary gear?
- When turning planetary gear lightly, is there any abnormal noise or eccentric clearance.



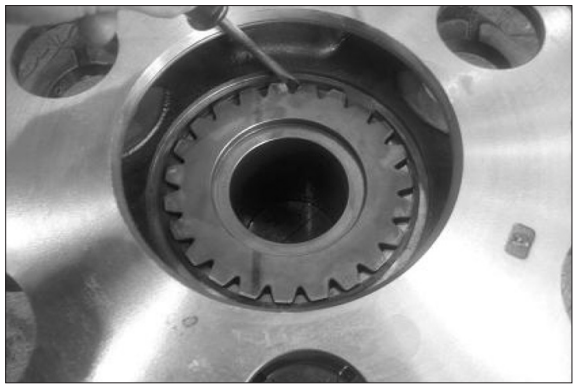
480H8TM12

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



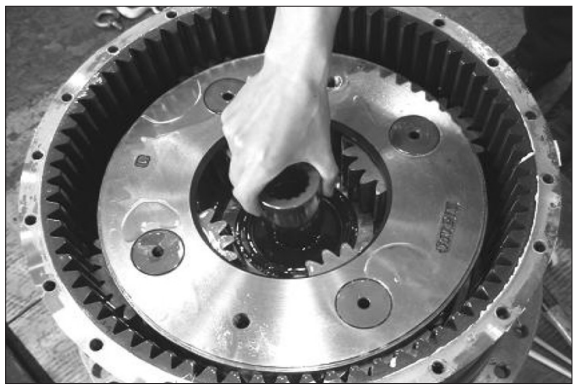
480H8TM13

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



480H8TM14

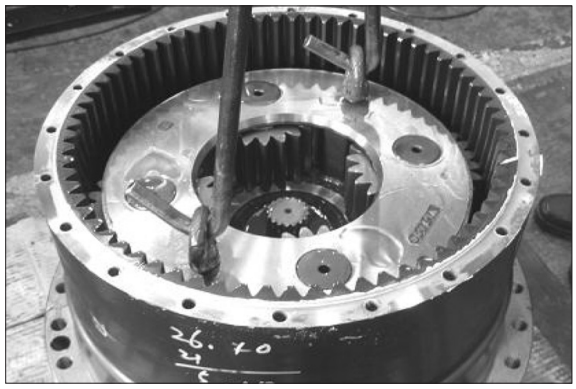
(15) Remove coupling (113) from drive shaft (202).



480H8TM15

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

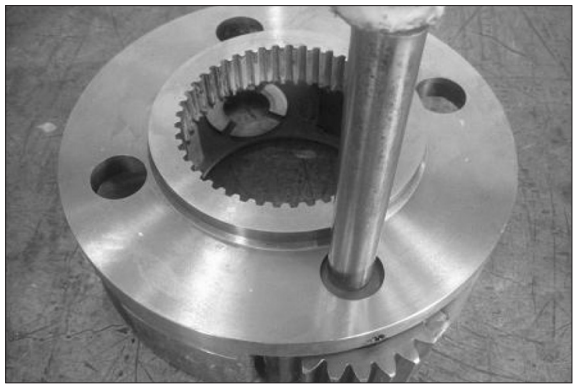
※ Mount two eyebolt M16, then lift it using crane.



480H8TM16

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

※ Remove shaft bearing 3 from carrier 3 rear.

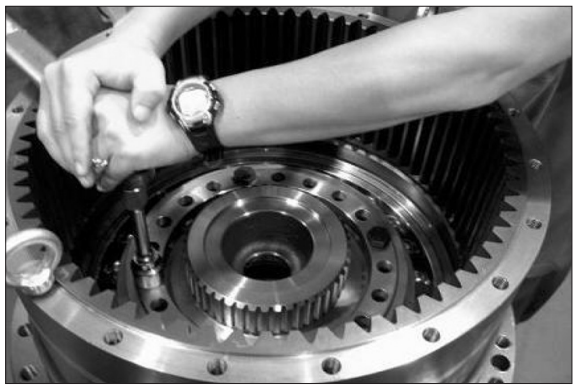


480H8TM17

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

480H8TM18

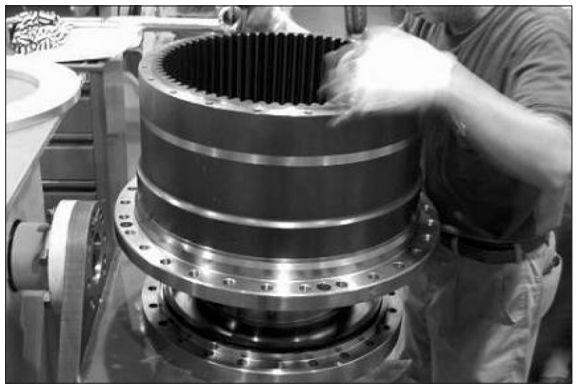
(19) Remove coupling (110), then distance piece.



480H8TM19

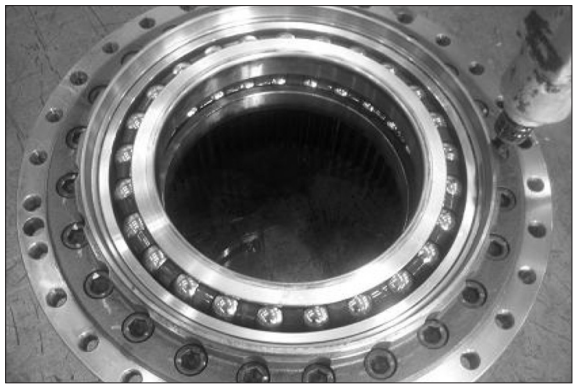
(20) Remove subassembly with hub (102) and ring gear (114), then remove floating seal (103).

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



480H8TM20

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



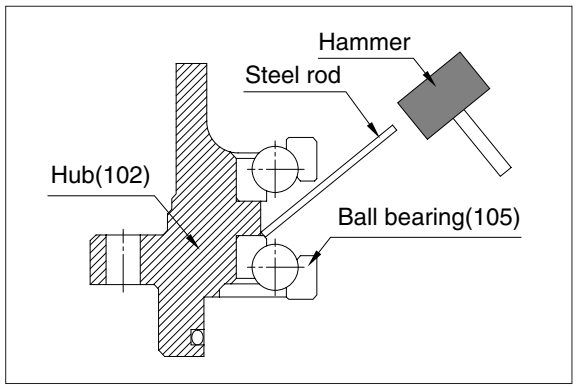
480H8TM21

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

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

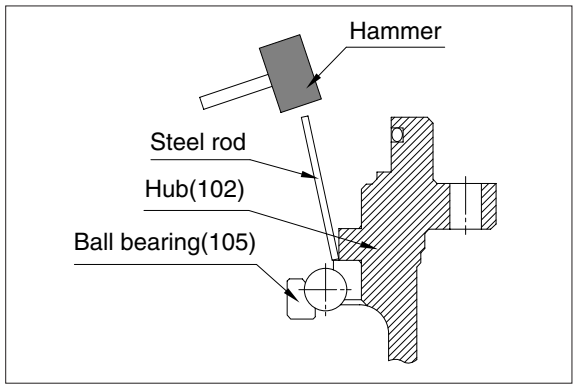
480H8TM22

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



480H8TM23

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



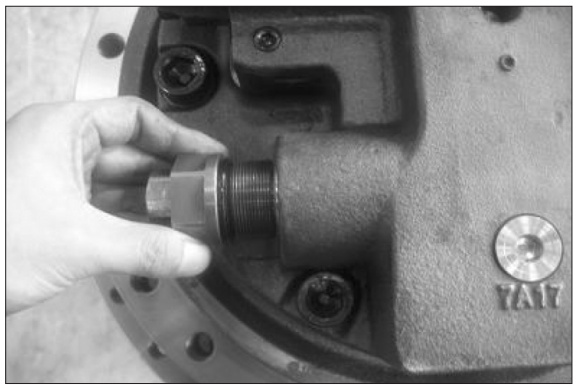
480H8TM24

3) DISASSEMBLY OF MOTOR

(1) Loosen reducing valve assy.

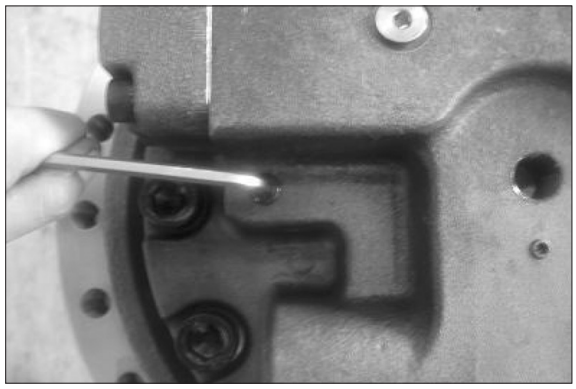
480H8TM25

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



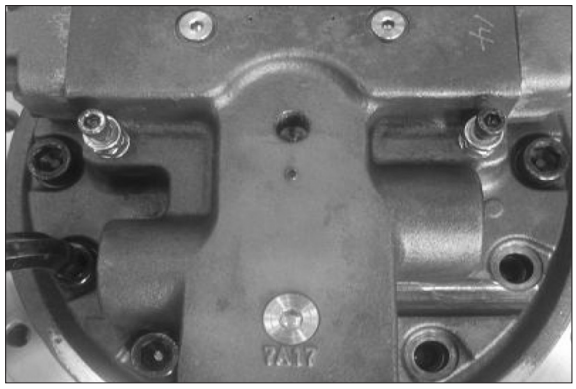
480H8TM26

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



480H8TM27

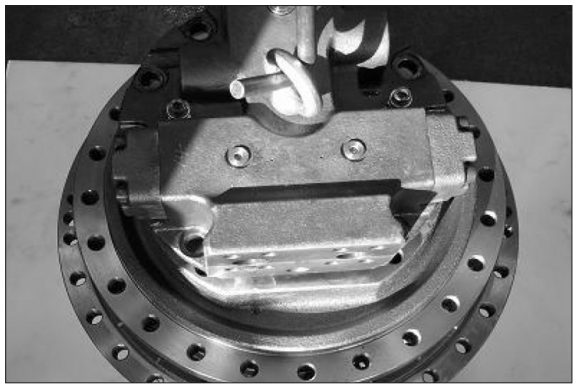
(4) Remove socket bolt (43, 8EA).



480H8TM28

(5) Remove it as lifting rear flange sub.

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



480H8TM29

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

480H8TM30

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

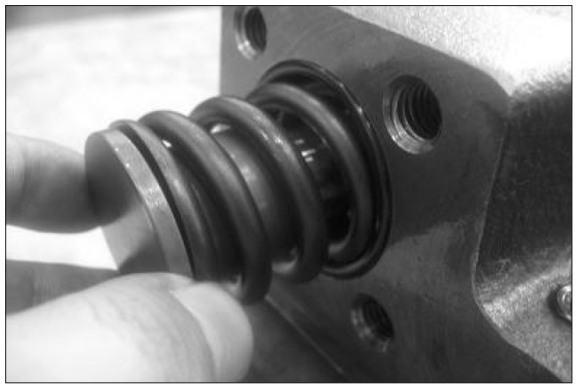
480H8TM31

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

480H8TM32

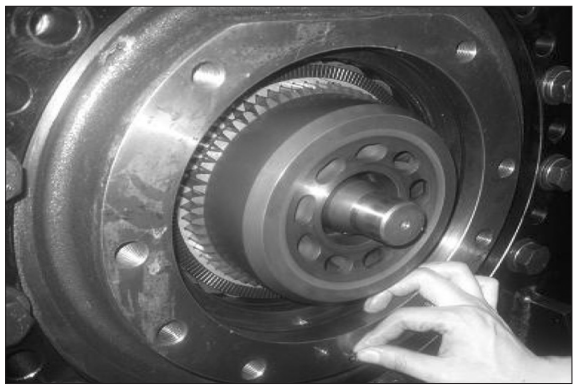
(9) Remove socket bolt (14) and cover (12) then remove counter balance spool assy.

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



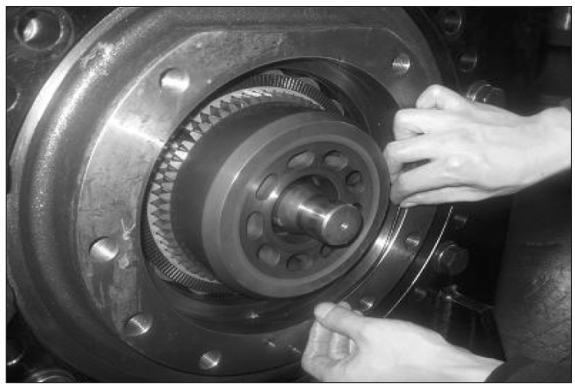
480H8TM33

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



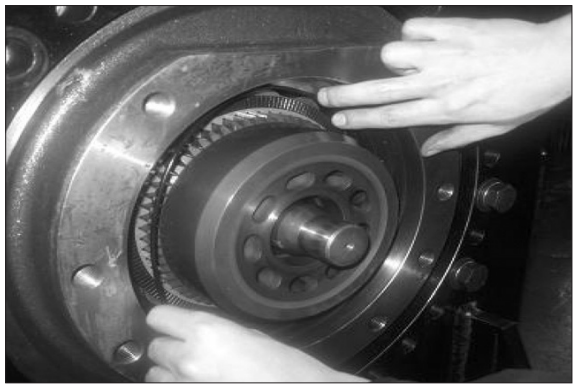
480H8TM34

(11) Remove O-ring (230).



480H8TM35

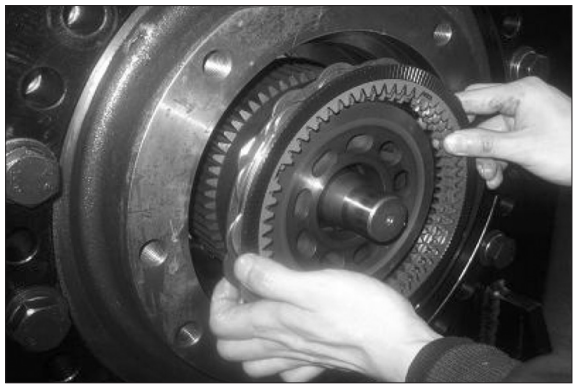
(12) Remove O-ring (231).



480H8TM36

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

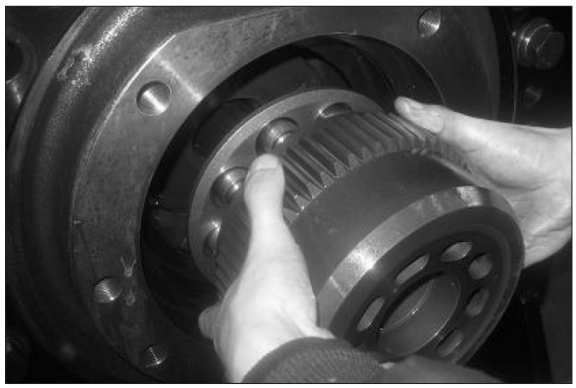
※ In this case, motor should be located in horizontally.



480H8TM37

(14) Remove cylinder block kit.

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



480H8TM38

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

480H8TM39

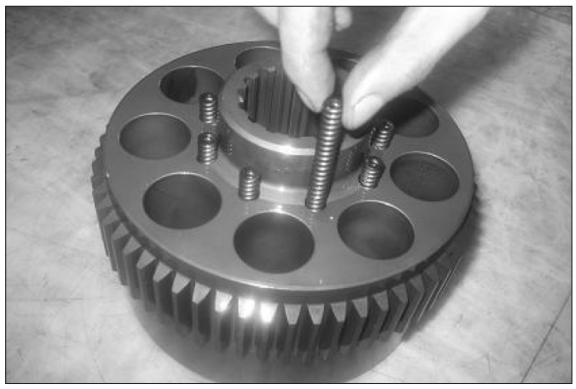
(16) Remove piston assy from retainer (207).

480H8TM40

(17) Remove trust ball (208).

480H8TM41

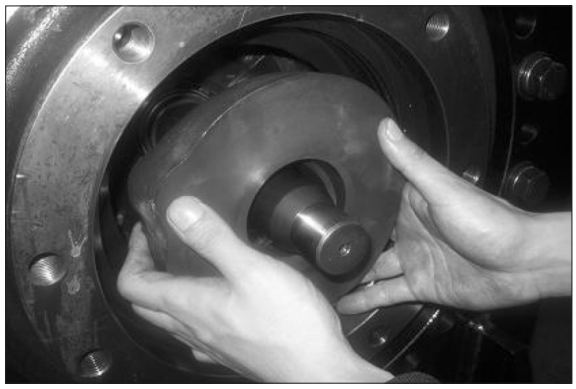
(18) Remove cylinder block spring (214, 9EA).



480H8TM42

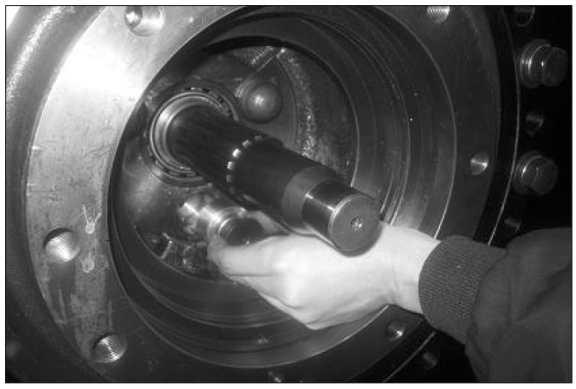
(19) Remove swash plate (203).

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



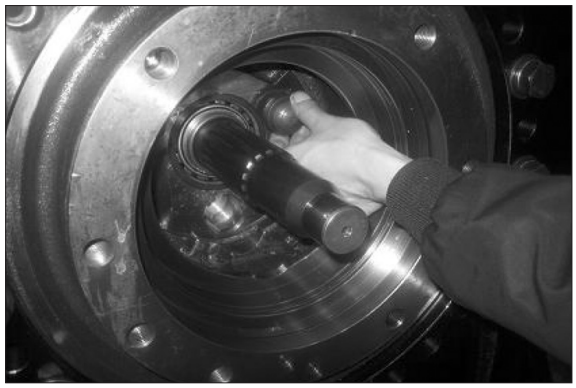
480H8TM43

(20) Remove piston assy (2 speed).



480H8TM44

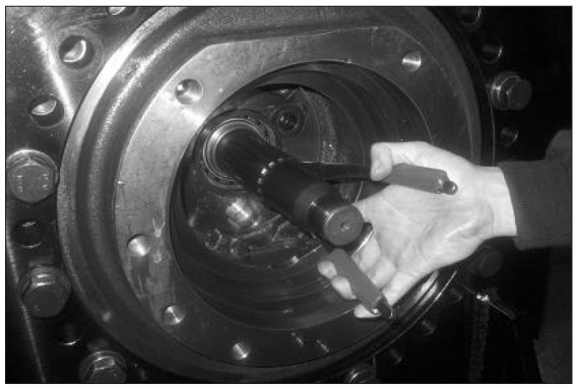
(21) Remove pivot (267, 2EA).



480H8TM45

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

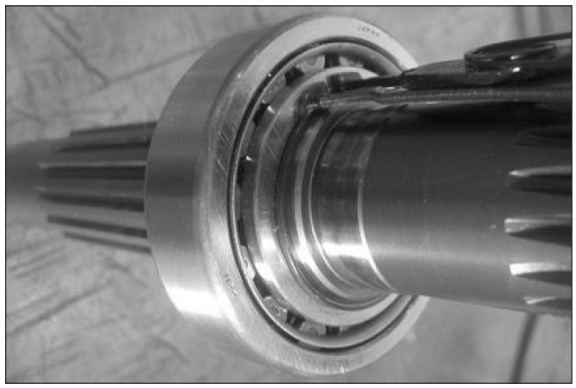
※ As remove snap ring (236), use snap ring plier.



480H8TM46

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

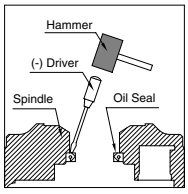
※ Use snap ring plier.



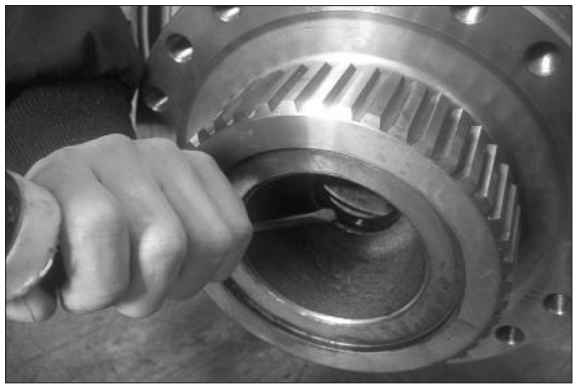
480H8TM47

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

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



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



480H8TM48

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

5. ASSEMBLING

1) GENERAL CAUTIONS

(1) Clean each part fully with washing oil and dry it by blasting compressed air. It is better not to use waste cloths as much as possible.
However, if they are to be used, use clean ones, and pay attention to not leaving lint and so on.
Don't clean the friction plate with washing oil without fail.

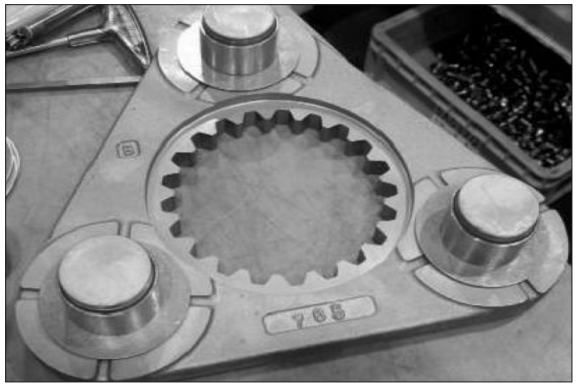
(2) Use the torque wrench in tightening fitting screws and plugs to their respective torque shown in page 8-72, 8-74.

(3) When hammering is required, use the plastic hammer and try to hit parts lightly.

(4) Similarly to the disassembling procedures, the numeral in parentheses following each part name indicates its item number shown in the attached assembly drawings.

2) ASSEMBLY OF REDUCTION GEAR

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

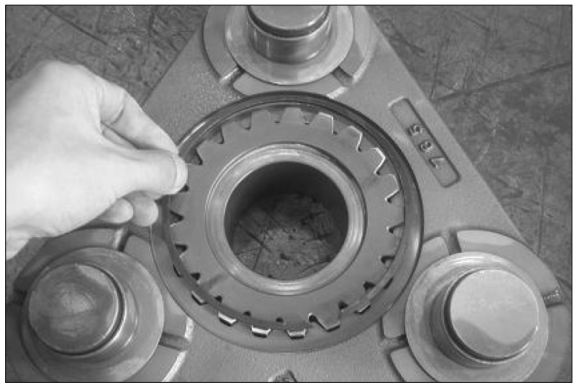


480H8TM50

(2) Assemble needle bearing (142).

480H8TM51

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



480H8TM52

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

480H8TM53

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

480H8TM54

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

480H8TM55

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

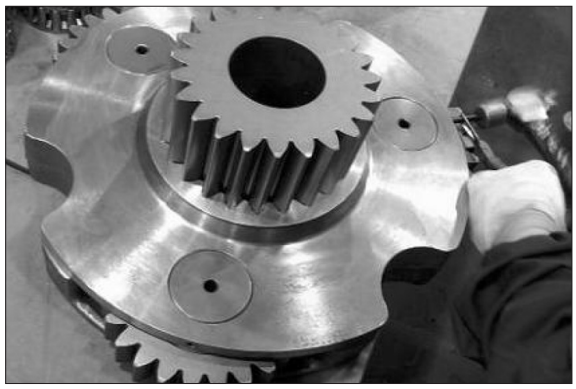
480H8TM56

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

480H8TM57

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

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

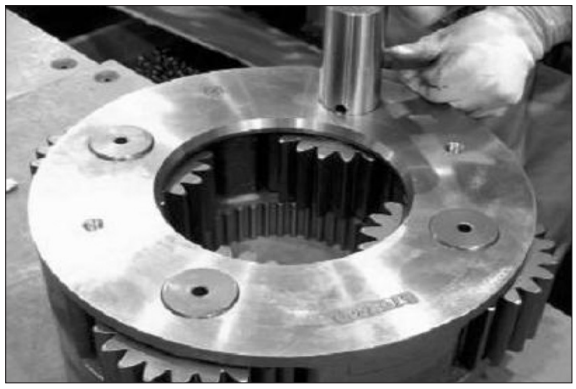


480H8TM58

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

480H8TM59

(11) Insert shaft bearing 3 (124).



480H8TM60

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

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

480H8TM61

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

480H8TM62

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

480H8TM63

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

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

480H8TM64

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

480H8TM65

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

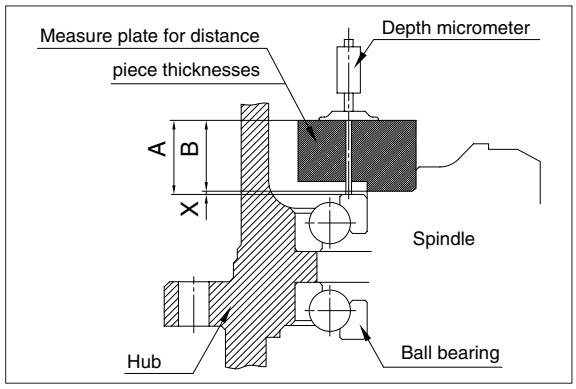
① Mount a measure plate on the spindle without inserting a distance piece.
② Tighten socket bolt (111) lightly.
③ As shown in the diagram at right, measure dimension "A" using depth micrometer.
④ As shown in the diagram at right, measure dimension "C" of coupling (B) (110) to be mounted.
⑤ Using the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

a. Measure the clearance between the edge of the spindle (101) and that of the ball bearing (105).
Take this clearance as "X"
"X" = "A" - "B"

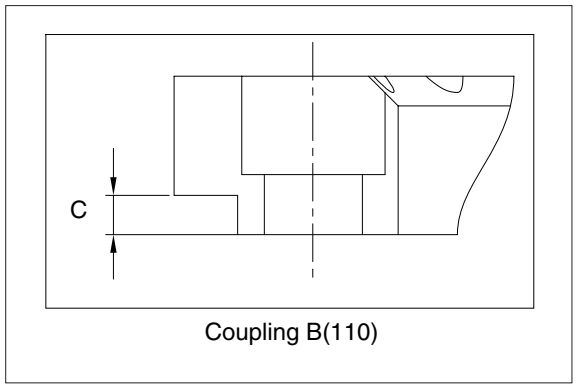
b. Next, determine the distance piece (109) of the appropriate thickness.
Take this thickness as "T"
"T" = ("C" - "X") ±0.1

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

480H8TM66



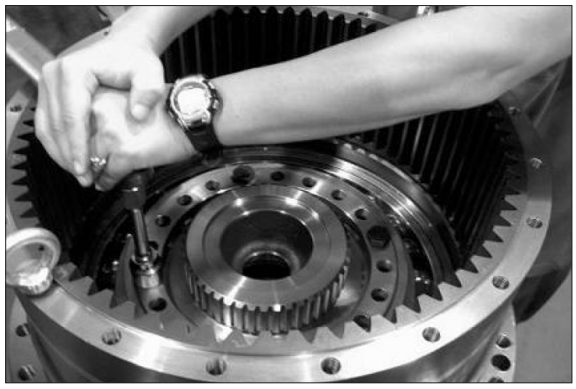
480H8TM67



480H8TM68

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

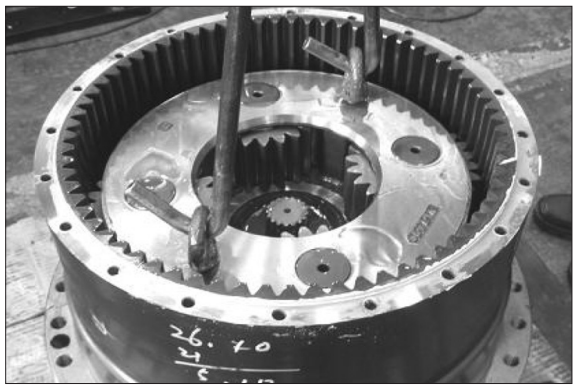
※ Tightening torque
socket bolt (111) : 25.7 kgf · m
(186 lbf · ft)



480H8TM69

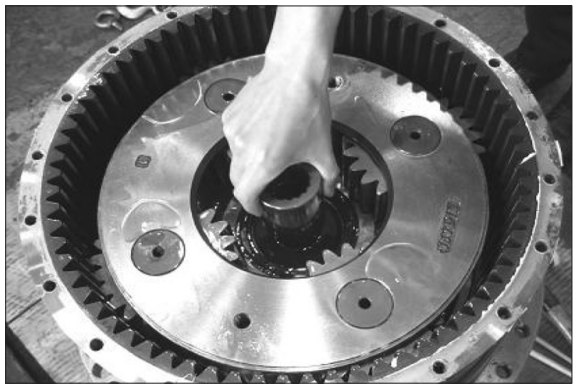
(19) Mount thrust plate R (112) to spindle (101), and then assemble carrier 3 sub-assembly to ring gear (114).

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



480H8TM70

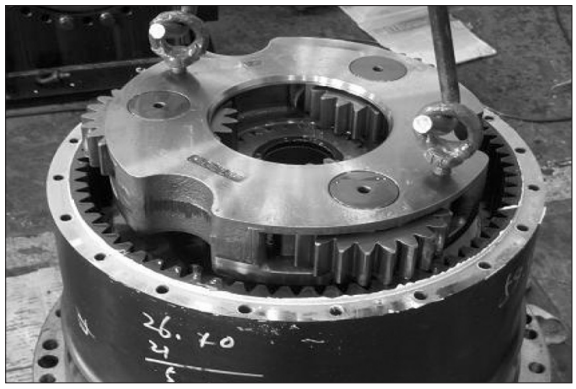
(20) Assemble coupling (113) to drive shaft (202).



480H8TM71

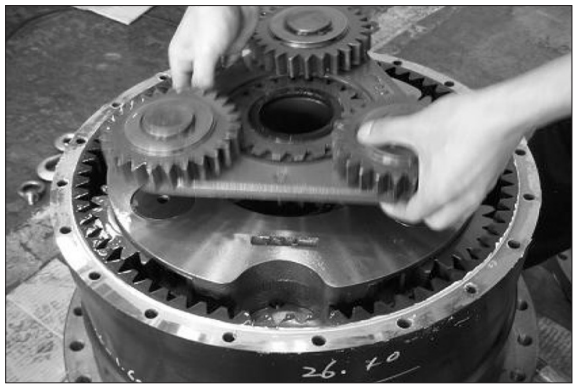
(21) Assemble carrier 2 sub-assembly to ring gear (114).

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



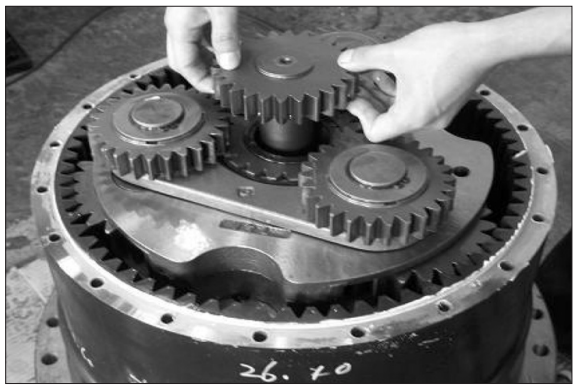
480H8TM72

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



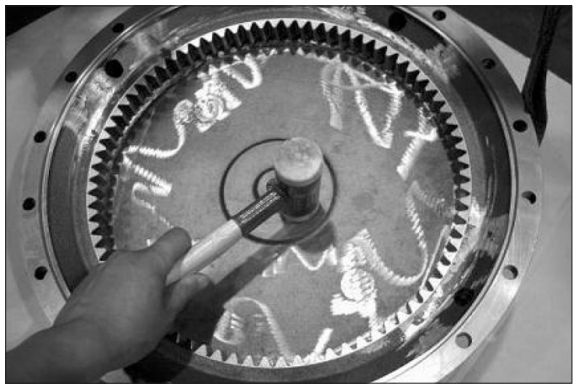
480H8TM73

(23) Assemble drive gear (170).



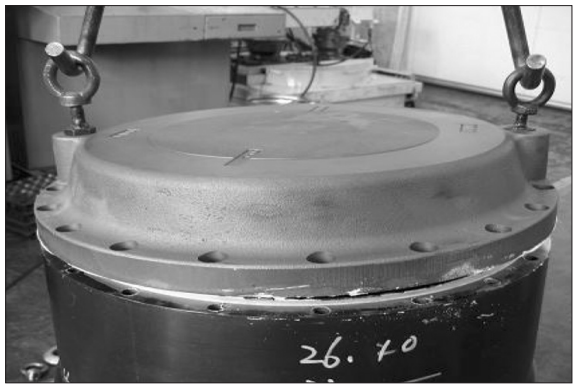
480H8TM74

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


480H8TM75

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

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



480H8TM76

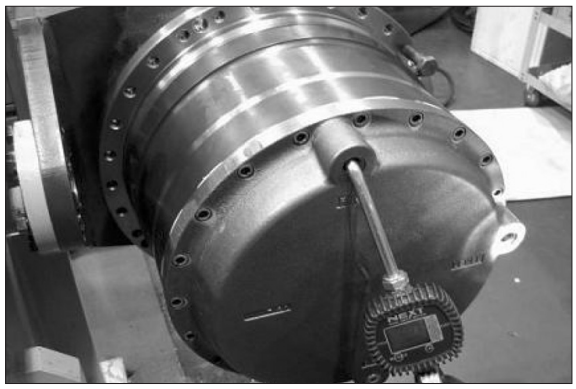
(26) Assemble socket bolt (185) to cover (180).

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

480H8TM77

(27) Injection reduction gear oil.

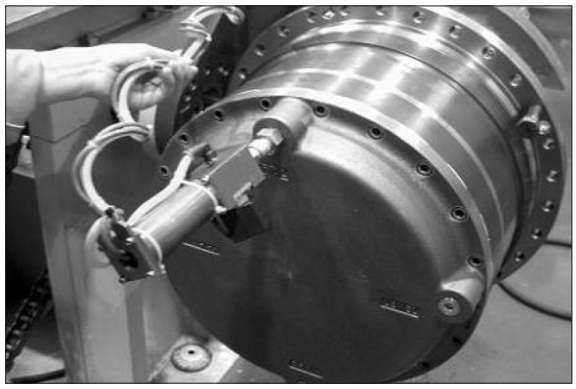
※ Injected reduction gear oil :
Approximately 10.0 ℓ



480H8TM78

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

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

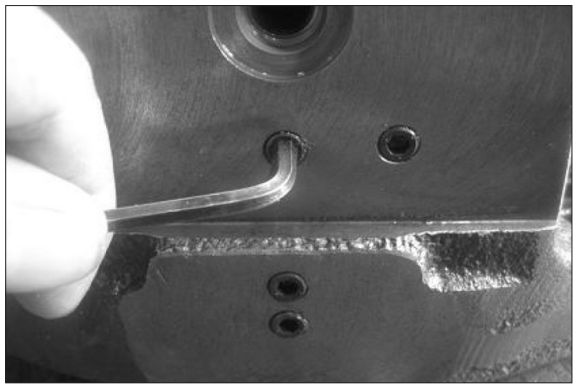


480H8TM79

2) ASSEMBLY OF MOTOR

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

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



480H8TM80

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

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

480H8TM81

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

480H8TM82

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

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

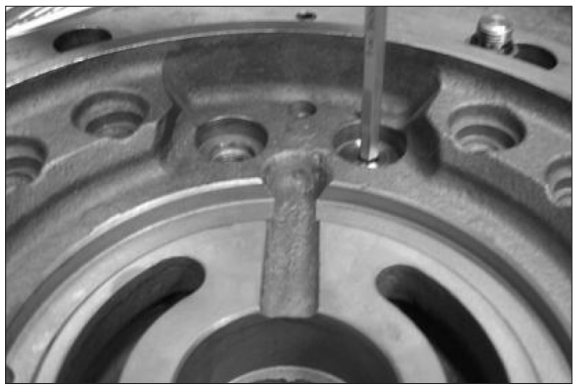
480H8TM83

(5) Assemble steel ball (68).

480H8TM84

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

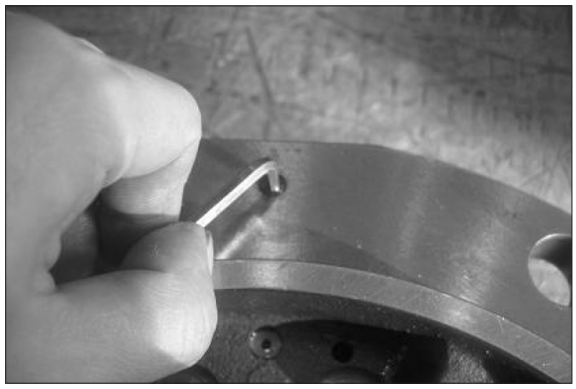
※ Tightening torque
Plug (52) : 3.7 kgf · m (27 lbf · ft)



480H8TM85

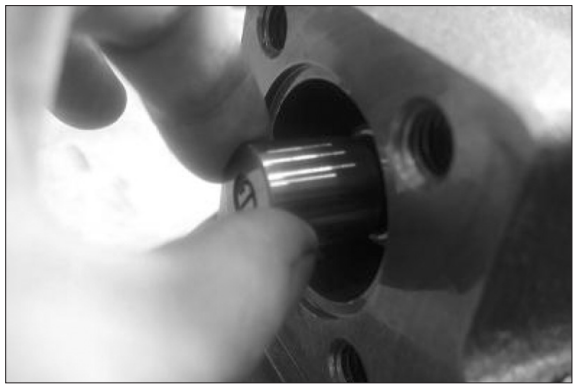
(7) Tighten orifice (71) into rear flange (1) with specified torque.

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



480H8TM86

(8) Assemble counterbalance spool (2).



480H8TM87

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

480H8TM88

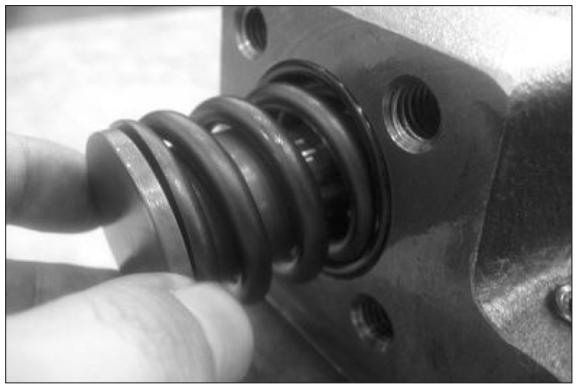
(10) Assemble O-ring (13) (P44).

480H8TM89

(11) Assemble main spring (6).

480H8TM90

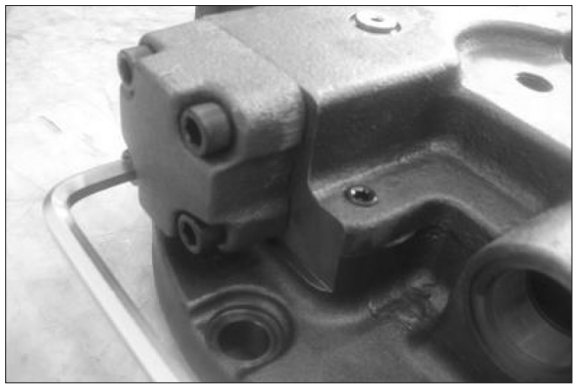
(12) Assemble counter balance spool (2), washer (7), main spring (6), seat (8) in the order named.



480H8TM91

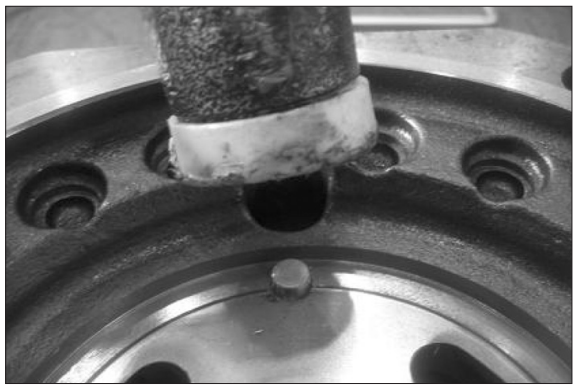
(13) Fix cover (12) by tightening socket bolt (14).

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



480H8TM92

(14) Interference-fit pin (41).



480H8TM93

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

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

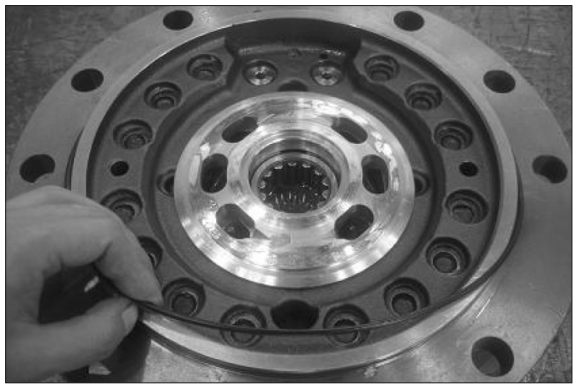
480H8TM94

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

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

480H8TM95

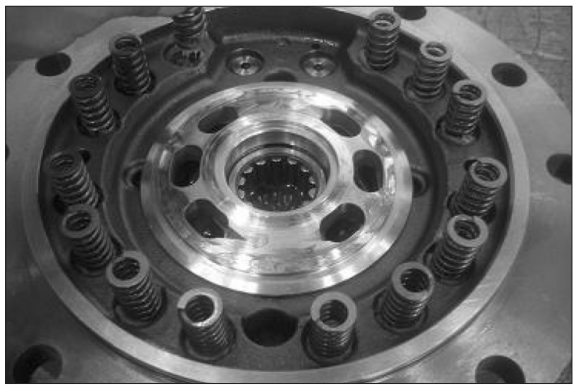
(17) Assemble O-ring (26) (WG51) to rear flange (1) sub-assembly.



480H8TM96

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

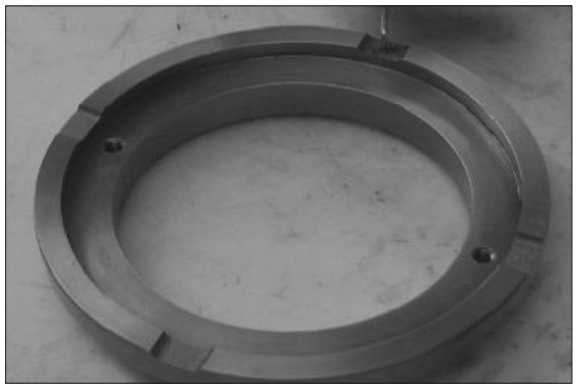
※ Apply grease on spring and pay attention to not dropping spring.



480H8TM97

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

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



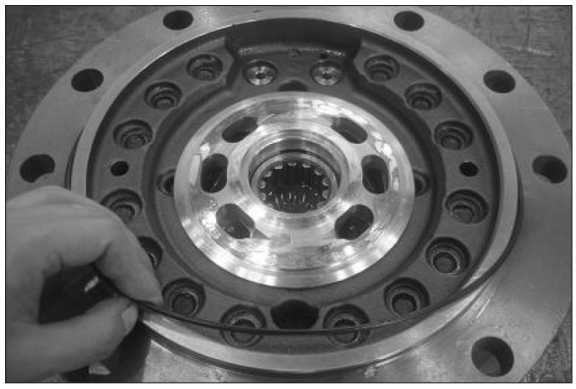
480H8TM98

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

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

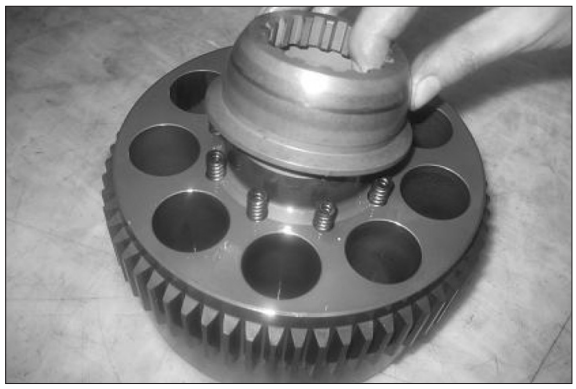
480H8TM99

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



480H8TM100

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



480H8TM101

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

480H8TM102

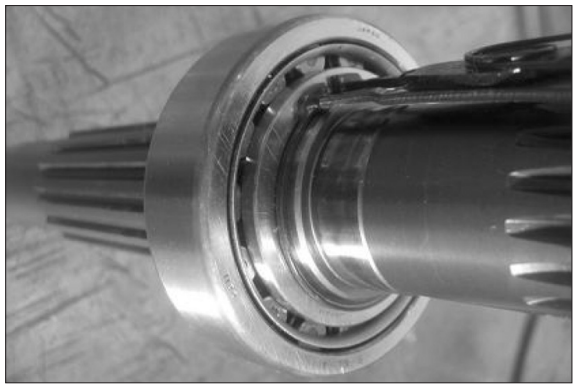
(24) Assemble retainer plate assembly to cylinder block (204).

480H8TM103

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

※ Pay attention to not damaging oil seal sliding area of driving shaft.

※ Pay attention to not fitting snap ring the other way around.

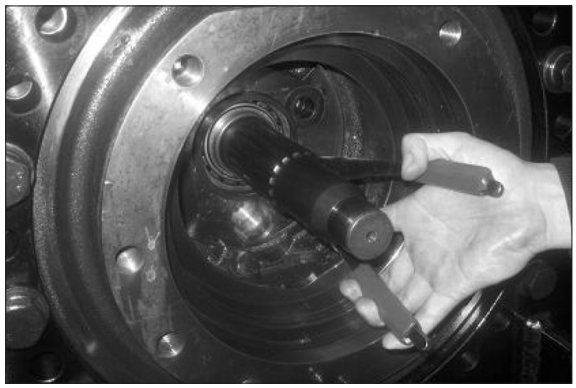


480H8TM104

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

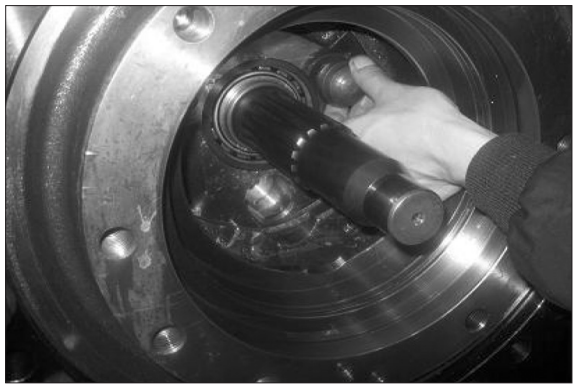
480H8TM105

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



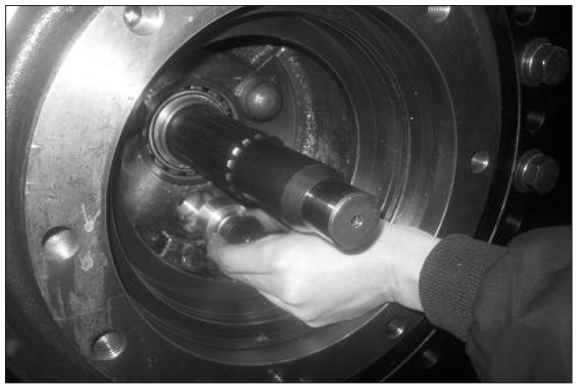
480H8TM106

(28) Assemble pivot (267).



480H8TM107

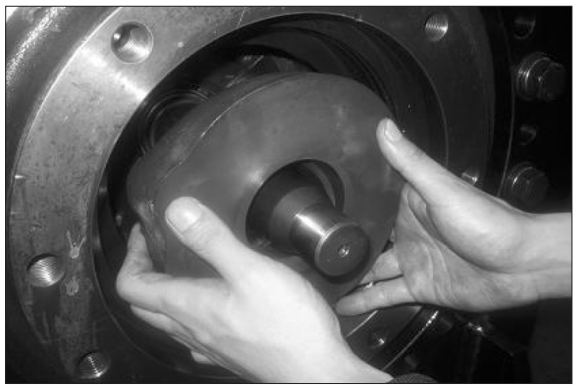
(29) Assemble two speed piston (261), shoe (262) assy.



480H8TM108

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

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



480H8TM109

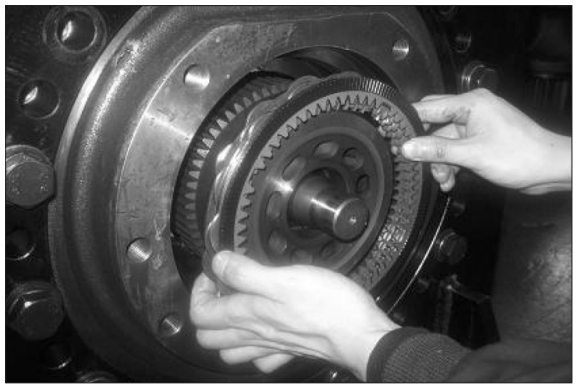
(31) Assemble cylinder block sub-assembly (CB1) to spindle (101).

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

480H8TM110

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

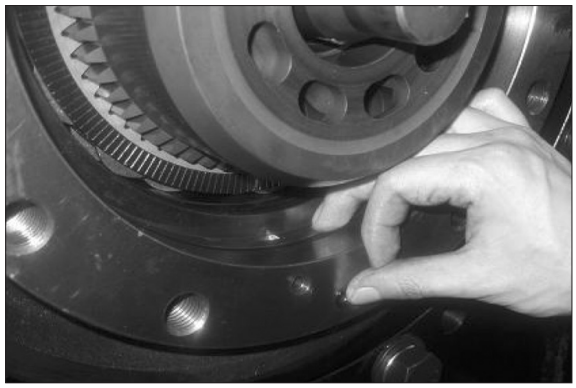
※ Ortehr :
Friction plate → Mating plate → Friction plate → Mating plate → Friction plate → Mating plate → Friction plate



480H8TM111

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

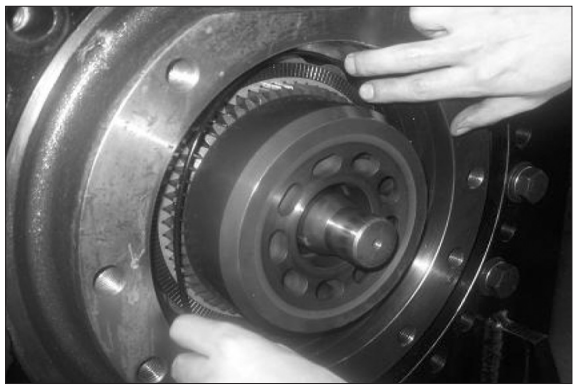
※ Do not reuse the disassembling O-ring (233).



480H8TM112

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

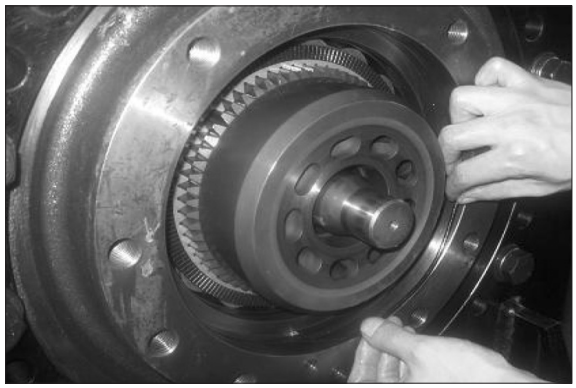
※ Do not reuse the disassembling O-ring (231).



480H8TM113

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

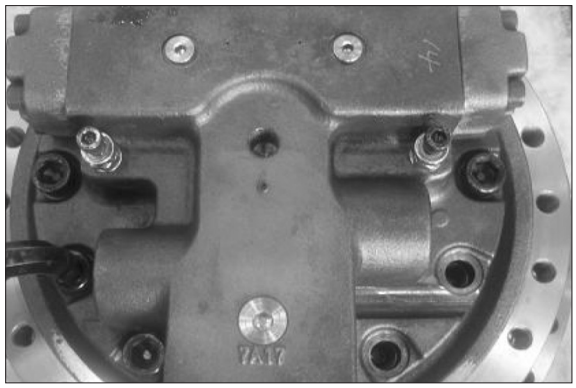
※ Do not reuse the disassembling O-ring (230).



480H8TM114

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

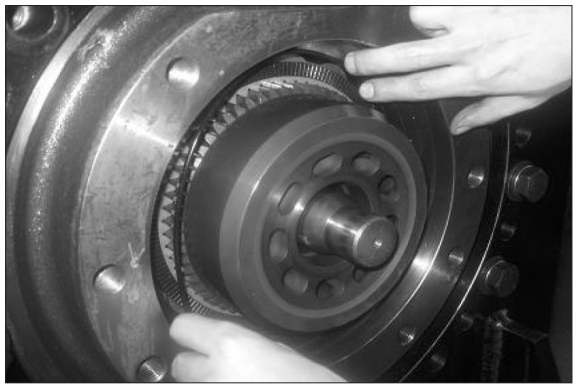
※ Apply grease on roller of needle bearing (50) in rear flange (1).
Tightening torque :
Socket bolt (43) : 44 kgf · m (318 lbf · ft)



480H8TM115

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

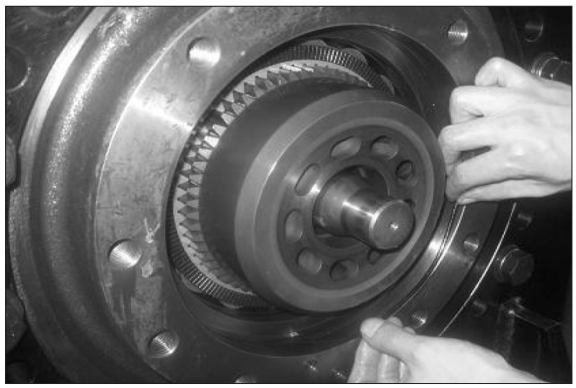
※ Tightening torque :
Plug (45) : 2.2 kgf · m (15.9 lbf · ft)



480H8TM116

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

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



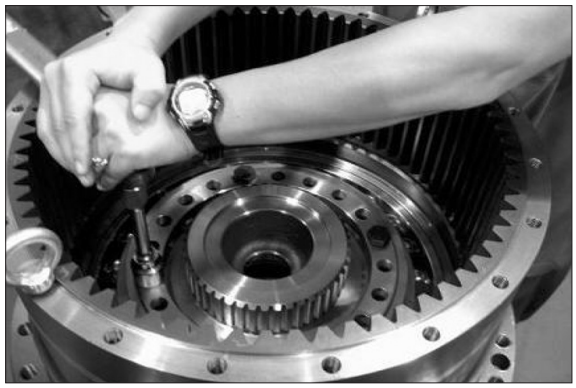
480H8TM117

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

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

480H8TM25

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



480H8TM19

GROUP 7 RCV LEVER

1. REMOVAL AND INSTALL

1) REMOVAL

(1) Lower the work equipment to the ground and stop the engine.

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

(3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

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

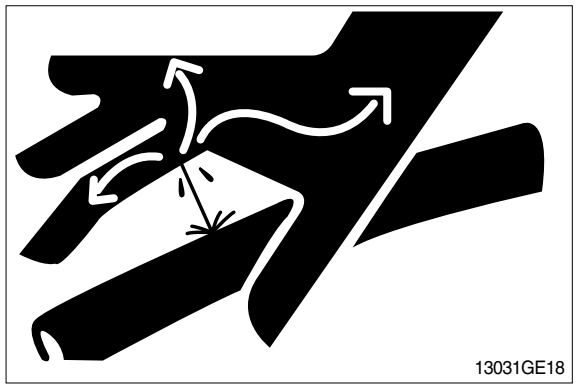
(4) Loosen the socket bolt(1).

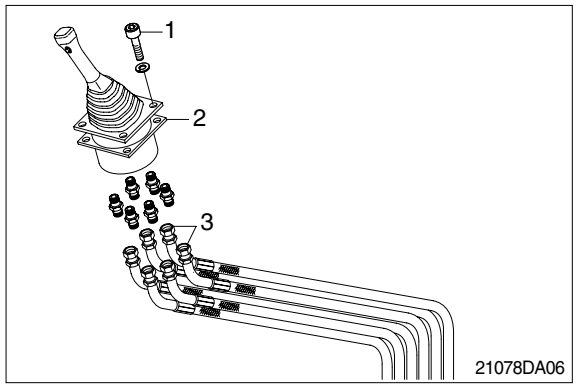
(5) Remove the cover of the console box.

(6) Disconnect pilot line hoses(3).

(7) Remove the pilot valve assembly(2).

※ When removing the pilot valve assembly, check that all the hoses have been disconnected.





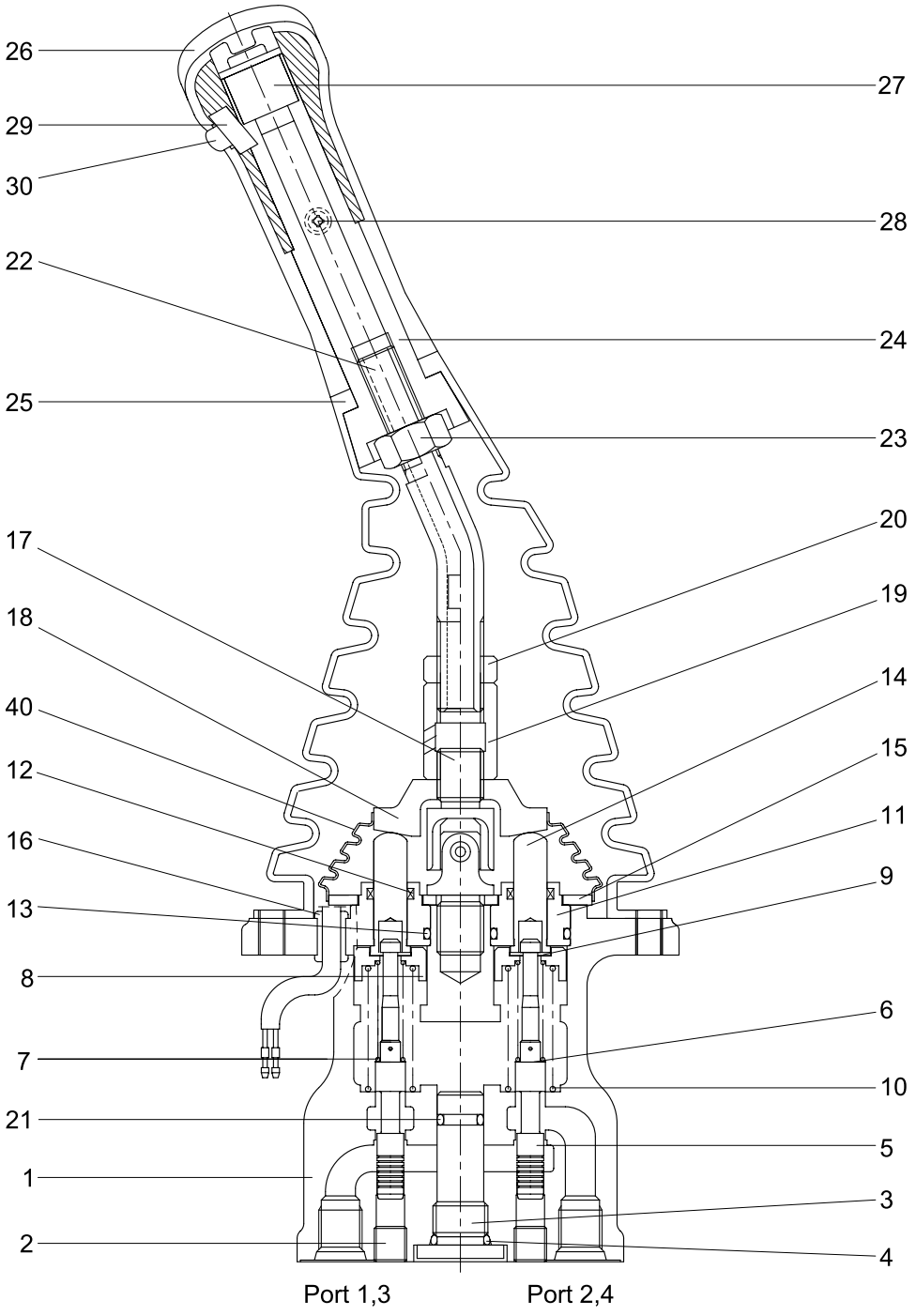
2) INSTALL

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

(2) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

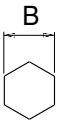


14072SF80

1 Case
2 Plug
3 Plug
4 O-ring
5 Spool
6 Shim
7 Spring
8 Spring seat
9 Stopper
10 Spring
11 Plug
12 Rod seal
13 O-ring
14 Push rod
15 Plate
16 Bushing
17 Joint assembly
18 Swash plate
19 Adjusting nut
20 Lock nut
21 O-ring
22 Handle connector
23 Nut
24 Insert
25 Boot
26 Handle
27 Switch assembly
28 Screw
29 Switch assembly
30 Switch cover
40 Boot

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	6	
Spanner	22	
	27	
(+) Driver	Length 150	
(-) Driver	Width 4~5	
Torque wrench	Capable of tightening with the specified torques	

(2) Tightening torque

Part name	Item	Size	Torque	
			kgf · m	lbf · ft
Plug	2	PT 1/8	3.0	21.7
Joint	18	M14	3.5	25.3
Swash plate	19	M14	5.0±0.35	36.2±2.5
Adjusting nut	20	M14	5.0±0.35	36.2±2.5
Lock nut	21	M14	5.0±0.35	36.2±2.5
Screw	29	M 3	0.05	0.36

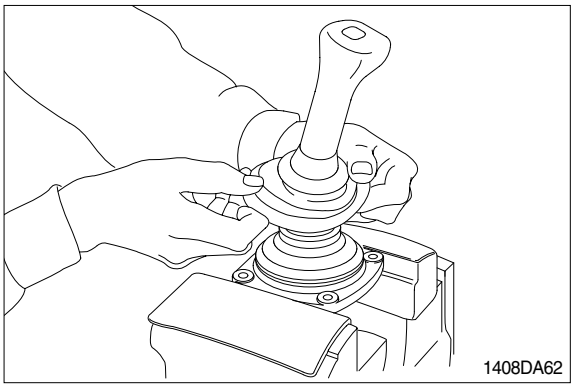
3) DISASSEMBLY

(1) Clean pilot valve with kerosene.

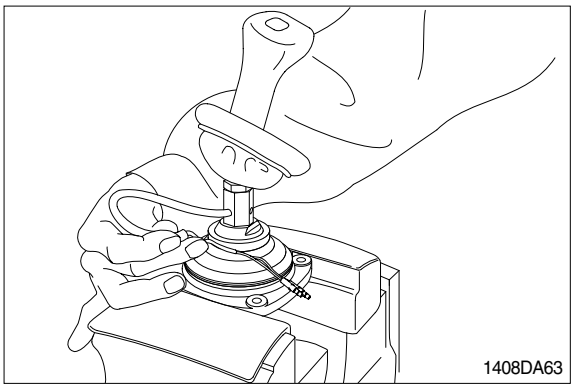
※ Put blind plugs into all ports

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

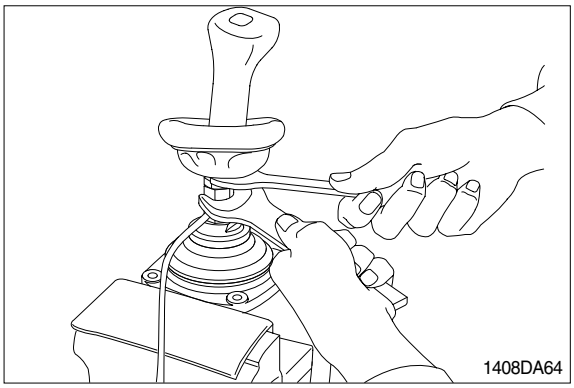
(3) Remove end of boot(25) from case(1) and take it out upwards.



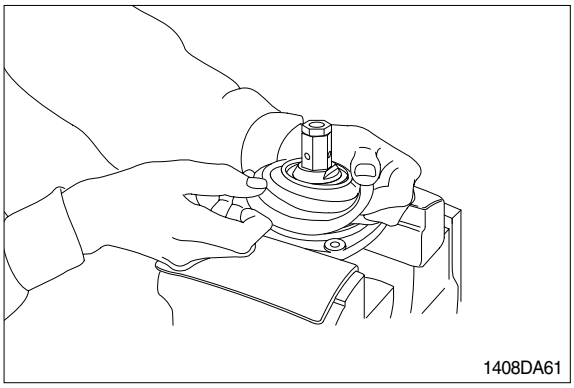
※ For valve with switch, remove cord also through hole of casing.



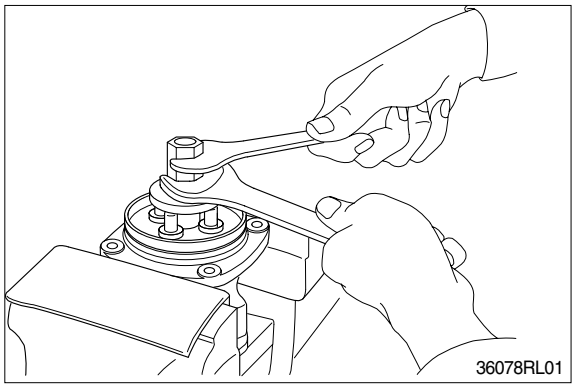
(4) Loosen lock nut(20) and adjusting nut(19) with spanners on them respectively, and take out handle section as one body.

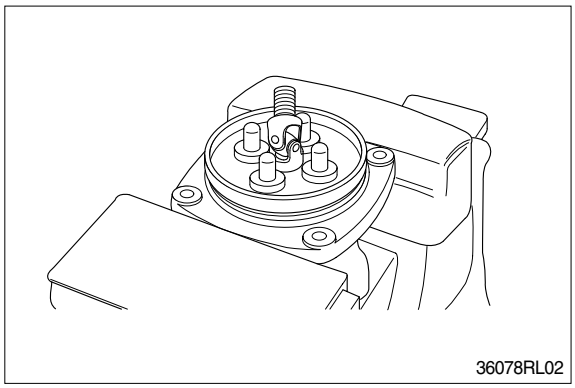


(5) Remove the boot(40)



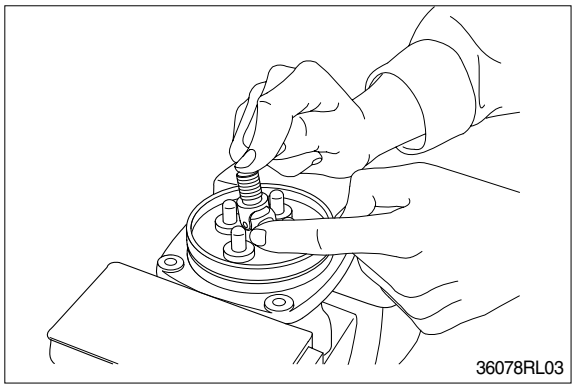
(6) Loosen adjusting nut(19) and plate(18) with spanners on them respectively, and remove them.

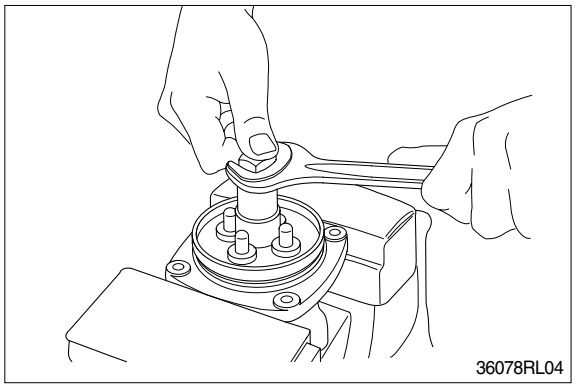




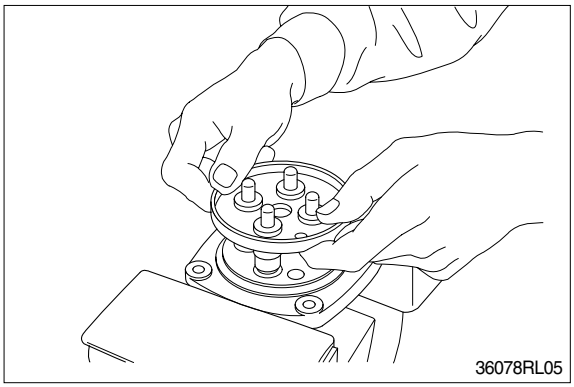
(7) Turn joint anticlockwise to loosen it, utilizing jig(Special tool).

※ When return spring(10) is strong in force, plate(15), plug(11) and push rod(14) will come up on loosening joint.
Pay attention to this.





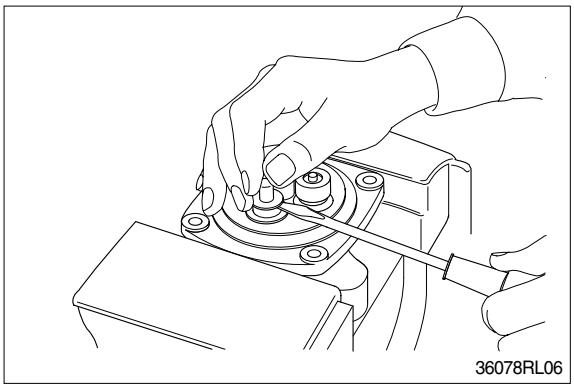
(8) Remove plate(15).



(9) When return spring(10) is weak in force, plug(11) stays in casing because of sliding resistance of O-ring.

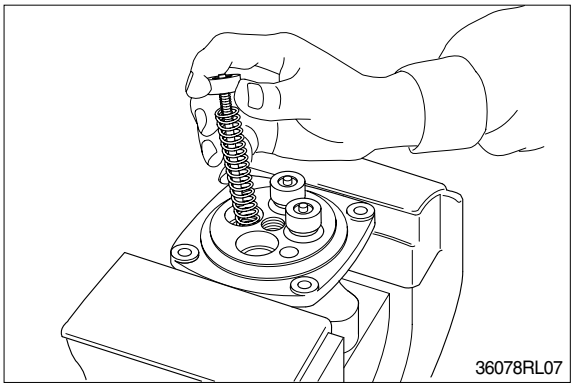
※ Take it out with minus screwdriver.
Take it out, utilizing external periphery groove of plug and paying attention not to damage it by partial loading.

※ During taking out, plug may jump up due to return spring(10) force.
Pay attention to this.

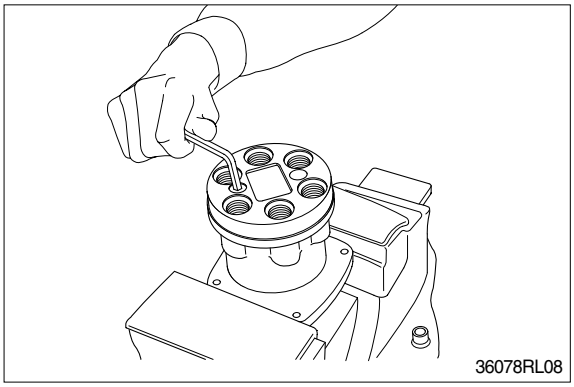


(10) Remove reducing valve subassembly and return spring(10) out of casing.

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



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

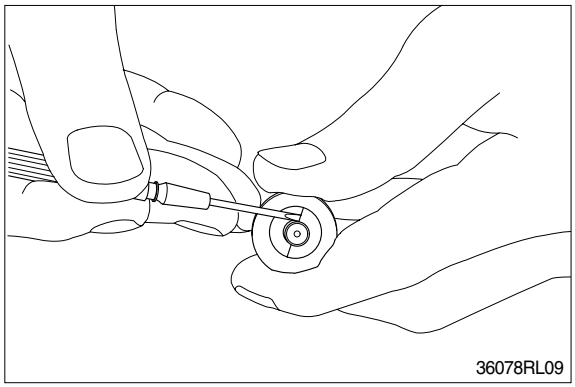


(12) For disassembling reducing valve section, stand it vertically with spool(5) bottom placed on flat workbench. Push down spring seat(8) and remove two pieces of semicircular stopper(9) with tip of small minus screwdriver.

※ Pay attention not to damage spool surface.

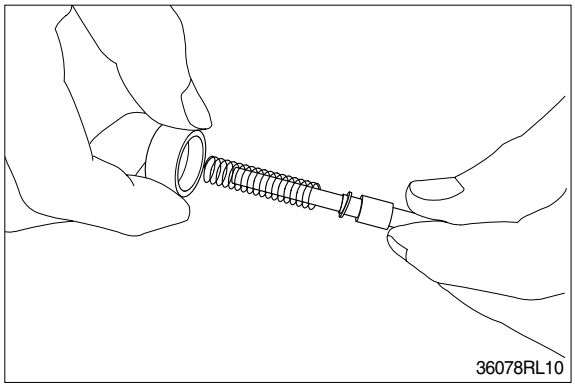
※ Record original position of spring seat(8, 31).

※ Do not push down spring seat more than 6㎜.

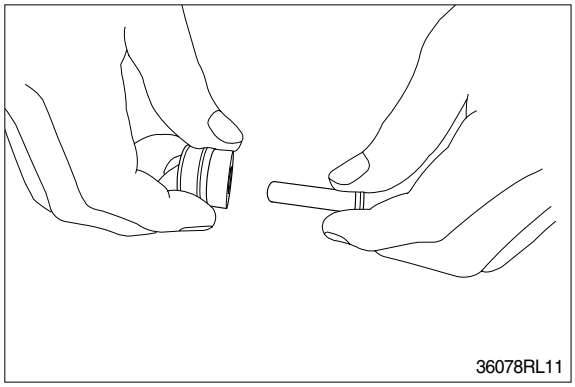


(13) Separate spool(5), spring seat(8), spring(7) and shim(6) individually.

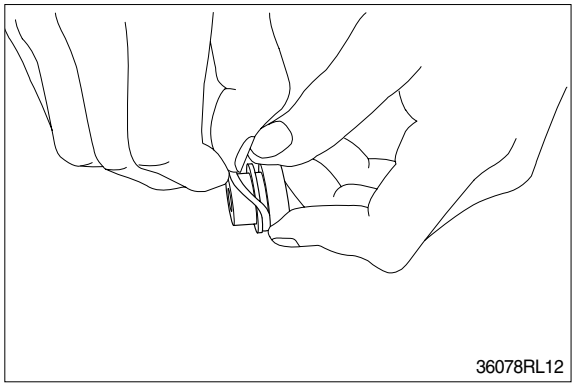
※ Until being assembled, they should be handled as one subassembly group.

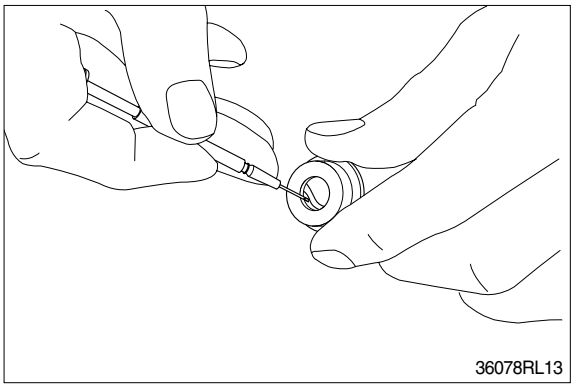


(14) Take push rod(14) out of plug(11).

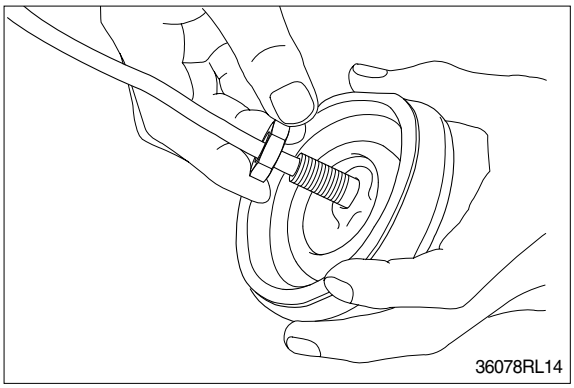


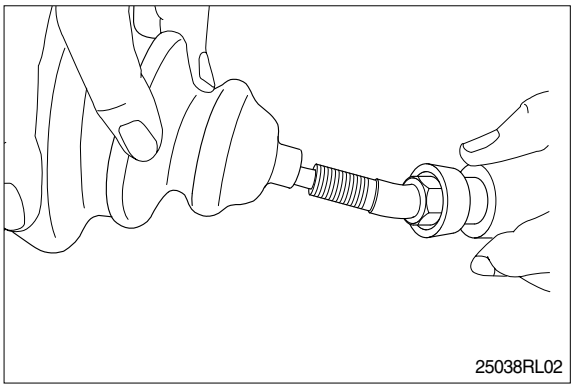
(15) Remove O-ring(13) and seal(12) from plug(11).
Use small minus screwdriver or so on to remove this seal.





(16) Remove lock nut(20) and then boot(25).





(17) Cleaning of parts

① Put all parts in rough cleaning vessel filled with kerosene and clean them (Rough cleaning).

※ If dirty part is cleaned with kerosene just after putting it in vessel, it may be damaged. Leave it in kerosene for a while to loosen dust and dirty oil.

※ If this kerosene is polluted, parts will be damaged and functions of reassembled valve will be degraded.
Therefore, control cleanliness of kerosene fully.

② Put parts in final cleaning vessel filled with kerosene, turning it slowly to clean them even to their insides(Finish cleaning).

※ Do not dry parts with compressed air, since they will be damaged and/or rusted by dust and moisture in air.

(18) Rust prevention of parts.

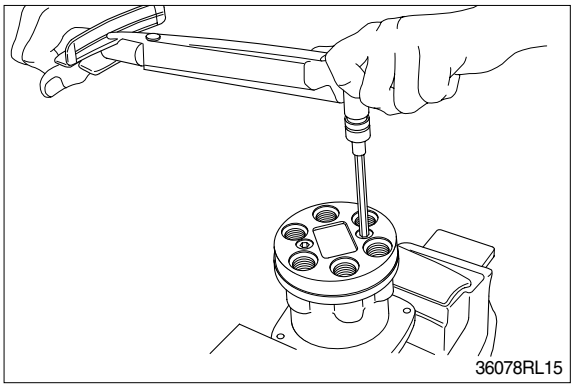
Apply rust-preventives to all parts.

※ If left as they after being cleaned, they will be rusted and will not display their functions fully after being reassembled.

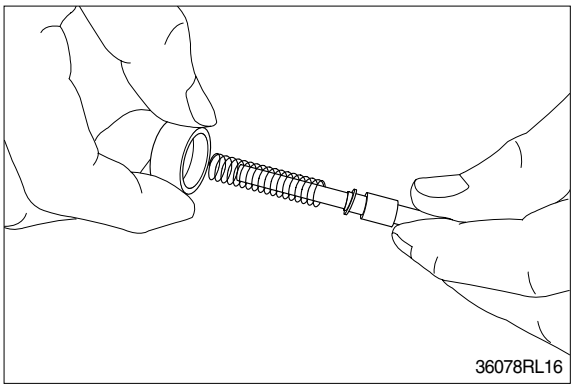
4) ASSEMBLY

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

※ Tighten two bolts alternately and slowly.

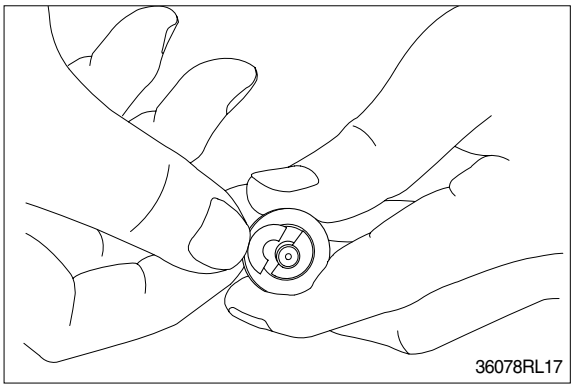


(2) Put shim(6), springs(7) and spring seat(8) onto spool(5) in this order.



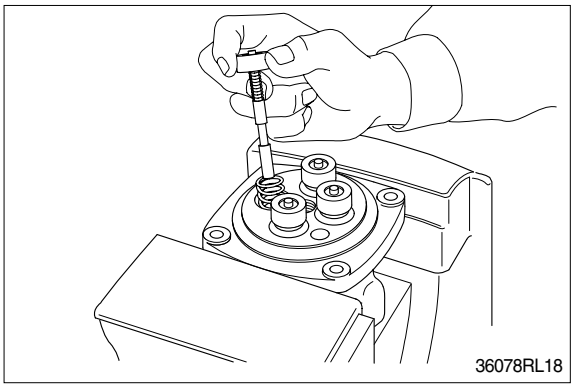
(3) Stand spool vertically with its bottom placed on flat workbench, and with spring seat pushed down, put two pieces of semicircular stopper(9) on spring seat without piling them on.

※ Assemble stopper(9) so that its sharp edge side will be caught by head of spool. Do not push down spring seat more than 6mm.

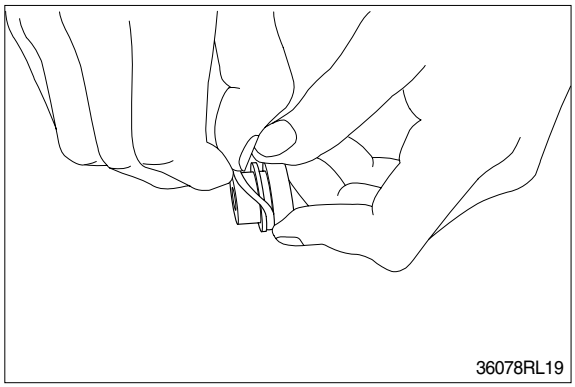


(4) Assemble spring(10) into casing(1). Assemble reducing valve subassembly into casing.

※ Assemble them to their original positions.

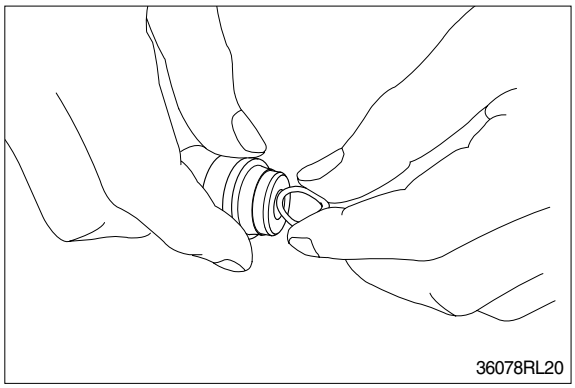


(5) Assemble O-ring(13) onto plug(11).



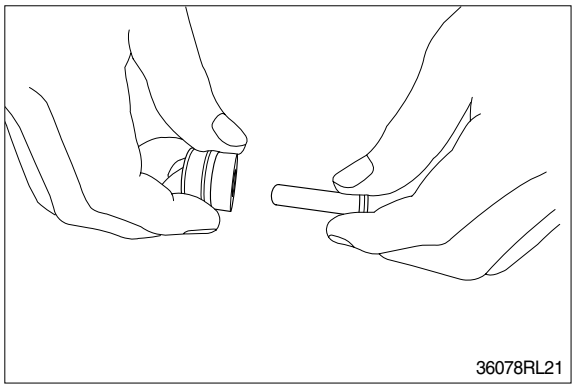
(6) Assemble seal(12) to plug(11).

※ Assemble seal in such lip direction as shown below.



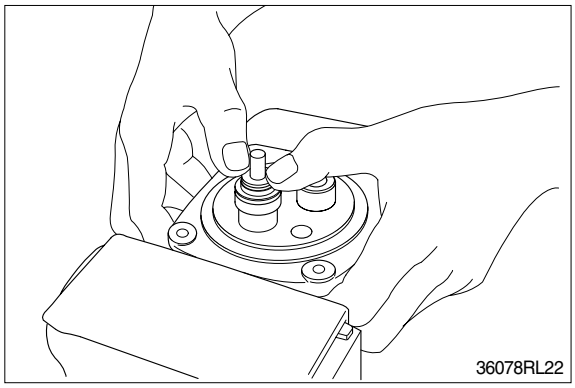
(7) Assemble push rod(14) to plug(11).

※ Apply working oil on push-rod surface.

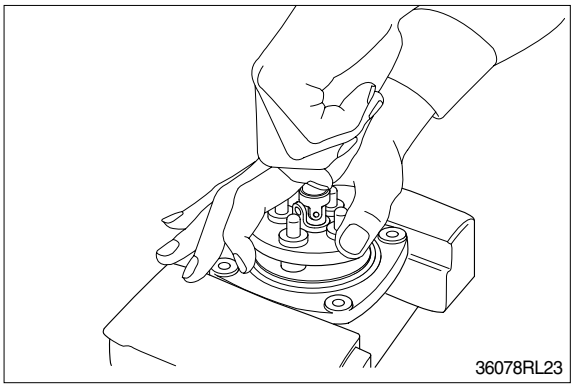


(8) Assemble plug subassembly to casing.

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

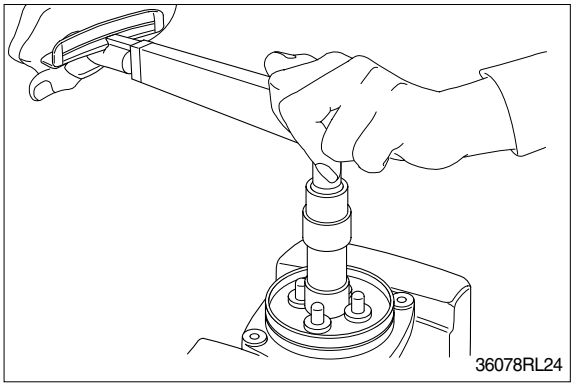


(9) When return spring is strong in force, assemble 4 sets at the same time, utilizing plate(15), and tighten joint(17) temporarily.

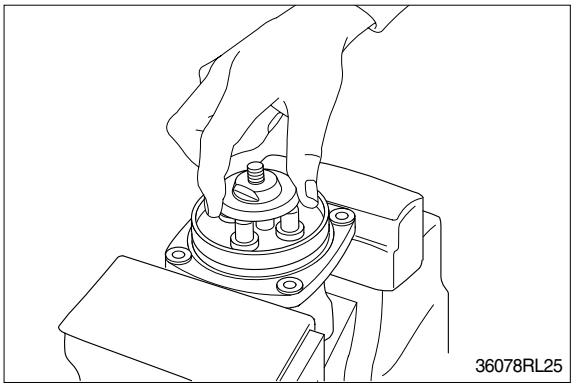


(10) Fit plate(15).

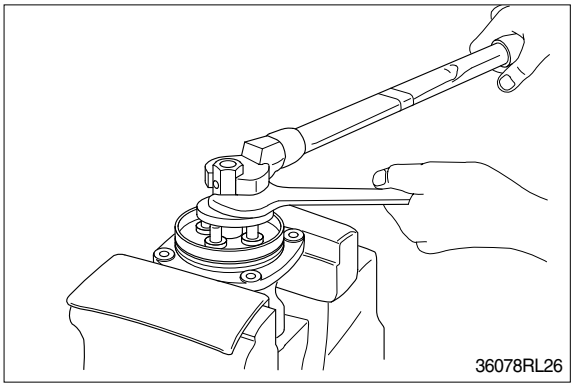
(11) Tighten joint(17) with the specified torque to casing, utilizing jig.



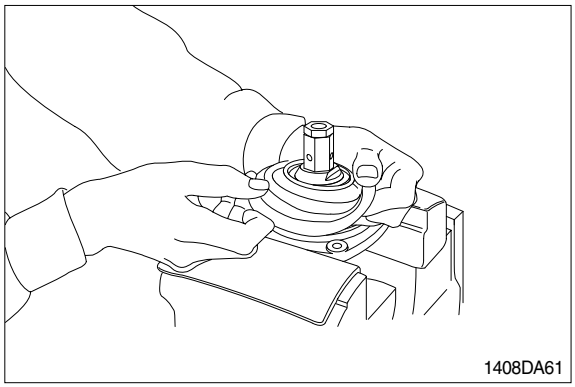
(12) Assemble swash plate(18) to joint(17).
- ※ Screw it to position that it contacts with 4 push rods evenly.
- ※ Do not screw it over.



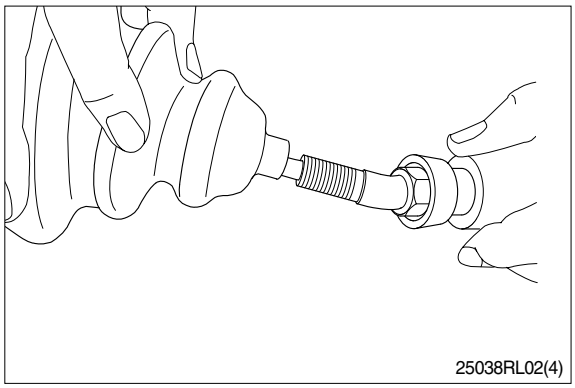
(13) Assemble adjusting nut(19), apply spanner to width across flat of plate(18) to fix it, and tighten adjusting nut to the specified torque.
- ※ During tightening, do not change position of disk.

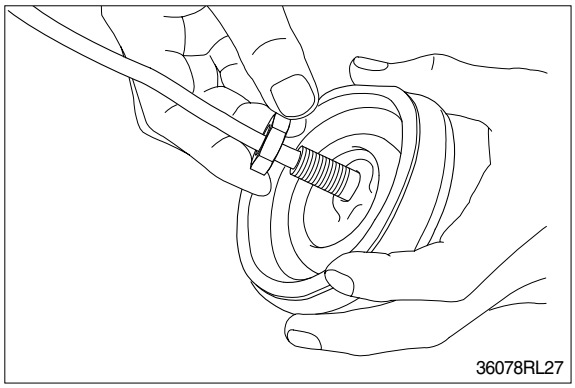


(14) Fit boot(40) to plate.

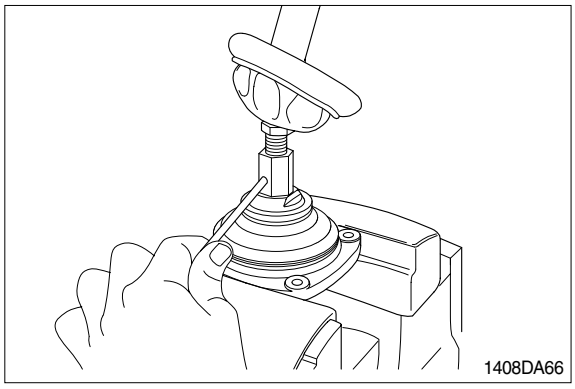


(15) Fit boot(25) and lock nut(20), and handle subassembly is assembled completely.



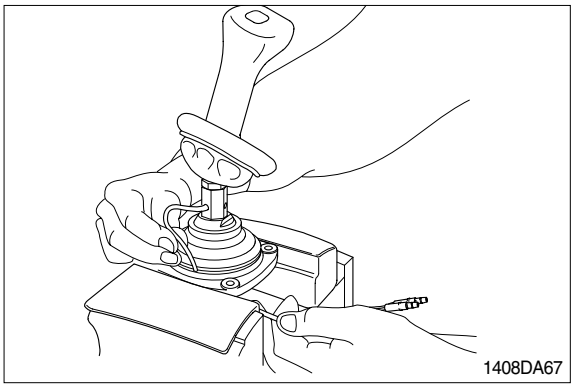


(16) Pull out cord and tube through adjusting nut hole provided in direction 60° to 120° from casing hole.

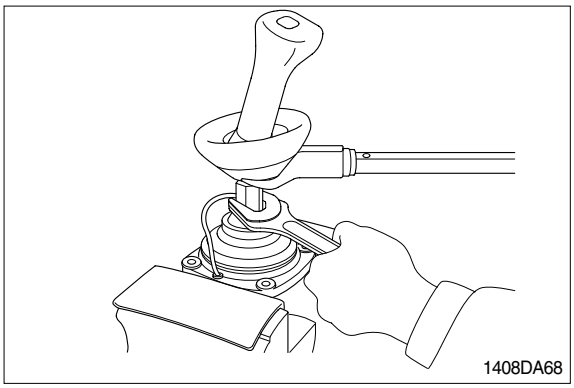


(17) Assemble bushing(16) to plate and pass cord and tube through it.

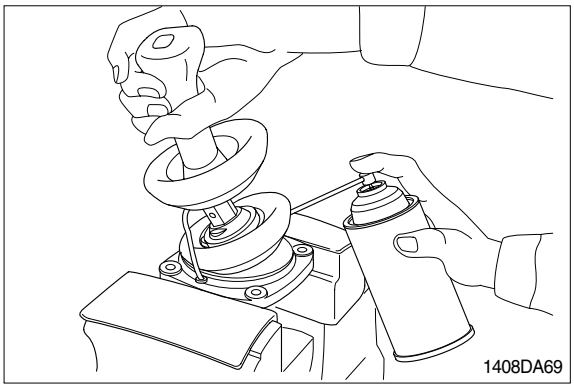
※ Provide margin necessary to operation.



(18) Determine handle direction, tighten lock nut(20) to specified torque to fix handle.

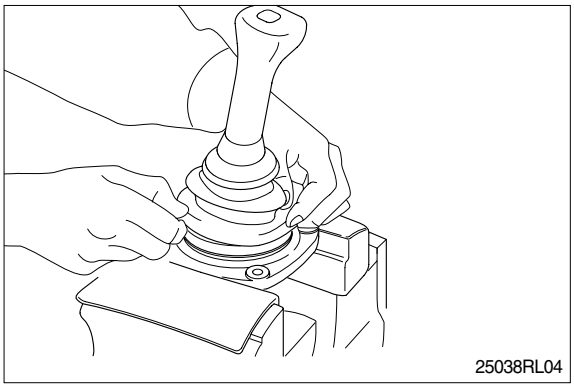


(19) Apply grease to rotating section of joint and contacting faces of disk and push rod.



(20) Assemble lower end of bellows to casing.

(21) Inject volatile rust-preventives through all ports and then put blind plugs in ports.



GROUP 8 TURNING JOINT

1. REMOVAL AND INSTALL

1) REMOVAL

(1) Lower the work equipment to the ground and stop the engine.

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

(3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

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

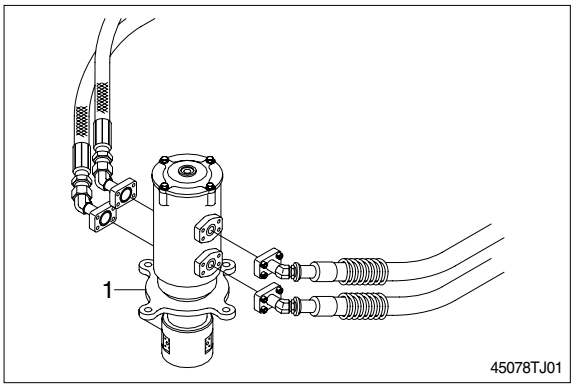
※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

(4) Disconnect all hoses .

(5) Sling the turning joint assembly(1) and remove the mounting bolt(2).
- Weight : 50kg(110lb)
- Tightening torque : 29.7 ± 45kgf · m (215 ± 32.5lbf · ft)

(6) Remove the turning joint assembly.

※ When removing the turning joint, check that all the hoses have been disconnected.



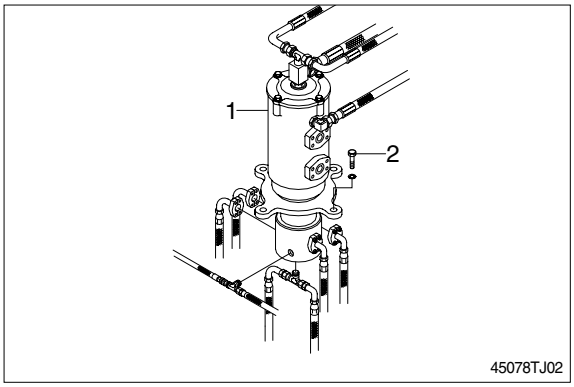
2) INSTALL

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

※ Take care of turning joint direction.

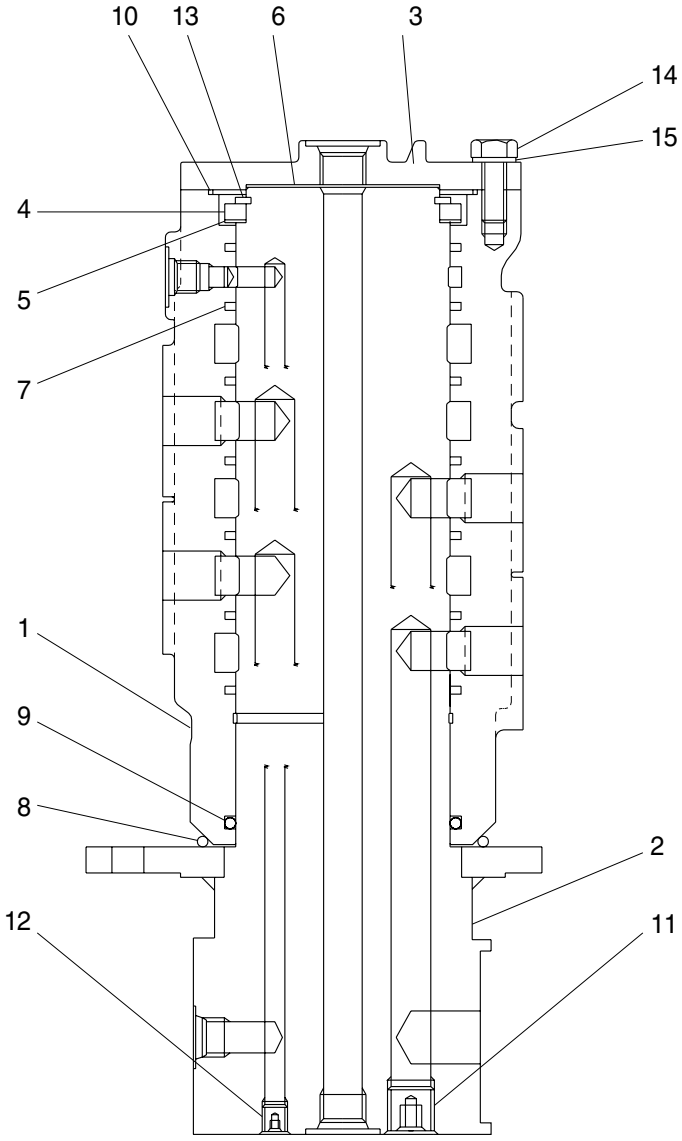
※ Assemble hoses to their original positions.

※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.



2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE



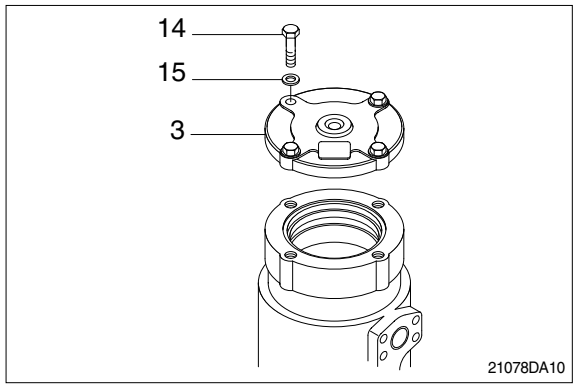
R210TJT2

1	Hub	6	Shim	11	Plug
2	Shaft assembly	7	Slipper seal	12	Plug
3	Cover	8	O-ring	13	Retaining ring
4	Spacer	9	O-ring	14	Hexagon bolt
5	Shim	10	O-ring	15	Spring washer

2) DISASSEMBLY

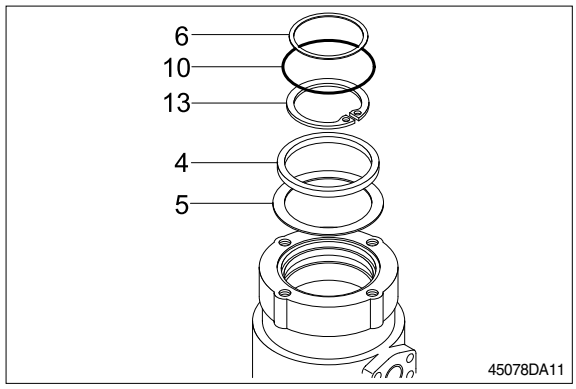
※ Before the disassembly, clean the turning joint.

(1) Remove bolts(14), washer(15) and cover(3).



(2) Remove shim(6) and O-ring(10).

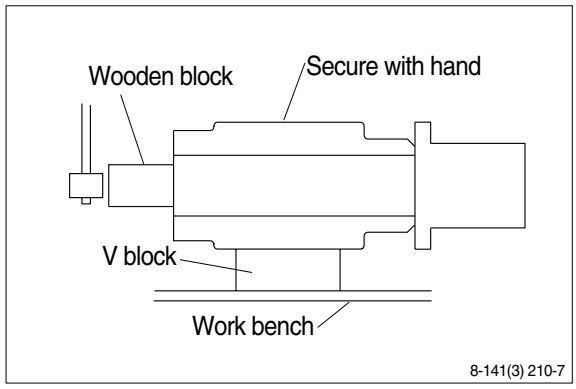
(3) Remove retainer ring(13), spacer(4) and shim(5).



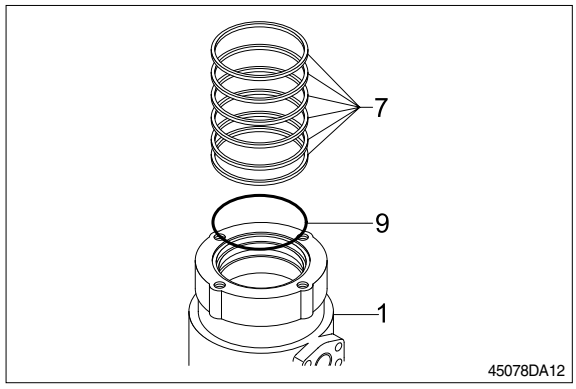
(4) Place body(1) on a V-block and by using a wood buffer at the shaft end, hit out shaft(2) to about 1/2 from the body with a hammer.

※ Take care not to damage the shaft(2) when remove body(1) or rest it sideway.

※ Put a fitting mark on body(1) and shaft(2).



(5) Remove six slipper seals(7) and O-ring(9), from body(1).

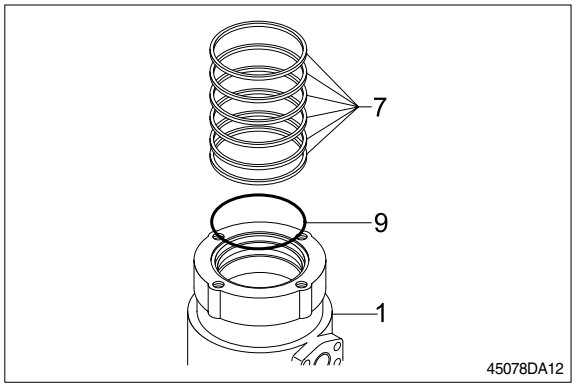


3) ASSEMBLY

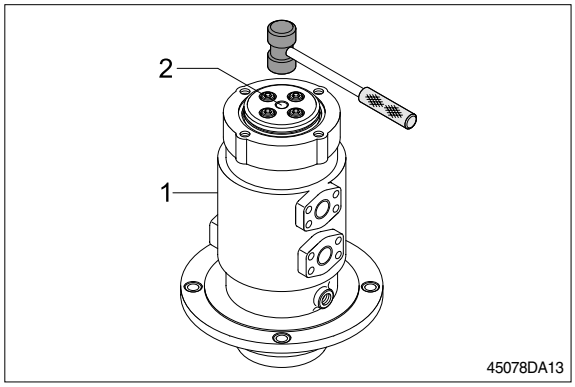
※ Clean all parts.
※ As a general rule, replace oil seals and O-ring.
※ Coat the sliding surfaces of all parts with engine oil or grease before installing.

(1) Fix seven slipper seal(7) and O-ring(9), to body(1).

(2) Fit O-ring(8) to shaft(2).



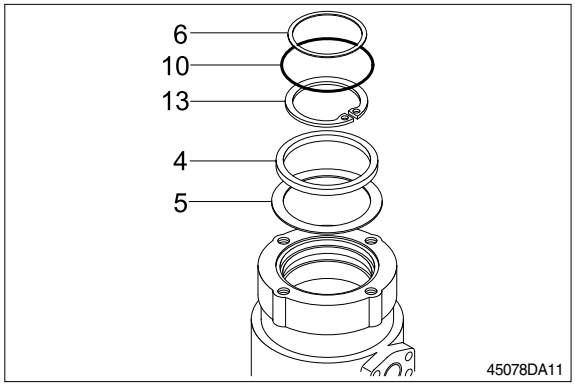
(3) Set shaft(2) on block, tap body(1) with a plastic hammer to install.



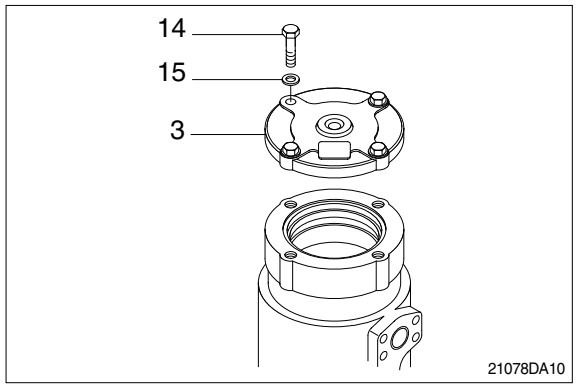
(4) Fit shim(5), spacer(4) and retainer ring (13) to shaft(2).

(5) Fit O-ring(10) to body(1).

(6) Fit shim(6) to shaft(2).



(7) Install cover(3) to body(1) and tighten bolts(14).
 · Torque : 10~12.5kgf · m(72.3~90.4lbf · ft)



GROUP 9 BOOM, ARM AND BUCKET CYLINDER

1. REMOVAL AND INSTALL

1) BUCKET CYLINDER

(1) Removal

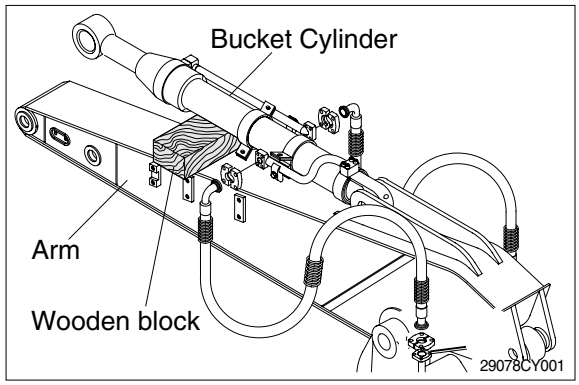
※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.

※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

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

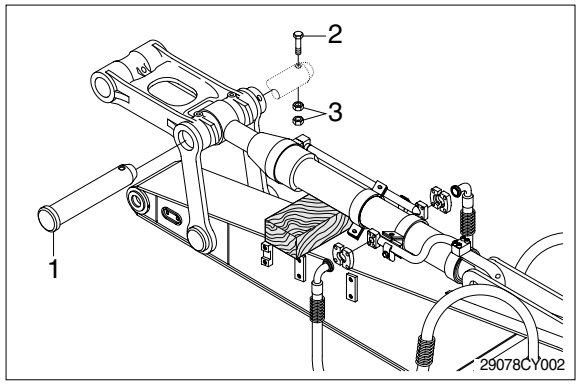
※ Escaping fluid under pressure can penetrate the skin causing serious injury. Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Set block between bucket cylinder and arm.

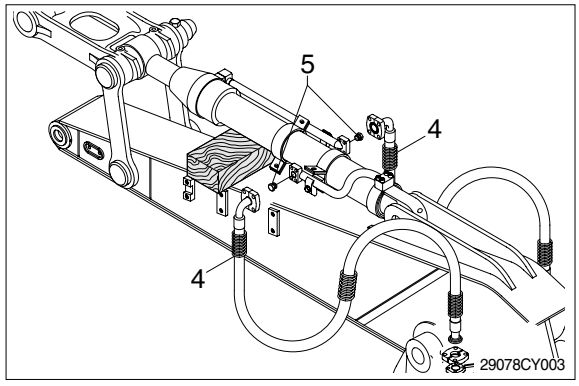


② Remove bolt(2), nut(3) and pull out pin (1).

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



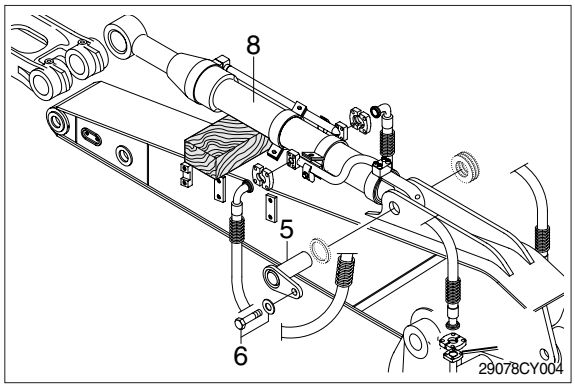
③ Disconnect bucket cylinder hoses(4) and put plugs(5) on cylinder pipe.



④ Sling bucket cylinder assembly(8) and remove bolt(6) then pull out pin (5).

⑤ Remove bucket cylinder assembly(8).

· Weight : 300kg(660lb)



(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

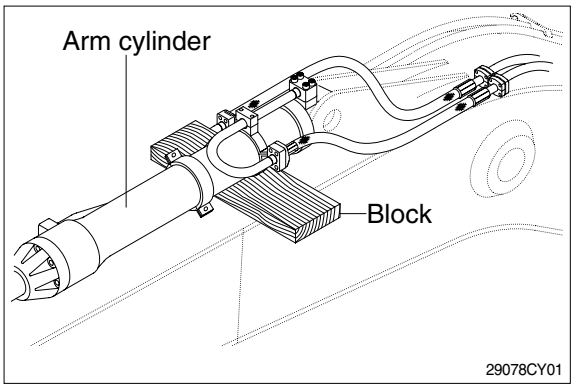
※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.

※ 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.

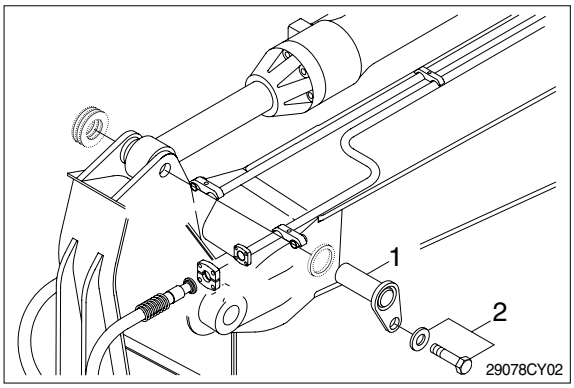
※ Escaping fluid under pressure can penetrate the skin causing serious injury.
Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Set block between arm cylinder and boom.



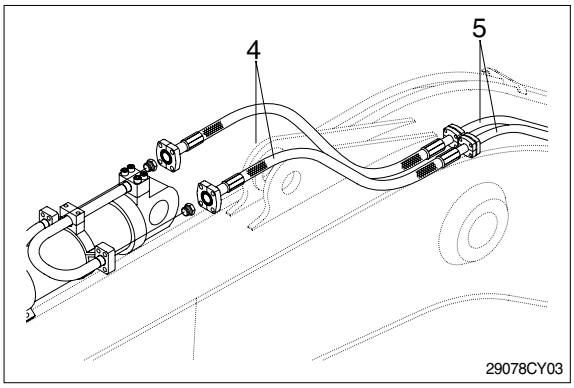
② Remove bolt(2) and pull out pin(1).

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



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

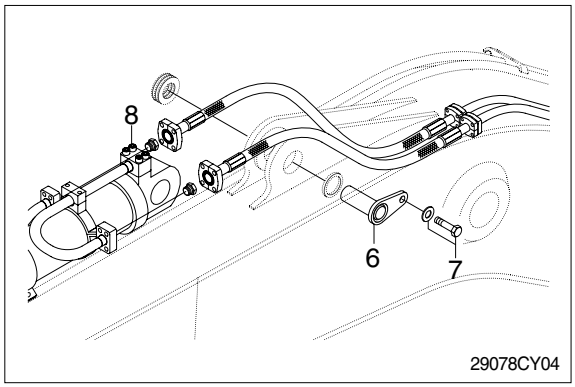
④ Disconnect greasing pipings(5).



⑤ Sling arm assembly(8) and remove bolt (7) then pull out pin(6).

⑥ Remove arm cylinder assembly(8).

· Weight : 540kg(1190lb)



(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.

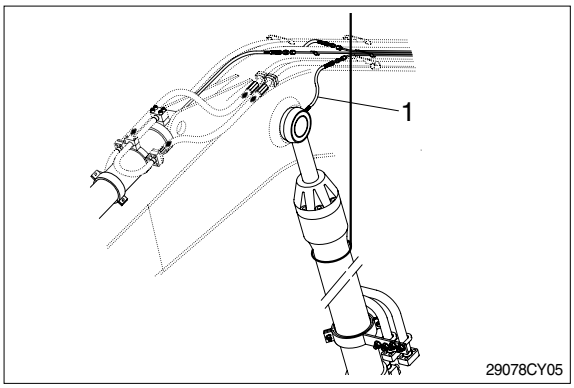
※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

⚠ 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.

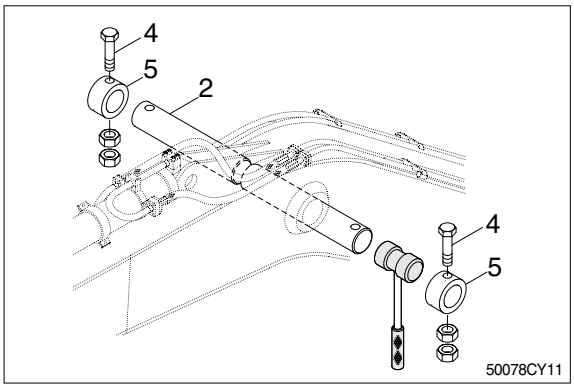
① Disconnect greasing hoses(1).

② Sling boom cylinder assembly.

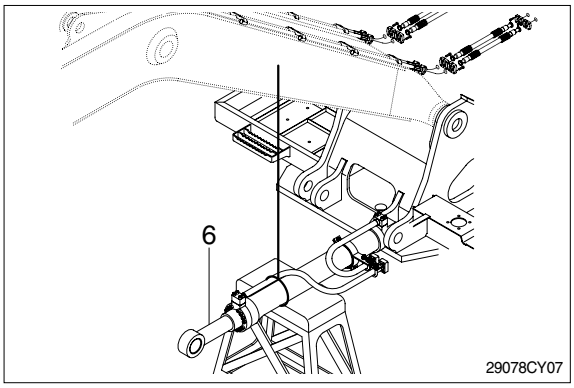


③ Remove bolt(4), pin stopper(5) and pull out pin(2).

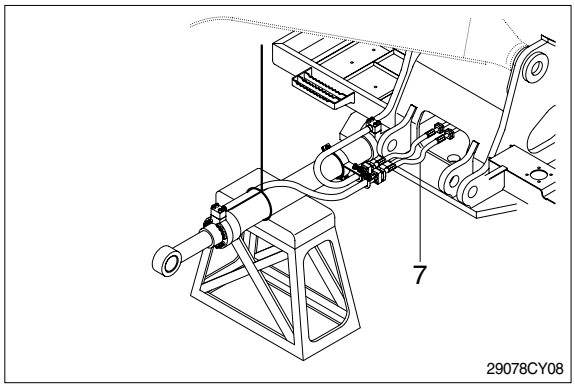
※ Tie the rod with wire to prevent it from coming out.



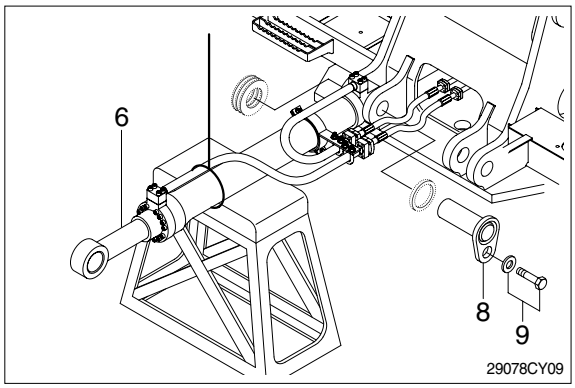
④ Lower the boom cylinder assembly(6) on a stand.



⑤ Disconnect boom cylinder hoses(7) and put plugs on cylinder pipe.



⑥ Remove bolt(9) and pull out pin(8).
⑦ Remove boom cylinder assembly(6).
· Weight : 910kg(2010lb)



(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.

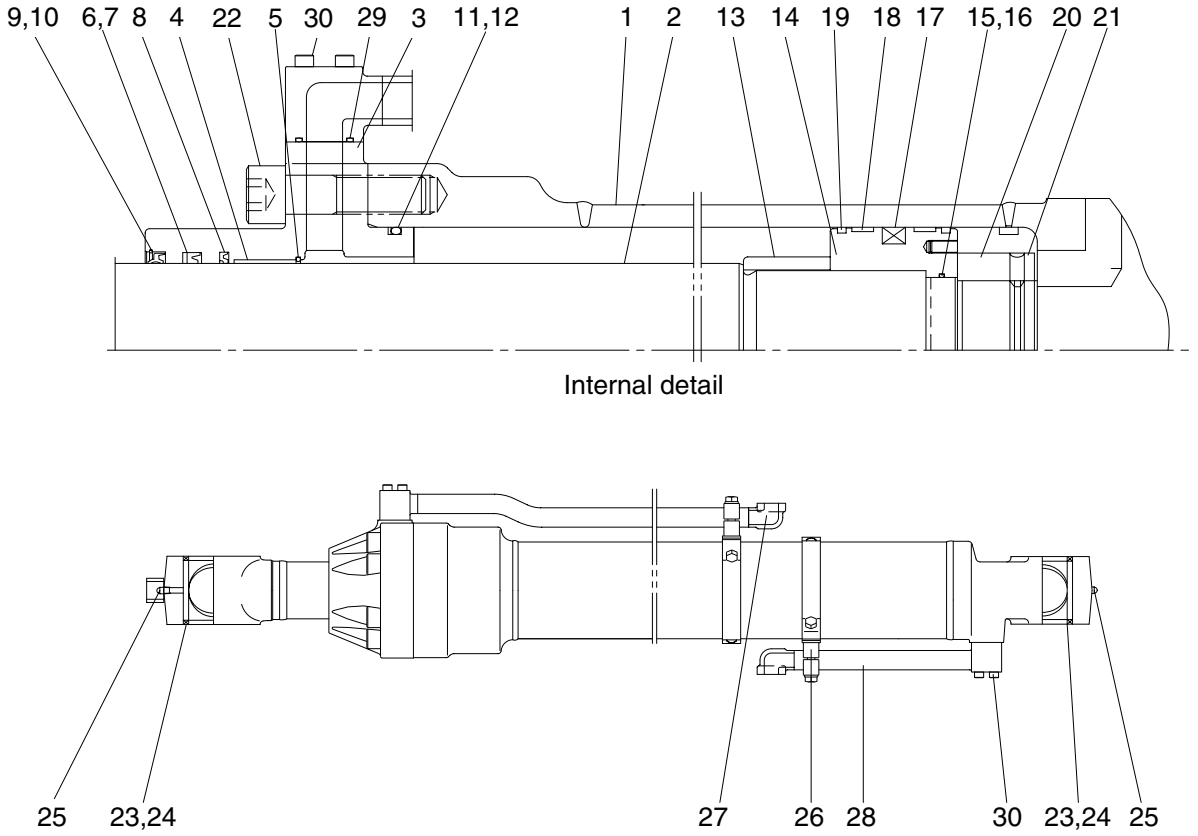
※ Bleed the air from the boom cylinder.

※ Conformed the hydraulic oil level and check the hydraulic oil leak or not.

2. DISASSEMBLY AND ASSEMBLY

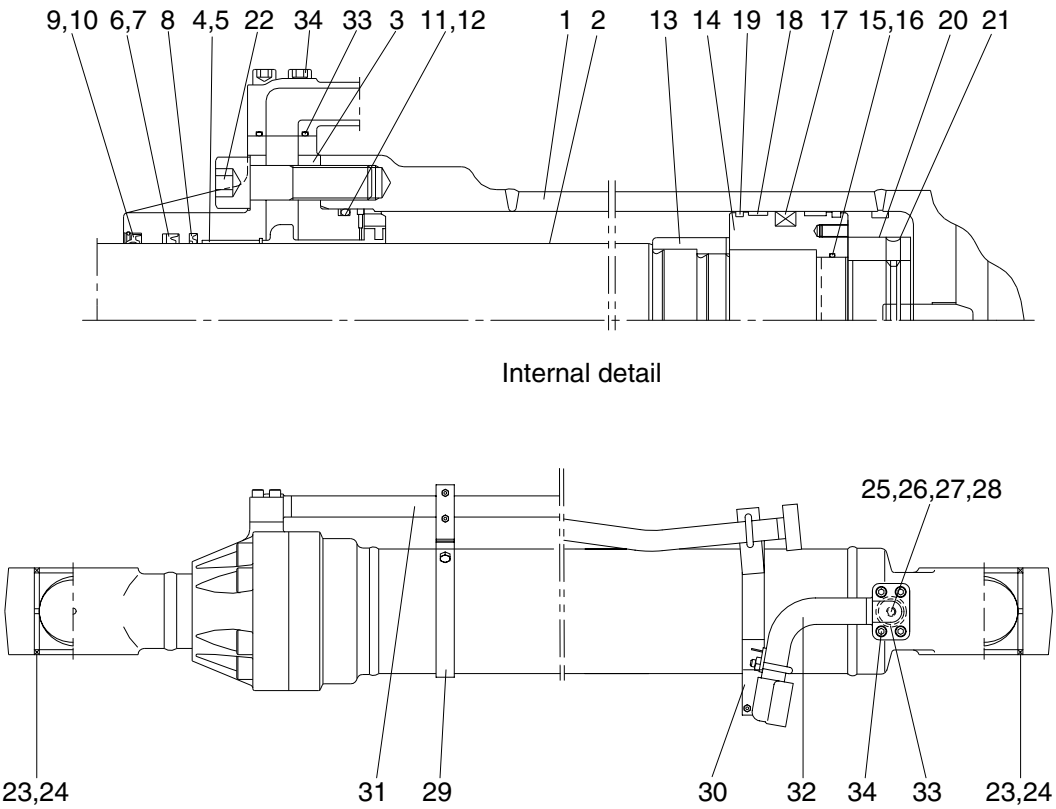
1) STRUCTURE

(1) Bucket cylinder



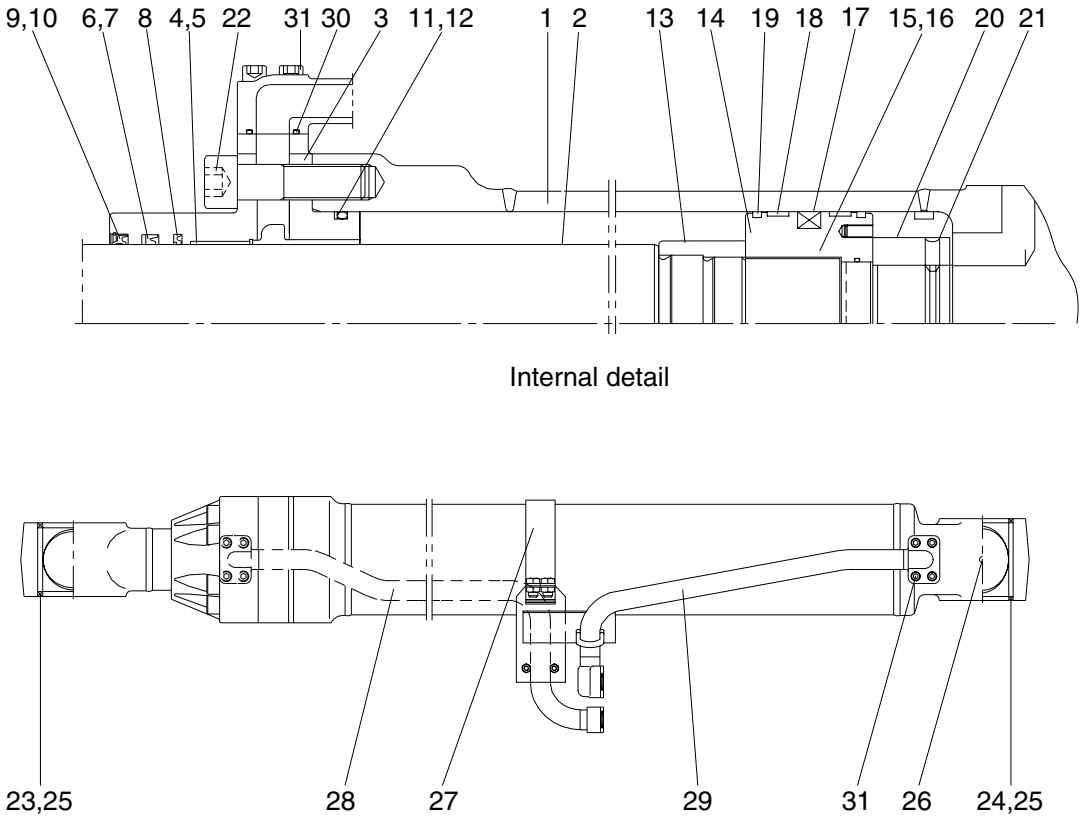
1	Tube assembly	11	O-ring	21	Hexagon socket set screw
2	Rod assembly	12	Back up ring	22	Hexagon socket head bolt
3	Gland	13	Cushion ring	23	Pin bushing
4	DD2 bushing	14	Piston	24	Dust seal
5	Snap ring	15	O-ring	25	Grease nipple
6	Rod seal	16	Back up ring	26	Band assembly
7	Back up ring	17	Piston seal	27	Pipe assembly
8	Buffer ring	18	Wear ring	28	Pipe assembly
9	Dust wiper	19	Dust ring	29	O-ring
10	Snap ring	20	Lock nut	30	Hexagon socket head bolt

(2) Arm cylinder



1	Tube assembly	12	Back up ring	23	Pin bushing
2	Rod assembly	13	Cushion ring	24	Dust seal
3	Gland	14	Piston	25	Check valve
4	DD2 bushing	15	O-ring	26	Coil spring
5	Snap ring	16	Back up ring	27	O-ring
6	Rod seal	17	Piston seal	28	Plug
7	Back up ring	18	Wear ring	29	Band assembly
8	Buffer ring	19	Dust ring	30	Band assembly
9	Dust wiper	20	Lock nut	31	Pipe assembly
10	Snap ring	21	Hexagon socket set screw	32	Pipe assembly
11	O-ring	22	Hexagon socket head bolt	33	O-ring
				34	Hexagon socket head bolt

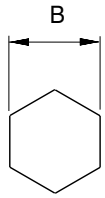
(3) Boom cylinder



1	Tube assembly	11	O-ring	21	Hexagon socket set screw
2	Rod assembly	12	Back up ring	22	Hexagon socket head bolt
3	Gland	13	Cushion ring	23	Pin bushing
4	DD2 bushing	14	Piston	24	Pin bushing
5	Snap ring	15	O-ring	25	Dust seal
6	Rod seal	16	Back up ring	26	Grease nipple
7	Back up ring	17	Piston seal	27	Band assembly
8	Buffer ring	18	Wear ring	28	Pipe assembly
9	Dust wiper	19	Dust ring	29	Pipe assembly
10	Snap ring	20	Lock nut	30	O-ring
				31	Hexagon socket head bolt

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	10	
	14	
	18	
	24	
	30	
(-) 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
Socket head bolt	Bucket cylinder	22	M22	63.0±6.0	456±43
	Boom cylinder	22	M22	63.0±6.0	456±43
	Arm cylinder	22	M24	79.0±8.0	571±58
Socket head bolt	Bucket cylinder	21	M10	5.4±0.5	39.1±3.6
		30	M12	9.4±1.0	68.0±7.2
	Boom cylinder	21	M10	5.4±0.5	39.1±3.6
		31	M12	9.4±1.0	68.0±7.2
	Arm cylinder	21	M10	5.4±0.5	39.1±3.6
		34	M12	9.4±1.0	68.0±7.2

3) DISASSEMBLY

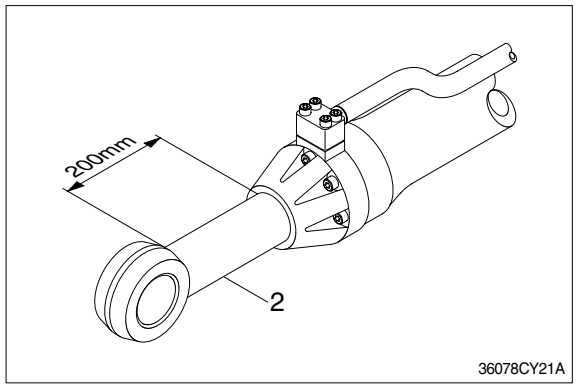
(1) Remove cylinder head and piston rod

※ Procedures are based on the bucket cylinder.

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

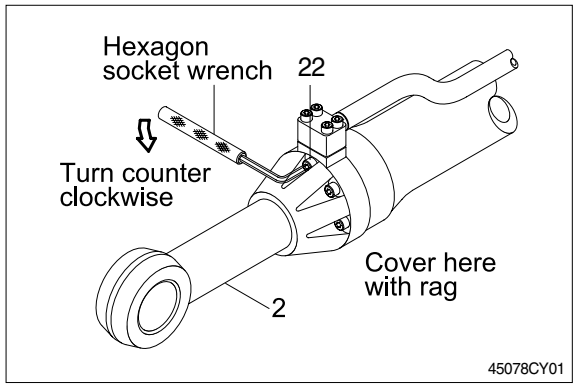
※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside

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



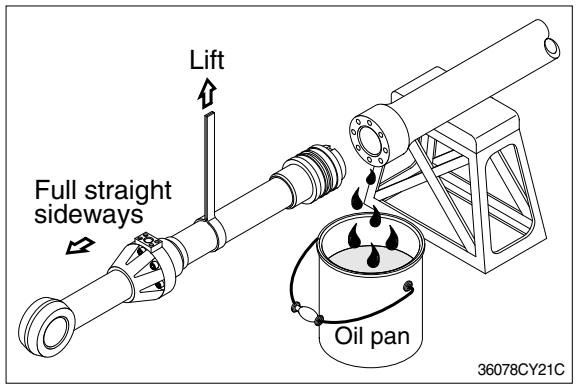
③ Loosen and remove socket bolts(22) of the gland in sequence.

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



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

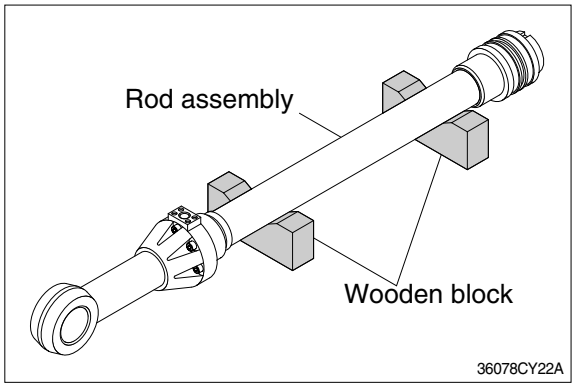
※ Since the rod assembly is heavy in this case, lift the tip of the rod assembly(2) with a crane or some means and draw it out. However, when rod assembly(2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.



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

⑤ Place the removed rod assembly on a wooden V-block that is set level.

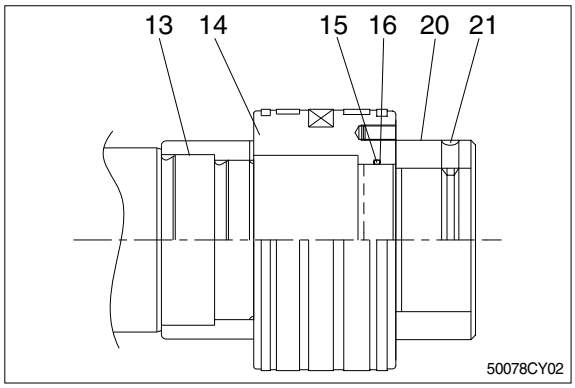
※ Cover a V-block with soft rag.



(2) Remove piston and cylinder head

① Remove screw(21) and lock nut(20).

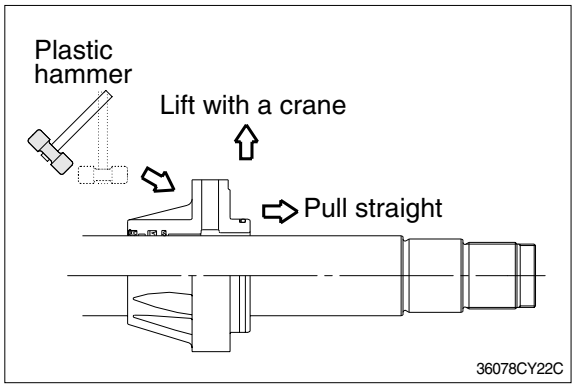
② Remove piston assembly(14), back up ring(16), and O-ring(15).



③ Remove the cylinder head assembly from rod assembly(2).

※ If it is too heavy to move, move it by striking the flanged part of cylinder head with a plastic hammer.

※ Pull it straight with cylinder head assembly lifted with a crane.
Exercise care so as not to damage the lip of rod bushing(4) and packing (6, 7, 8, 9, 10) by the threads of rod assembly(2).

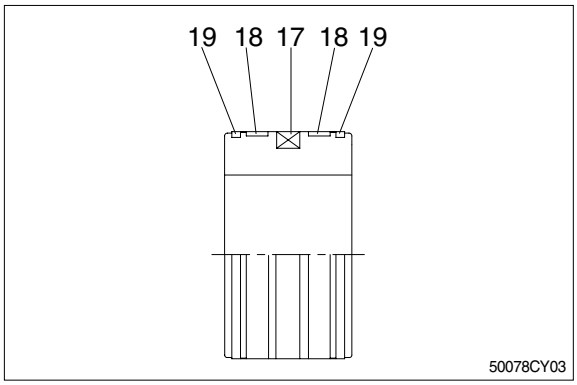


(3) Disassemble the piston assembly

① Remove wear ring(18).

② Remove dust ring(19) and piston seal (17).

※ Exercise care in this operation not to damage the grooves.



(4) Disassemble cylinder head assembly

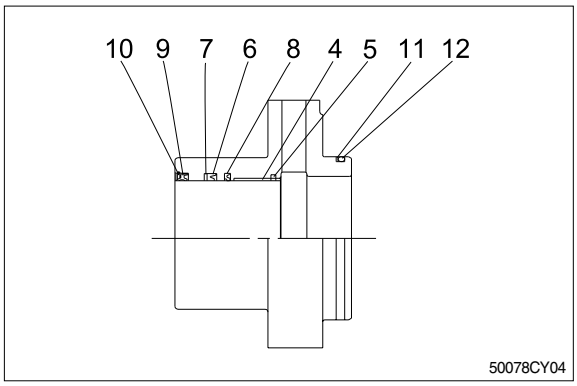
① Remove back up ring(12) and O-ring (11).

② Remove snap ring(10), dust wiper(9).

③ Remove back up ring(7), rod seal(6) and buffer ring(8).

※ Exercise care in this operation not to damage the grooves.

※ Do not remove seal and ring, if does not damaged.

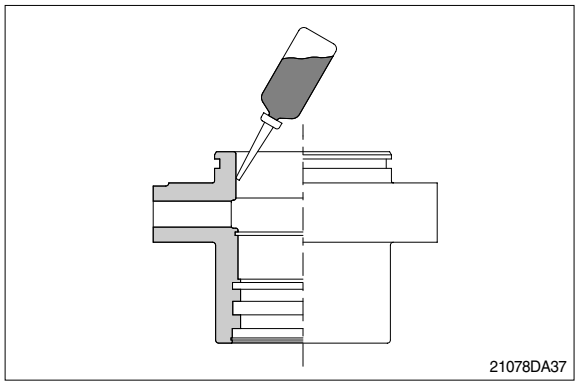


3) ASSEMBLY

(1) Assemble cylinder head assembly

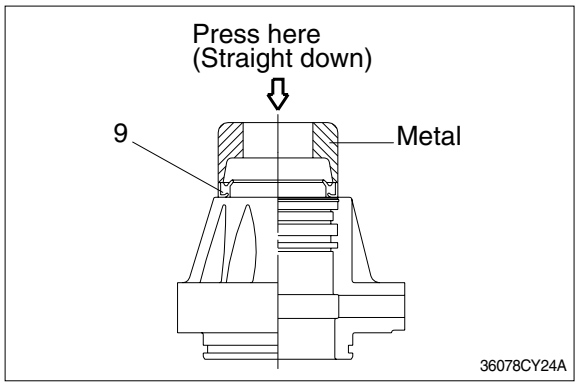
※ Check for scratches or rough surfaces if found smooth with an oil stone.

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



② Coat dust wiper(9) with grease and fit dust wiper(9) to the bottom of the hole of dust seal.
At this time, press a pad metal to the metal ring of dust seal.

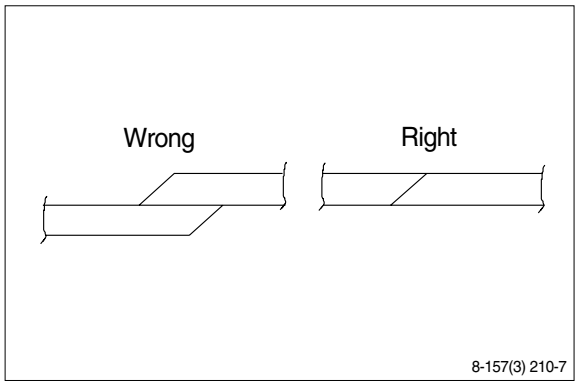
③ Fit snap ring(10) to the stop face.



④ Fit back up ring(7), rod seal(6) and buffer ring(8) to corresponding grooves, in that order.

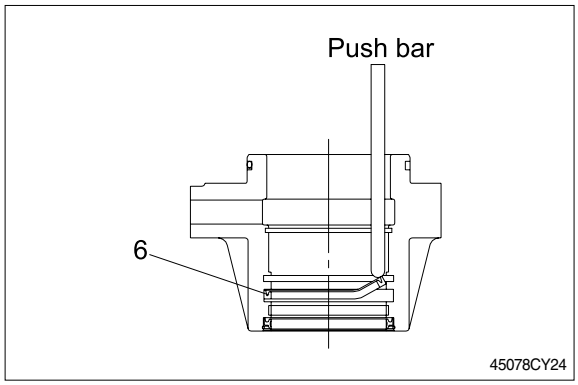
※ Coat each packing with hydraulic oil before fitting it.

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



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

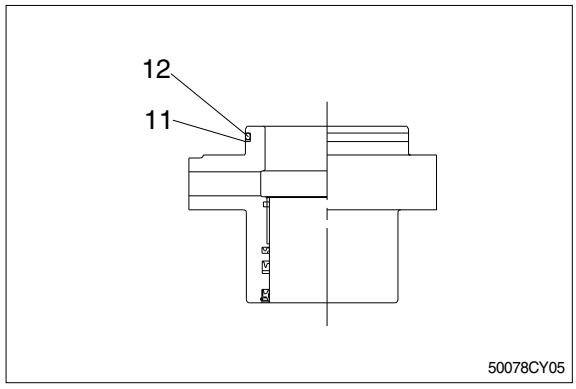
※ Fitting rod seal(6) upside down may damage its lip. Therefore check the correct direction that is shown in fig.



⑤ Fit back up ring(12) to gland(3).

※ Put the backup ring in the warm water of 30~50°C.

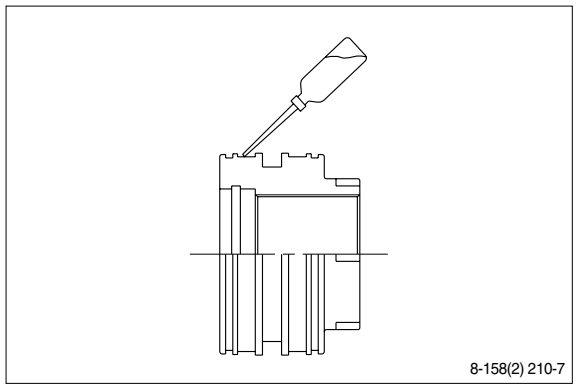
⑥ Fit O-ring(11) to gland(3).



(2) Assemble piston assembly

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

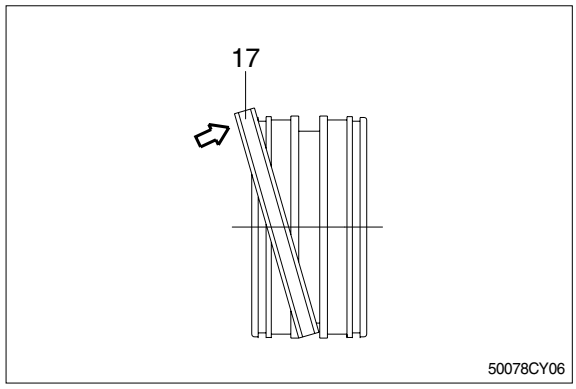
① Coat the outer face of piston(17) with hydraulic oil.



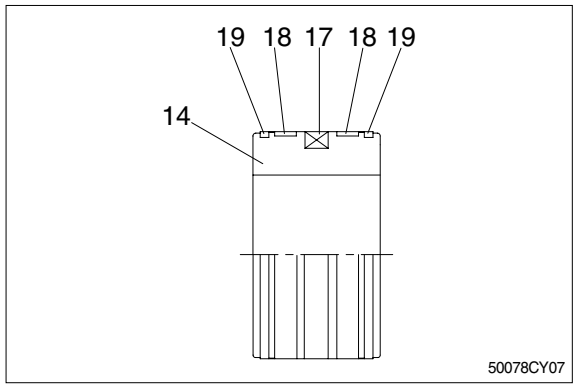
② Fit piston seal(17) to piston.

※ 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(18) and dust ring(19) to piston(14).

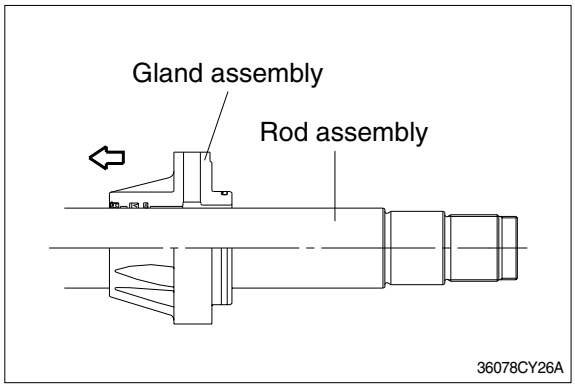


(3) Install piston and cylinder head

① Fix the rod assembly to the work bench.

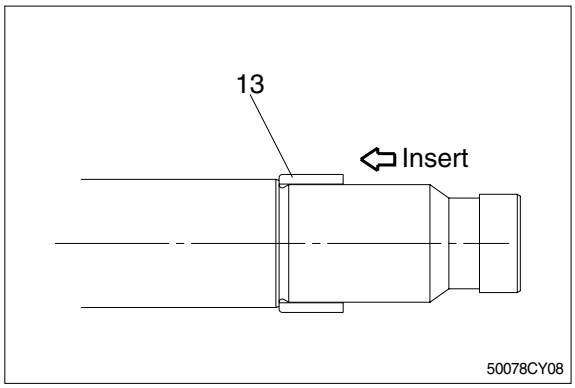
② Apply hydraulic oil to the outer surface of rod assembly(2), the inner surface of piston and cylinder head.

③ Insert cylinder head assembly to rod assembly.

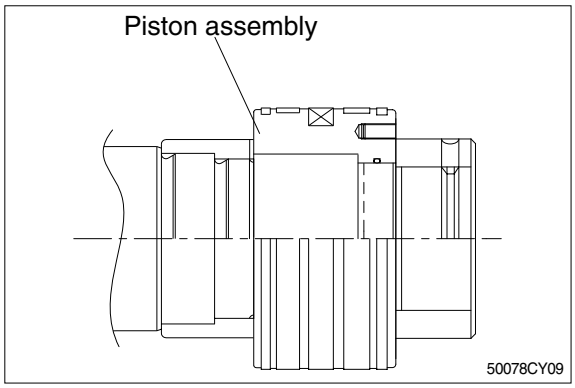


④ Insert cushion ring(13) to rod assembly.

※ Note that cushion ring(13) has a direction in which it should be fitted.



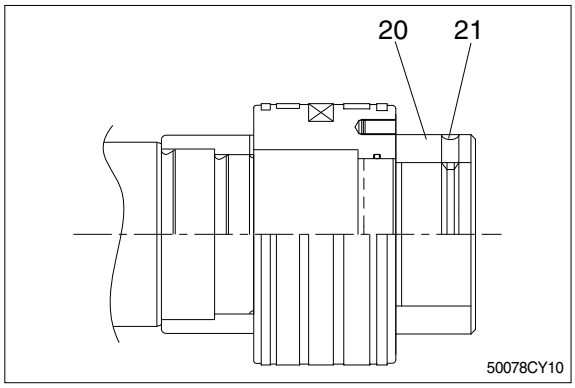
⑤ Fit piston assembly to rod assembly.



⑥ Fit lock nut(20) and tighten the screw (21).

· Tightening torque :

Item		kgf · m	lbf · ft
Bucket	21	5.4±0.5	39.1±3.6
Boom	21	5.4±0.5	39.1±3.6
Arm	21	5.4±0.5	39.1±3.6



(3) Overall assemble

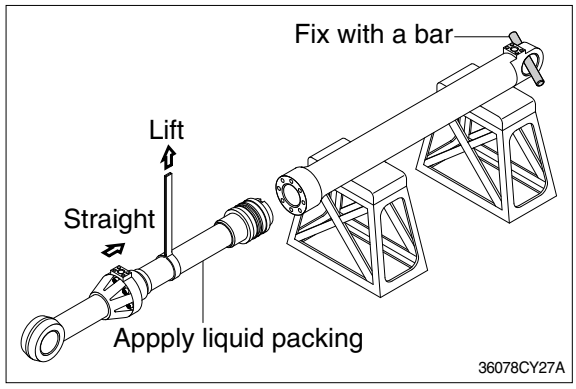
① Place a V-block on a rigid work bench. Mount the tube assembly(1) on it and fix the assembly by passing a bar through the clevis pin hole to lock the assembly.

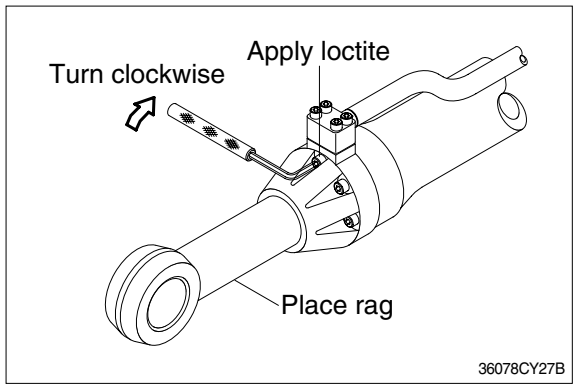
② Insert the rod assembly in to the tube assembly, while lifting and moving the rod assembly with a crane.

※ Be careful not to damage piston seal by thread of tube assembly.

③ Match the bolt holes in the cylinder head flange to the tapped holes in the tube assembly and tighten socket bolts to a specified torque.

※ Refer to the table of tightening torque.





1. TRACK LINK

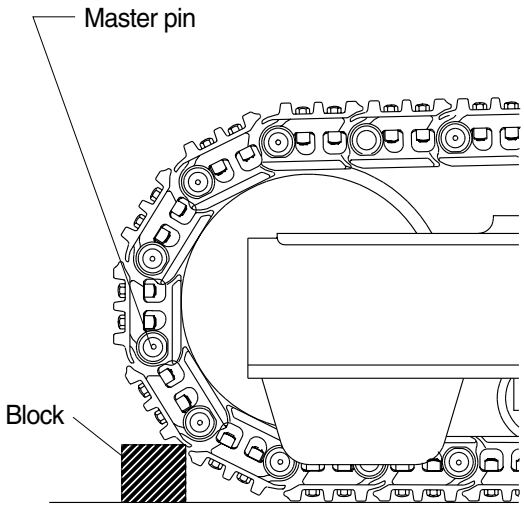
1) REMOVAL

(1) Move track link until master pin is over front idler in the position put wooden block as shown.

(2) Loosen tension of the track link.

※ If track tension is not relieved when the grease valve is loosened, move the machine backwards and forwards.

(3) Push out master pin by using a suitable tool.

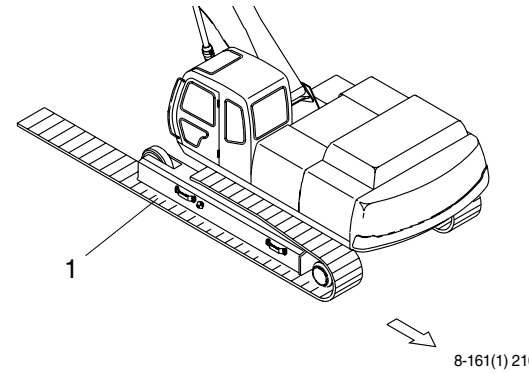


8-161(1) 210-7

(4) Move the machine slowly in reverse, and lay out track link assembly (1).

※ Jack up the machine and put wooden block under the machine.

※ Don't get close to the sprocket side as the track shoe plate may fall down on your feet.

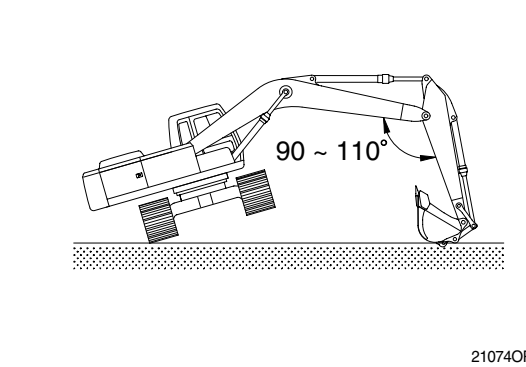


8-161(1) 210-7

2) INSTALL

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

※ Adjust the tension of the track link.



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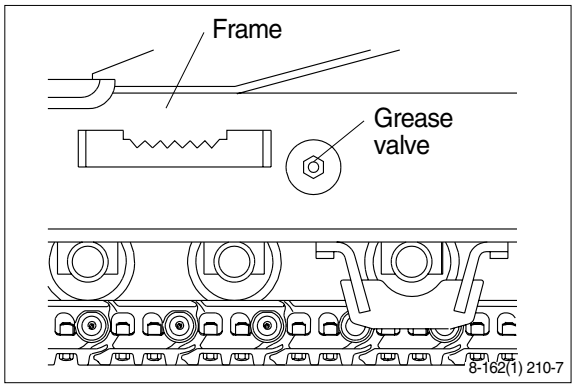
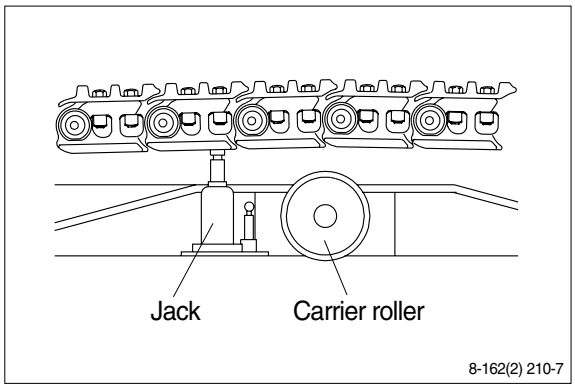
2. CARRIER ROLLER

1) REMOVAL

(1) Loosen tension of the track link.

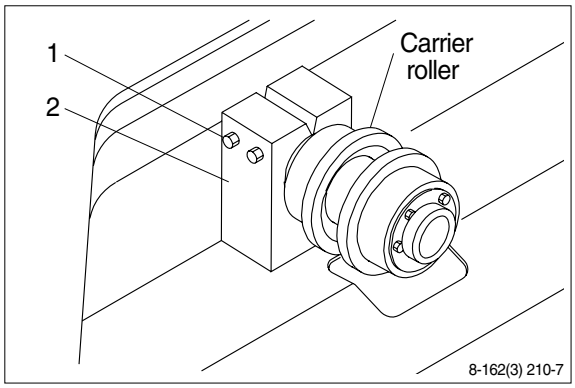


(2) Jack up the track link height enough to permit carrier roller removal.



(3) Loosen the lock nut (1).

(4) Open bracket(2) with a screwdriver, push out from inside, and remove carrier roller assembly.
- Weight : 80kg(180lb)



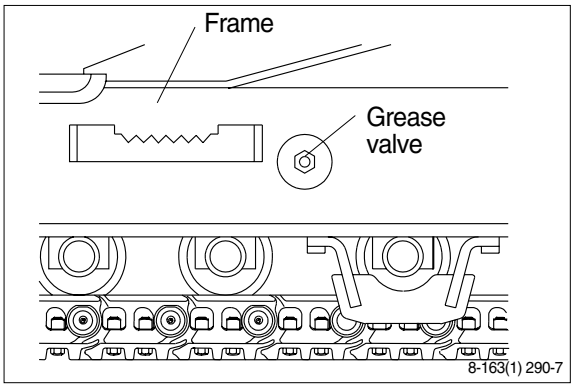
2) INSTALL

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

3. TRACK ROLLER

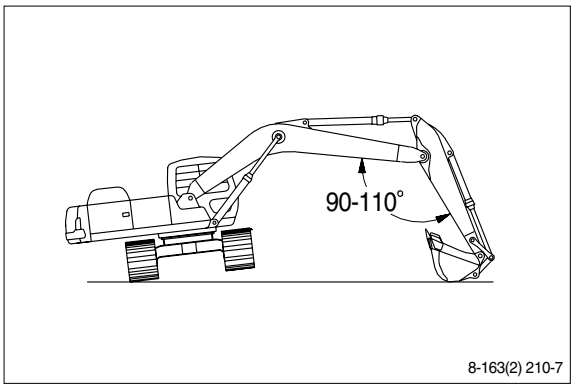
1) REMOVAL

(1) Loosen tension of the track link.



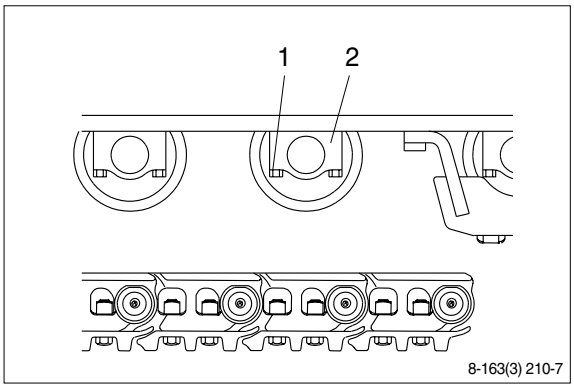
(2) Using the work equipment, push up track frame on side which is to be removed.

※ 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 : 80kg(180lb)



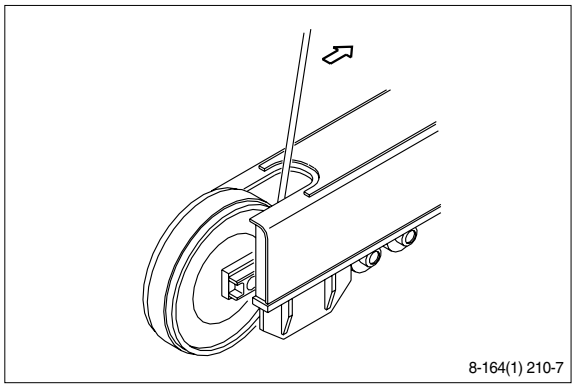
2) INSTALL

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

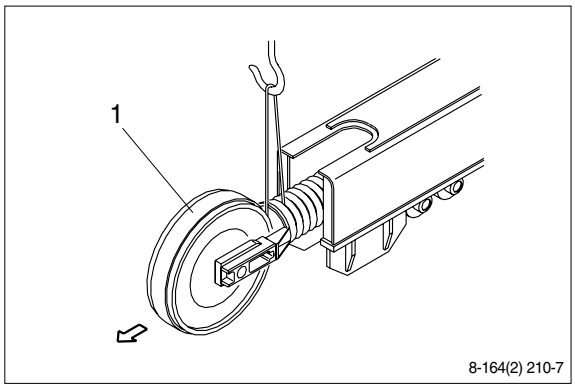
4. IDLER AND RECOIL SPRING

1) REMOVAL

(1) Remove the track link.
For detail, see **removal of track link**.

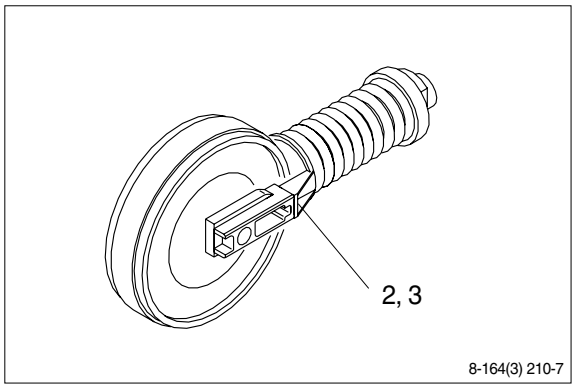

8-164(1) 210-7

(2) Sling the recoil spring(1) and pull out idler and recoil spring assembly from track frame, using a pry.
· Weight : 550kg(1210lb)



8-164(2) 210-7

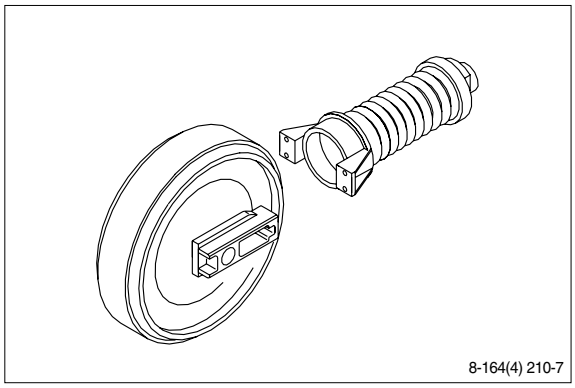
(3) Remove the bolts(2), washers(3) and separate ilder from recoil spring.



8-164(3) 210-7

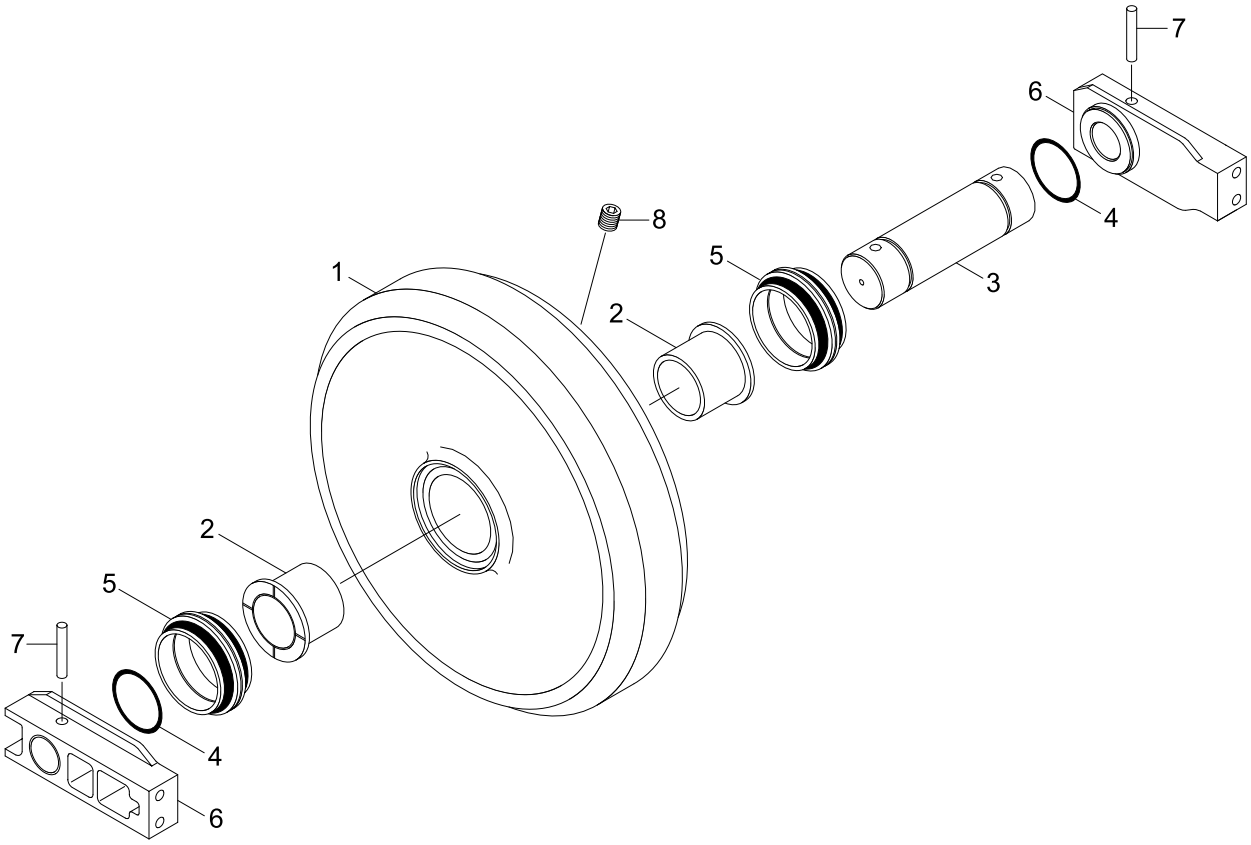
2) INSTALL

(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.


8-164(4) 210-7

3) DISASSEMBLY AND ASSEMBLY OF IDLER

(1) Structure

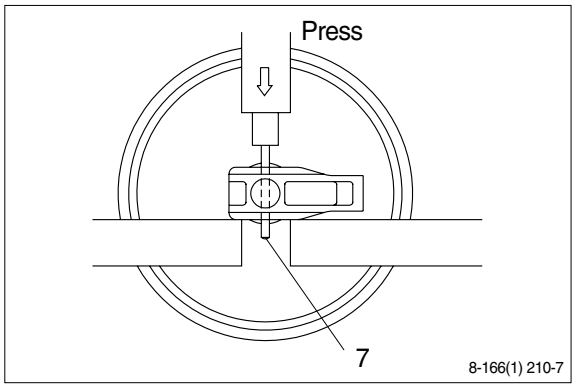


1	Shell	4	O-ring	7	Spring pin
2	Bushing	5	Seal assembly	8	Plug
3	Shaft	6	Bracket		

(2) Disassembly

① Remove plug and drain oil.

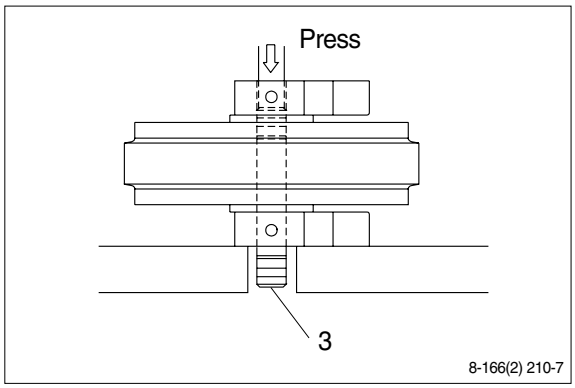
② Draw out the spring pin(7), using a press.



③ Pull out the shaft(2) with a press.

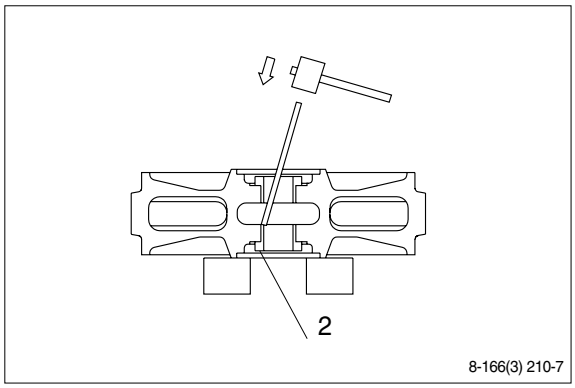
④ Remove seal(5) from shell(1) and bracket(6).

⑤ Remove O-ring(4) from shaft.



⑥ Remove the bushing(2) from idler, using a special tool.

※ Only remove bushing if replacement is necessity.

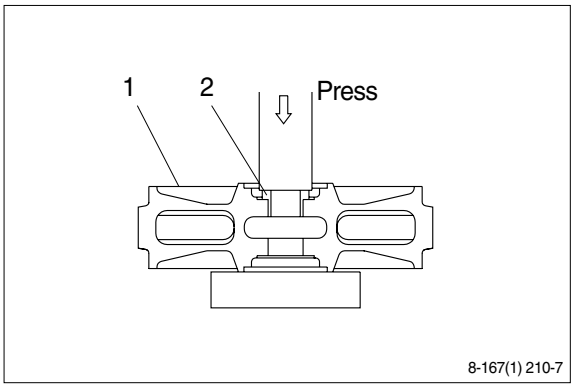


(3) Assembly

※ Before assembly, clean the parts.

※ Coat the sliding surfaces of all parts with oil.

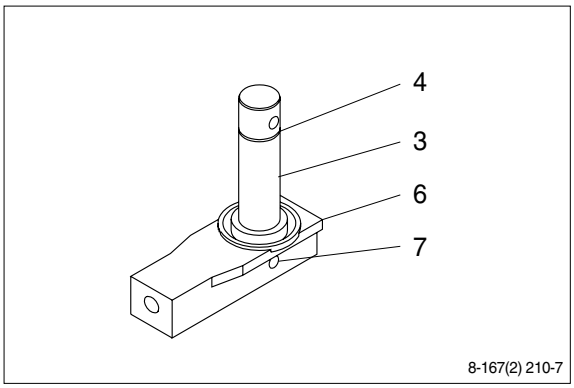
① Cool up bushing(2) fully by some dry ice and press it into shell(1).
Do not press it at the normal temperature, or not knock in with a hammer even after the cooling.



8-167(1) 210-7

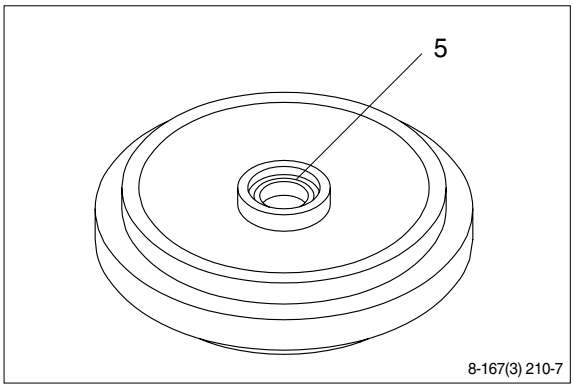
② Coat O-ring(4) with grease thinly, and install it to shaft(3).

③ Insert shaft(3) into bracket(6) and drive in the spring pin(7).



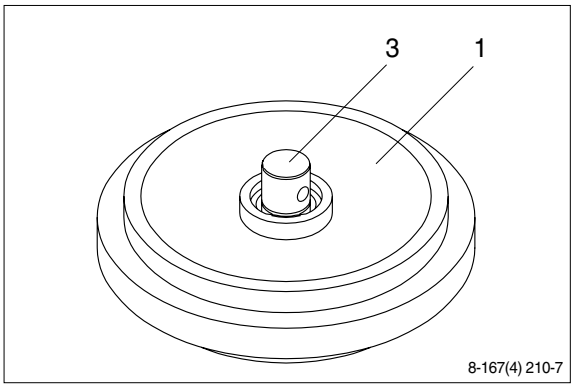
8-167(2) 210-7

④ Install seal(5) to shell(1) and bracket(6).



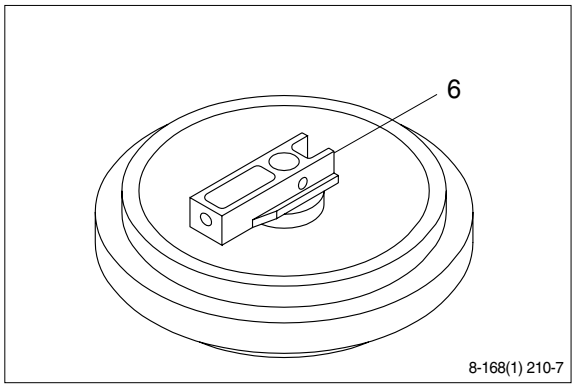
8-167(3) 210-7

⑤ Install shaft(3) to shell(1).

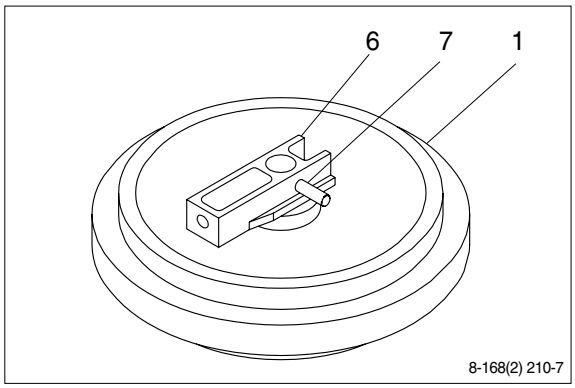


8-167(4) 210-7

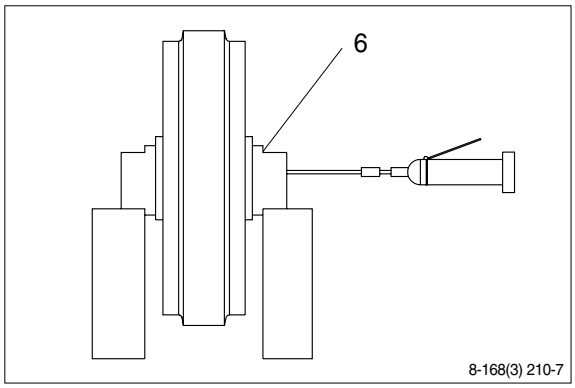
⑥ Install bracket(6) attached with seal(5).



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

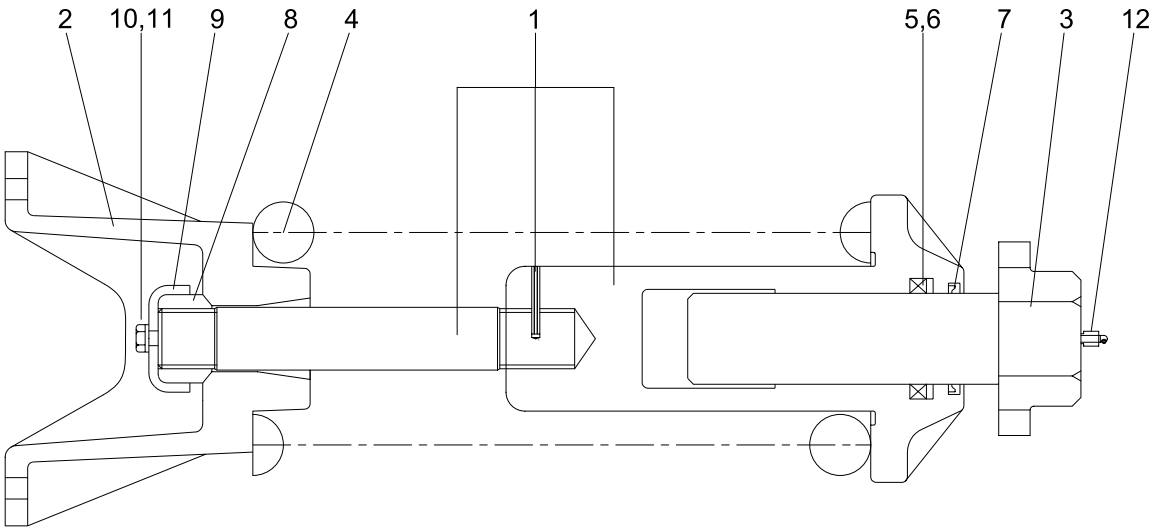


⑧ Lay bracket(6) on its side.
Supply engine oil to the specified level, and tighten plug.



4) DISASSEMBLY AND ASSEMBLY OF RECOIL SPRING

(1) Structure



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1	Body	5	Rod seal	9	Lock plate
2	Bracket	6	Back up ring	10	Hex bolt
3	Rod assembly	7	Dust seal	11	Spring washer
4	Spring	8	Lock nut	12	Grease valve

(2) Disassembly

① Apply pressure on spring(4) with a press.

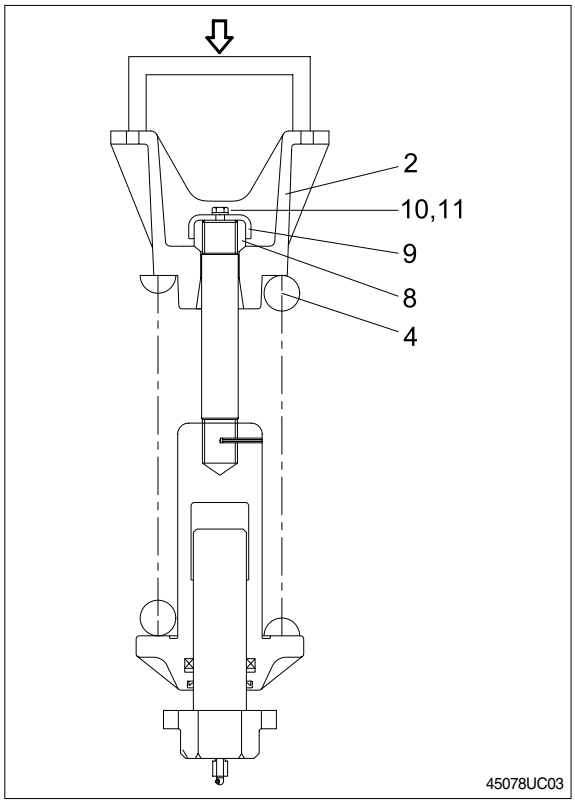
※ The spring is under a large installed load. This is dangerous, so be sure to set properly.

· Spring set load : 24375kg(53737lb)

② Remove bolt(10), spring washer(11) and lock plate(9).

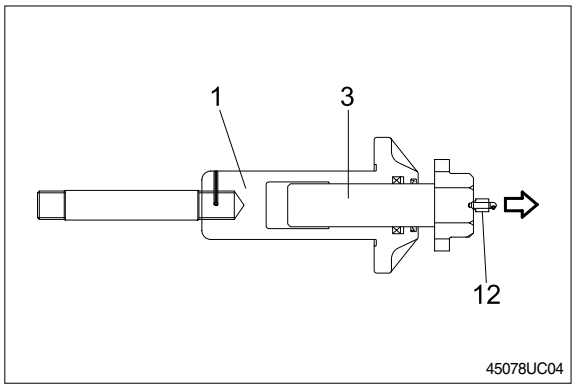
③ Remove lock nut(8).
Take enough notice so that the press which pushes down the spring, should not be slipped out in its operation.

④ Lighten the press load slowly and remove bracket(2) and spring(4).

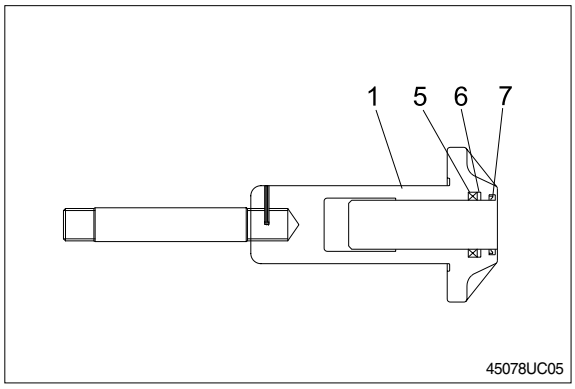


⑤ Remove rod(3) from body(1).

⑥ Remove grease valve(12) from rod(3).



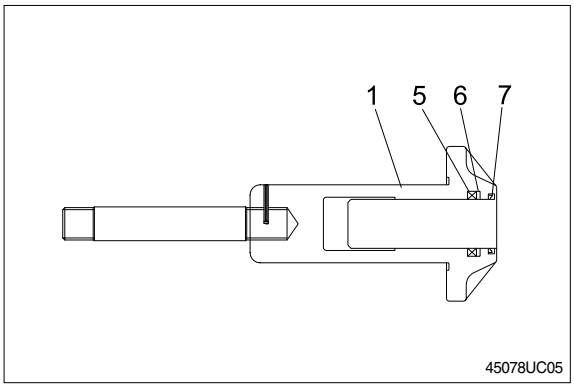
⑦ Remove rod seal(5), back up ring(6) and dust seal(11).



(3) Assembly

① Install dust seal(7), back up ring(6) and rod seal(5) to body(1).

※ When installing dust seal(7) and rod seal(5), take full care so as not to damage the lip.

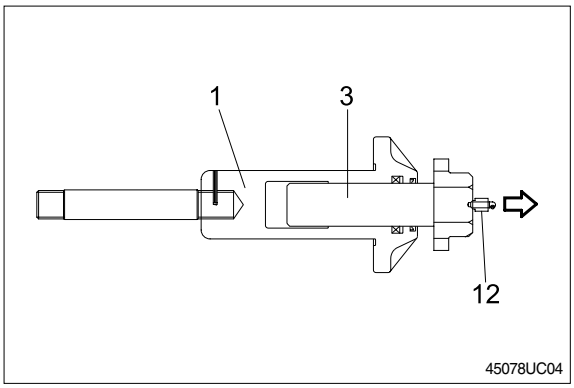


② Pour grease into body(1), then push in rod(3) by hand.
After take grease out of grease valve mounting hole, let air out.

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

③ Fit grease valve(12) to rod(3).

· Tightening torque : 13.0±1.0kgf · m
(94±7.2lbf · ft)

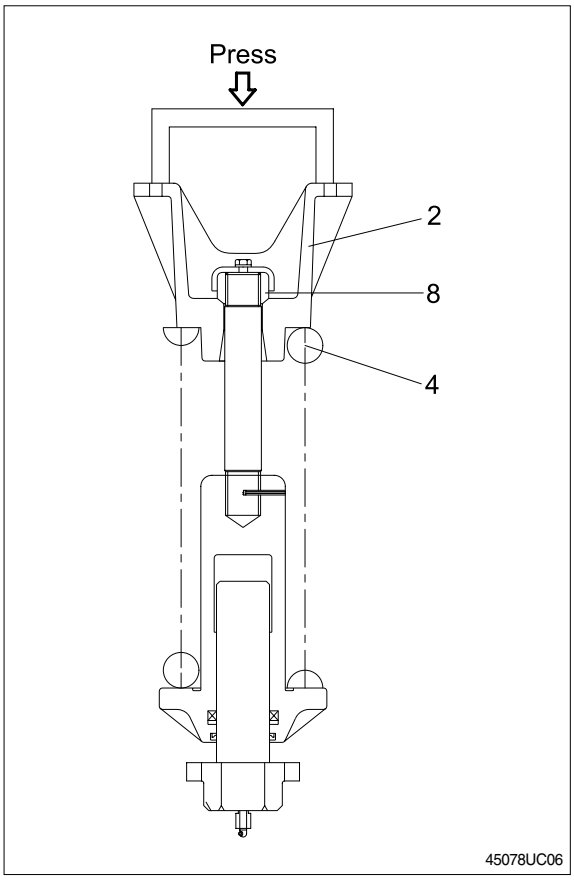


④ Install spring(4) and bracket(2) to body (1).

⑤ Apply pressure to spring(4) with a press and tighten lock nut(8).

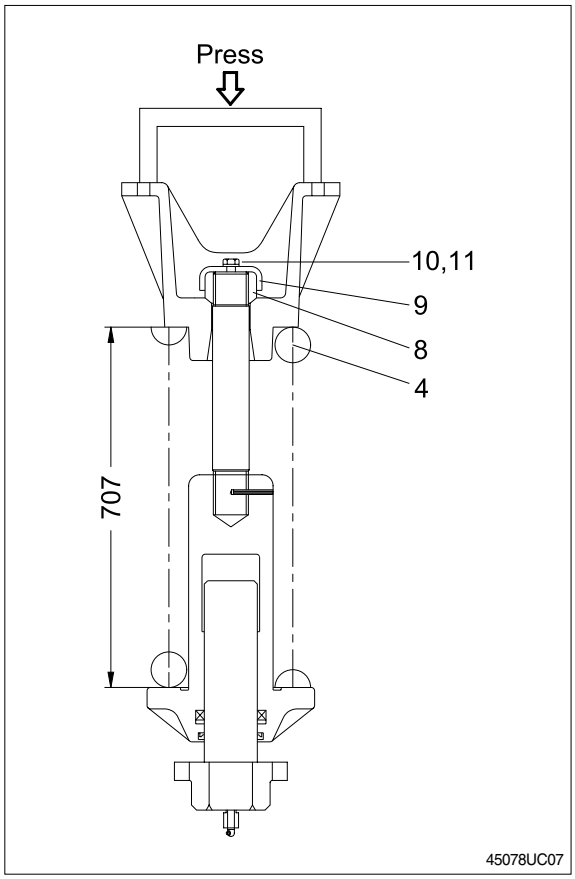
※ Apply sealant before assembling.

※ During the operation, pay attention specially to prevent the press from slipping out.



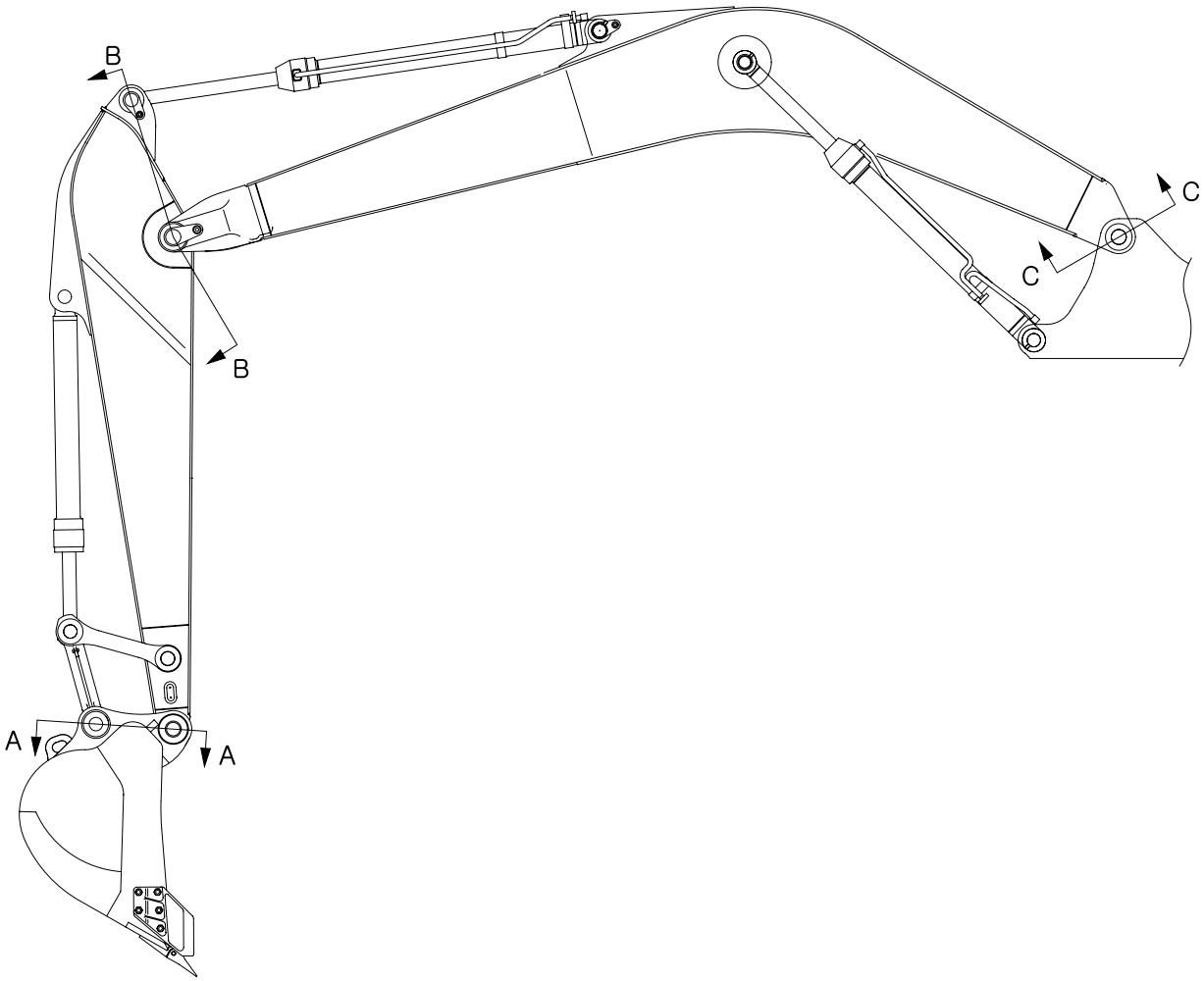
⑥ Lighten the press load and confirm the set length of spring(4).

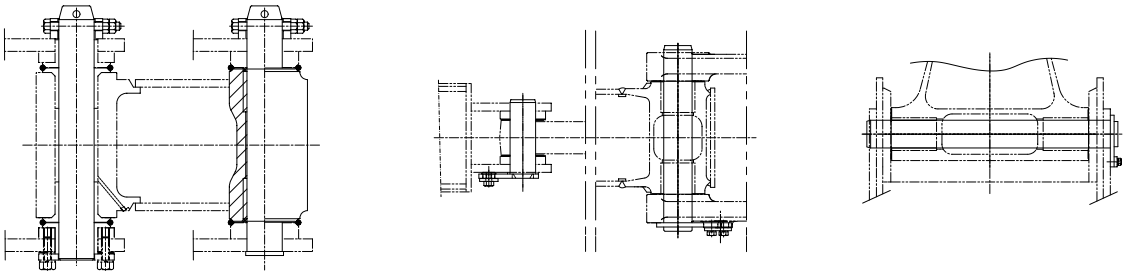
⑦ After the setting of spring(4), install lock plate(9), spring washer(11) and bolt(10).



GROUP 11 WORK EQUIPMENT

1. STRUCTURE





SECTION A SECTION B SECTION C

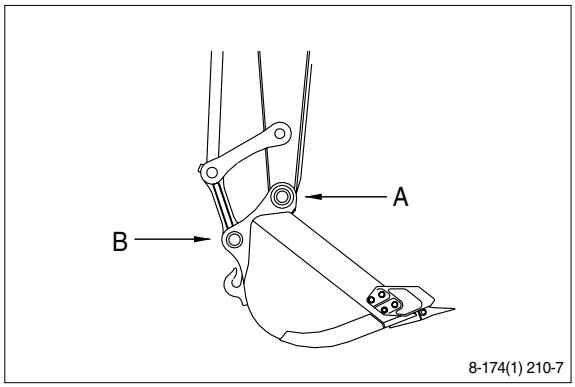
29078WE01

2. REMOVAL AND INSTALL

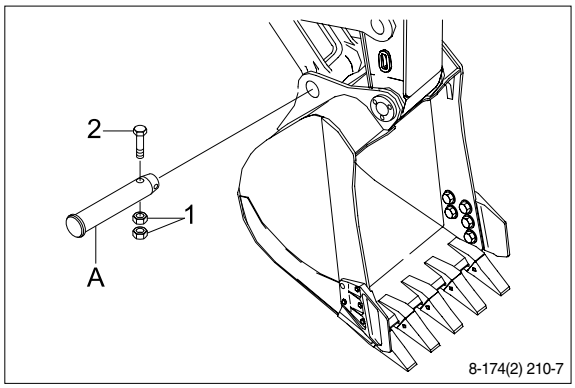
1) BUCKET ASSEMBLY

(1) Removal

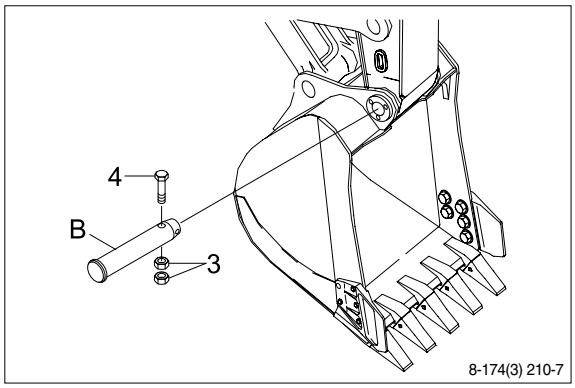
① Lower the work equipment completely to ground with back of bucket facing down.



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



③ Remove nut(3), bolt(4) and draw out the pin(B).

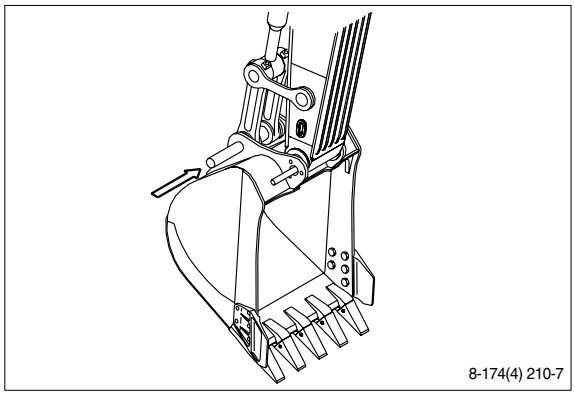


(2) Install

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 **operation manual.**



2) ARM ASSEMBLY

(1) Removal

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

⚠ Escaping fluid under pressure can penetrated the skin causing serious injury.

① Remove bucket assembly.
For details, see **removal of bucket assembly.**

② Disconnect bucket cylinder hose(1).

⚠ Fit blind plugs in the piping at the chassis end securely to prevent oil from spurting out when the engine is started.

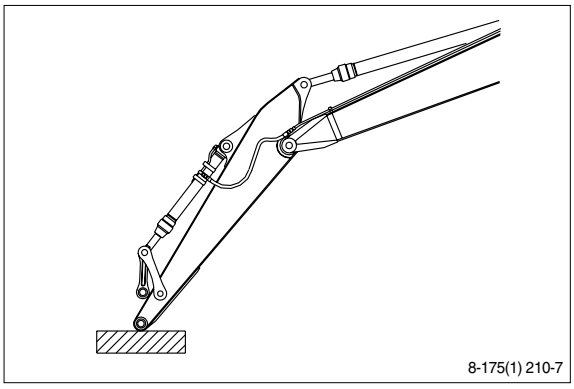
③ Sling arm cylinder assembly, remove spring, pin stopper and pull out pin.

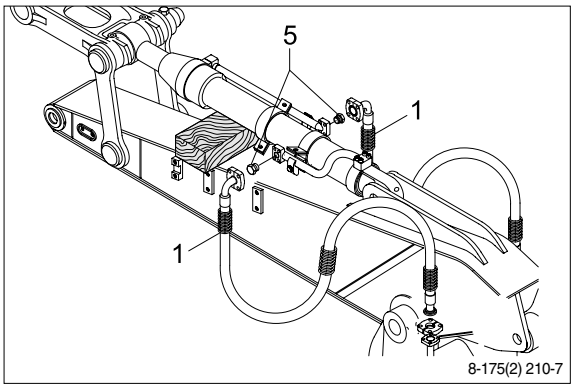
※ Tie the rod with wire to prevent it from coming out.

④ For details, see **removal of arm cylinder assembly.**
Place a wooden block under the cylinder and bring the cylinder down to it.

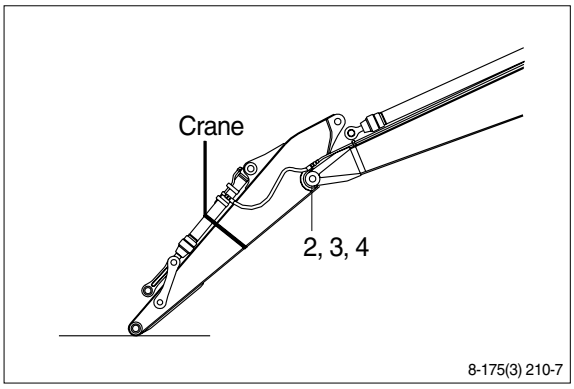
⑤ Remove bolt(2), plate(3) and pull out the pin(4) then remove the arm assembly.
· Weight : 1450kg(3200lb)

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


8-175(1) 210-7



8-175(2) 210-7



8-175(3) 210-7

(2) Install

① Carry out installation in the reverse order to removal.

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

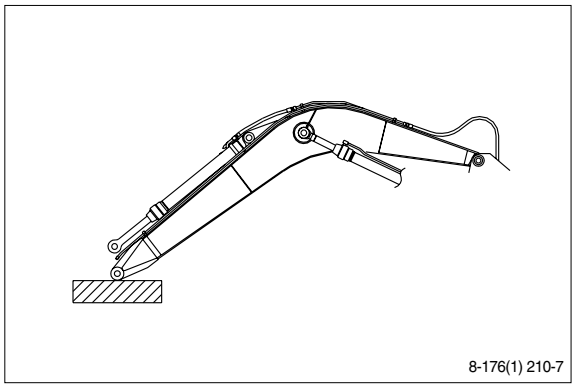
※ Bleed the air from the cylinder.

3) BOOM ASSEMBLY

(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 boom cylinder assembly.**

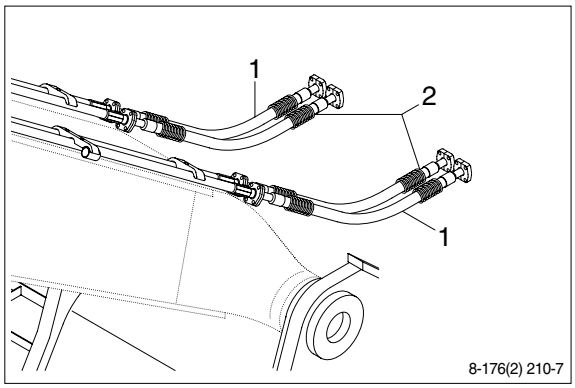

8-176(1) 210-7

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.

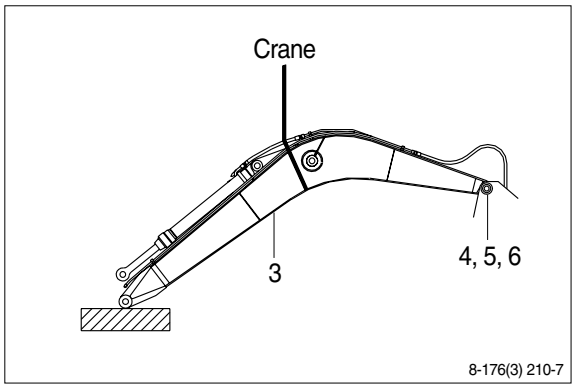
⑤ Sling boom assembly(3).



8-176(2) 210-7

⑥ Remove bolt(4), plate(5) and pull out the pin(6) then remove boom assembly.
· Weight : 3300kg(7360lb)

※ When lifting the boom assembly always lift the center of gravity.



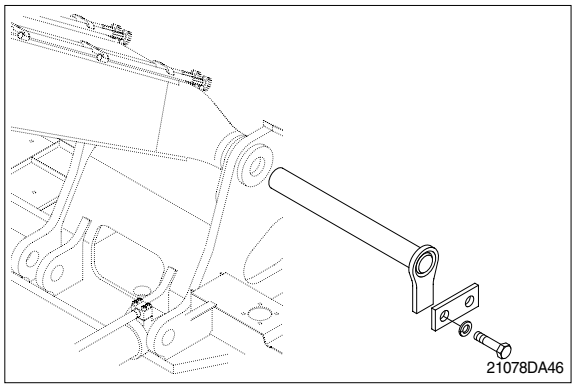
8-176(3) 210-7

(2) Install

① Carry out installation in the reverse order to removal.

⚠ When lifting the boom assembly, always lift the center of gravity.

※ Bleed the air from the cylinder.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