SECTION 8 DISASSEMBLY AND ASSEMBLY

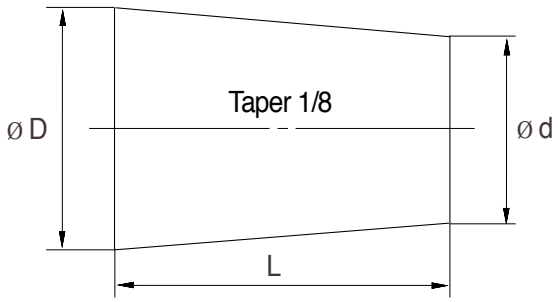
SECTION 8 DISASSEMBLY AND ASSEMBLY

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	M20 × 2.5	55±3.5	398±25.3
2		Radiator mounting bolt	M12 × 1.75	12.8±3.0	92.5±21.6
3		Main pump housing mounting bolt	M10 × 1.5	6.9±0.3	49.9±2.2
4		Coupling mounting bolt	M16 × 2.0	22.1±2.4	159±17.3
5	Hydraulic system	Main pump mounting bolt	M16 × 2.0	22.1±2.4	159±17.3
6		Main control valve mounting bolt	M12 × 1.75	12.8±3.0	92.5±21.6
7		Fuel tank mounting bolt	M20 × 2.5	46.0±5.1	333±36.9
8		Hydraulic oil tank mounting bolt	M20 × 2.5	46.0±5.1	333±36.9
9		Turning joint mounting bolt, nut	M12 × 1.75	12.2±1.3	88.2±9.4
10	Power train system	Swing motor mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
11		Swing bearing upper mounting bolt	M18 × 2.5	41.3±6.2	299±44.8
12		Swing bearing lower mounting bolt	M16 × 1.5	31.3±4.7	266±34.0
13		Front axle mounting bolt, nut	M20 × 2.5	57.9±8.7	419±63
15		Rear axle mounting bolt, nut	M20 × 2.5	58.0±6.3	420±45.6
16		Transmission mounting bolt	M20 × 2.5	44.0±2.0	318±14.5
17		Oscillating cylinder mounting bolt	M22 × 1.5	83.2±9.2	602±66.5
18		Oscillating cylinder support bolt	M12 × 1.75	12.3±2.5	88.9±18.1
19		Wheel nut	M22 × 1.5	62.0±3.0	448±21.7
20		Front drive shaft mounting bolt, nut	M10 × 1.0	5.9±0.6	42.7±4.3
21		Rear drive shaft mounting bolt, nut	M10 × 1.0	5.9±0.6	42.7±4.3
22	Others	Counter weight mounting bolt	M27 × 3.0	140±15.0	1013±108
23		Cab mounting bolt, nut	M12 × 1.75	12.2±1.3	88.2±9.4
24		Operator's seat mounting bolt	M 8 × 1.25	1.17±0.1	8.5±0.7

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

2. TORQUE CHART

The torques given are standard figures. Any figures specifically described in this manual has priority.

1) METRIC BOLT-coarse thread

Bolt size	8T		10T	
	kg · m	lb · ft	kg · m	lb · 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	2.73 ~ 4.12	19.7 ~ 29.8
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 79.5	9.8 ~ 15.8	71 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 167
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.5	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 343
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	350 ~ 457	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.5	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1655
M36 × 4.0	174 ~ 236	1261 ~ 1703	250 ~ 310	1808 ~ 2242

2) METRIC BOLT-Fine thread

Bolt size	8T		10T	
	kg · m	lb · ft	kg · m	lb · ft
M 8 × 1.0	2.17 ~ 3.37	15.7 ~ 24.3	3.04 ~ 4.44	22.0 ~ 32.0
M10 × 1.25	4.46 ~ 6.66	32.3 ~ 48.2	5.93 ~ 8.93	42.9 ~ 64.6
M12 × 1.25	7.78 ~ 11.58	76.3 ~ 83.7	10.6 ~ 16.0	76.6 ~ 115
M14 × 1.5	13.3 ~ 18.1	96.2 ~ 130	17.9 ~ 24.1	130 ~ 174
M16 × 1.5	19.9 ~ 26.9	144 ~ 194	26.6 ~ 36.0	193 ~ 260
M18 × 1.5	28.6 ~ 43.6	207 ~ 315	38.4 ~ 52.0	278 ~ 376
M20 × 1.5	40.0 ~ 54.0	289 ~ 390	53.4 ~ 72.2	386 ~ 522
M22 × 1.5	52.7 ~ 71.3	381 ~ 515	70.7 ~ 95.7	512 ~ 692
M24 × 2.0	68 ~ 92	491 ~ 664	90.9 ~ 123	658 ~ 890
M30 × 2.0	137 ~ 185	990 ~ 1338	182 ~ 248	1314 ~ 1795
M36 × 3.0	192 ~ 260	1389 ~ 1879	262 ~ 354	1893 ~ 2561

3) PIPE & 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

4) FITTING

Thread size	Width across flat(mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	6	43.4
3/4"	36	12	86.8
1"	41	14	101

GROUP 3 PUMP DEVICE

1. REMOVAL AND INSTALL

1) REMOVAL

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

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

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

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

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

· Hydraulic tank quantity : 124 ℓ

(5) Remove socket bolts(13) and disconnect pipe(1,2).

(6) Disconnect pilot line hoses(5, 6, 7, 8, 9, 10, 11, 12).

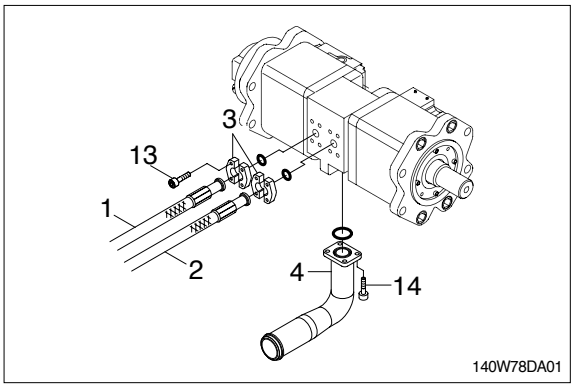
(7) Remove socket bolts(14) and disconnect pump suction tube(4).

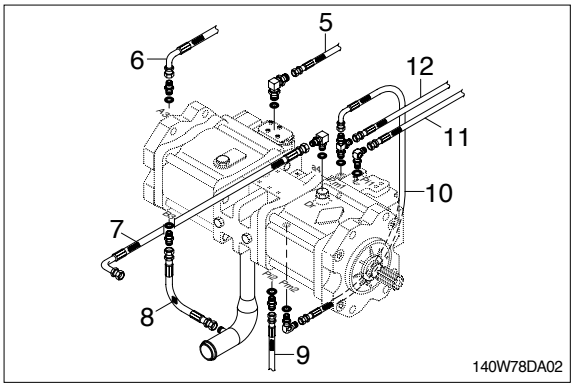
※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.

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

· Weight : 91kg(200lb)

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





2) INSTALL

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

(2) Remove the suction strainer and clean it.

(3) Replace return filter with new one.

(4) Remove breather and clean it.

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

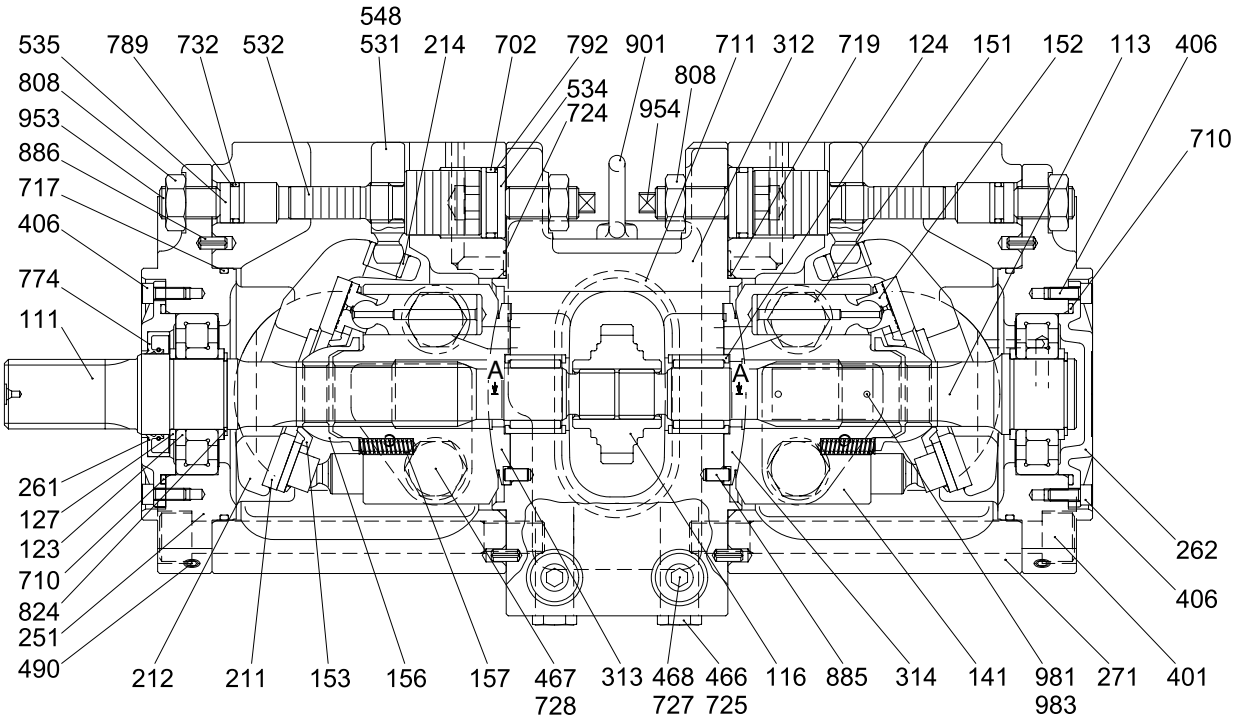
(6) Bleed the air from the hydraulic pump.
① Remove the air vent plug(2EA).
② Tighten plug lightly.
③ Start the engine, run at low idling, and check oil come out from plug.
④ Tighten plug.

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

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

2. MAIN PUMP(1/2)

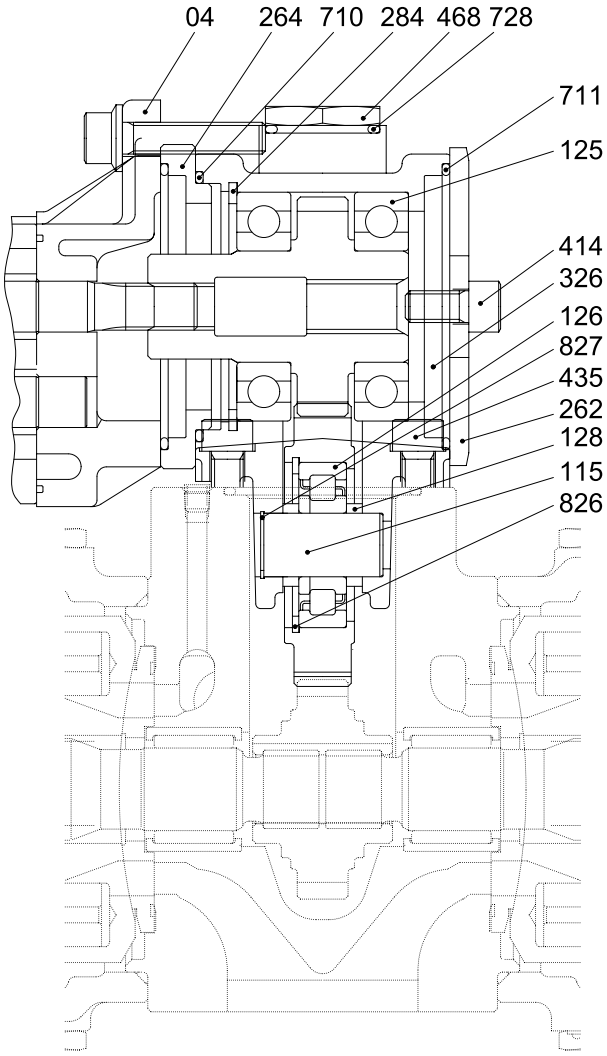
1) STRUCTURE



14W72SF02

111	Drive shaft(F)	271	Pump casing	724	O-ring
113	Drive shaft(R)	313	Valve plate(R)	725	O-ring
116	Gear	314	Valve plate(L)	727	O-ring
123	Roller bearing	401	Hexagon socket bolt	728	O-ring
124	Needle bearing	406	Hexagon socket bolt	732	O-ring
127	Bearing spacer	466	VP Plug	774	Oil seal
141	Cylinder block	467	VP Plug	789	Back up ring
151	Piston	468	VP Plug	792	Back up ring
152	Shoe	490	Plug	808	Hexagon head nut
153	Push-plate	531	Tilting pin	824	Snap ring
156	Bushing	532	Servo piston	885	Pin
157	Cylinder spring	534	Stopper(L)	886	Spring pin
211	Shoe plate	535	Stopper(S)	901	Eye bolt
212	Swash plate	548	Pin	953	Set screw
214	Bushing	702	O-ring	954	Set screw
251	Support	710	O-ring	981	Plate
261	Seal cover(F)	717	O-ring	983	Pin
262	Seal cover(R)	719	O-ring		

MAIN PUMP(2/2)



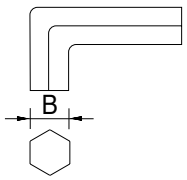
140W72SF03

04	Gear pump	262	Cover	710	O-ring
115	Shaft	284	Plate	711	O-ring
117	Gear No.2	326	Case	728	O-ring
118	Gear No.3	414	Screw	825	Retainer ring
125	Ball bearing	435	Hexagon socket bolt	826	Retainer ring
126	Roller bearing	468	Plug	827	Retainer ring
128	Bearing spacer				

2) 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="5">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>8</td><td>M10</td><td>BP-3/8</td><td>PO-3/8</td><td colspan="2">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 colspan="2">-</td></tr>
<tr><td rowspan="6">Double ring spanner, socket wrench, double(Single) open end spanner
 
</td><td>-</td><td colspan="2">Hexagon socket head bolt</td><td colspan="2">Henagon nut</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	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 Plug(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 Plug(Materal : 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	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

(1) Select place suitable to disassembling.

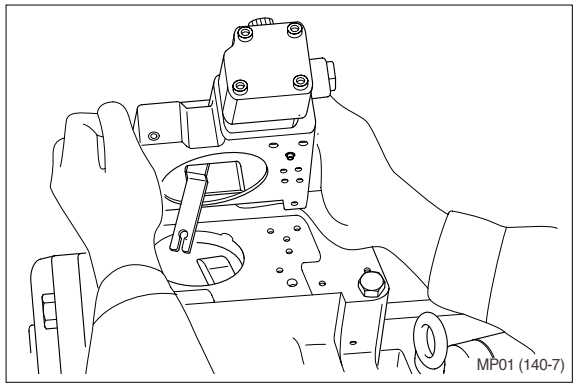
※ Select clean place.

※ 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.

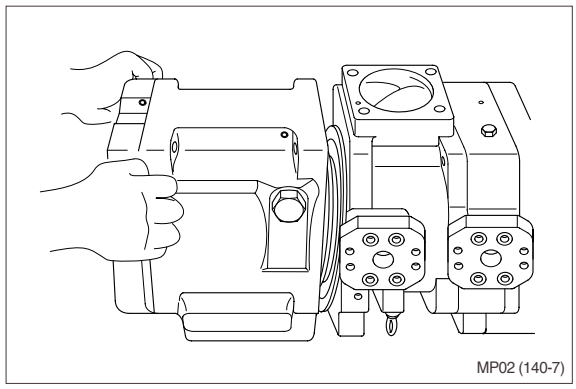

MP01 (140-7)

(5) Loosen hexagon socket head bolts(401) which tighten swash plate support(251), pump casing(271) and valve block(312).

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

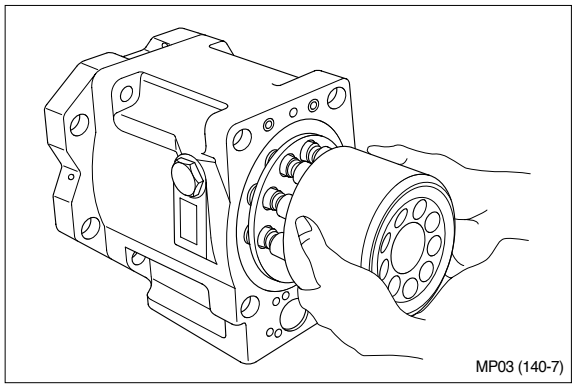
(6) Place pump horizontally on workbench with its regulator-fitting surface down and separate pump casing(271) from valve block(312).

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


MP02 (140-7)

(7) Pull cylinder block(141) out of pump casing(271) straightly over drive shaft (111). 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.

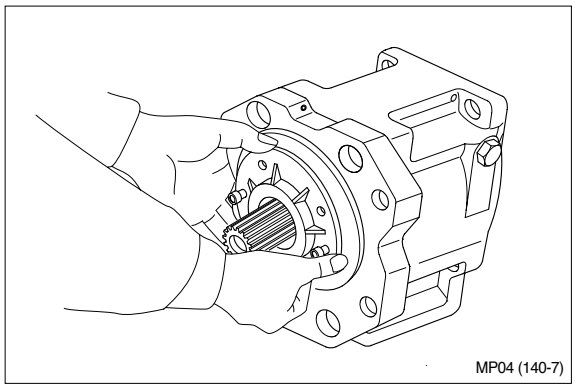

MP03 (140-7)

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

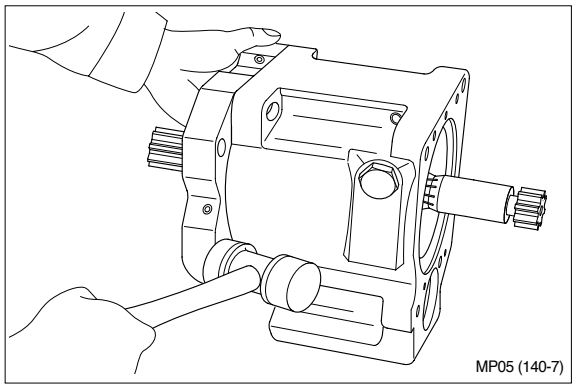
※ Fit bolt into pulling out tapped hole of seal cover(F), and cover can be removed easily.

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

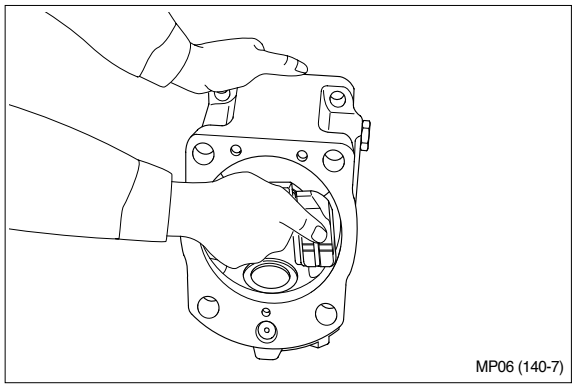
(9) Remove hexagon socket head bolts(408) and then seal cover(R, 262).
In case fitting a gear pump, first, remove gear pump.


MP04 (140-7)

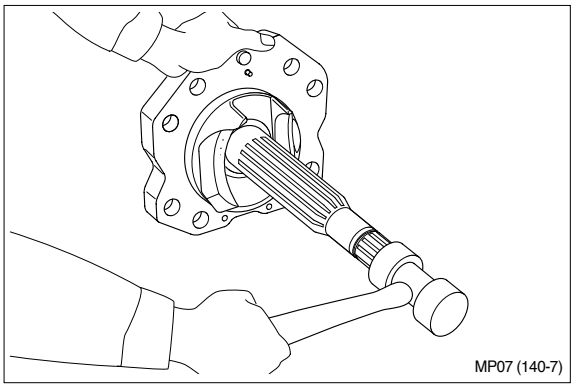
(10) Tapping lightly fitting flange section of swash plate support(251) on its pump casing side, separate swash plate support from pump casing.


MP05 (140-7)

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

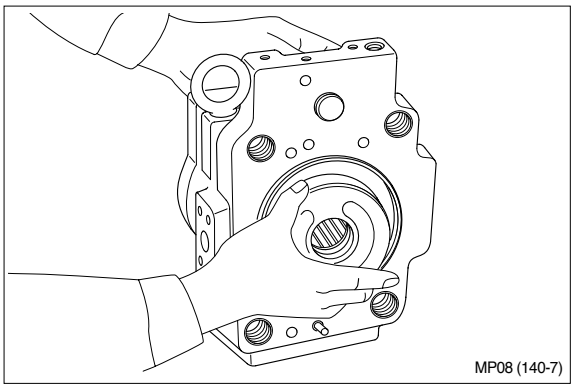

MP06 (140-7)

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


MP07 (140-7)

(13) Remove valve plates(313, 314) from valve block(312).

※ These may be removed in work(6).


MP08 (140-7)

(14) If necessary, remove stopper(L, 534), stopper(S, 535), servo piston(532) and tilting pin(531) from pump casing(271), and needle bearing(124) and splined coupling(114) from valve block(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 block and swash plate support.
If loosened, flow setting will be changed.

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.

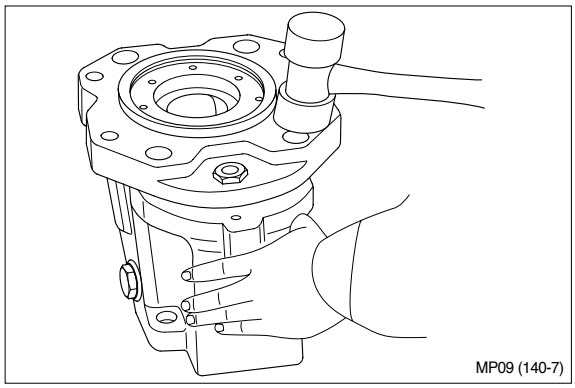
⑤ For fitting bolts, plug, etc., prepare a torque wrench or so on, and tighten them with torques shown in page 8-11, 12.

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.

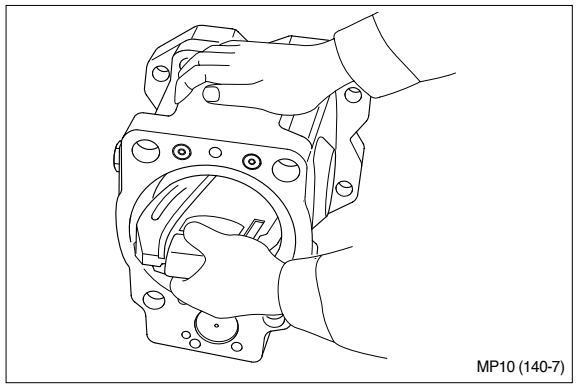


MP09 (140-7)

(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.

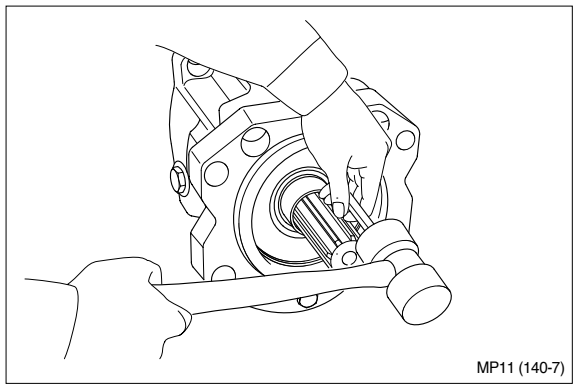


MP10 (140-7)

(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.



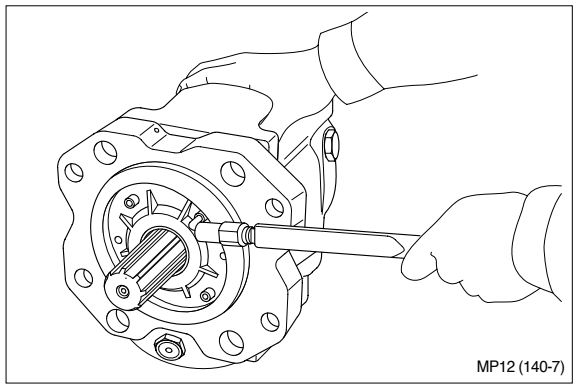
MP11 (140-7)

(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).

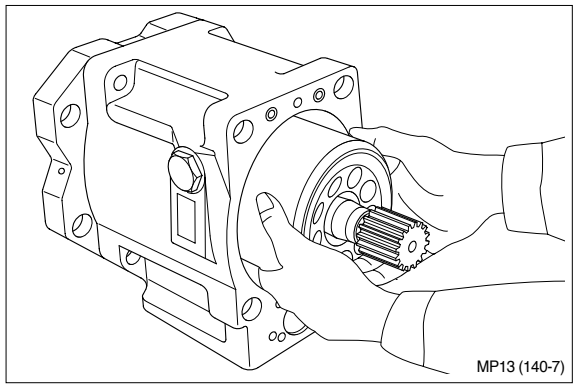
※ Assemble oil seal, taking full care not to damage it.

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



MP12 (140-7)

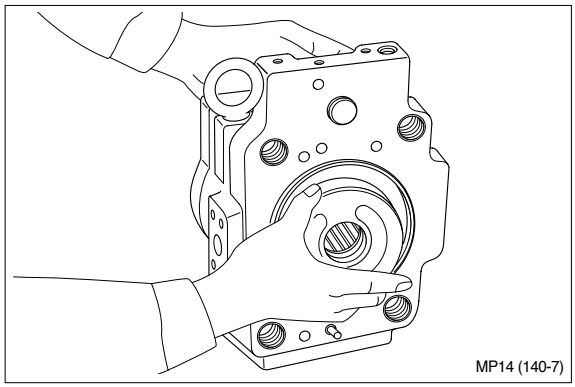
(6) Assemble piston cylinder subassembly 〔cylinder block(141), piston subassembly (151, 152), set plate(153), spherical bush (156), spacer(158) and cylinder spring (157)〕.
Fit spline phases of retainer and cylinder.
Then, insert piston cylinder subassembly into pump casing.



MP13 (140-7)

(7) Fit valve plate(313) to valve block(312), entering pin into pin hole.

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



MP14 (140-7)

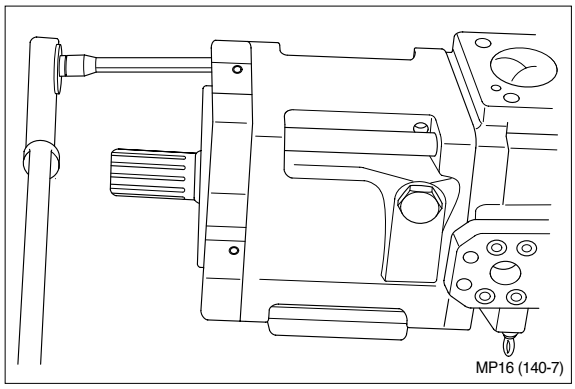
(8) Fit valve block(312) to pump casing(271) and tighten hexagon socket head bolts (401).

※ At first assemble this at rear pump side, and this work will be easy.

※ Take care not to mistake direction of valve block.

※ Clockwise rotation(Viewed from input shaft side) - Fit block with regulator up and with delivery flange left, viewed from front side.

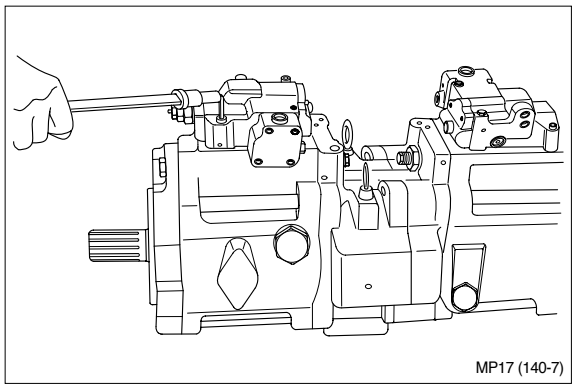
※ Counter clockwise rotation(Viewed from input shaft side) - Fit block with delivery flange right, viewed from front side.



MP16 (140-7)

(9) 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.



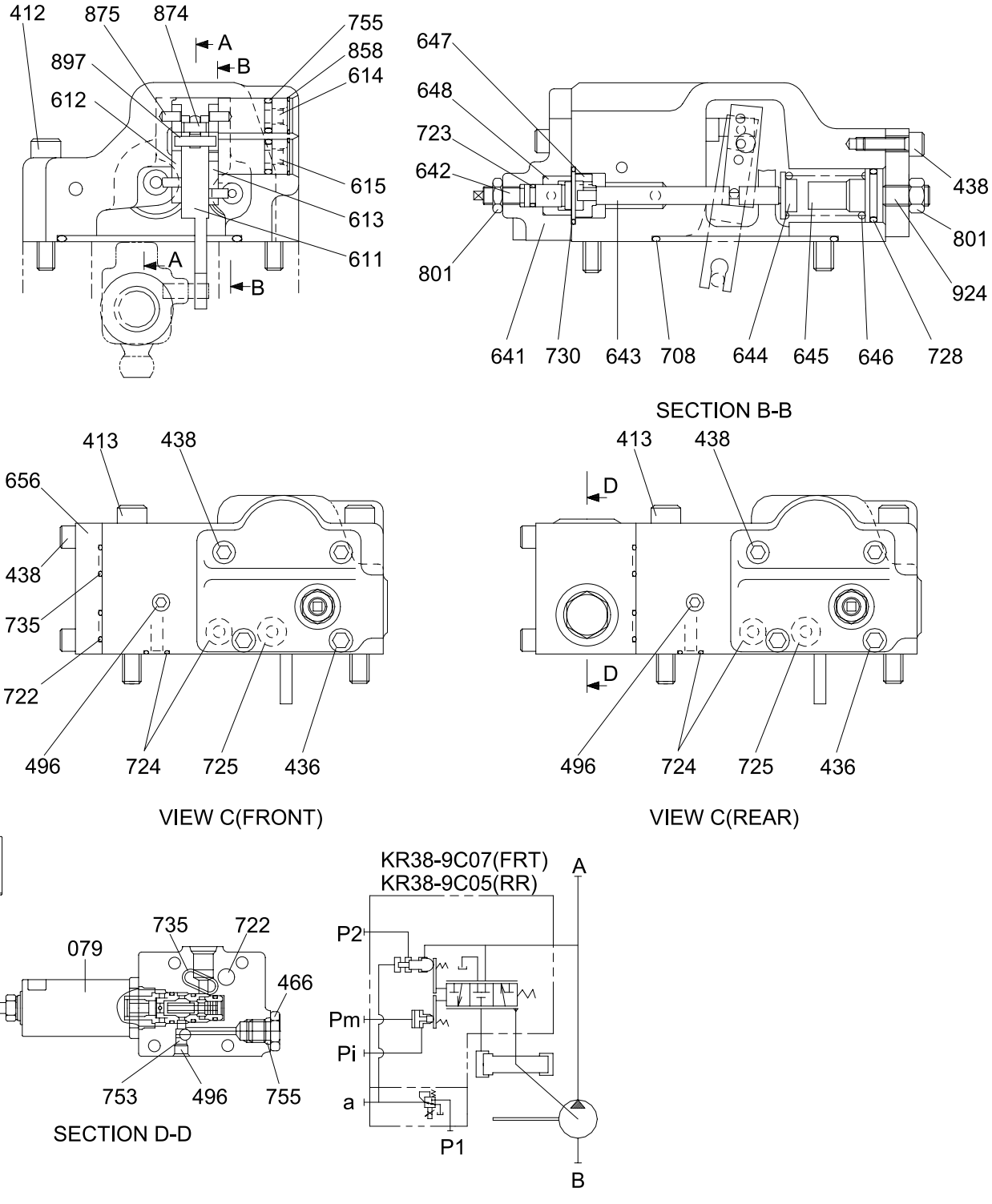
MP17 (140-7)

(10) Fit drain port plug(468).

This is the end of reassembling procedures.

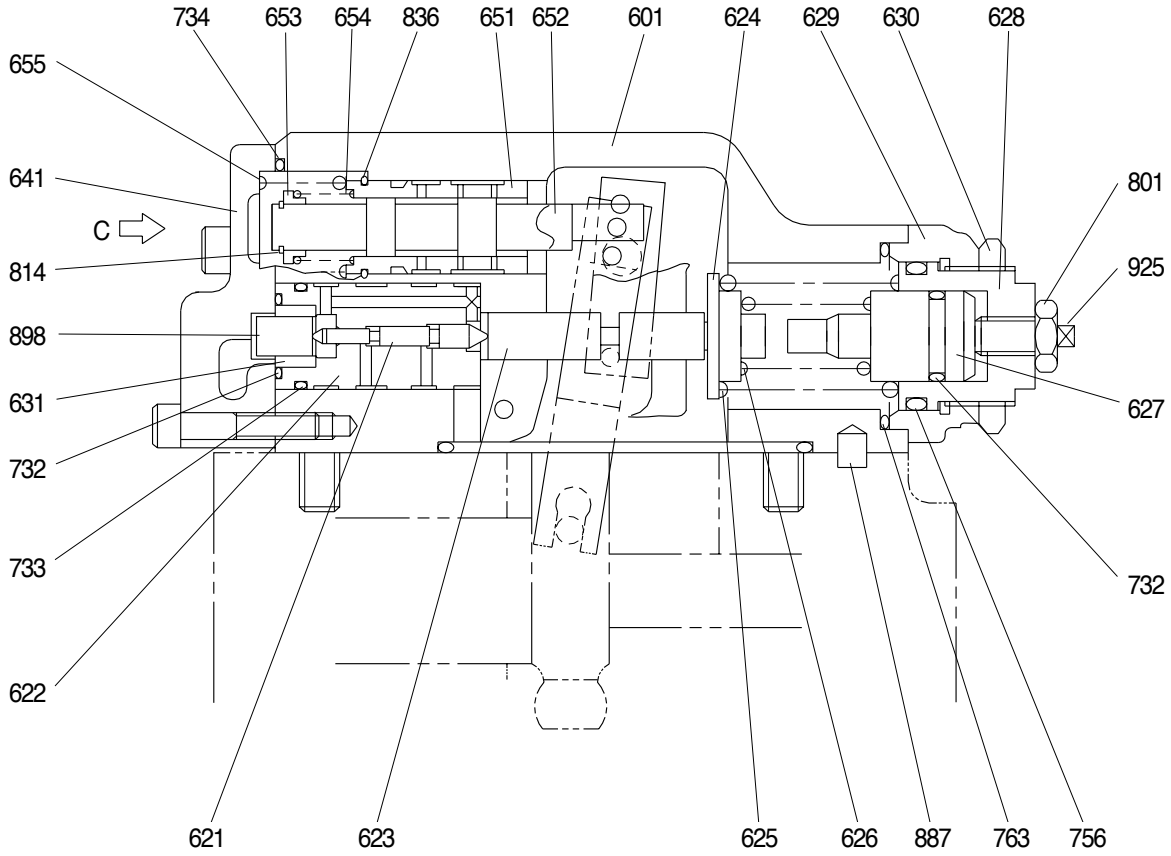
3. REGULATOR

1) STRUCTURE(1/2)



14072SF03

REGULATOR(2/2)



SECTION A-A

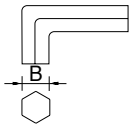
2-5 (140-7)

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

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

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

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

(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.

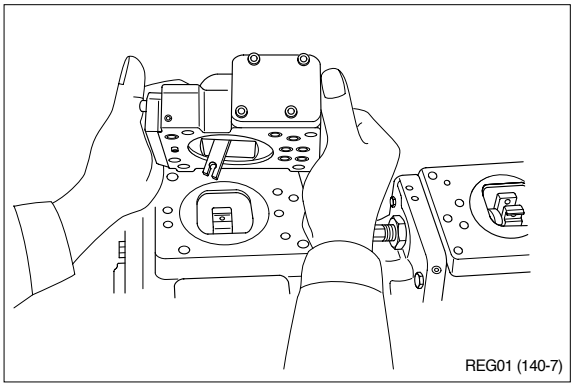
※ Choose a clean place.

※ Spread rubber sheet, cloth, or so on 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.



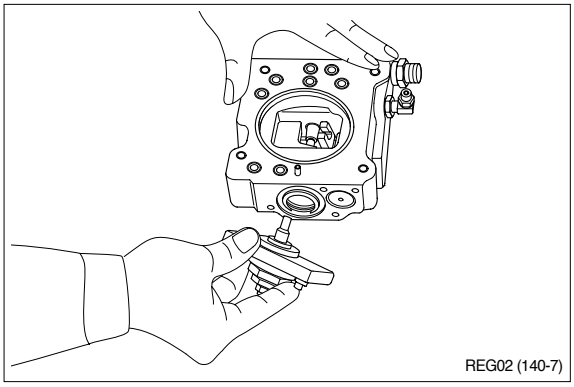
REG01 (140-7)

(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.

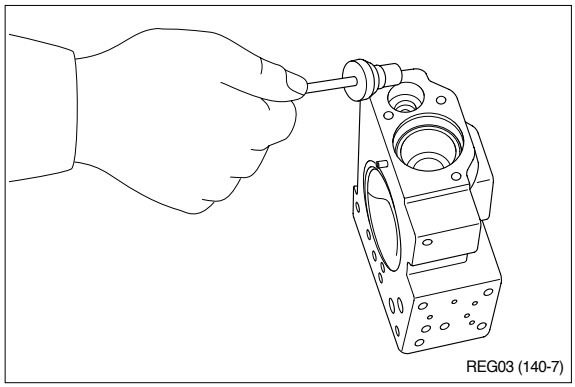
If they are loosened, adjusted pressure-flow setting will vary.



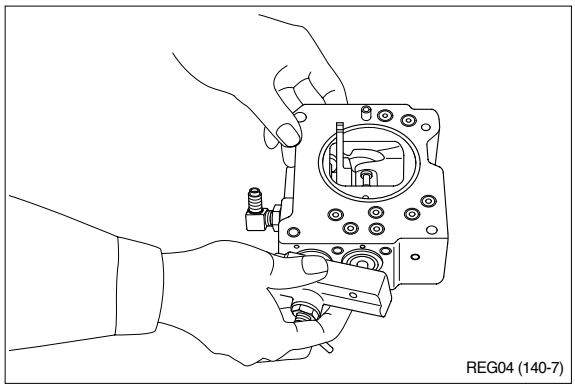
REG02 (140-7)

(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 (140-7)

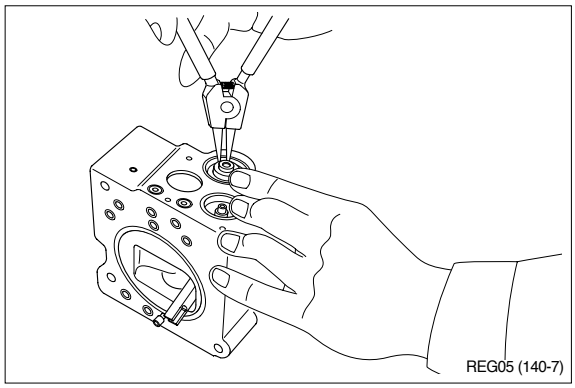
(6) Remove hexagon socket head screws (436, 438) and remove pilot cover(641).
After removing pilot cover, take out set spring(655) from pilot section.


REG04 (140-7)

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

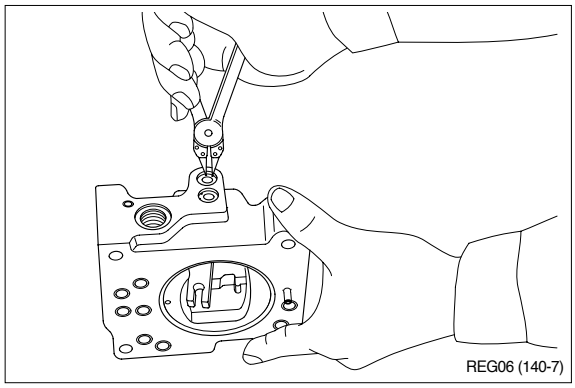
※ Sleeve(651) is fitted with snap ring(836).

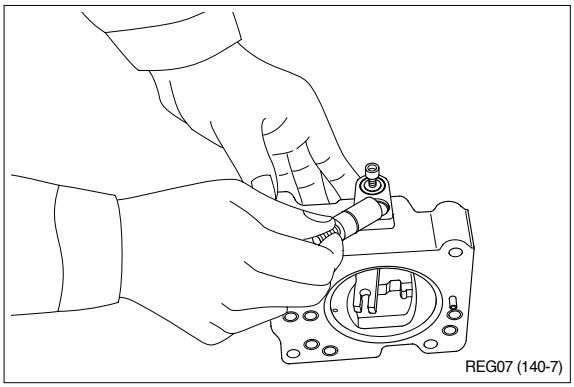
※ When removing snap ring(814), return spring(654) may pop out.
Take care not to lose it.


REG05 (140-7)

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

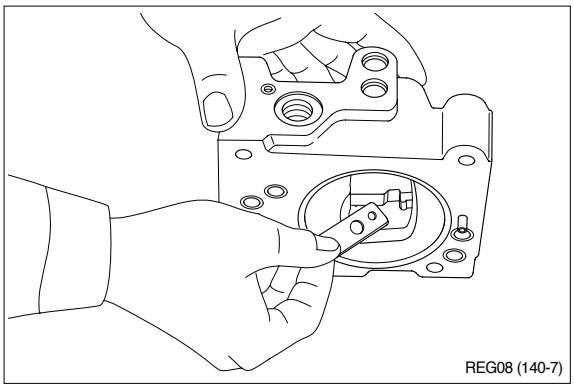
※ Fulcrum plug(614) and adjusting plug (615) can easily be taken out with M6 bolt.


REG06 (140-7)

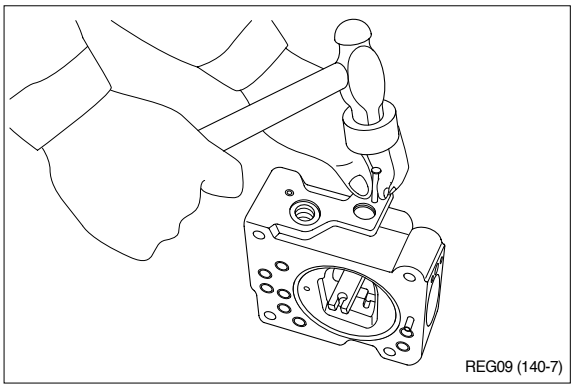

REG07 (140-7)

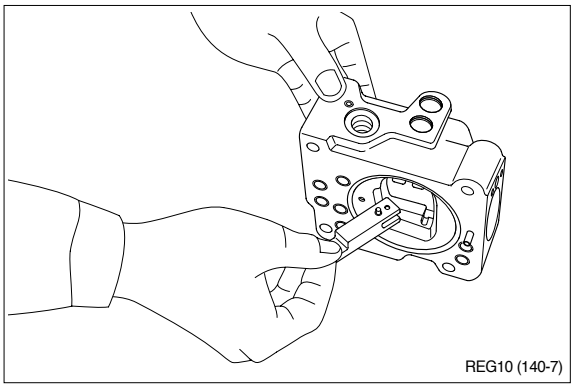
(9) Remove lever(2, 613). Do not draw out pin(875).

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


REG08 (140-7)

(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 (140-7)


REG10 (140-7)

(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 them in clean place.

③ Always tighten bolts, plugs, etc. to their specified torques.

④ Do not fail to coat sliding surfaces with clean hydraulic oil before assembly.

⑤ Replace seals such as O-ring with new ones as a rule.

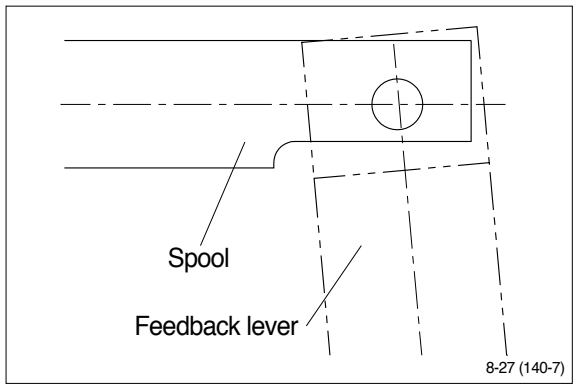
(2) Put compensating rod(623) into compensating hole of casing(601).

(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.

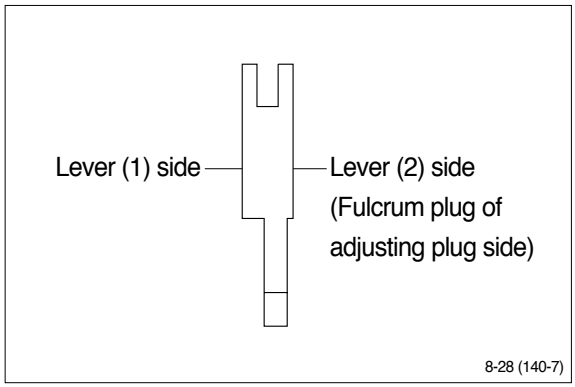
※ Pay attention to orientation of spool.



(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.

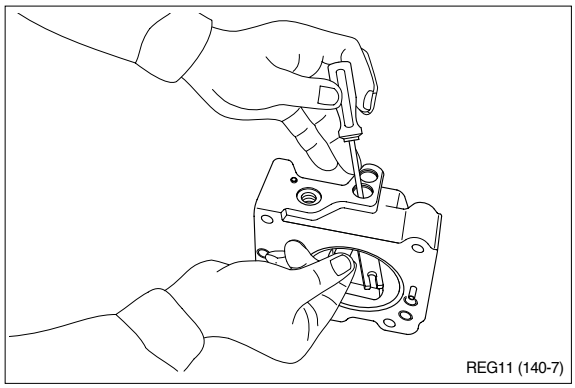


8-28 (140-7)

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

※ Confirm that pilot piston slides smoothly without binding.

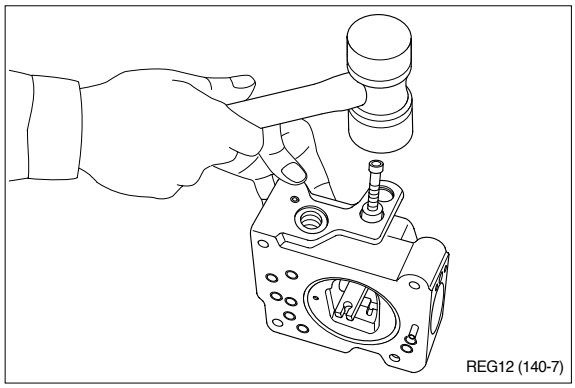
(7) Put pin force-fitted in lever(2, 613) into groove of pilot piston.
Then fix lever(2).


REG11 (140-7)

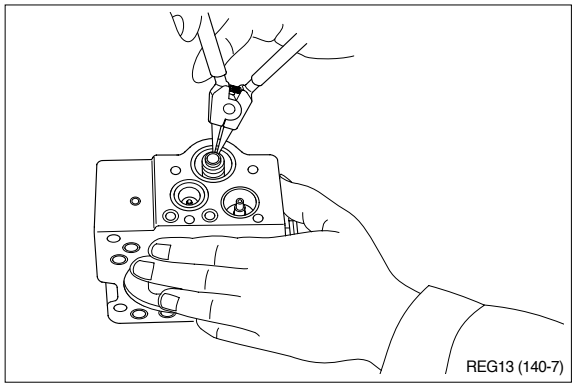
(8) Fit fulcrum plug(614) so that pin force-fitted in fulcrum plug(614) can be put into pin hole of lever(2).
Then fix locking ring(858).

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

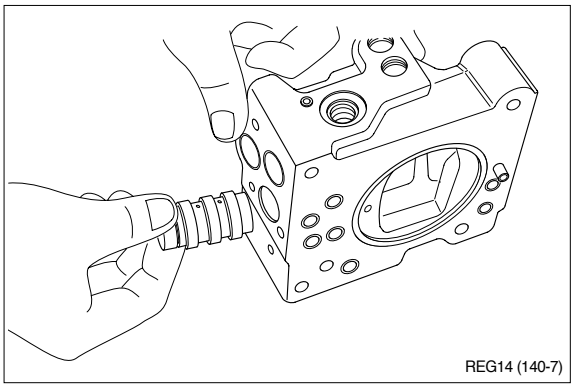
※ Take care not to mistake inserting holes for fulcrum plug and adjusting plug.
At this point in time move feedback lever to confirm that it has no large play and is free from binding.


REG12 (140-7)

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

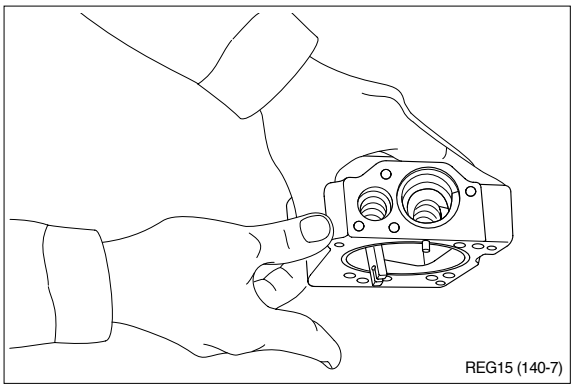

REG13 (140-7)

(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 (140-7)

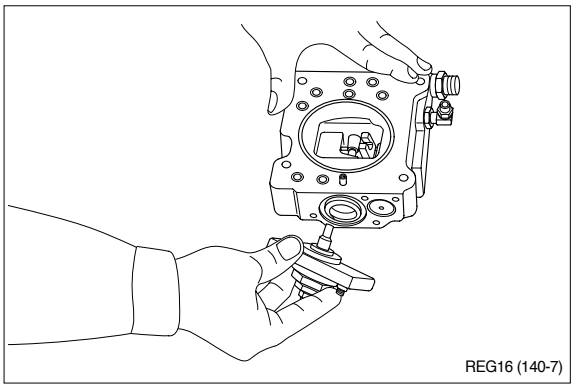
(12) Put spring seat(644), pilot spring(646) and adjusting ring(Q, 645) into pilot hole.
Then fix spring seat(624), inner spring (626) and outer spring(625) into compensating hole.

※ When fitting spring seat, take care not to mistake direction of spring seat.


REG15 (140-7)

(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 (140-7)

GROUP 4 MAIN CONTROL VALVE

1. REMOVAL AND INSTALL OF MOTOR

1) REMOVAL

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

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

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

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

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

(4) 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 : 80kg(180lb)

(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.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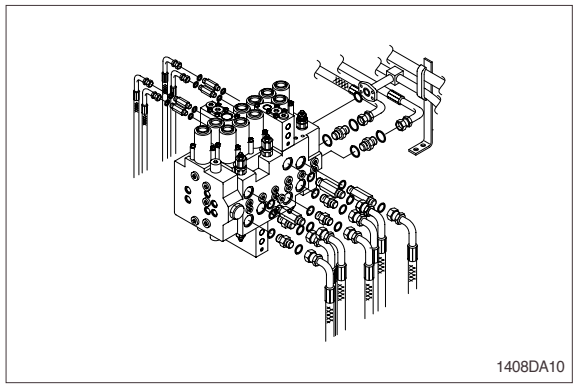
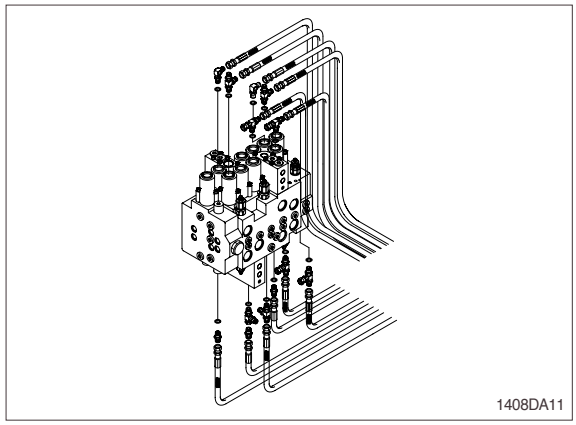
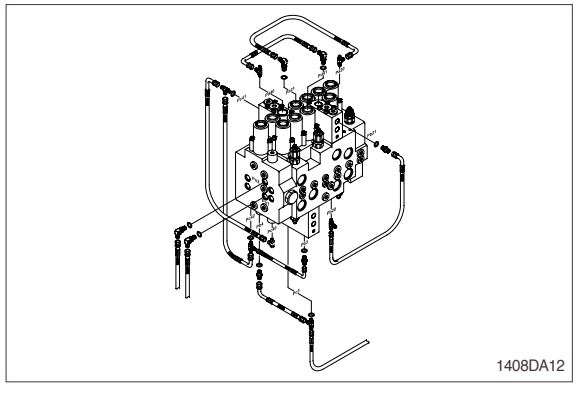
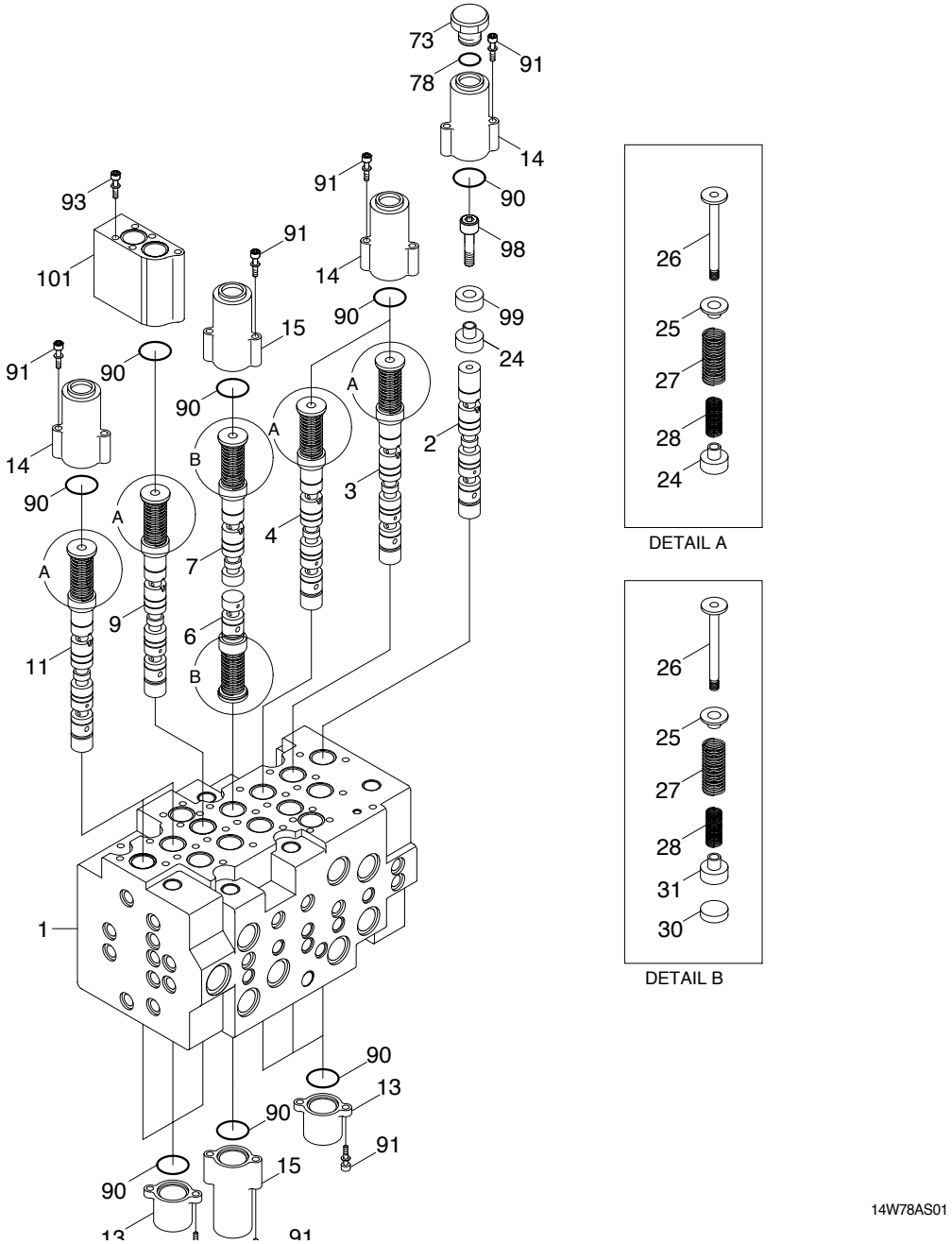

1408DA10


1408DA11

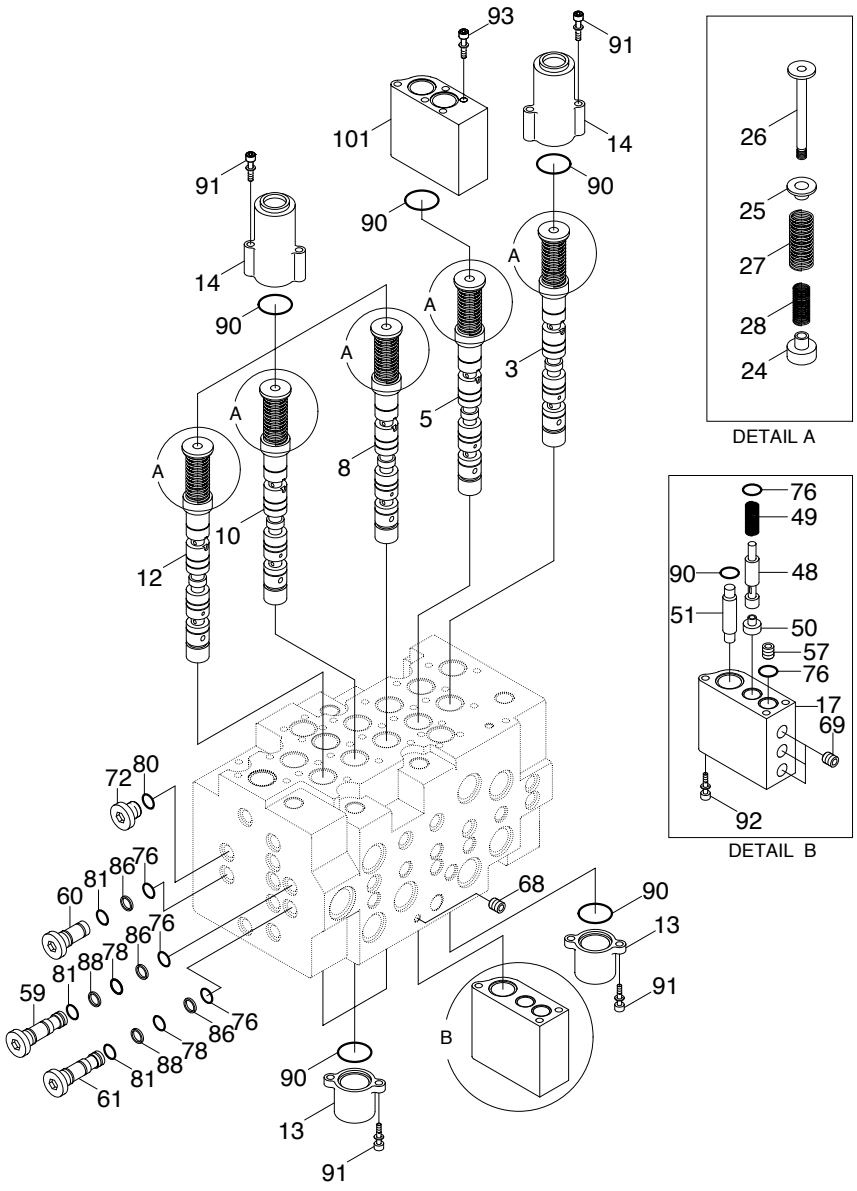

1408DA12

2. STRUCTURE(1/4)



1	Body	14	Cover-pilot	31	Holder-spring
2	Spool	15	Cover-pilot	73	Plug
3	Spool	24	Holder-spring	78	O-ring
4	Spool	25	Holder-spring	90	O-ring
6	Spool	26	End-spool	91	Bolt-socket head
7	Spool	27	Spring	93	Bolt-socket head
9	Spool	28	Spring	98	Bolt-socket head
11	Spool	29	Stopper	99	Stopper
13	Cover-pilot	30	Stopper	101	Lock-valve

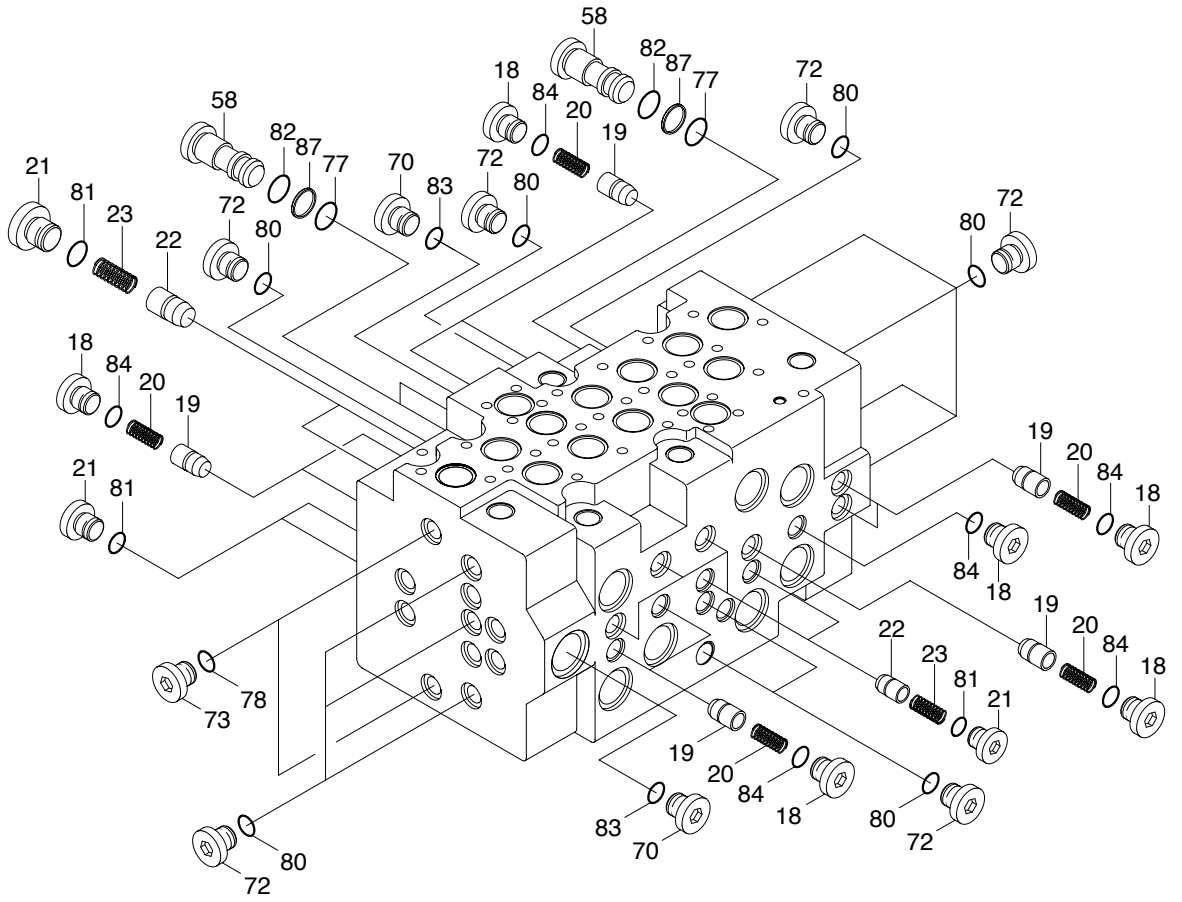
STRUCTURE(2/4)



14W78AS02

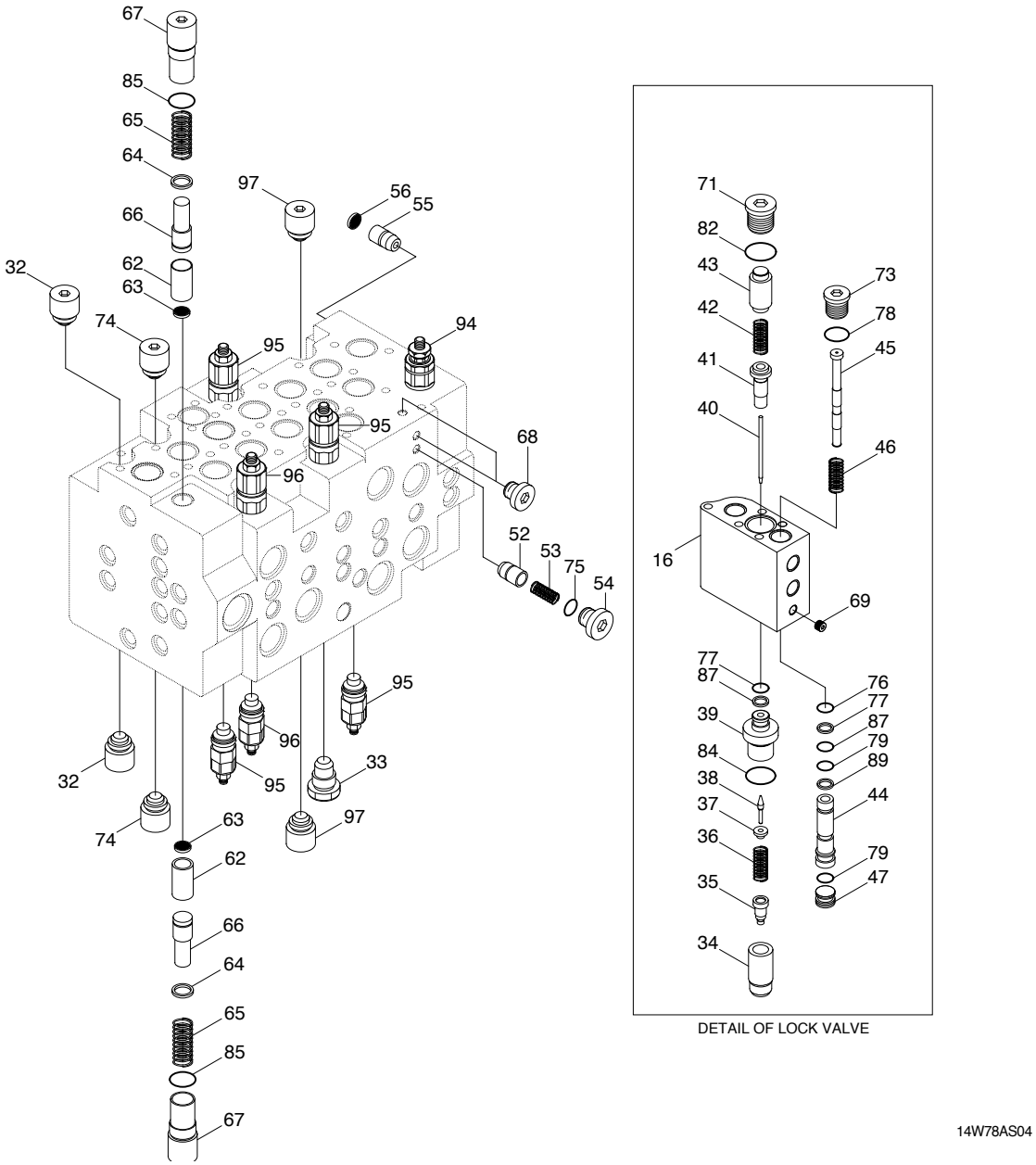
3	Spool	27	Spring	72	Plug
5	Spool	28	Spring	76	O-ring
8	Spool	48	Spool-selector	78	O-ring
10	Spool	49	Spring	80	O-ring
12	Spool	50	Stopper	81	O-ring
13	Cover-pilot	51	Piston	86	Back-up ring
14	Cover-pilot	57	Restrictor	88	Back-up ring
17	Cover-pilot	59	Plug	90	O-ring
24	Holder-spring	60	Plug	91	Bolt-socket head
25	Holder-spring	61	Restrictor	92	Bolt-socket head
26	End-spool	68	Plug-socket head	93	Bolt-socket head
		69	Plug-socket head	101	Lock-valve

STRUCTURE(3/4)



18	Plug	58	Plug	80	O-ring
19	Valve-check	70	Plug	81	O-ring
20	Spring-check valve	72	Plug	82	O-ring
21	Plug	73	Plug	83	O-ring
22	Valve-check	77	O-ring	84	O-ring
23	Spring-check valve	78	O-ring	87	Back-up ring

STRUCTURE(4/4)



14W78AS04

16	Cover-pilot	47	Plug-lock valve	74	Plug-relief valve
32	Plug-relief valve	52	Valve-check	75	O-ring
33	Plug-relief valve	53	Spring-check valve	76	O-ring
34	Valve-lock	54	Plug	77	O-ring
35	Restrictor-lock valve	55	Restrictor	78	O-ring
36	Spring-lock valve	56	Filter-coin type	79	O-ring
37	Holder-spring	62	Poppet-negative	82	O-ring
38	Poppet	63	Filter-coin type	84	O-ring
39	Seat-poppet	64	Holder-spring	85	O-ring
40	Piston	65	Spring-negative	87	Back-up ring
41	Guide-piston	66	Piston-negative	89	Back-up ring
42	Spring-lock valve	67	Socket-negative	94	Relief valve-main
43	Piston	68	Plug	95	Bolt-socket head
44	Socket-lock valve	69	Plug	96	Over load relief valve
45	Spool-lock valve	71	Plug	97	Make up check valve
46	Spring-lock valve	73	Plug		

3. DISASSEMBLY AND ASSEMBLY

1) GENERAL PRECAUTIONS

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

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

(3) When a control valve is to be 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) TOOLS

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

Name of tool	Quantity	Size(㎜)
Vice mounted on bench(Soft jaws)	1 unit	
Hexagon wrench	Each 1 piece	5, 6, 10, 12 and 14
Socket wrench	Each 1 piece	27 and 32
Spanner	Each 1 piece	32(Main relief valve)

3) DISASSEMBLY

(1) Disassembly of spools without holding valve

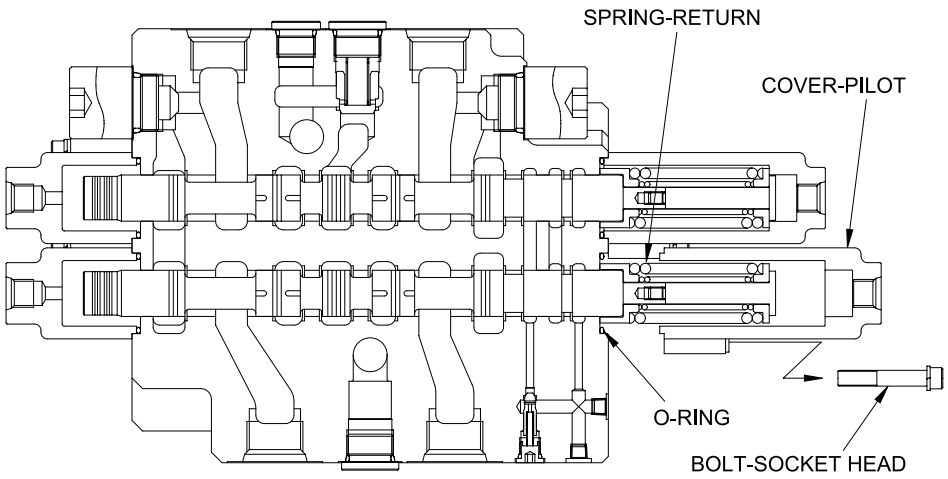
① Loosen hexagon socket head bolts with washer
(Hexagon wrench : 5㎜)

② Remove the pilot cover.

※ Pay attention not to lose the O-ring under the pilot cover.

③ Remove the spool assembly from the body by hand slightly.

※ When extracting each spool from its body, pay attention not to damage the body.
※ When extracting each spool assembly, it must be extracted from spring side only.
※ When any abnormal parts are found, replace it with completly new spool assembly.
※ When disassembled, tag the components for identification so that they can be reassembled correctly.



1408DA17

(2) Disassembly of spools with holding valve(Boom 1, Arm 1 spool)

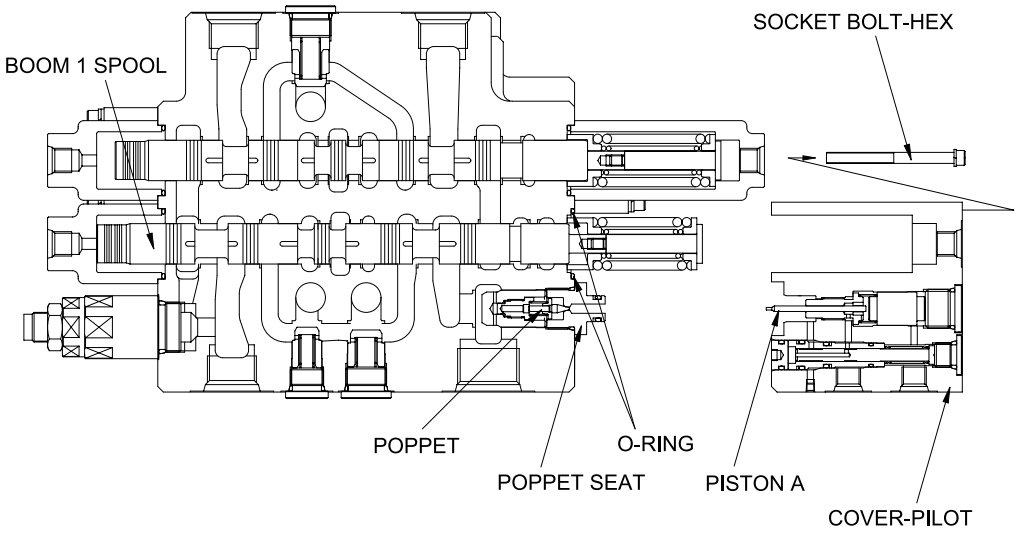
① Loosen hexagon socket head bolts with washer
(Hexagon wrench : 5㎜)

② Remove the pilot cover with internal parts.

※ Pay attention not to lose the O-ring and the poppet under the pilot cover.
※ Pay attention not to damage the "piston A" under pilot cover.

③ Remove the spool assembly from the body by hand slightly.

※ When extracting each spool from its body, pay attention not to damage the body.
※ When extracting each spool assembly, it must be extracted from spring side only.
※ When any abnormal parts are found, replace it with completly new spool assembly.
※ When disassembled, tag the components for identification so that they can be reassembled correctly.



1408DA22

(3) Disassembly of the holding valve

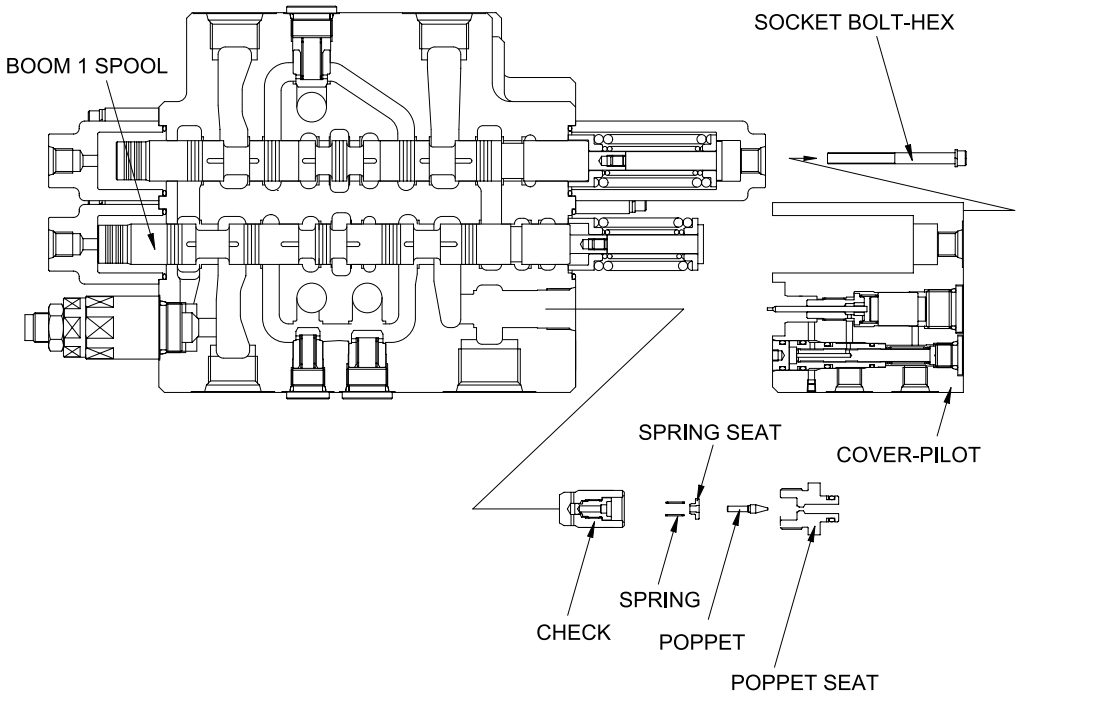
① Remove the pilot cover with the holding valve as discribed on previous page.

※ Do not disassembled internal parts of the pilot cover.

② Loosen the poppet seat and remove the poppet, the spring seat, the spring and the check. (Spanner : 32㎜)

※ Pay attention not to lose the poppet.

※ Do not disassembled internal parts of the check.



(4) Disassembly of the load check valve and the negative relief valve

① **The load check valve**

a. Fix the body to suitable work bench.

※ Pay attention not to damage the body.

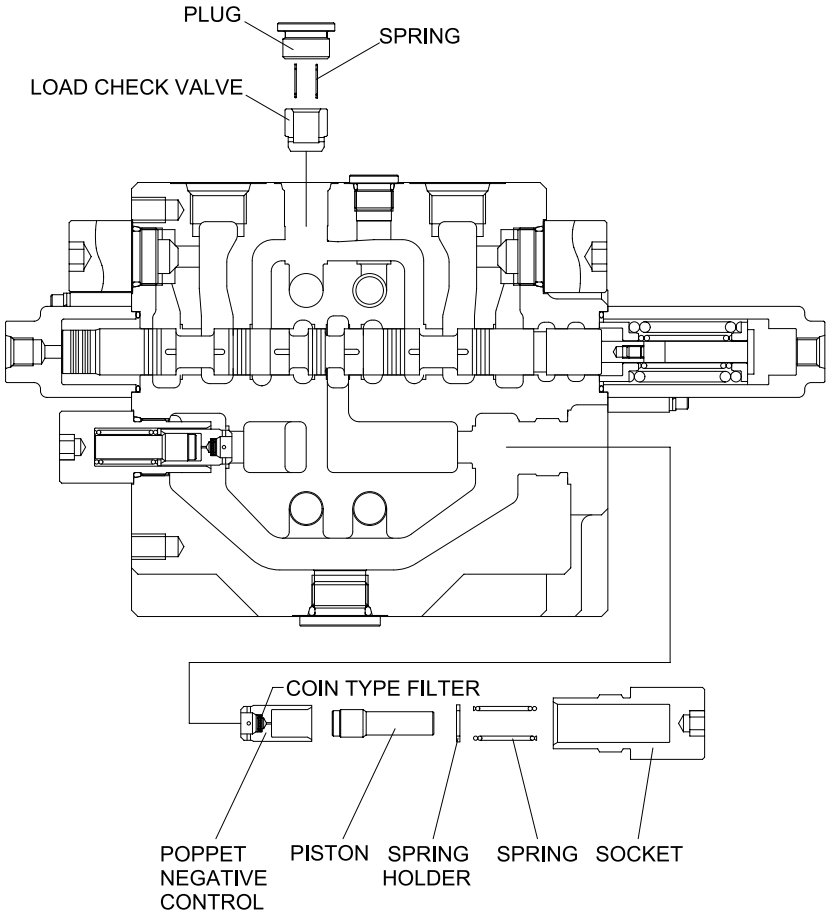
b. Loosen the plug (Hexagon wrench : 10㎜).

c. Remove the spring and the load check valve with pincers or magnet.

② **The negative relief valve**

a. Loosen the socket (Hexagon wrench : 12㎜).

b. Remove the spring, the spring holder, the piston and the negative control poppet.



1408DA21

(5) Disassembly of the main and overload relief valve

① Fix the body to suitable work bench.

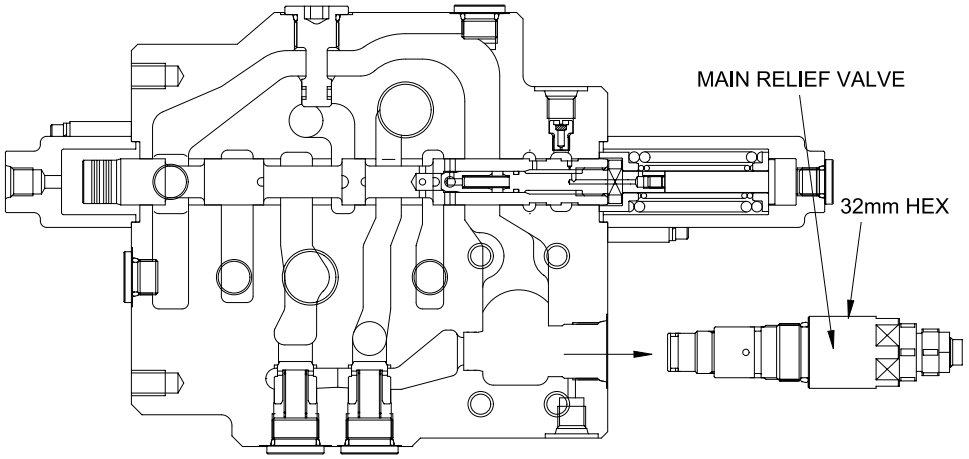
② Remove the main relief valve.
(Spanner : 32㎜)

③ Remove the overload relief valve.
(Spanner : 32㎜)

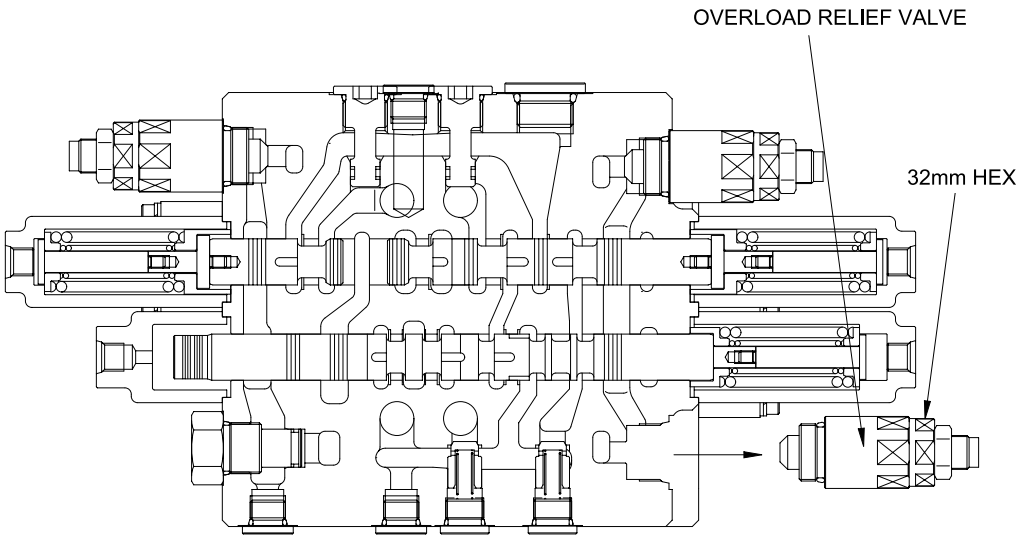
※ When disassembled, tag the relief valve for identification so that they can be reassembled correctly.

※ Pay attention not to damage seat face.

※ When any abnormal parts are found, replace it with completly new relief valve assembly.



1408DA19



1408DA20

(6) Inspection after disassembly

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

① Control valve

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

② Relief valve

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

4) ASSEMBLY

(1) General precaution

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

(2) Load check valve

① Assemble the load check valve and spring.
② Put O-rings on to plug.
③ Tighten plug to the specified torque.
· Hexagon wrench : 10㎜
· Tightening torque : 6~7kgf · m(43.4~50.6lbf · ft)

(3) Negative control relief valve

① Assemble the nega-con poppet, piston, spring holder and spring together into body.
② Put O-ring on to plug and tighten the latter to its specified torque.
· Hexagon wrench : 12㎜
· Tightening torque : 8~9kgf · m(57.8~65.1lbf · ft)

(4) Main relief, port relief valves

Install main relief valve, overload relief valve into the body and tighten to the specified torque.

Component	Tools	Tightening torque	
		kgf · m	lbf · ft
Main relief valve	Spanner 32㎜	8~9	57.8~65.1
Overload relief valve	Spanner 32㎜	8~9	57.8~65.1

(5) Main spools

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

(6) Covers

① Fit spool covers to the non-spring assembly end of the spool, and tighten the hexagonal socket head bolts to the specified torque.
- Hexagon wrench : 5㎜
- Tightening torque : 1~1.1kgf · m(7.2~7.9lbf · ft)

※ Confirm that O-rings have been fitted.

② Fit spring covers to the spring end for the spools, and tighten hexagon socket head bolts to the specified torque.
- Hexagon wrench : 5㎜
- Tightening torque : 1~1.1kgf · m(7.2~7.9lbf · ft)

※ Confirm that O-rings have been fitted.

(7) Holding valves

① Assemble the check, spring seat and poppet together into body.

② Tighten the poppet seat to the specified torque.
- Spanner : 26mm
- Tightening torque : 6~7kgf · m(43.4~50.6lbf · ft)

③ Fit the "piston A" under pilot cover with internal parts into hole on the poppet seat.

④ Tighten hexagon socket head bolt to specified torque.
- Hexagon wrench : 5mm
- Tightening torque : 1~1.1kgf · m(7.2~7.9lbf · ft)

GROUP 5 SWING DEVICE

1. REMOVAL AND INSTALL OF MOTOR

1) REMOVAL

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

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

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

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

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

(4) Disconnect hose assembly(2).

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

(6) Sling the swing motor assembly(1) and remove the swing motor mounting bolts (10).

※ Motor device weight : 36kg(79.4lb)

(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.

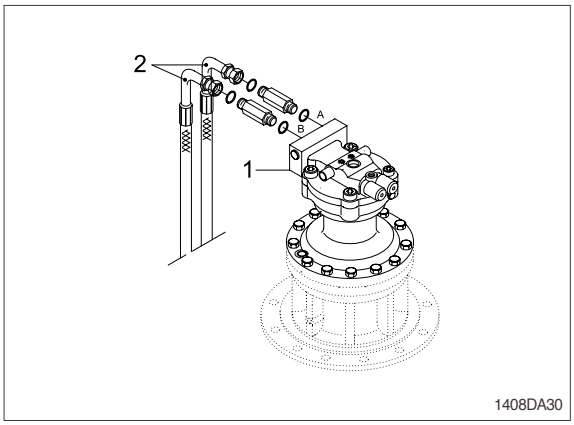
② Pour in hydraulic oil until it overflows from the port.

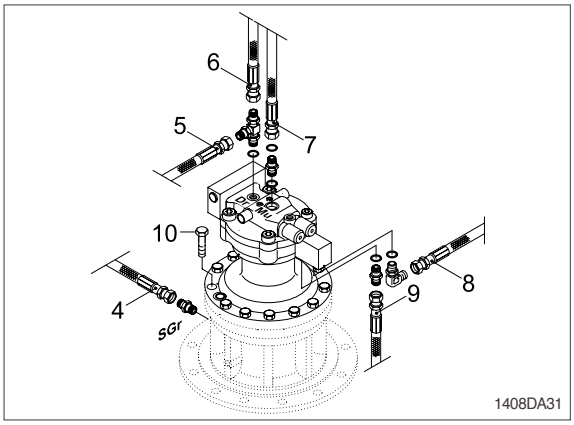
③ Tighten plug lightly.

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

⑤ Tighten plug fully.

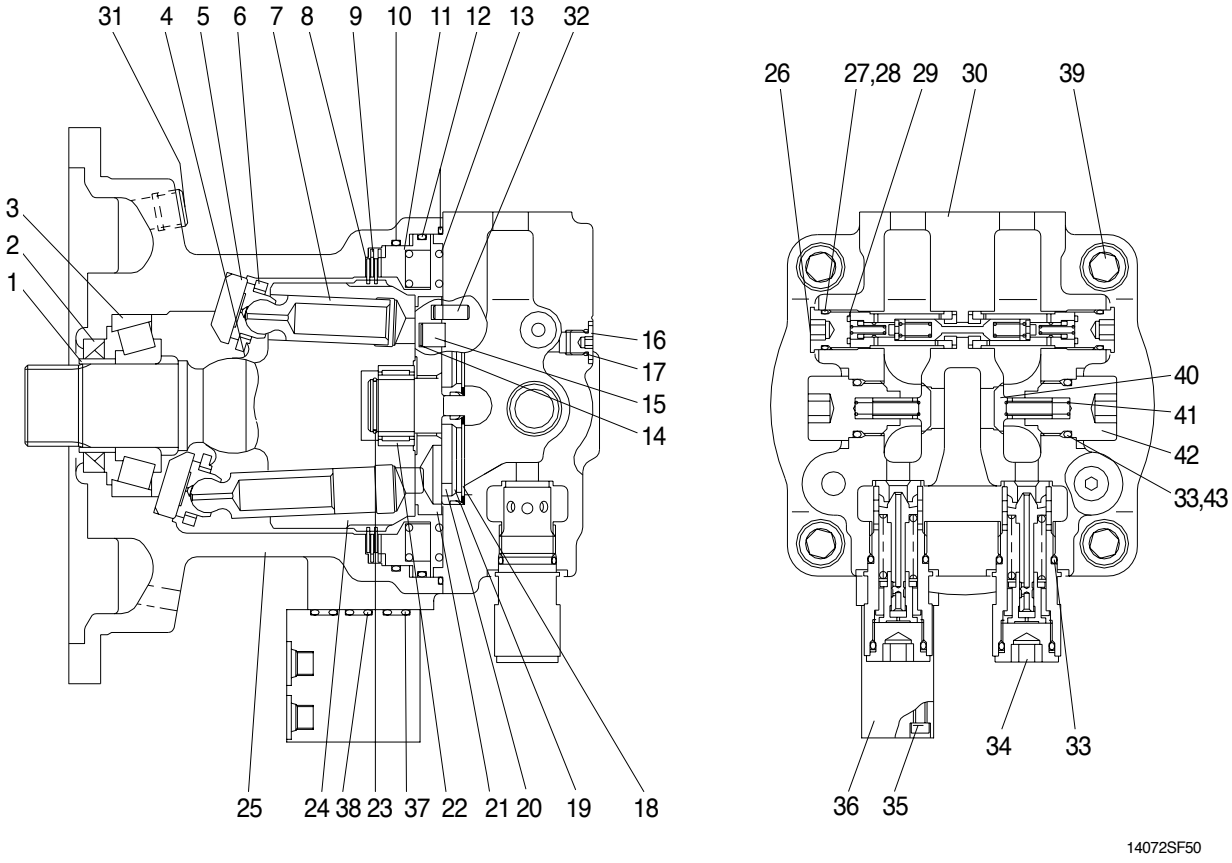
(3) Confirm the hydraulic oil level and check the hydraulic oil leak or not.





2. DISASSEMBLY AND ASSEMBLY OF SWING MOTOR

1) STRUCTURE



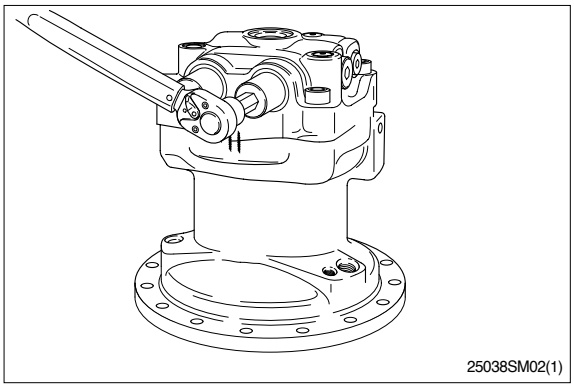
1	Inner ring	15	Piston	29	O-ring
2	Oil seal	16	Cap	30	Cover
3	Tappered roller bearing	17	O-ring	31	Plug
4	Backing spring	18	Scrowave	32	Parallel pin
5	Cam plate	19	Teflon ring	33	O-ring
6	Return plate	20	Bush	34	Relief valve
7	Piston assembly	21	Balance plate	35	Bolt
8	Lining plate	22	Needle bearing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

2) DISASSEMBLY

(1) Removal of relief valve assembly

Remove cap of relief valve assembly(34) with 14㎜ hexagonal wrench.

※ Assemble removed relief valve assembly (34) to original state when reassembling.

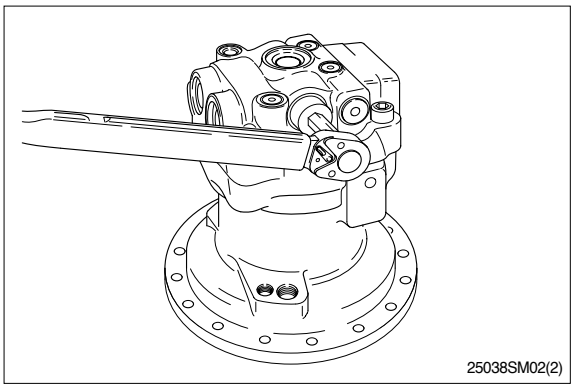


(2) Removal of make up valve and bypass valve assembly

Loosen cap(42) with 14㎜ hexagonal wrench, and remove check valve(40) and spring(41).

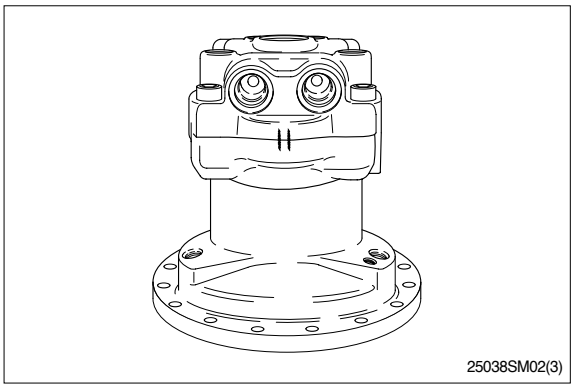
Remove bypass valve assembly(26) with 10㎜ hexagonal wrench.

※ Assemble removed bypass valve assembly(26) to original state when reassembling.



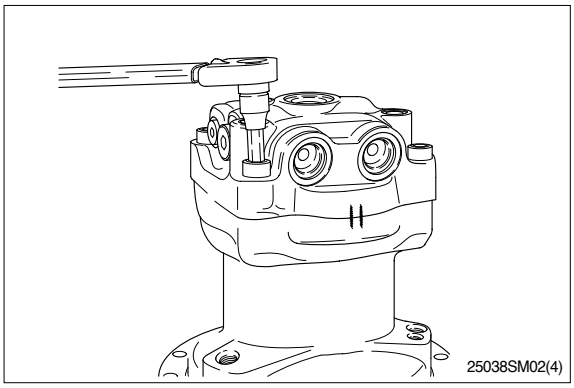
(3) Marking at swing motor

Before disassembling motor, make a matching mark between cover(30) and housing(25) for easy reassembling.



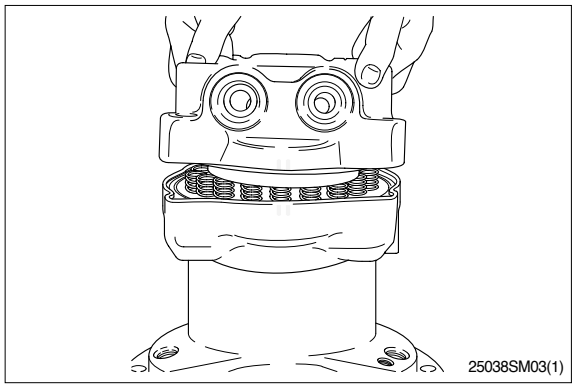
(4) Remove mounting bolts of cover

Loosen hexagon socket bolt(39) with 12㎜ hexagonal wrench.

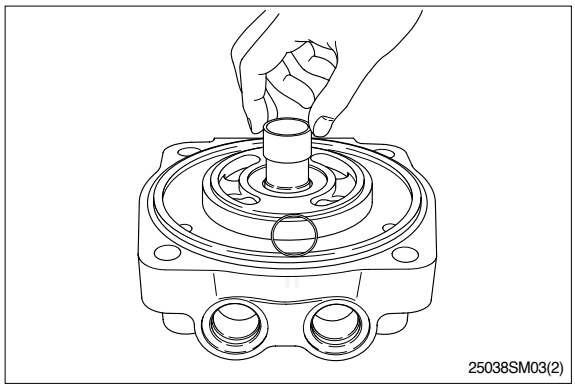


(5) Removal of cover assembly

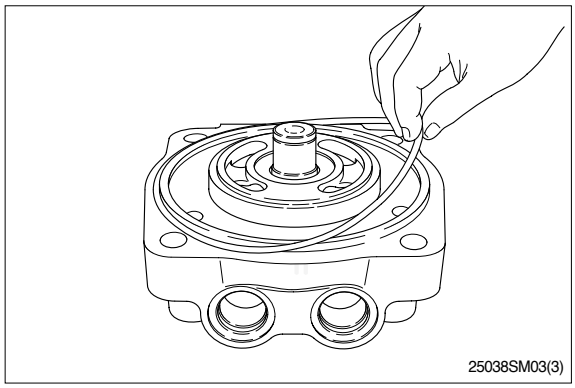
Place shaft of motor assembly to downward and take cover(30) out.



(6) Remove snap ring(23) with steel pointer and remove inner race of needle bearing (22) by bearing puller.



(7) Remove O-ring(12) from cover.

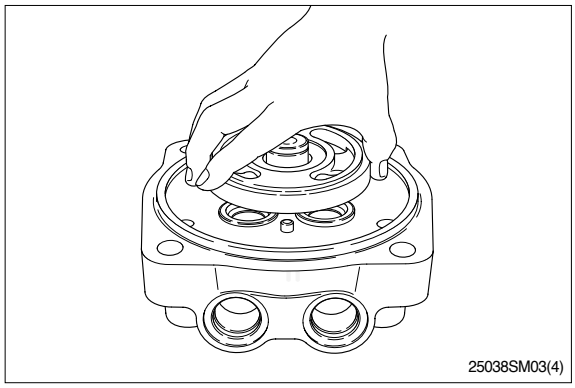


(8) Remove balance plate

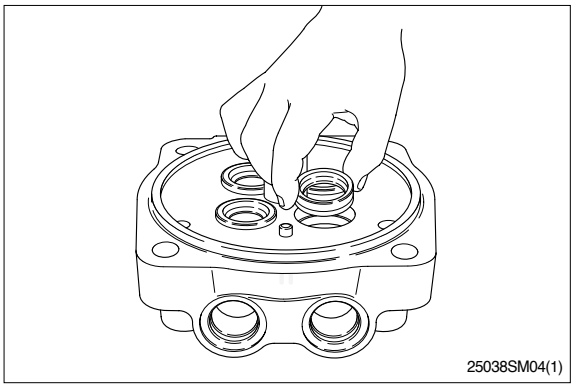
Balance plate(21) is adhered on end surface of cylinder(24) by oil viscosity. Take off balance plate(21) with hands. Assembling method of balance plate(21) depends on cover(30).

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

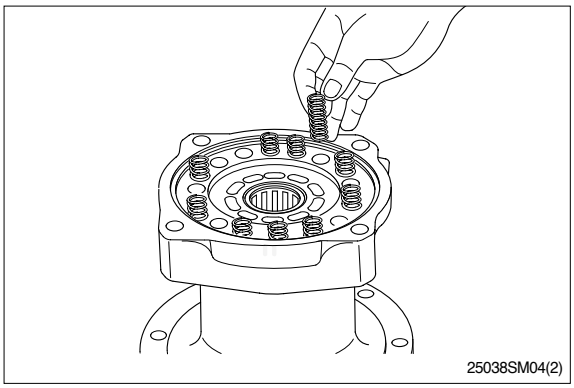
Before removing, check and record location of balance plate(21) to prevent misassembling.



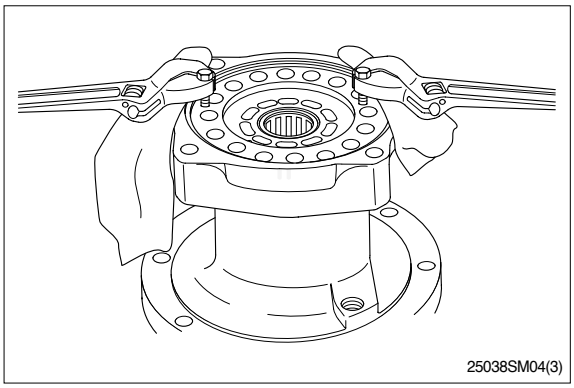
(9) Remove bushing(20) and scrowave(18) from teflon ring(19).



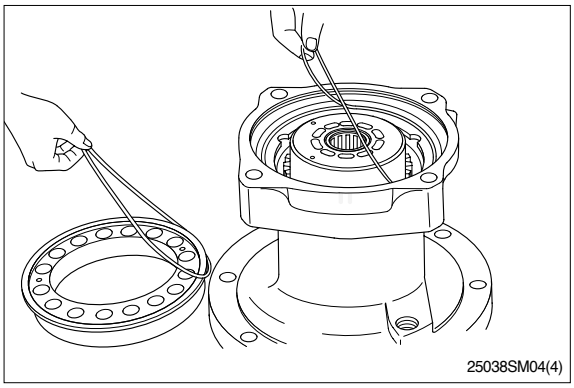
(10) Removal of spring(13, brake area)
Remove spring(13) from piston(11).
Check and record original position of each spring(13) for correct assembling.



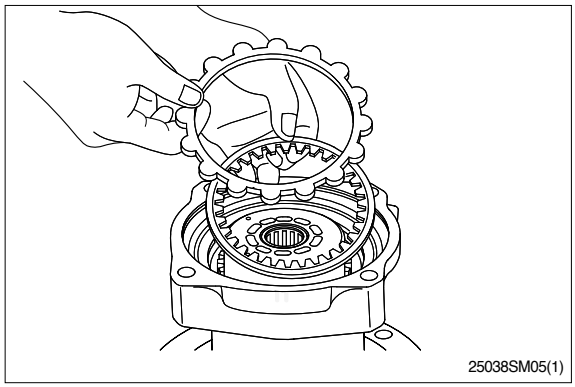
(11) Removal of brake piston
When removing piston(11) from housing (25), there is a sliding resistance against tightening of O-rings(10,12). Use tap hole(M6) on piston(11) as shown in the picture.



(12) Remove O-rings(10,12) from piston(11) and housing(25).



(13) Remove friction plate(9) and lining plate (8) from housing(25).


25038SM05(1)

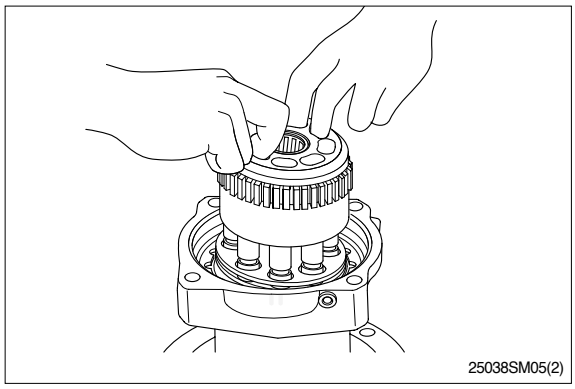
(14) Removal of cylinder assembly

Holding end of cylinder assembly(24) with hand, draw out cylinder assembly from housing.

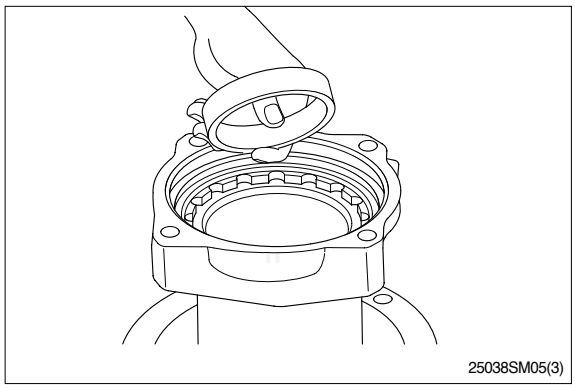
※ Oil seal(2) and outer race of taper roller bearing(3) are left inside of housing.

※ End surface of cylinder(24) is sliding face . So, protect the surface with a scrap of cloth against damage.

※ Make a matching mark on piston hole of cylinder(24) and piston assembly(7) to fit piston into the same hole when reassembling.


25038SM05(2)

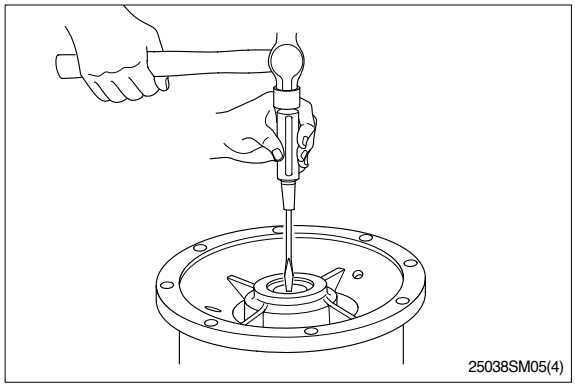
(15) Separate outer race of taper roller bearing(3) from housing.


25038SM05(3)

(16) Removal of oil seal

Remove oil seal(2) from housing(25) with driver and hammer.

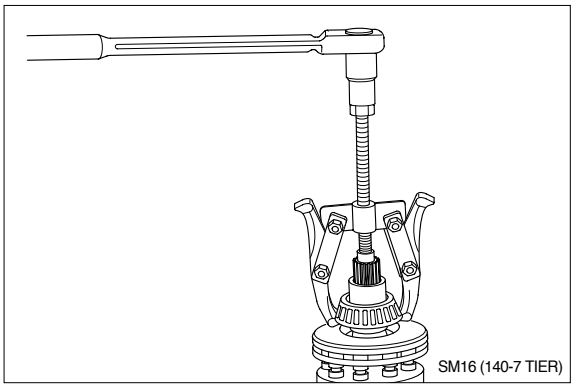
※ Do not reuse oil seal after removal.


25038SM05(4)

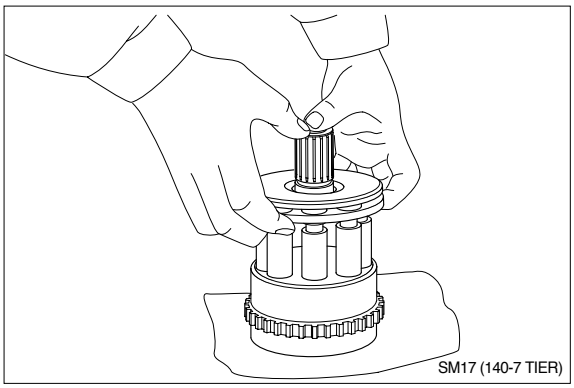
(17) Disassembly of cylinder assembly

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

After removing snap ring(23), lift out cylinder(24) with 2 inner race of roller bearing(3) by applying gear puller at the end of spline in the cylinder.

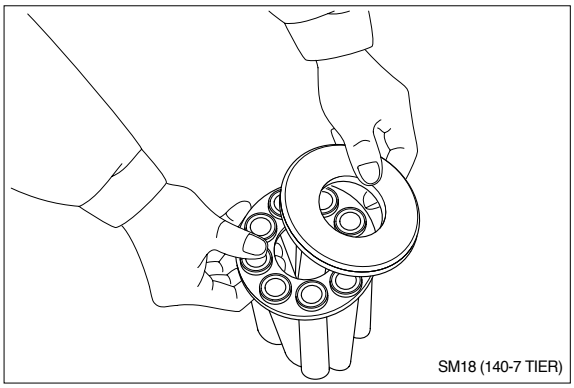

SM16 (140-7 TIER)

② Separate cam plate(5), piston assembly (7), return plate(6) from cylinder(24).

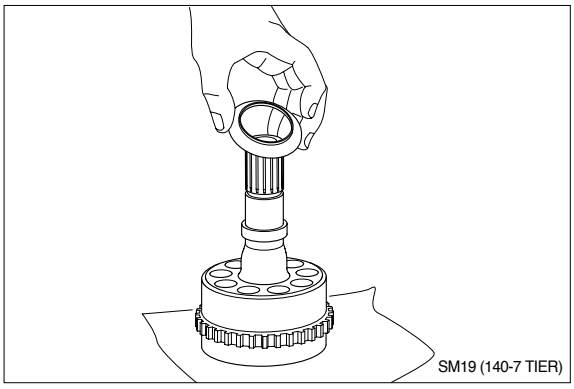

SM17 (140-7 TIER)

③ Get cam plate(5) slide on sliding face of piston assembly(7) and remove it.

※ Be cautious not to damage on sliding face of cam plate.


SM18 (140-7 TIER)

④ Remove backing spring(4) from cylinder (24).


SM19 (140-7 TIER)

This completes disassembly.

3) ASSEMBLY

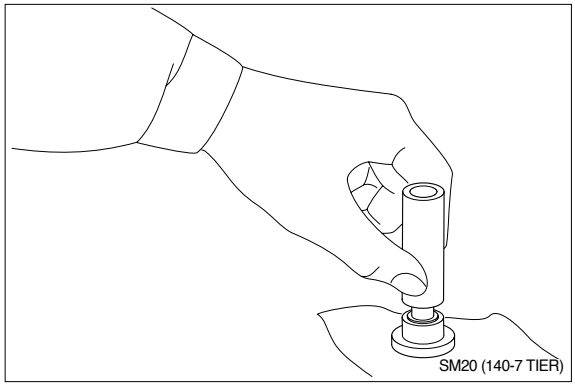
(1) Preparation

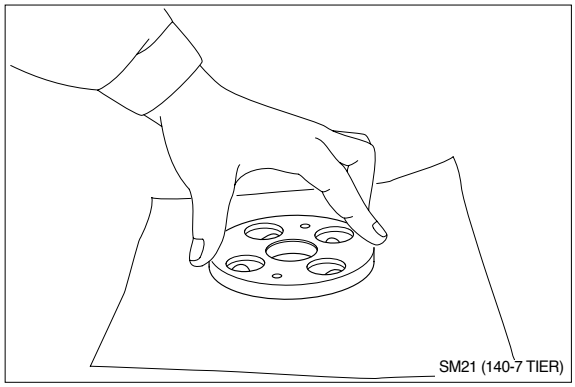
Before reassembling, perform below procedure.

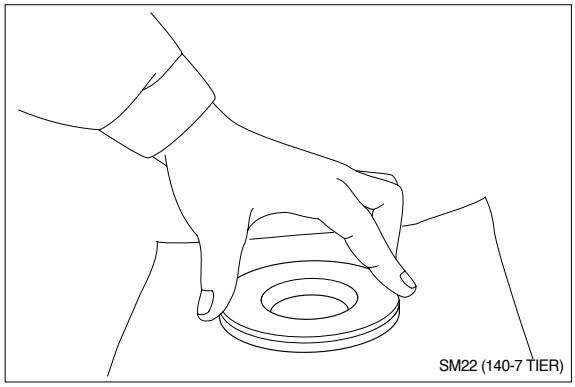
① Check each part for damage caused by using or disassembling. If damaged, eliminate damage by grinding with proper sandpaper, wash them with cleaning oil and dry with compressed air.

② Replace seal with new one.

③ Grind sliding face of piston assembly(7), balance plate(21) and cam plate(5) with sandpaper #2000.


SM20 (140-7 TIER)


SM21 (140-7 TIER)

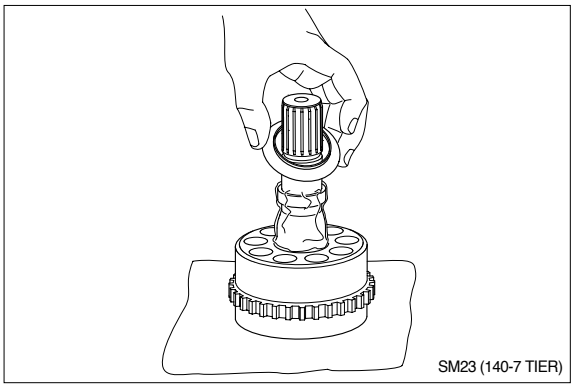

SM22 (140-7 TIER)

④ When assembling, lubricate with specified clean hydraulic oil.

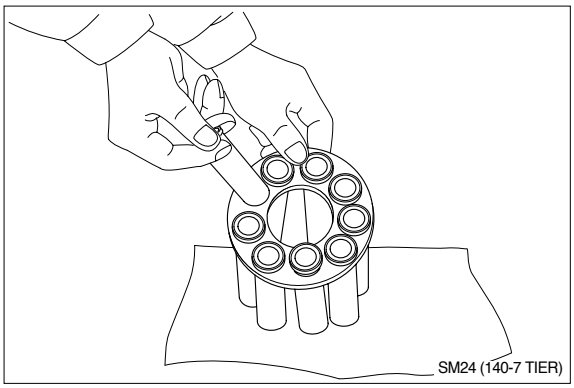
⑤ When assembling piston assembly(7) to piston hole of cylinder(24), check matching mark between them.

(2) Cylinder assembly

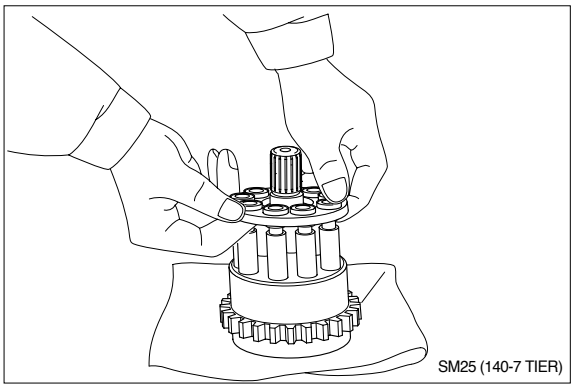
① Lubricate grease on round area (Contacting area with spring(4)) of cylinder(24) and assemble spring(4).


SM23 (140-7 TIER)

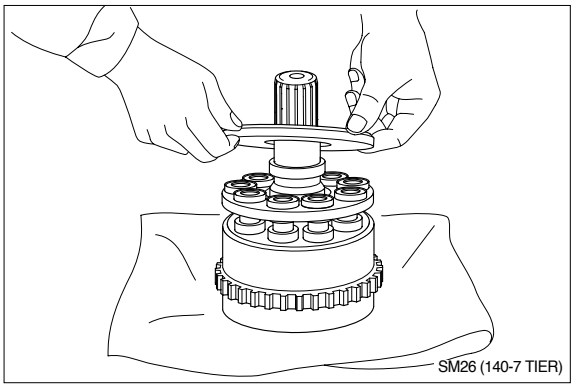
② Insert piston assembly(7) in hole of return plate(6).


SM24 (140-7 TIER)

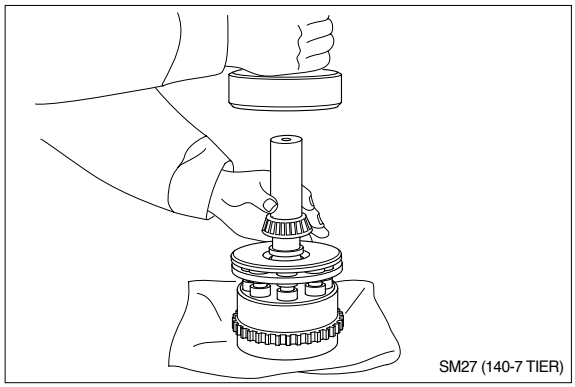
③ Assemble piston assembly(7) and return plate(6) to cylinder(24). When assembling, check matching mark between them. Before assembling, lubricate specified hydraulic oil in piston hole of cylinder(24).


SM25 (140-7 TIER)

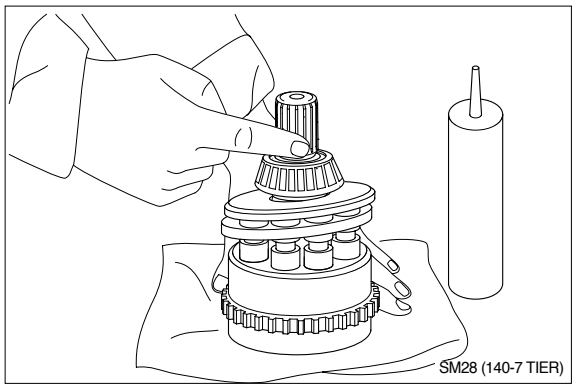
④ Lubricate specified hydraulic oil on shoe sliding face of piston assembly(7) and assemble cam plate(5).


SM26 (140-7 TIER)

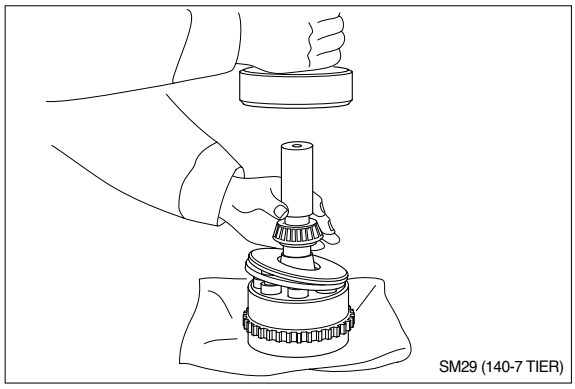
⑤ Assemble inner race of taper roller bearing(3) to cylinder(24).


SM27 (140-7 TIER)

⑥ Apply loctite to bearing mounting area of inner race of cylinder(24) lightly.


SM28 (140-7 TIER)

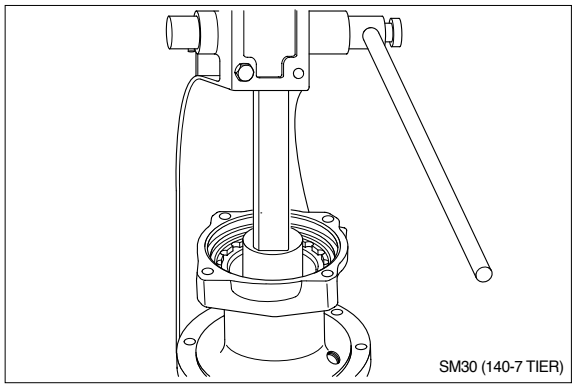
⑦ Assemble inner ring(1) to cylinder(24).


SM29 (140-7 TIER)

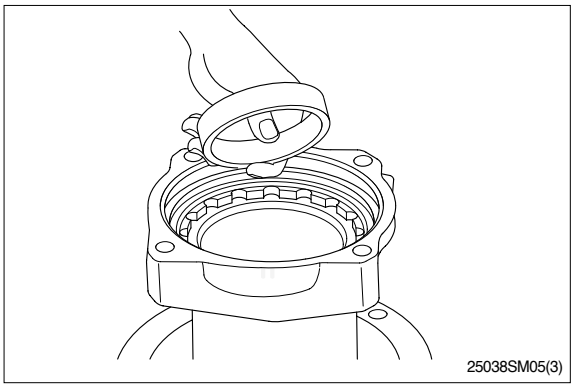
(3) Oil seal

Apply three bond of white color on outer surface of oil seal(2) and assemble and insert it.

※ Before assembling, lubricate lip of oil seal with grease.


SM30 (140-7 TIER)

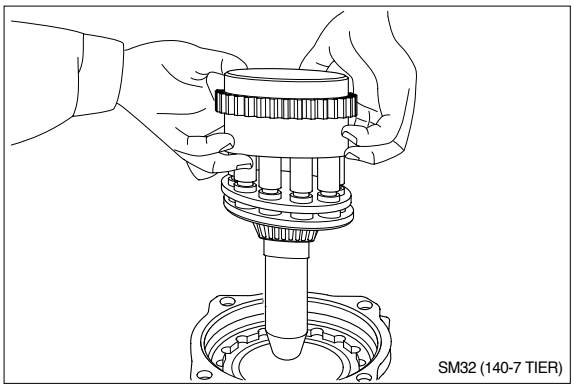
(4) Assemble outer race of taper roller bearing(3) to motor housing(25).



(5) Cylinder assembly

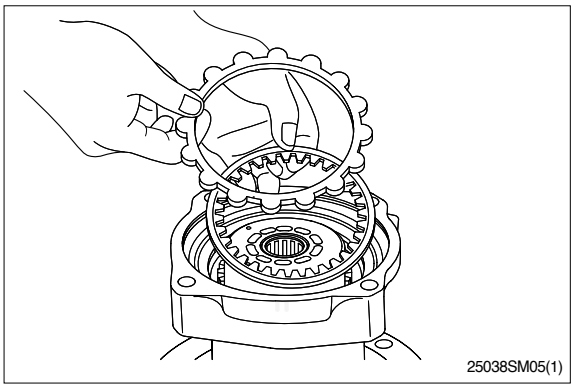
Hold end of cylinder assembly(24) with hands and assemble cylinder assembly to housing(25). Be careful to prevent damage of seal by spline of shaft.

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



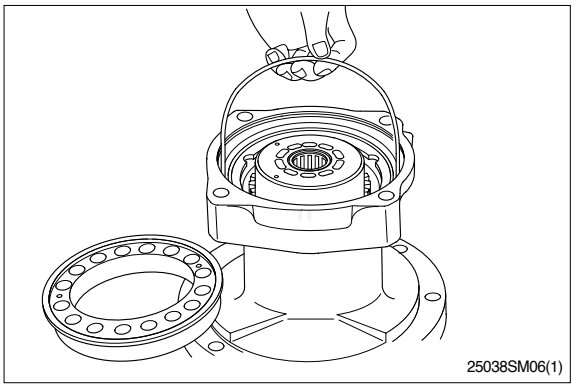
(6) Assemble plate(9) and lining plate(8).

※ Lubricate specified hydraulic oil on each side.



(7) Insert O-rings(10,12) into housing(25) and piston(11).

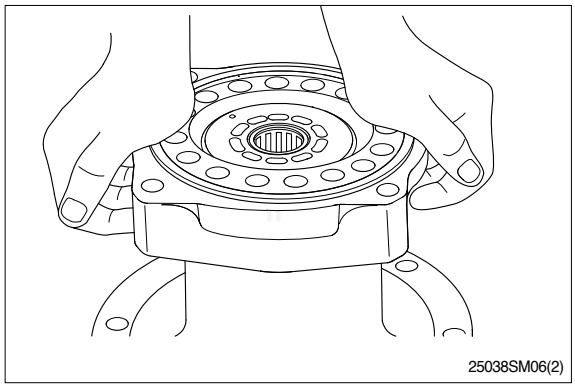
※ Lubricate O-ring with grease.



(8) Brake piston

Lubricate specified hydraulic oil on outer sliding face of piston(11) and assemble brake piston to housing(25).

※ It is too tight to assemble piston(7) because O-rings(10,12) are fitted, therefore it is recommended to push piston(11) horizontally by hands at once.

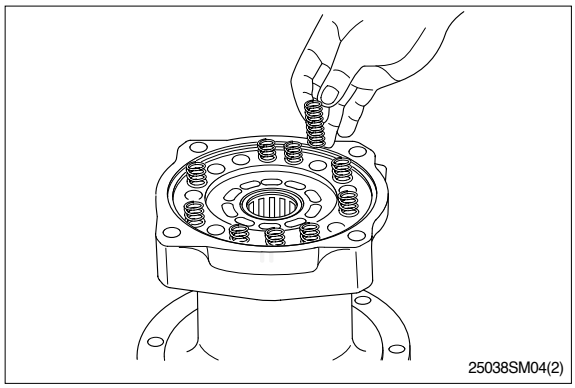


25038SM06(2)

(9) Spring(13, brake unit)

Assemble spring(13) to piston(11) of brake unit.

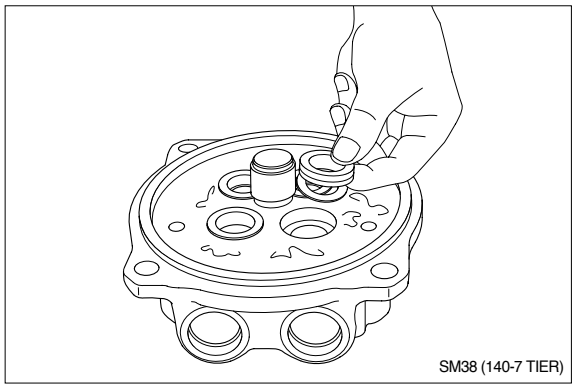
※ Insert spring(13) into original position.



25038SM04(2)

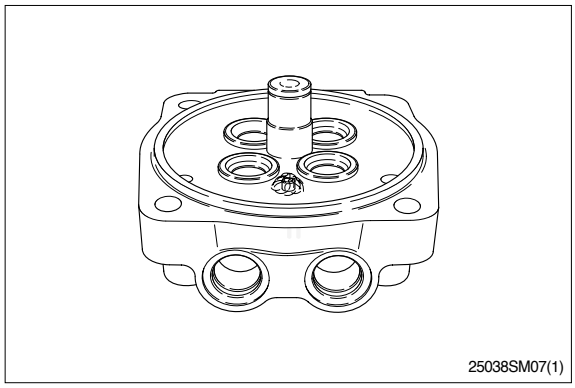
(10) Assemble bushing(20) with teflon ring(19) and scrowave(18) to bushing hole of cover(30).

※ Lubricate on both end surfaces of bushing(20) and outer face of teflon ring(19) with grease and assemble cover to housing, and parts are adhered on cover by grease viscosity which makes assembling easy.



SM38 (140-7 TIER)

(11) Lubricate locating pin for antirotation of balance plate(21) of cover(30) with grease sufficiently and install locating pin to housing.

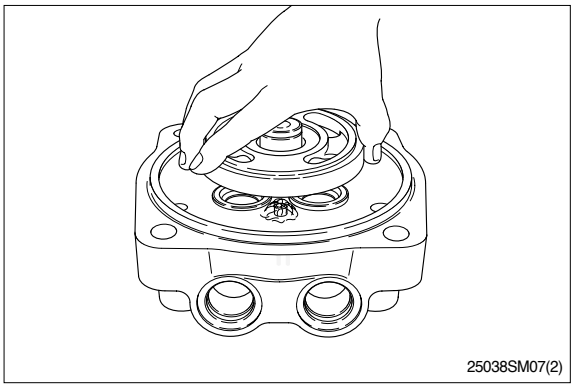


25038SM07(1)

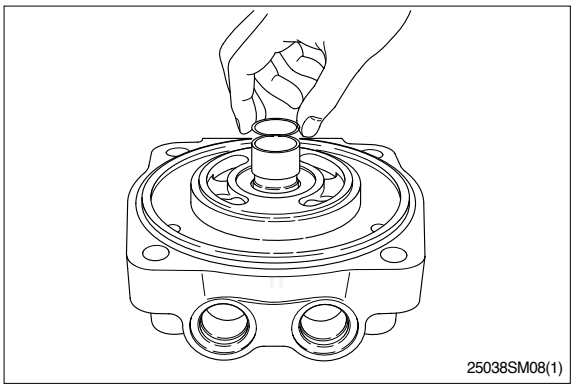
(12) Balance plate

Assemble balance plate(21) to cover(30).

※ Be cautious of assembling direction.

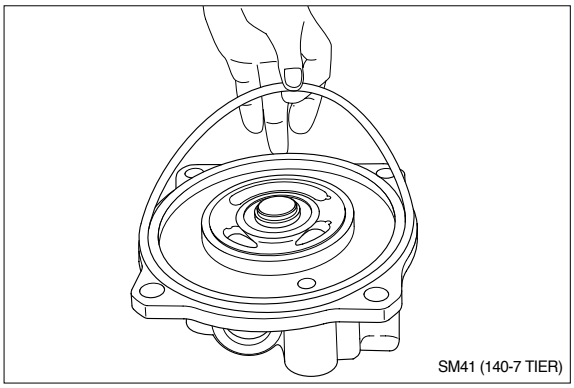


(13) Assemble inner race of needle bearing (22) and snap ring(23) to cover(30).

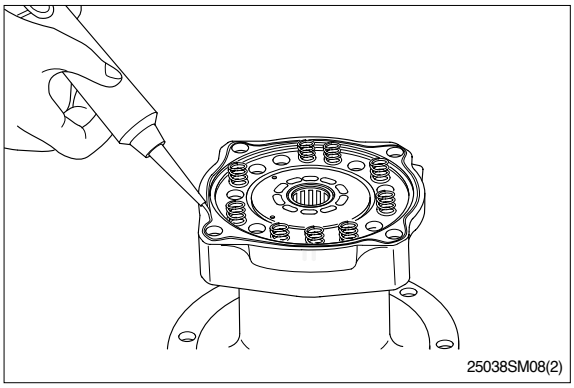


(14) Assemble O-ring(12) to cover(30).

※ Lubricate O-ring with grease.



(15) Apply three bond of white color to distinguish oil leakage from remaining oil in bolt hole(M14) of cover(30).

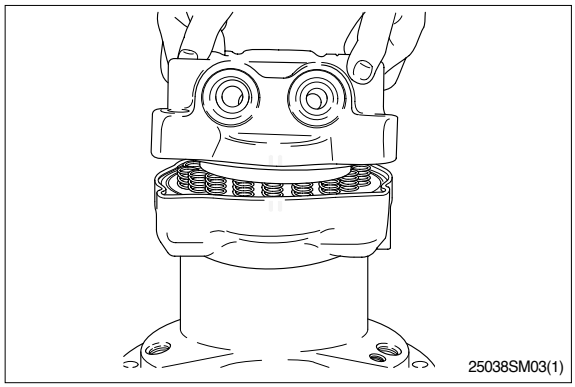


(16) Cover

Assemble cover(30) and balance plate (21) to housing(25) lightly, holding them up with hands.

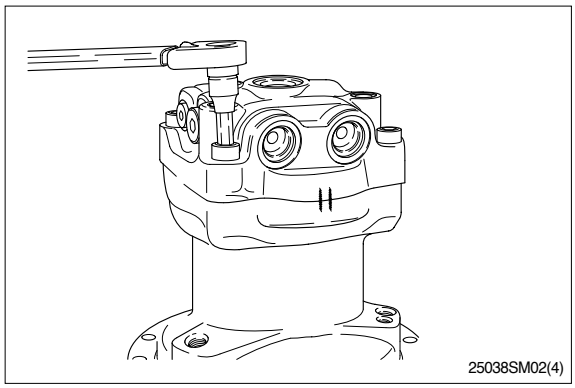
※ When assembling, be careful not to detach balance plate(21) and bushing (20) from cover(30).

※ Fit matching marks on housing(25) and cover(30) made before disassembling.



(17) Tighten cover(30) and housing(25) with 12㎜ hexagonal socket bolt(35).

· Tightening torque : 16kgf · m(116lbf · ft)



(18) Make up valve

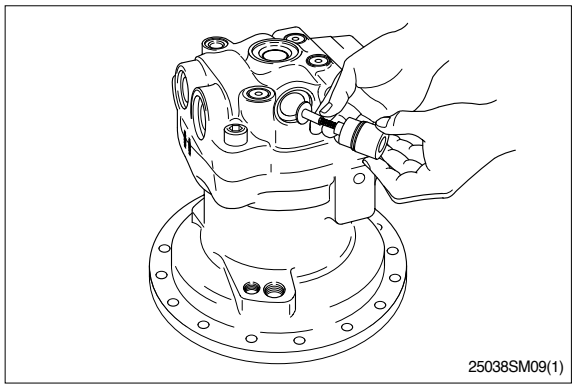
Assemble check(40) and spring(41) to cover(30) and tighten cap(42) with 14㎜ hexagonal socket bolt.

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

(19) Bypass valve assembly

Assemble bypass valve assembly(26) to cover(30) with 10㎜ hexagonal socket bolt.

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

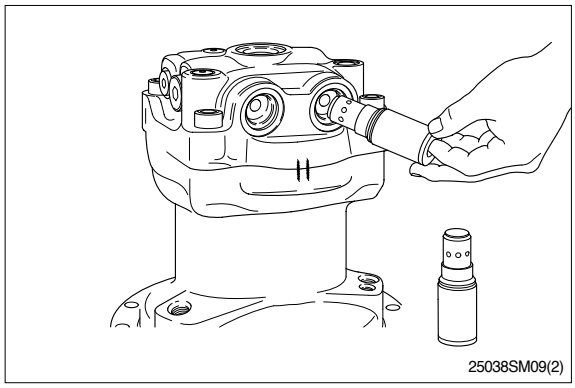


(20) Relief assembly

Assemble relief valve assembly(34) to cover(30) with 14㎜ hexagonal socket bolt.

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

※ Be cautious of assembling method.



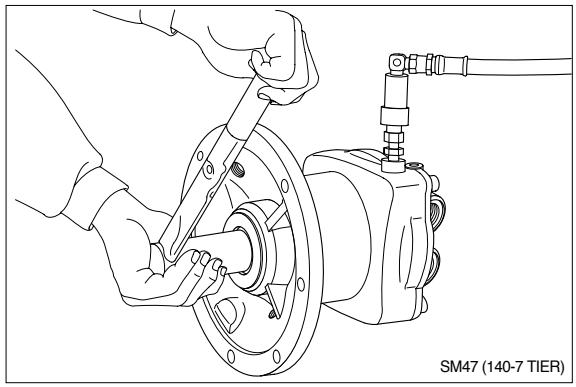
(21) Check of assembly

Load pilot pressure of 20kgf/cm² to brake release port after opening inlet and outlet port.

Check if output shaft is rotated smoothly around torque of 0.5~1kgf · m.

If not rotated, disassemble and check.

This completes assembly.



SM47 (140-7 TIER)

3. REMOVAL AND INSTALL OF REDUCTION GEAR

1) REMOVAL

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

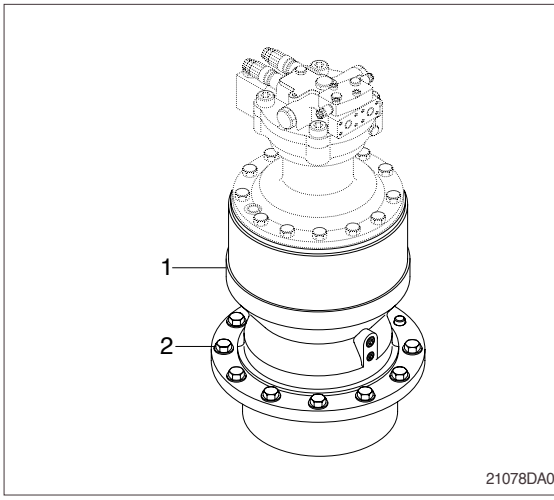
(2) Sling reduction gear assembly(1) and remove mounting bolts(2).

(3) Remove the reduction gear assembly.
· Reduction gear device weight : 95kg (209lb)


13031GE18

2) INSTALL

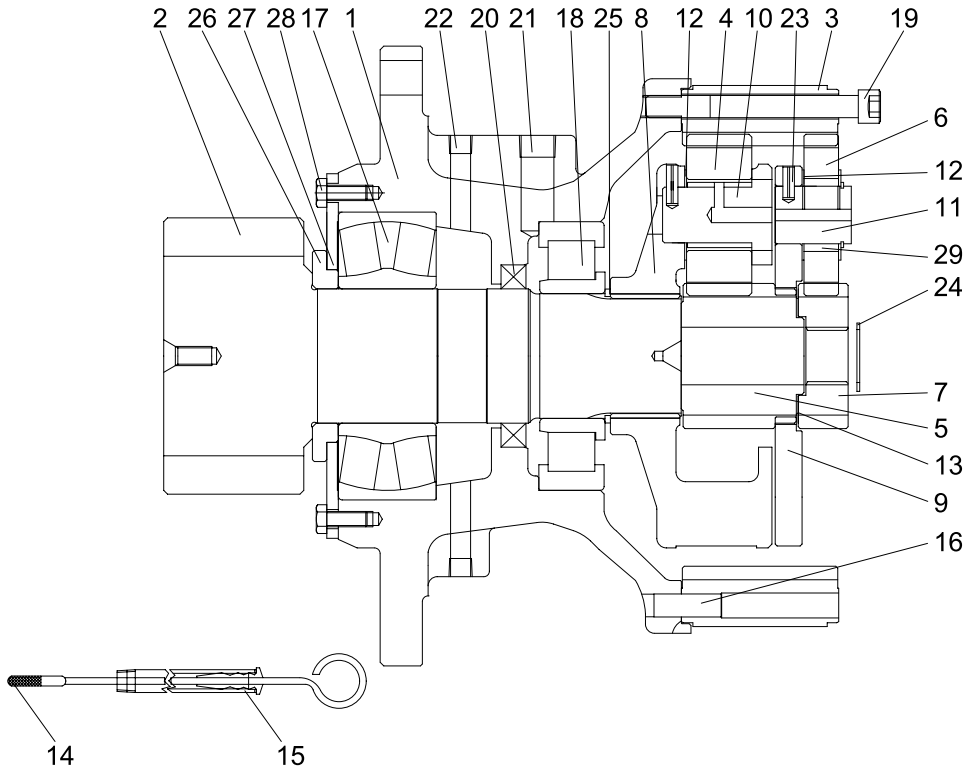
(1) Carry out installation in the reverse order to removal.
· Tightening torque : 29.7±4.5kgf · m (215±32.5lbf · ft)



21078DA05

4. DISASSEMBLY AND ASSEMBLY OF REDUCTION GEAR

1) STRUCTURE



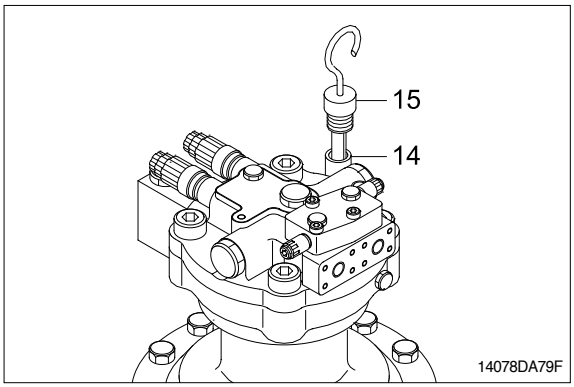
14072SF51

1	Casing	10	Pin No.2 assembly	20	Oil seal
2	Drive shaft	11	Pin No.1	21	Plug(B)
3	Ring gear	12	Thrust washer(B)	22	Plug(A)
4	Planet gear No.2	13	Thrust washer(A)	23	Spring pin
5	Sun gear No.2	14	Gage bar	24	Stop ring
6	Planet gear No.1	15	Gage pipe	25	Stop ring
7	Sun gear No.1	16	Knock pin	26	Spacer
8	Carrier No.2	17	Sph roller bearing	27	Cover plate
9	Carrier No.1	18	Cyl roller bearing	28	Bolt
		19	Bolt	29	Needle cage

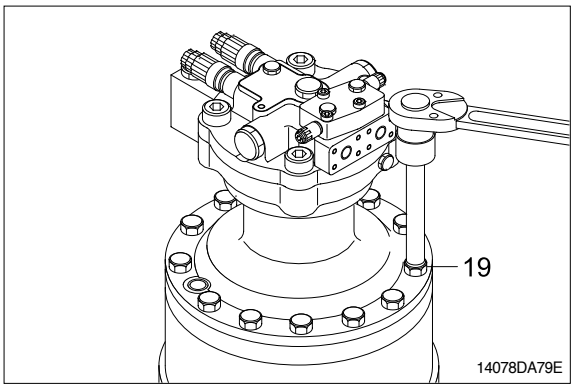
2) DISASSEMBLY

(1) Remove gauge bar(14) and gauge pipe (15) from the swing motor casing.

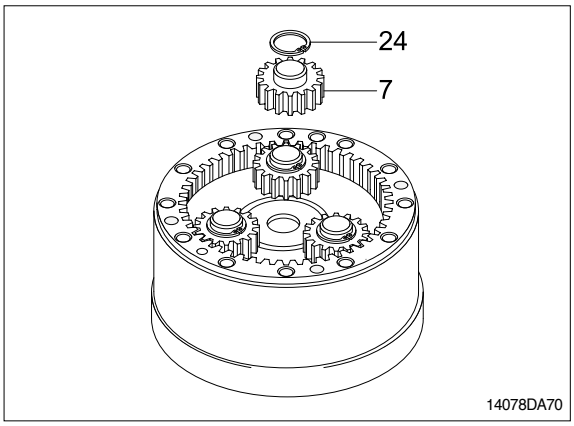
※ Pour the gear oil out of reduction gear into the clean bowl to check out the friction decrease.



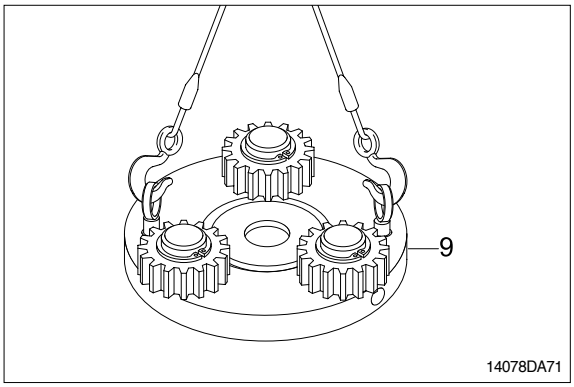
(2) Loosen the socket bolts(19) to separate swing motor from reduction gear.



(3) Remove stop ring(24) and then sun gear1(7).



(4) Tighten two M10 eye bolts to carrier1(9) and lift up and remove carrier1(9) as subassembly.



(5) Disassembling carrier1(9) assembly.

① Remove stop ring(24).

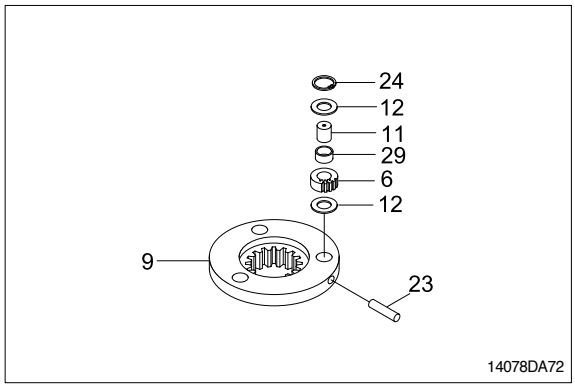
② Remove thrust washer(12), planet gear1 (6), needle cage(29), and thrust washer(12) from the carrier.

③ Using M8 solid drill, crush spring pin(23) so that the pin1(11) can be removed by hammering.

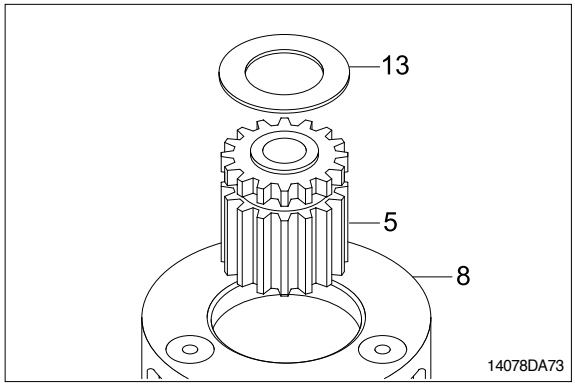
※ Do not reuse spring pin(23).

※ Do not remove pin1(11), carrier1(9) and spring pin(23) but in case of replacement.

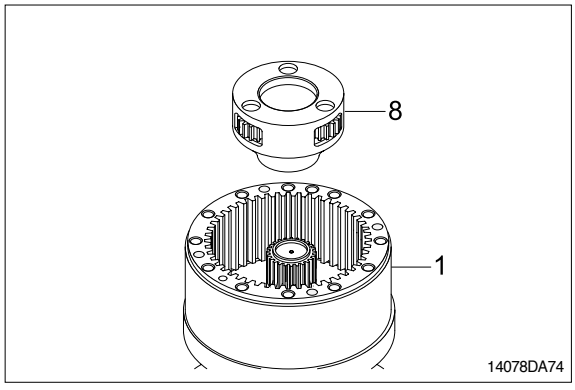
※ Put matching marks on the planet gear1 (6) and the pin1(11) for easy reassembly.



(6) Remove sun gear2(5) and thrust washer (13).



(7) Remove carrier2(8) assembly from casing (1).



(8) Disassembling carrier2(8) assembly

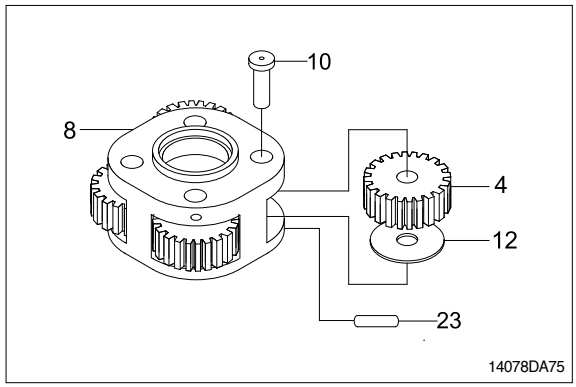
① Using M8 solid drill, crush spring pin(23) so that the pin2(10) can be removed.

※ Do not reuse spring pin(23).

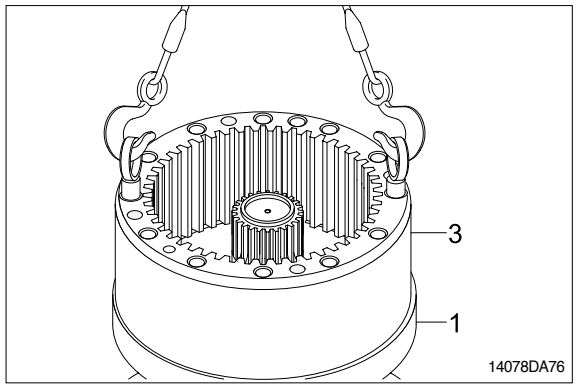
② Remove pin2(10), planet gear2(4) and thrust washer(12) from the carrier2(8).

※ Put matching marks on the planet gear2 (4) and the pin2(23) for easy reassembly.

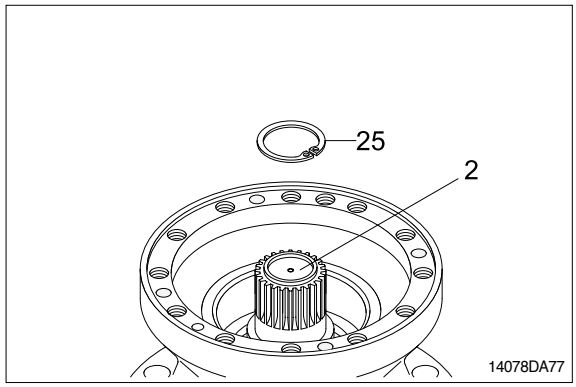
※ Do not disassemble pin2(23), carrier2(8) and spring pin(23) but in case of replacement.



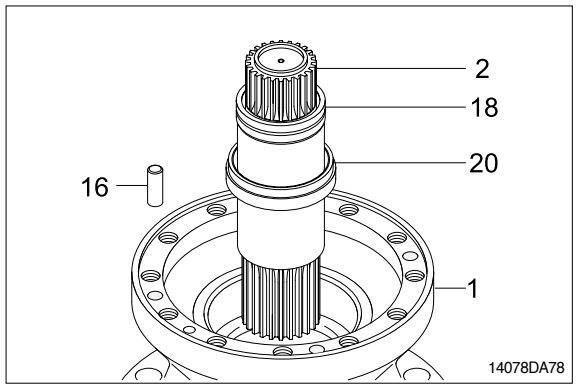
(9) Tighten two M16 eyebolt to the ring gear(3) and then lift the ring gear(3) out of casing(1).



(10) Remove stop ring (25) from the drive shaft(2).

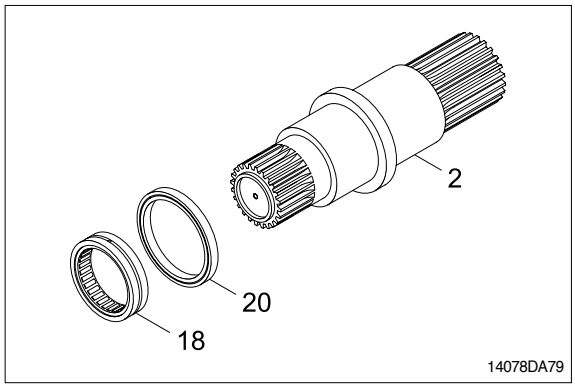


(11) Remove drive shaft(2) with roller bearing(18) and oil seal(20) assembled. Remove knock pin(16) from the casing(1).

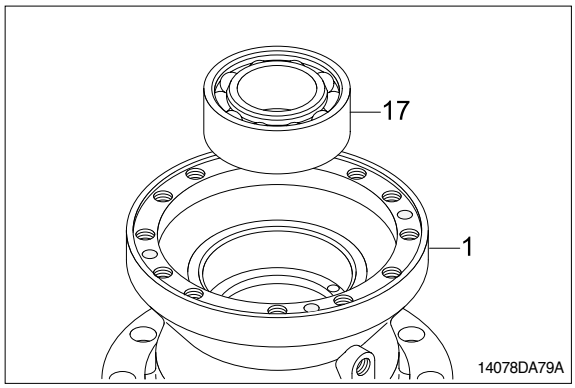


(12) Remove roller bearing(18) and oil seal(20) from the drive shaft(2).

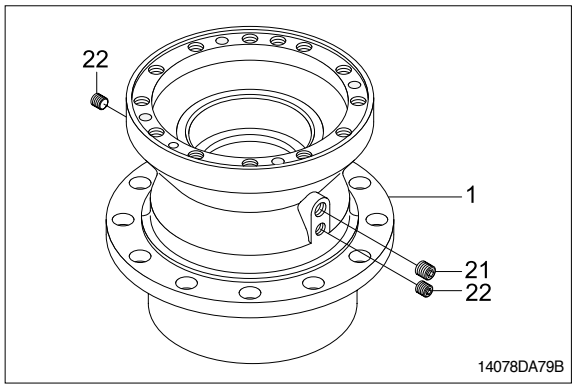
※ Do not reuse oil seal(20) once removed.



(13) Using the bearing disassembly tool, remove roller bearing(17).

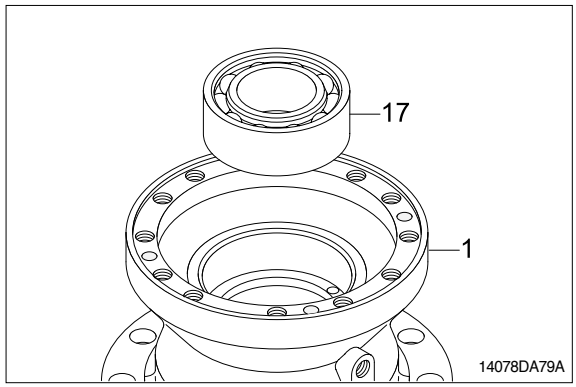


(14) Remove plugs(21, 22) from the casing(1).

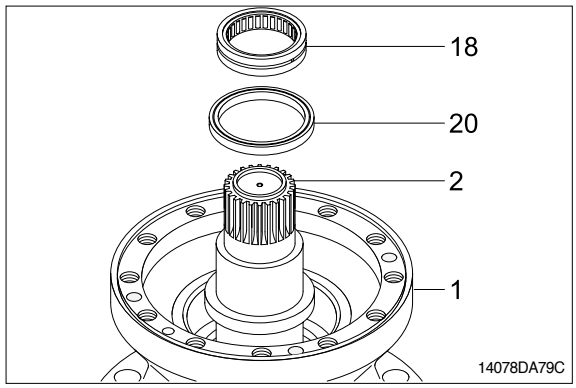


3) ASSEMBLY

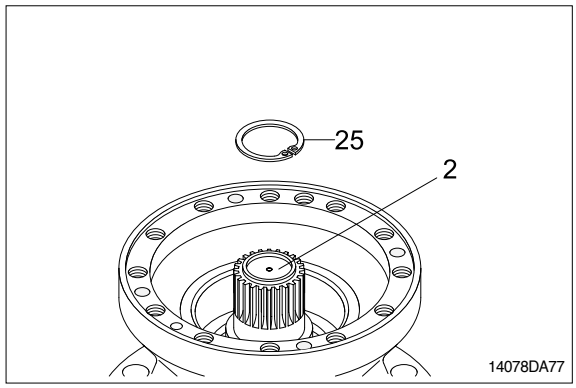
(1) Assemble roller bearing(17) inside the casing(1).



(2) Assemble the drive shaft(2) into the casing(1) and then install oil seal(20) and roller bearing(18).



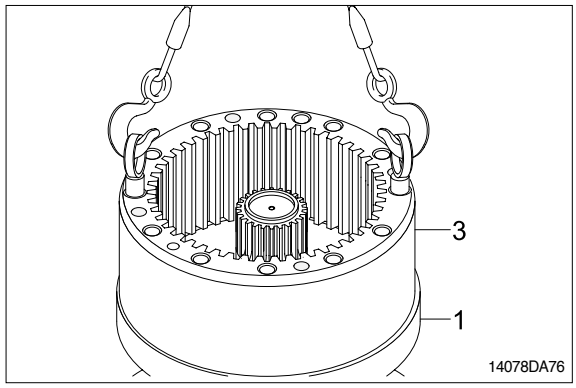
(3) Install stop ring(25) on top of drive shaft (2).



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

(5) Tighten 2 M16 eye bolts to the ring gear(3) and lift up and then assemble it onto the casing(1).

※ Don't fail to coincide the knock pin(16) holes.



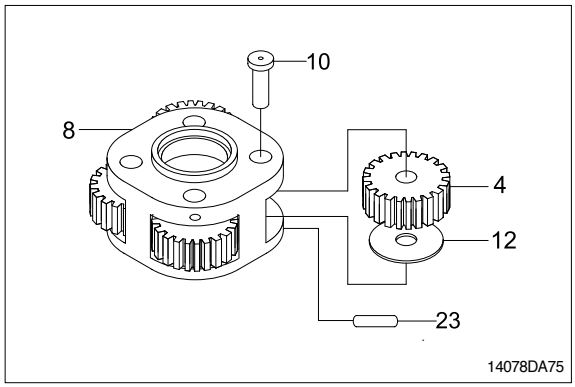
(6) Assembling carrier2(8) assembly.

① Install thrust washer(12) and the planet gear2(4) inside the carrier2(8).

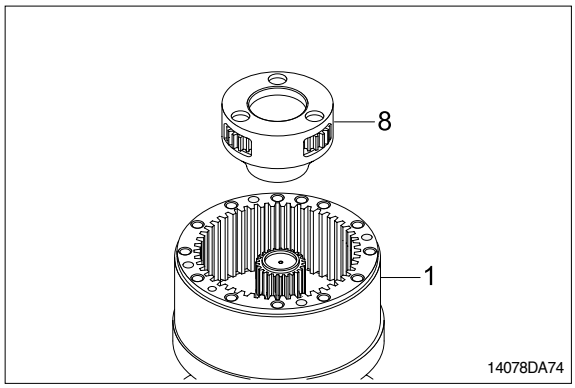
② Assemble the pin2(10) to the carrier2(8) and then press the spring pin(23) by hammering.

③ Punch 2 points of the spring pin(23) lip.

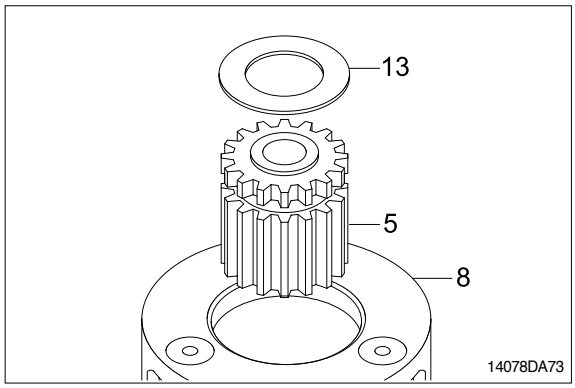
※ Take care not to mistake the matching marks of each part.



(7) Assemble carrier2(8) assembly correctly to the drive shaft(2).



(8) Assemble sun gear2(5) and thrust gear (13) to the center of the carrier2(8) assembly.



(9) Assembling carrier1(9) assembly.

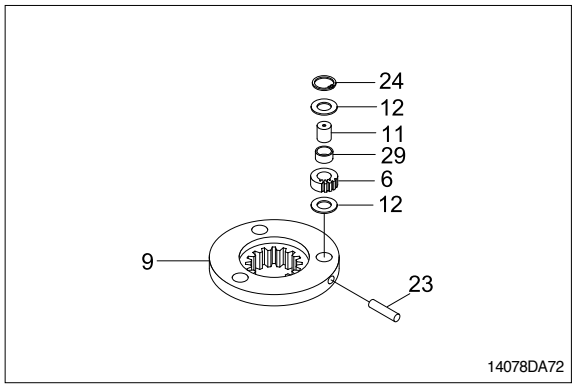
① Assemble the pin1(11) to the carrier1(9) and then press the spring pin(23) by hammering.

② Punch 2 points of the spring pin's(23) lip.

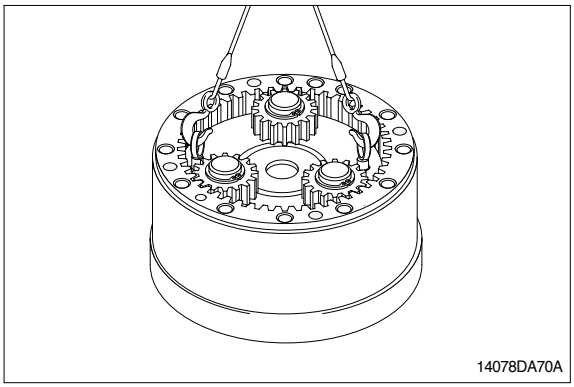
③ Install needle cage(29) into the planet gear1(6).

④ Assemble thrust washer(12), planet gear1(6), and then stop ring(24) to the pin1(11).

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

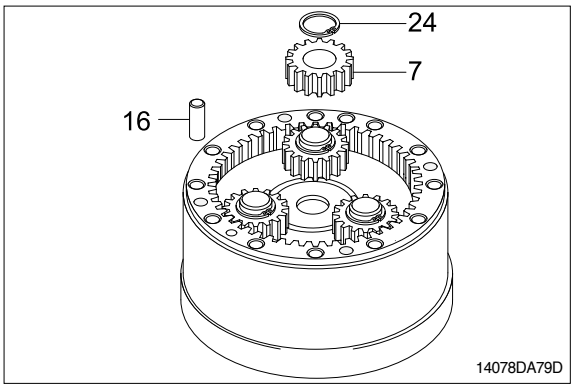


(10) Assemble carrier1(9) assembly into the ringgear.



(11) Hammer 4 knock pins(16) around the ring gear(3).

(12) Assemble sun gear1(7) and stop ring(24) to the drive shaft of the swing reduction gear.

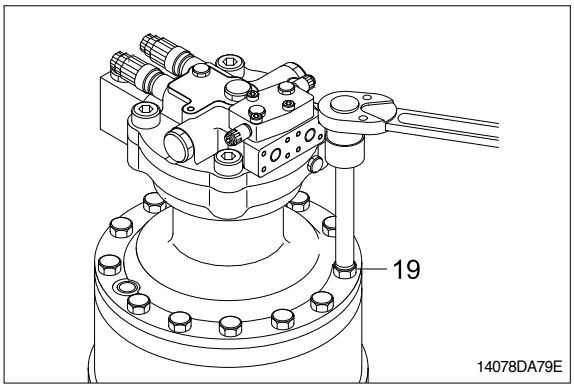


(13) Apply loctite to the tapped holes of the ring gear(3) and then mount swing motor onto the ring gear(3).

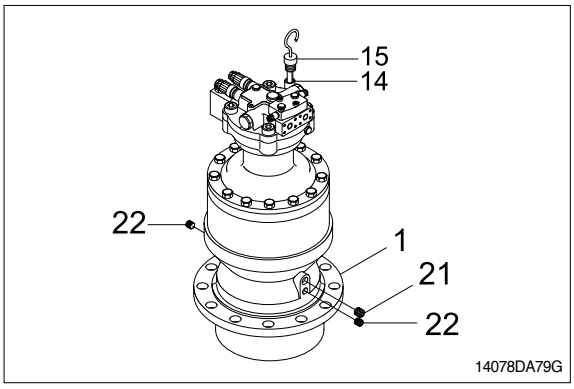
※ Don't fail to coincide the gauge bar(14) hole.

(14) Tighten socket bolts(19) around the swing motor assembly.

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



(15) Assemble plugs(21, 22), gauge bar(14) and gauge pipe(15).



GROUP 6 TRAVEL MOTOR

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.

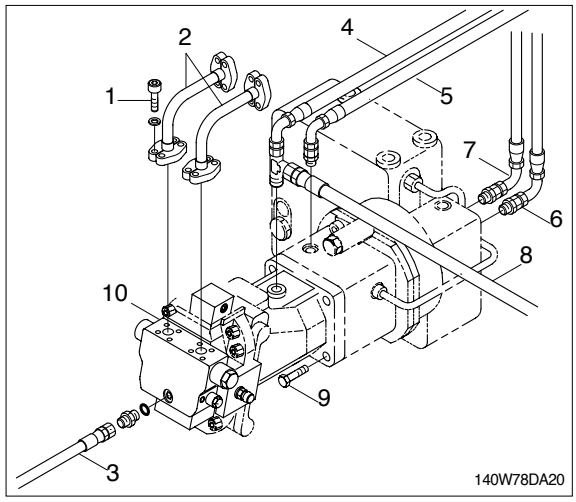
(4) Loosen the socket bolt(1) and remove the pipe assy(2).

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

(6) Loosen the hex bolt(9) and remove travel motor(10).

· Weight : 60kg(130lb)

※ When removing the travel motor assembly, check that all the hoses have been disconnected.



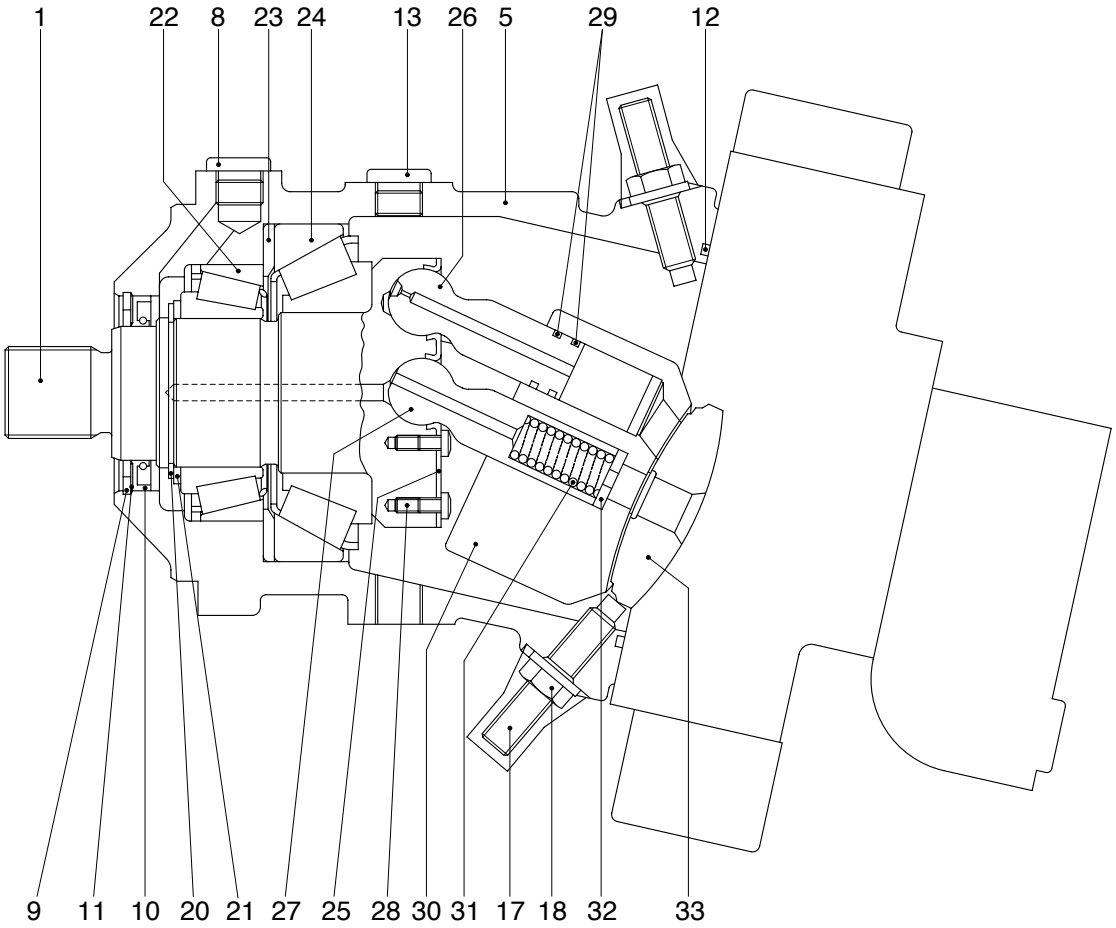
2) INSTALL

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

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

2. STRUCTURE

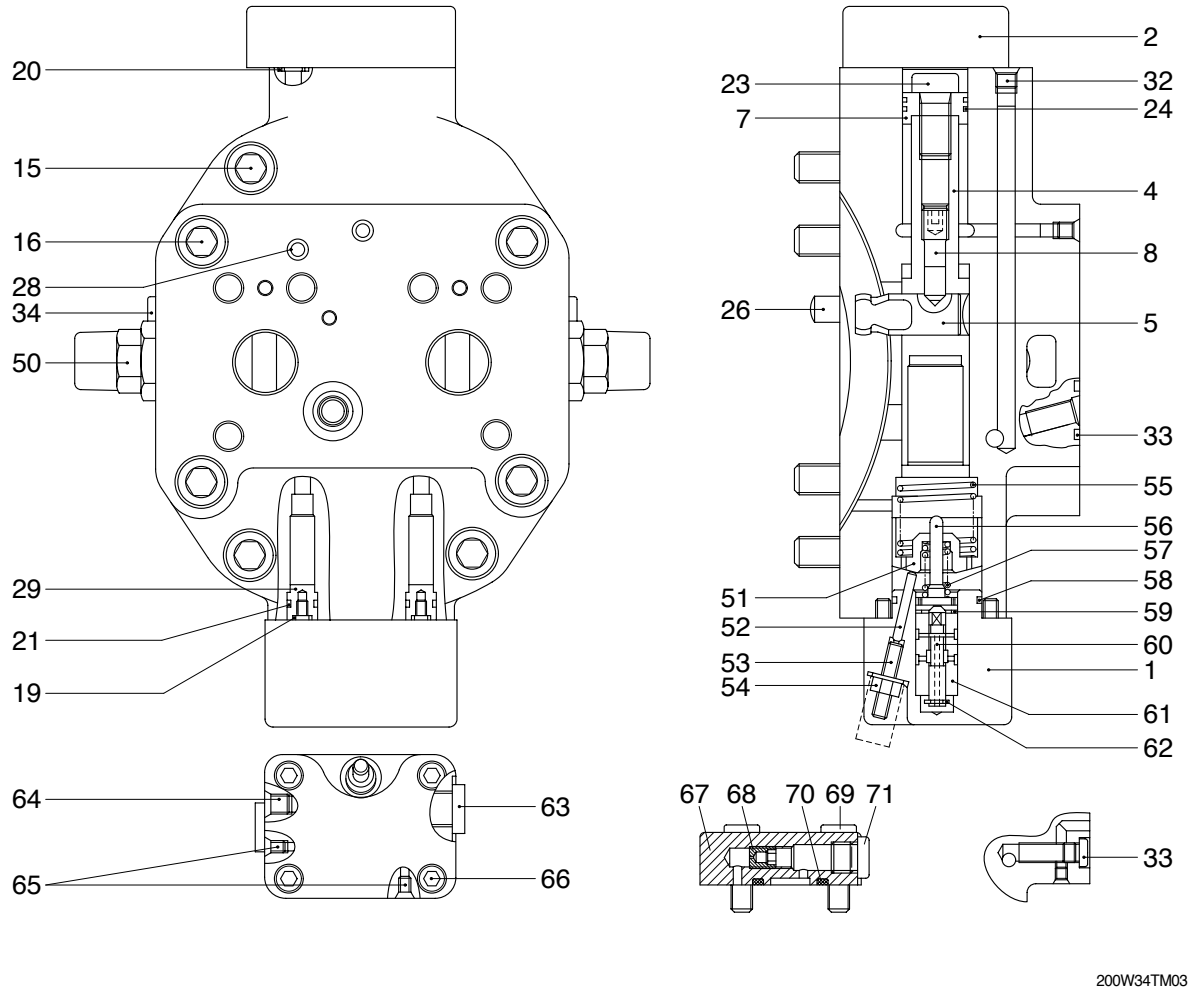
1) MOTOR UNIT



200W34TO02

1	Drive shaft	17	Threaded pin	26	Piston
5	Housing	18	Seal lock nut	27	Center pin
8	Locking screw	20	Retaining ring	28	Pan head screw
9	Retaining ring	21	Back up plate	29	Steel sealing ring
10	Shaft seal ring	22	Taper roller bearing	30	Cylinder block
11	Back up plate	23	Shim	31	Pressure spring
12	O-ring	24	Taper roller bearing	32	Adjustment shim
13	Locking screw	25	Retaining plate	33	Control lens

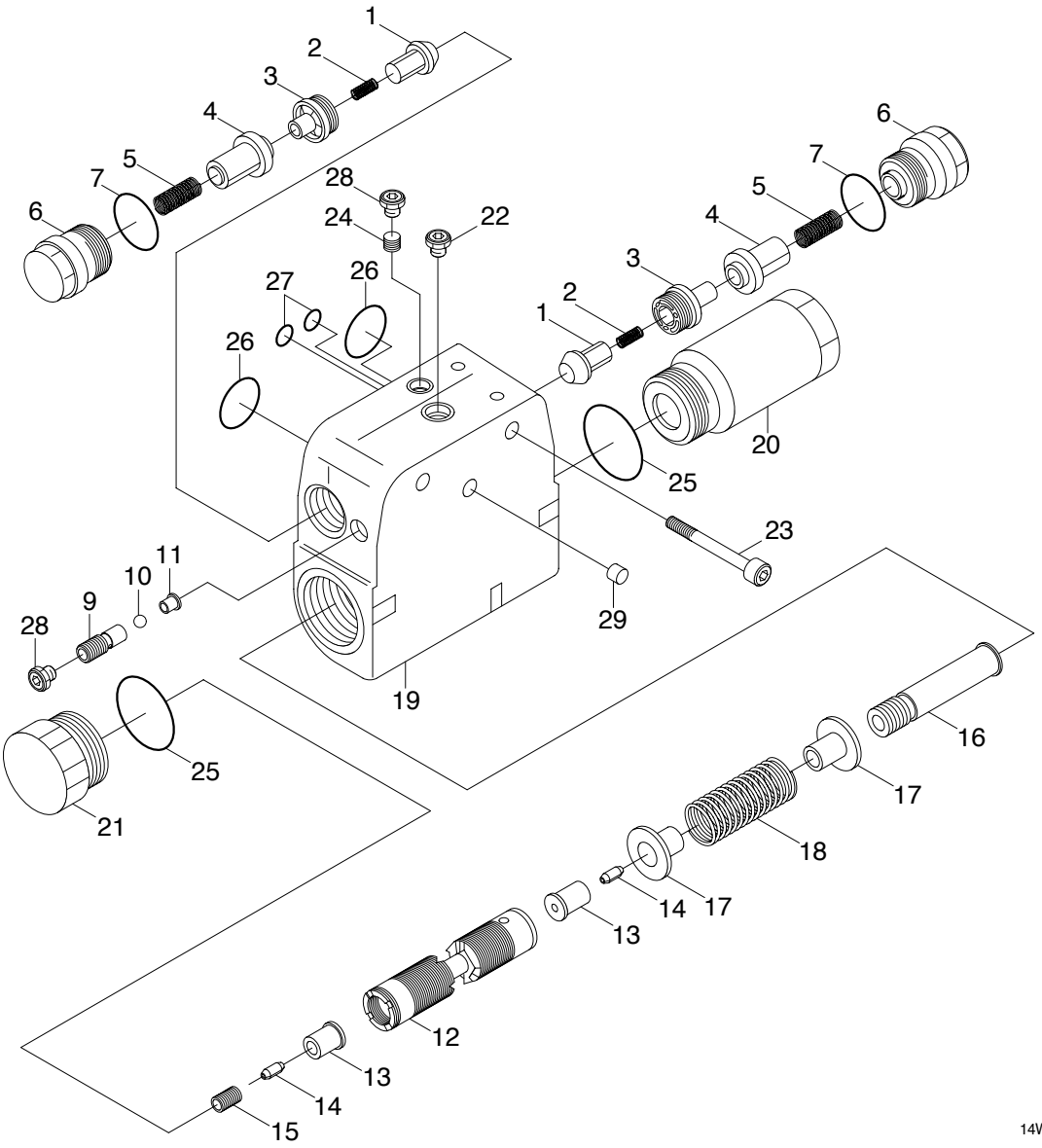
2) CONTROL UNIT



200W34TM03

1	Control housing	28	Double break off pin	59	Retaining ring
2	Cover	29	Plug	60	Control piston
4	Positioning piston	32	Double break off pin	61	Control bushing
5	Positioning trunnion	33	O-ring	62	Retaining disc
7	Piston	34	Locking screw	63	Locking screw
8	Threaded pin	50	Relief valve	64	Double break off pin
15	Socket head screw	51	Adjusting bushing	65	Double break off pin
16	Socket head screw	52	Cylinder pin	66	Socket head screw
19	O-ring	53	Threaded pin	67	Cover
20	O-ring	54	Seal lock nut	68	Throttle screw
21	O-ring	55	Pressure spring	69	Socket head screw
23	Socket head screw	56	Spring collar	70	O-ring
24	Square ring	57	Pressure spring	71	Locking screw
26	Cylinder pin	58	O-ring		

3) COUNTER-BALANCE VALVE



14W78AS05

1	Valve poppet	12	Brake piston	21	Locking screw
2	Pressure spring	13	Valve bushing	22	Locking screw
4	Poppet seat	14	Throttle pin	23	Socket screw
5	Pressure spring	15	Valve screw	24	Plug
6	Locking screw	16	Bolt	25	O-ring
7	O-ring	17	Spring collar	26	O-ring
9	Valve screw	18	Pressure spring	27	O-ring
10	Ball	19	Housing	28	Locking screw
11	Bushing	20	Locking screw	29	D/Break OFF pin

3. TIGHTENING TORQUE

The torques given are standard figures. Any figures specifically described in the procedure has priority.

Page	Item	Size	kgf · m	lbf · ft
8-75	8	M22 × 1.5	6.1	44
	13	M26 × 1.5	7.1	51
	18	M12	7.0	50.9
	28	M 6 × 20	1.4	10.3
8-76	15	M16 × 45	21.4	155
	23	M14 × 25	13.8	99.5
	34	M18 × 1.5	4.0	29
	53	M 6 × 30	1.4	10.3
	54	M6	1.0	7.4
	63	M14 × 1.5	3.0	22
	66	M 8 × 40	2.5	18.4
	69	M12 × 35	12.2	88.4
	71	M14 × 1.5	3.0	22

4. DISASSEMBLY AND ASSEMBLY

1) GENERAL PRECAUTIONS

(1) Disassembly

① Before disassembling the motor, check the items to be inspected and, for remedy against trouble, closely examine the nature of the trouble, so that the motor can be disassembled effectively.

② To disassemble the motor, use the disassembling procedures described in section 2) and select a clean place.

③ Place a rubber or vinyl sheet or other such protective materials on your working bench to protect the surface of the motor to be serviced.

④ During disassembly, give a match mark to the mating surfaces of each part.

⑤ Arrange removed parts in order so that they will not become damaged or missing during disassembly.

⑥ Once seals have been disassembled, they should be replaced even if damage is not observed. Have replacement seals ready on hand before starting your disassembling job.

(2) Assembly

① Reassemble in a work area that is clean and free from dust and grit.

② Handle parts with bare hands to keep them free of linty contanminats.

③ Repair or replace the damaged parts.
Each parts must be free of burrs its corners.

④ Do not reuse O-ring oil seal and floating seal that were removed in disassembly.
Provide the new parts.

⑤ Wash all parts thoroughly in a suitable solvent.
Dry thououghly with compressed air.
Do not use the cloths.

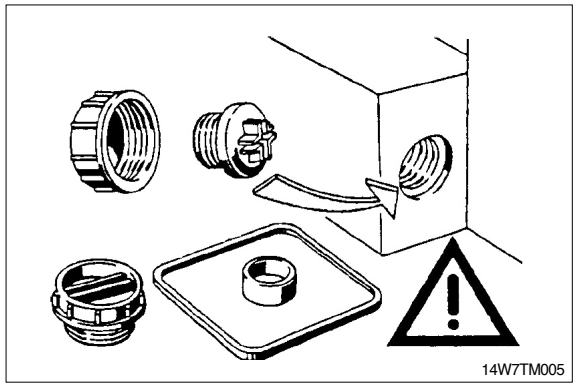
⑥ When reassembling oil motor components of motor, be sure to coat the sliding parts of the motor and valve with fresh hydraulic oil.(NAS class 9 or above)

⑦ Use a torque wrench to tighten bolts and plugs, to the torque specified as follows.

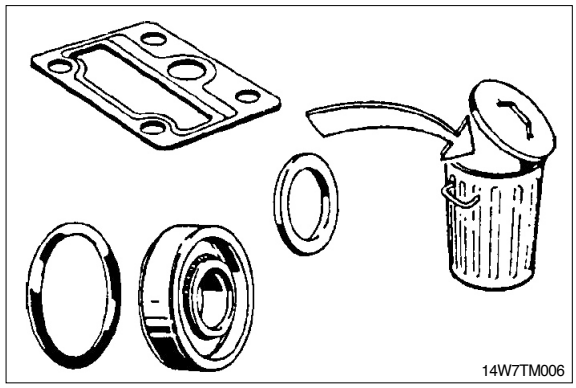
2) SEAL KITS AND COMPONENT GROUPS

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

(1) Close all ports of the hydraulic aggregates.

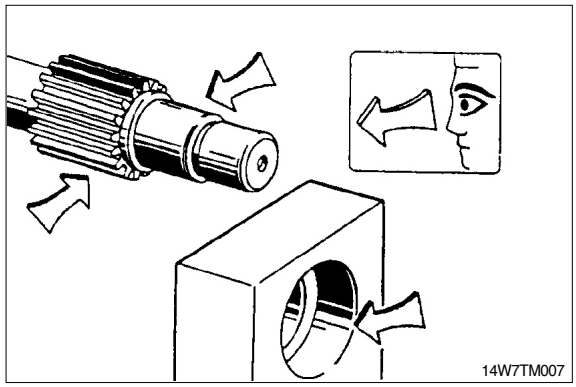


(2) Replace all seals.
Use only original hydromatik spare parts.

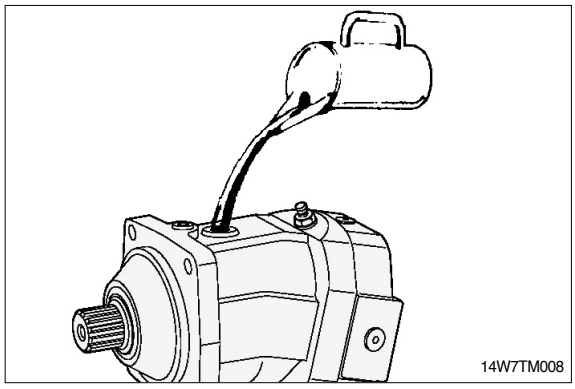


(3) Check all seal and sliding surfaces for wear.

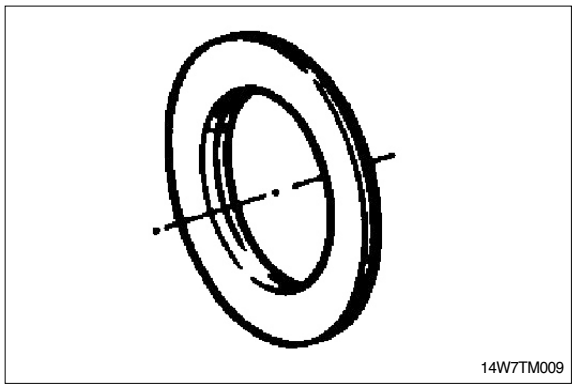
※ Rework of sealing area f.ex. with abrasive paper can damage surface.



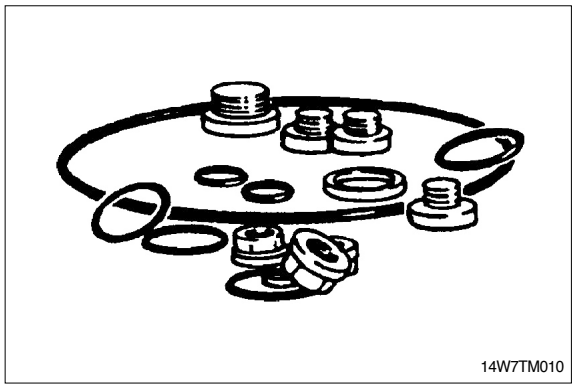
(4) Fill up hydraulic aggregates with hydraulic oil before start up.



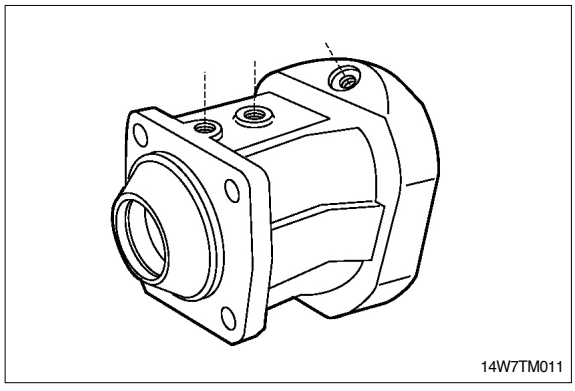
(5) Seal kit for drive shaft



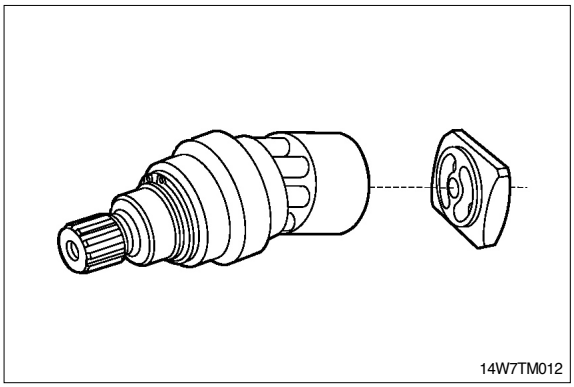
(6) External seal kit.



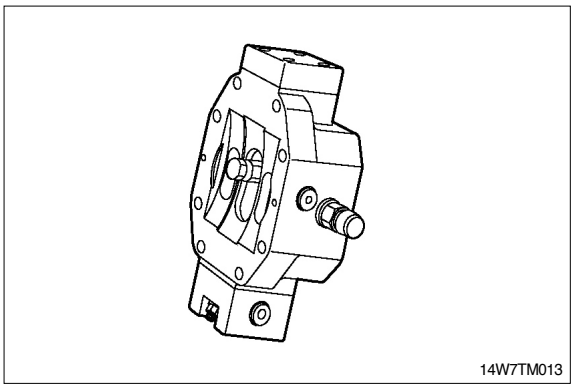
(7) Housing.



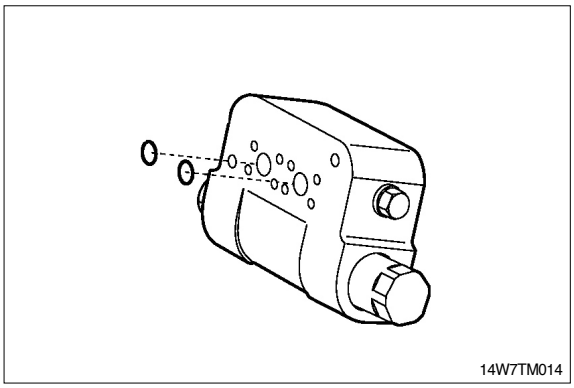
(8) Complete rotary group.



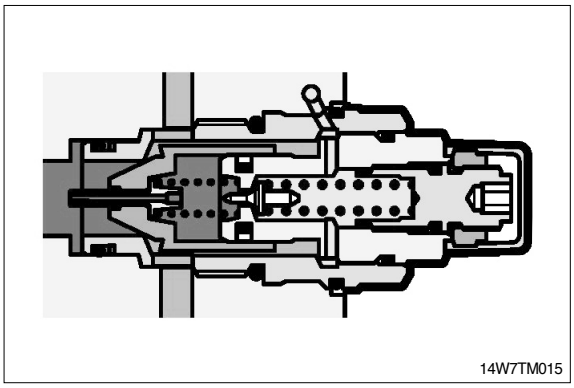
(9) Port plate with control piston.



(10) Counter balance valve.

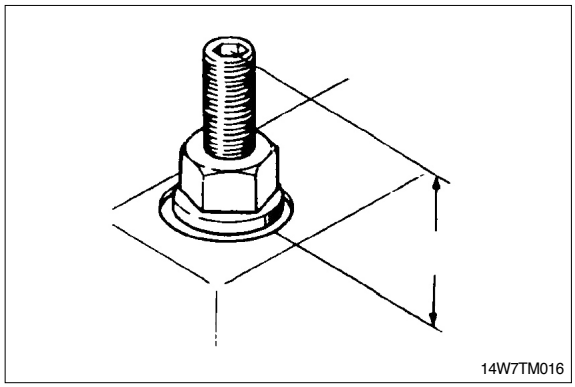


(11) Relief valve / Make up check valve.

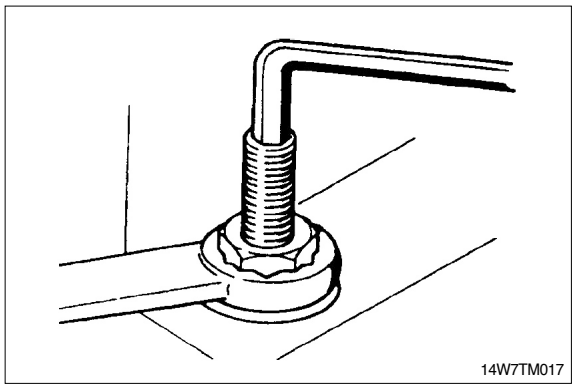


3) SEAL NUT

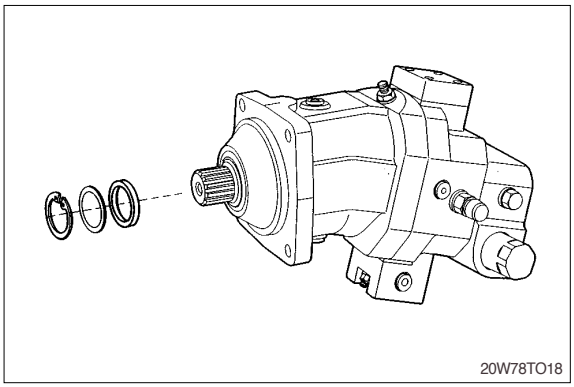
(1) Replace seal nut.
First measure and record setting height.



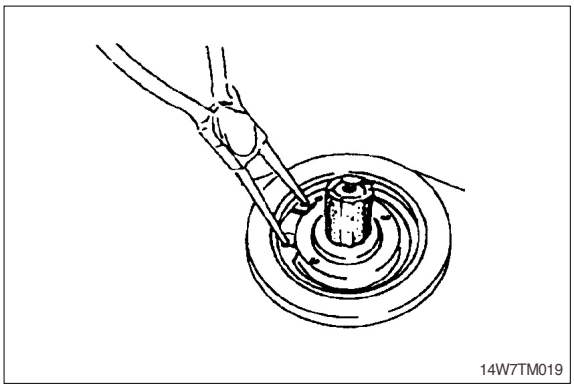
(2) When tightening, counterhold setting screw, then check setting height.



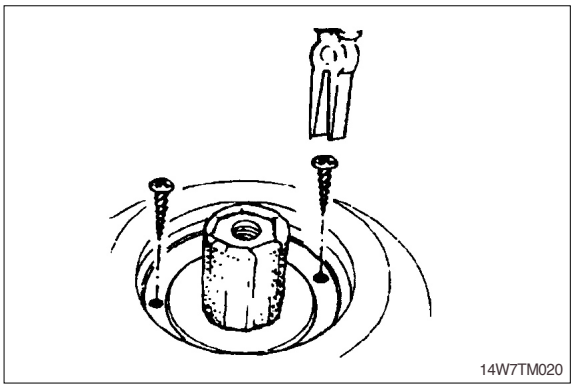
4) SEALING THE DRIVE SHAFT



(1) Protecting the drive shaft.
Remove retaining ring and shim.



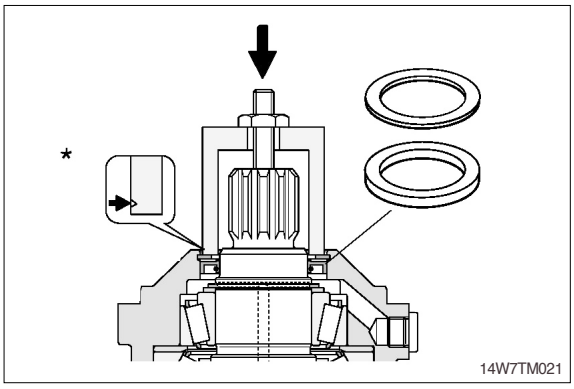
(2) Screw in sheet metal screw into the holes fitted with rubber.
Pull out seal with pliers.



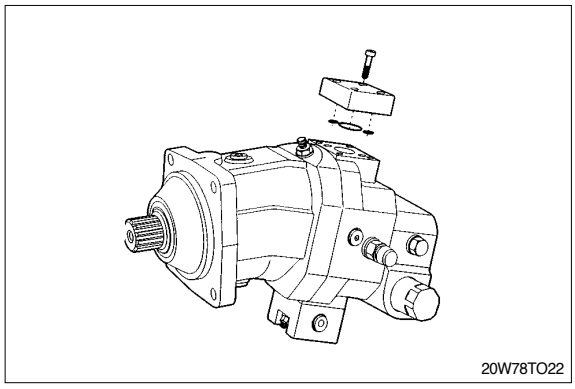
(3) Press in shaft seal and shim with bush to stop.

⚠ **Pay pattention to pressing depth.**

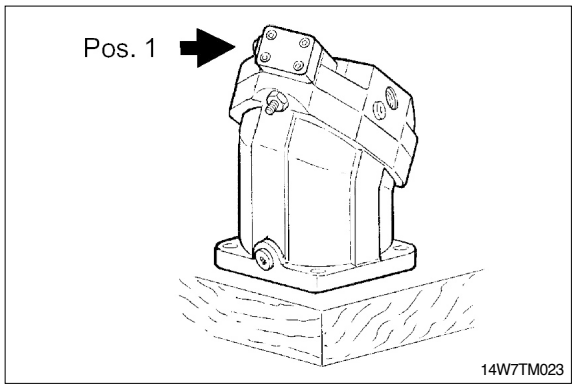
* **Mark for pressing depth.**
Assemble retaining ring.



5) SEALING OF THE CONTROL PARTS

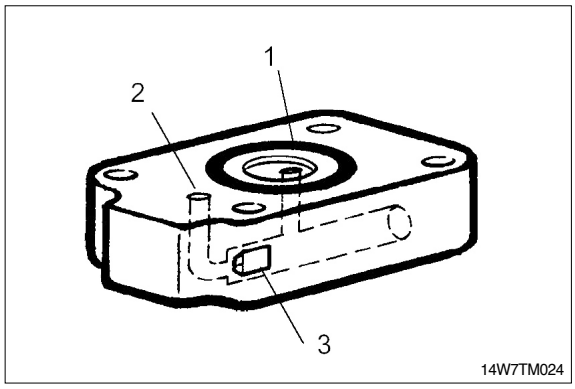


(1) Disassembly position
Remove cover 1.

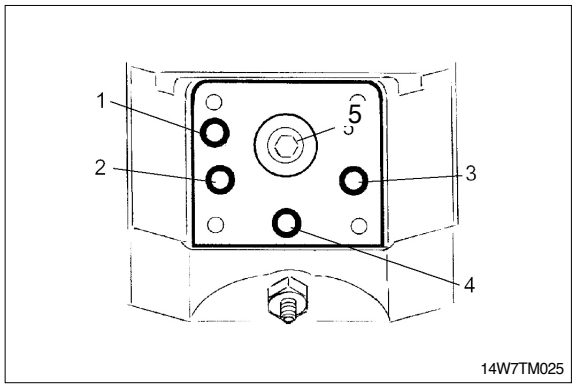


1 O-ring
2 Input flow of oil control
3 Throttle pin

※ Installation position differs according to the control components.

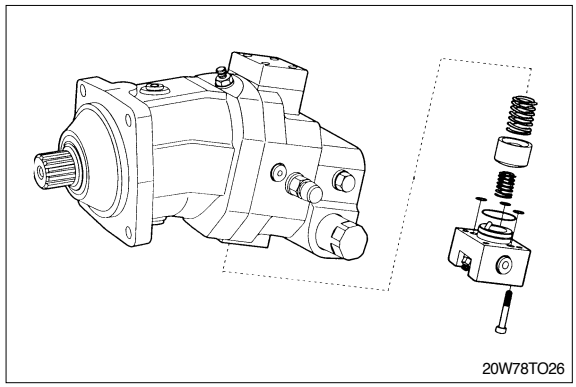


1 Input flow of oil control
2 High pressure / Low pressure
3 High pressure / Low pressure
4 Leckage oil
5 Control piston

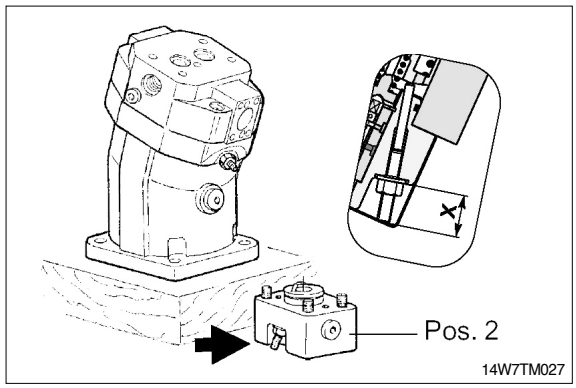


(2) Disassembly position : Remove cover 2.

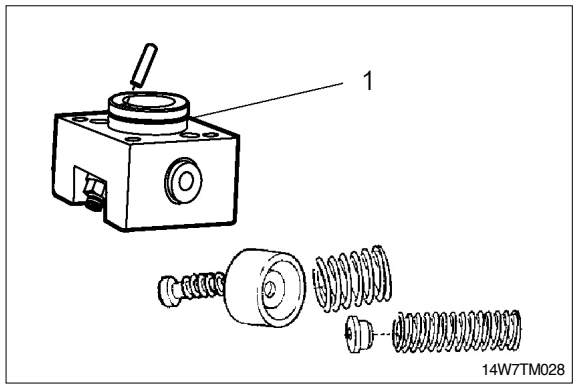
※ Atttention spring load.



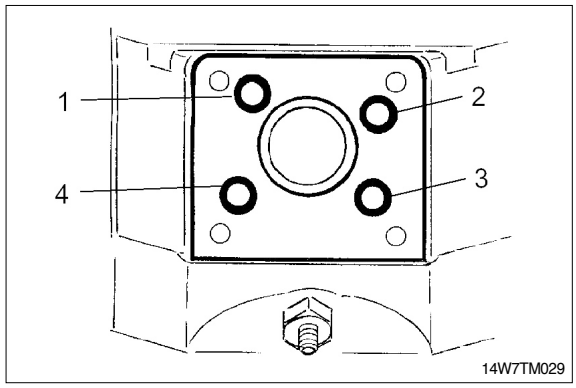
※ Dimension X : Note dimension(Begin of regulation)



1 Check of O-ring

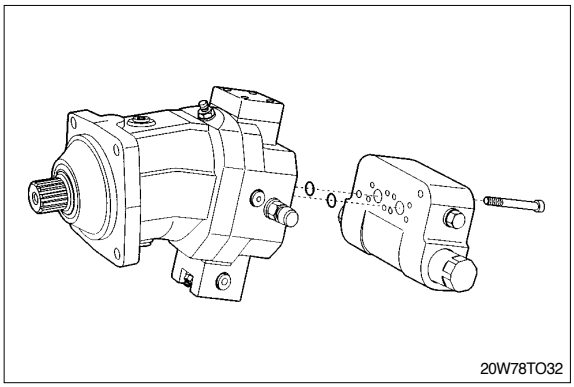


1 O-ring / High pressure-small control position side
2 O-ring / Control pressure
3 O-ring / High pressure-check valve
4 O-ring / High pressure-check valve

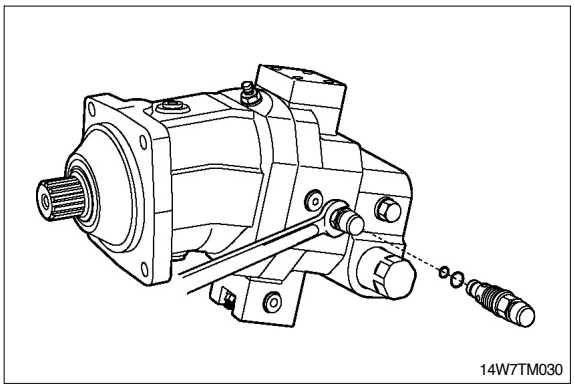


6) SEALING OF THE RELIEF VALVE / COUNTER BALANCE VALVE

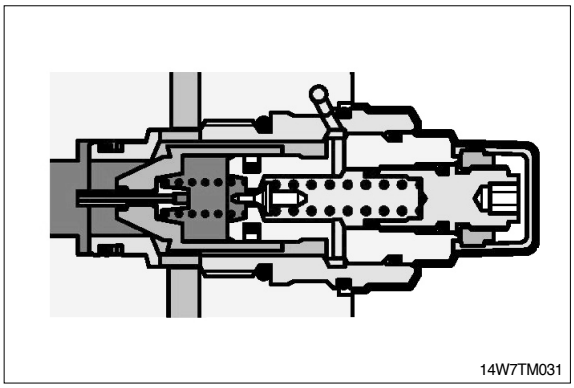
· Remove counter balance valve
· Inspect
· O-ring



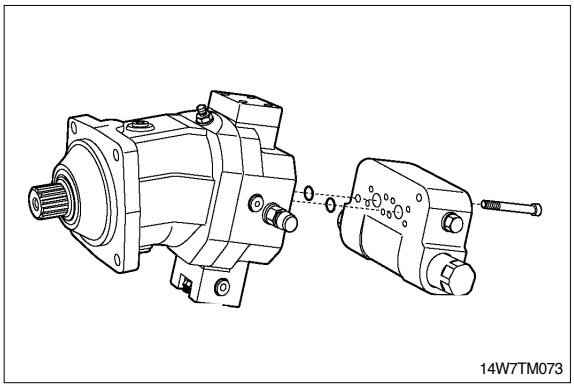
(1) Remove relief valve



(2) Inspect
O-ring



(3) Remove counter-balance valve.
Inspect
O-ring

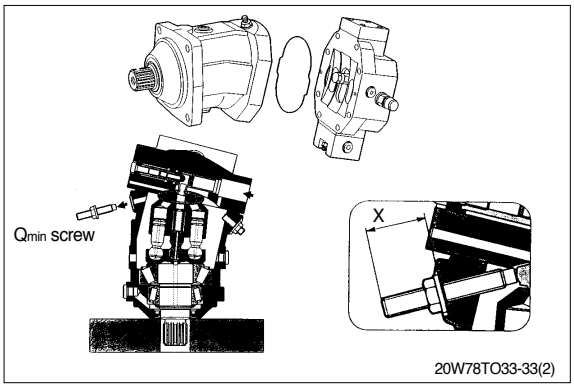


7) DISASSEMBLY OF THE PORT PLATE

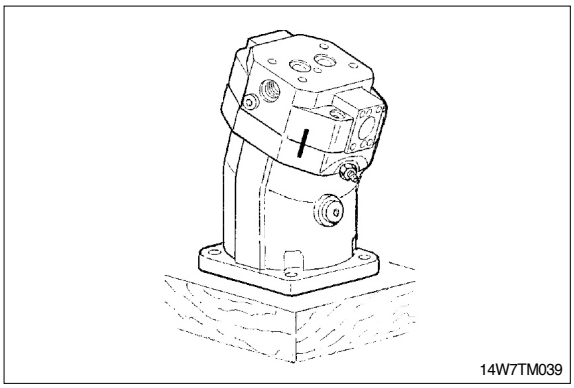
· Note dimension X

· Remove Q_{min} screw

· Swivel rotary group to zero P

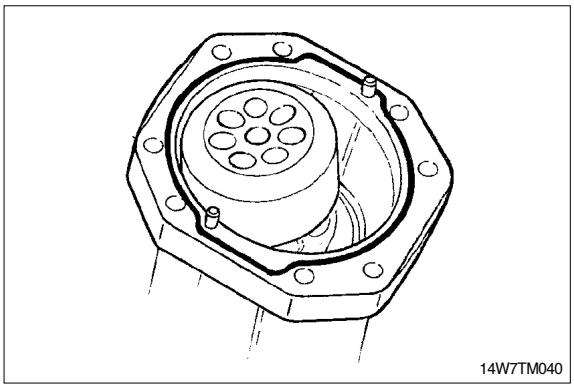


(1) Port plate.
Mark position. Loosen screws.
Removal.

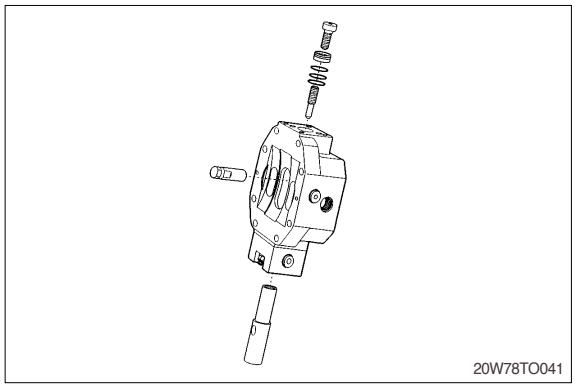


(2) Check O-ring.

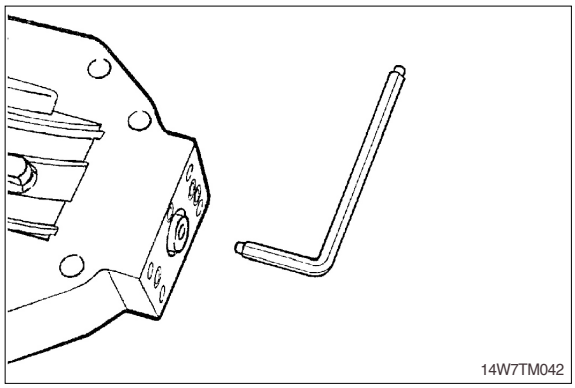
※ Stick new O-ring with some grease.
Do not swivel rotary group.
Piston rings to hang out from the cylinder boring.



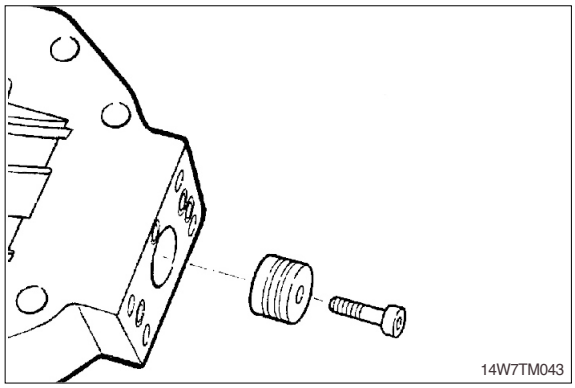
8) REMOVE OF THE POSITIONING PISTON



(1) Loosen fixing screw.
Use only socket wrench.

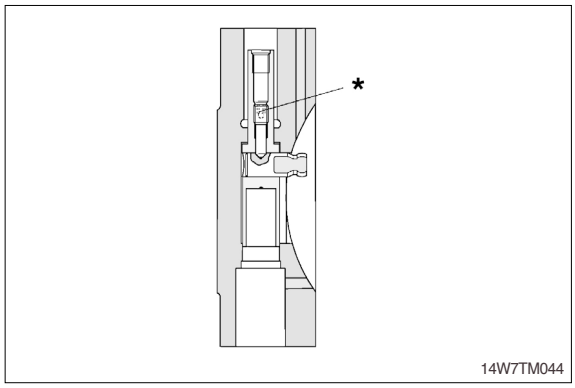


(2) Remove piston with piston ring.



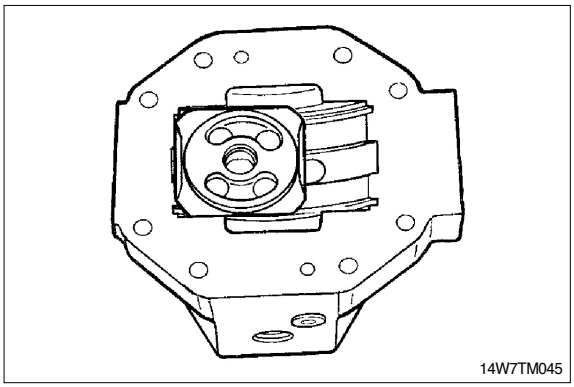
(3) Warm up fixation screw * for positioning plug via boring(Screw glued-to turn out).

※ Use new screw.
Precote coating.
Note tightening torque.

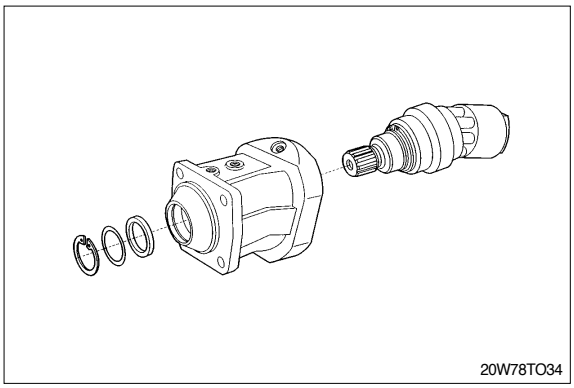


※ Stick control lens in sliding surface with grease. Assembly in reversal order. Mount port plate.

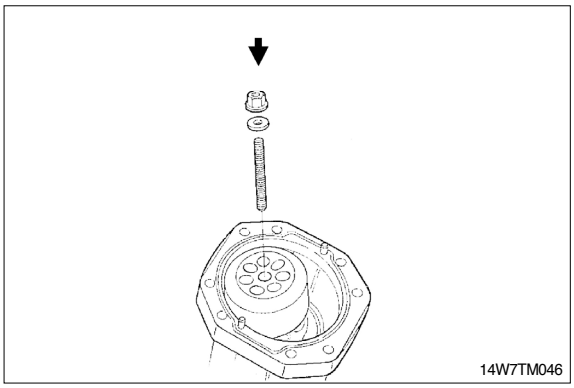
※ Rotary group vertical.



9) REMOVE ROTARY GROUP

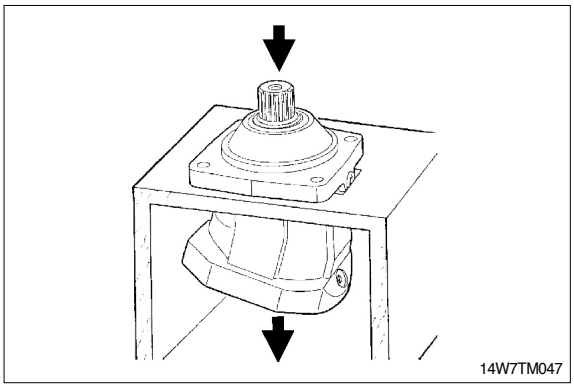


(1) Screw in threaded pin into center pin. Fix the cylinder with disc and locknut. M8×105 ℓ



(2) Press out rotary group.

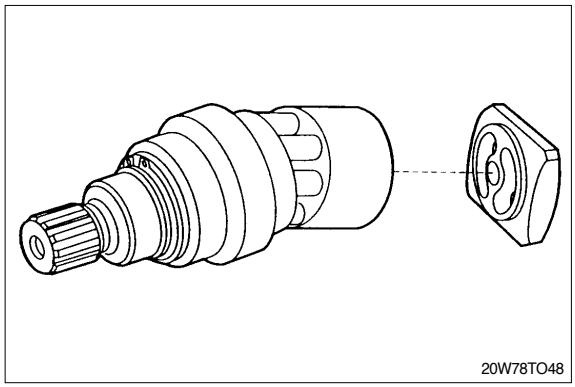
※ If the bearings are used again do not hit on the drive shaft.



10) EXCHANGING OF THE ROTARY GROUP

Complete rotary group

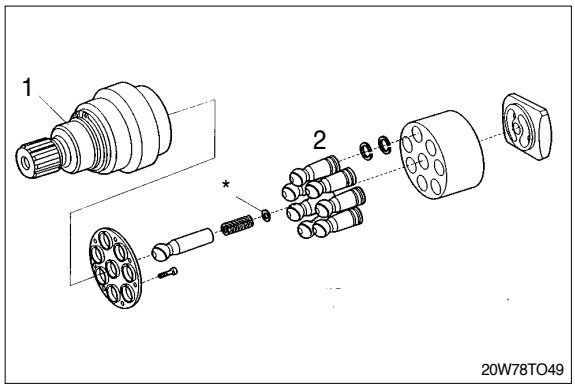
※ Setting of hydraulic part necessary.



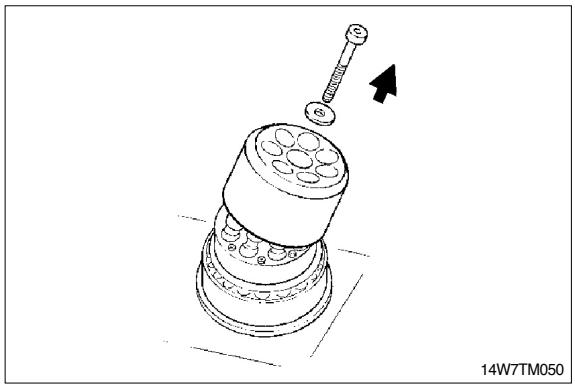
Rotary group

1 Mechanical part : Adjust drive shaft with bearing

2 Hydraulic part : Adjustment necessary

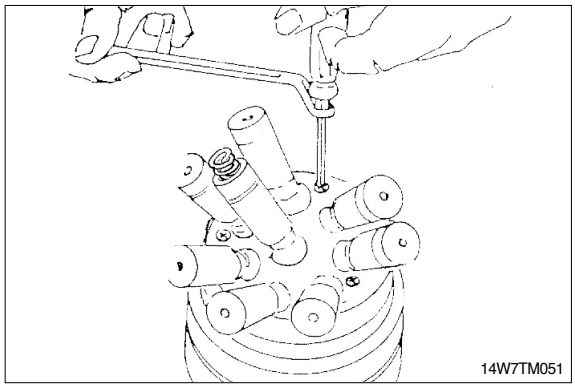


(1) Remove fixing screw(Cylinder).
Remove cylinder.



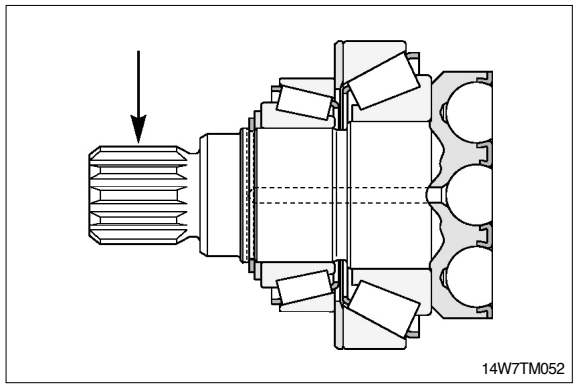
(2) Disassemble retaining plate.

※ Screws are glued.
Use Torx tools.

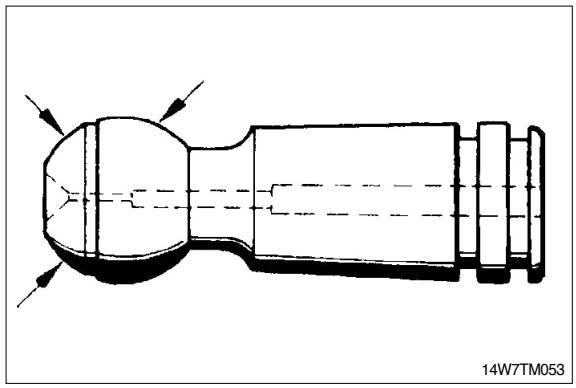


11) INSPECTION INSTRUCTIONS

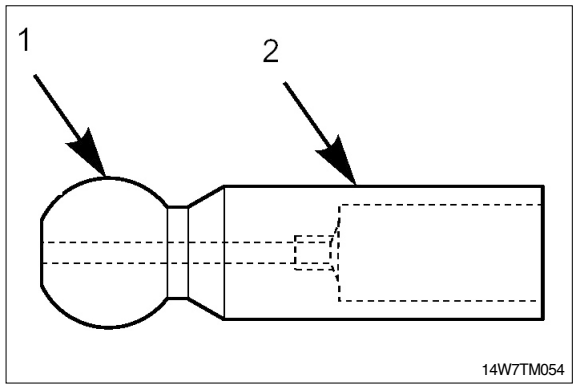
(1) Free of corrosion, erosion or fretting; No damage to splines or keyways.



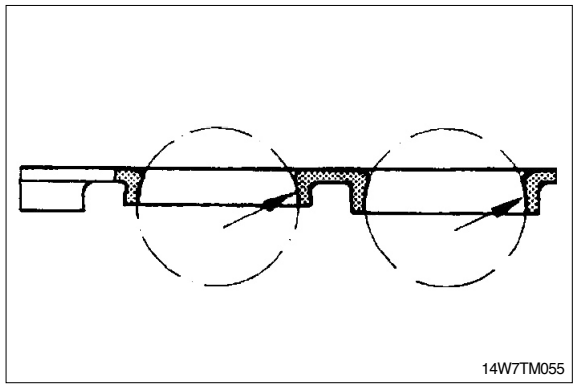
(2) Pistons
No scoring and no pittings.



(3) Center pin
No scoring and no pittings.



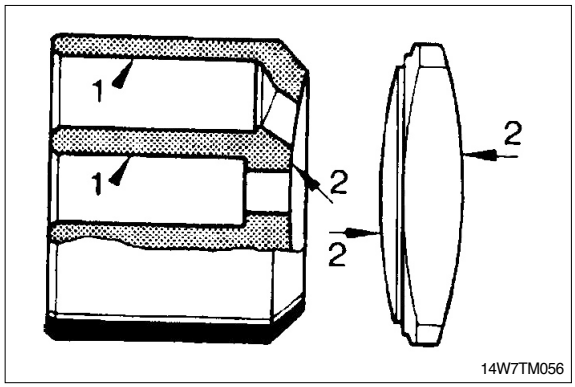
(4) Retaining plate
No scoring and no evidence of wear.



(5) Cylinder block / Control lens

1 Bores free of scoring, no evidence of wear

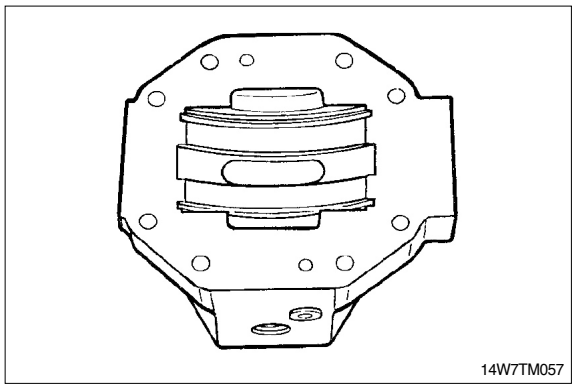
2 Faces smooth and even, free of cracks and scoring



14W7TM056

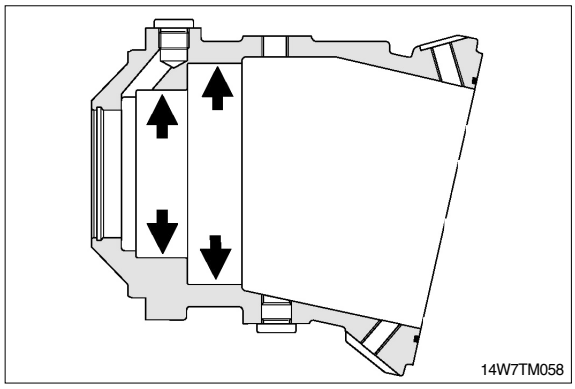
(6) Control housing

Sliding surface and side guides free of scoring and no wear.


14W7TM057

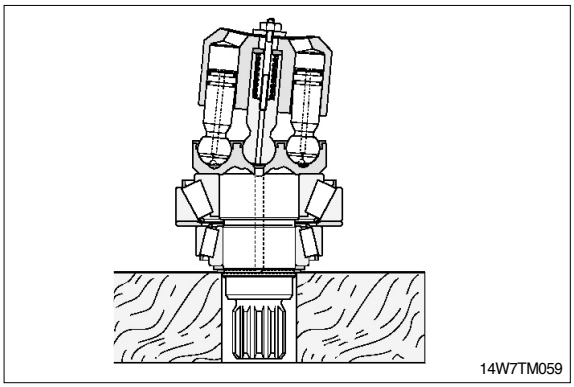
(7) Visual check

Bearing areas free of scoring and no evidence of wear.

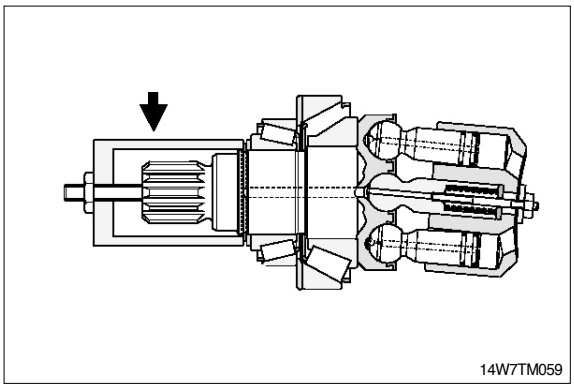

14W7TM058

12) ROTARY GROUP ASSEMBLY

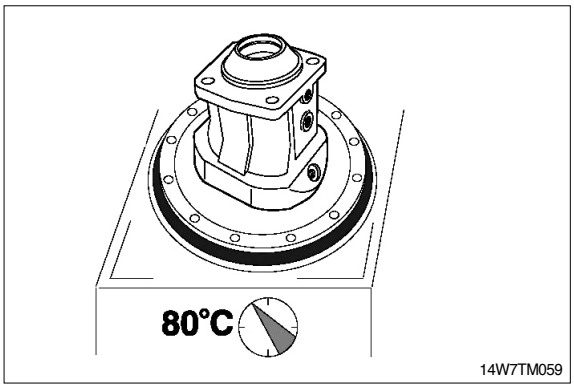
(1) Rotary group completely assembled ready for assembly.



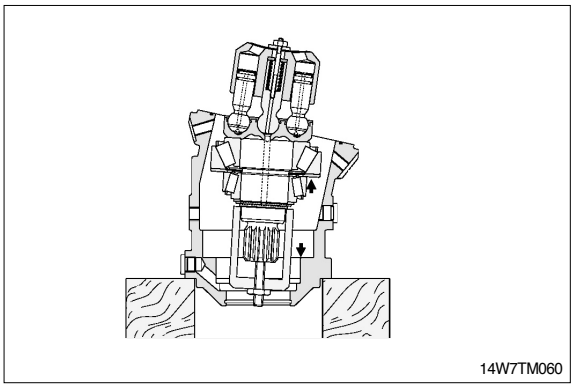
(2) Place assembly sleeve.



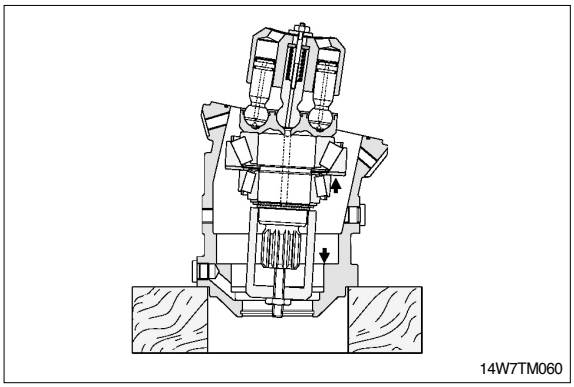
(3) Warm up housing to 80。C.



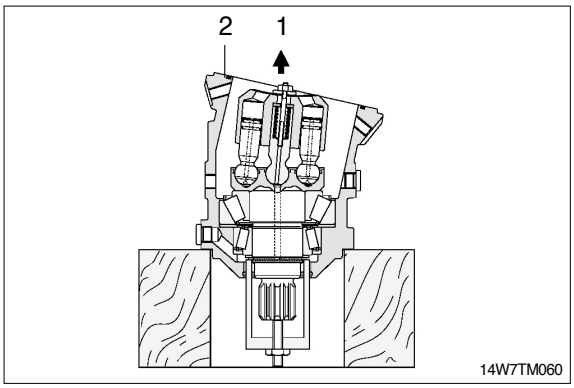
(4) Insert rotary group into housing to seat position.



(5) Insert rotary group into housing to seat position.

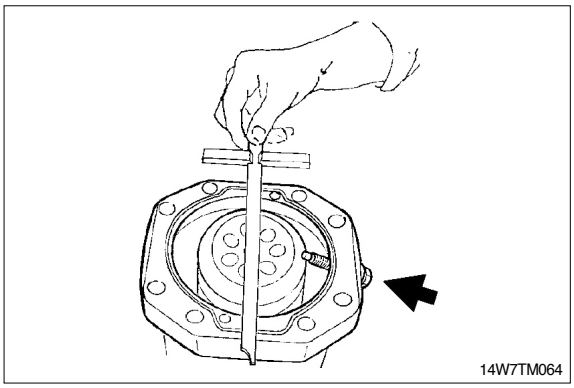


(6) Fix zero position of cylinder with Q_{max} screw.
1 Disassemble cylinder fixing screw
2 Insert O-ring

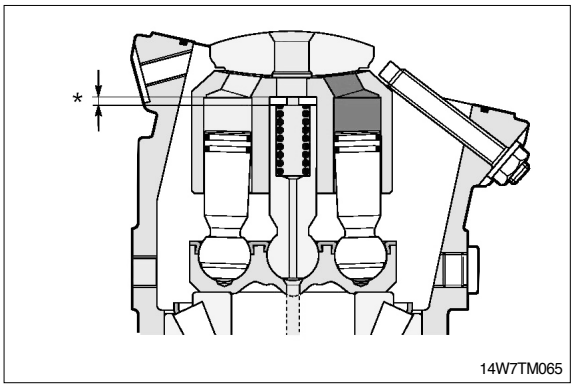


13) ROTARY GROUP ADJUTMENT

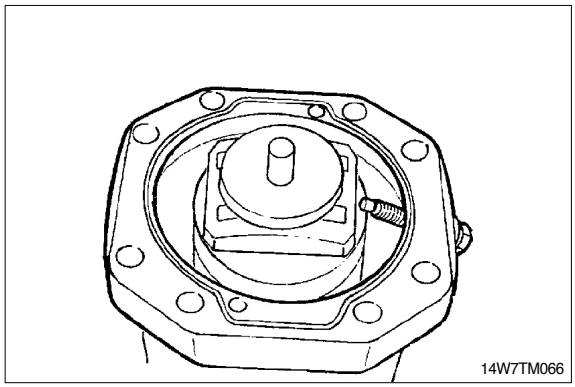
(1) Determine cylinder swivel range to max angle with screw.



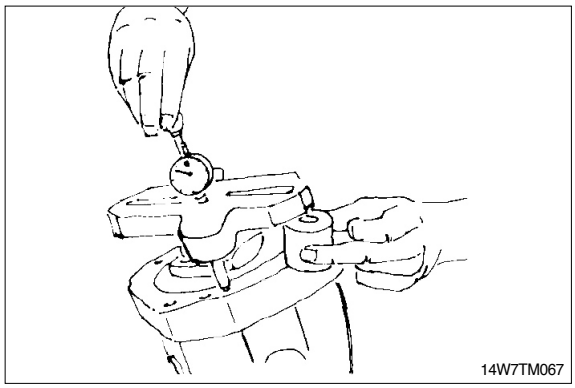
(2) * Disc



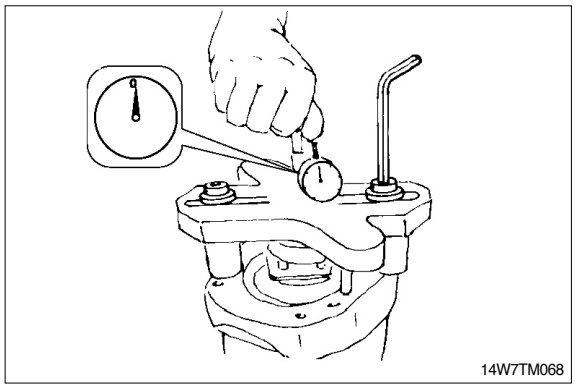
(3) Place centering disc.



(4) Mount measuring device.



(5) Check dimension X.



14) ASSEMBLY OF THE PORT PLATE

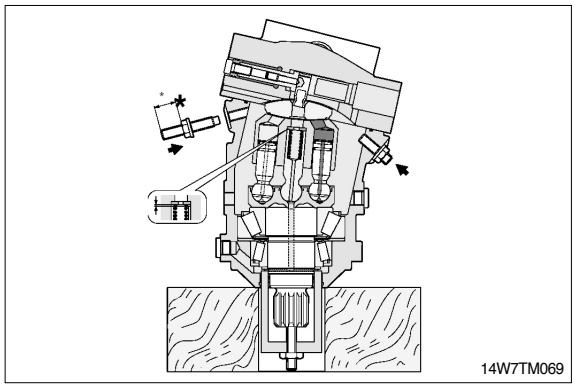
(1) Assemble port plate.

※ Take care of assembly design.
Tighten fixing screws with torque.

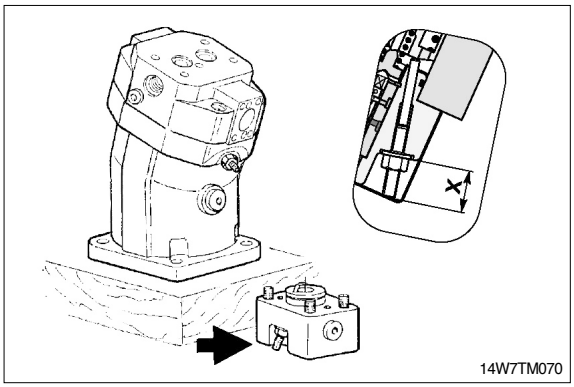
(2) Set Q_{min} screw to dimension(*).

(3) Assemble plug.

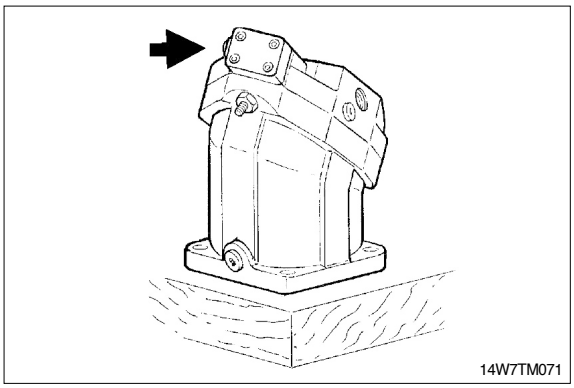
(4) Remove assembly sleeve.



(5) Assemble control components.

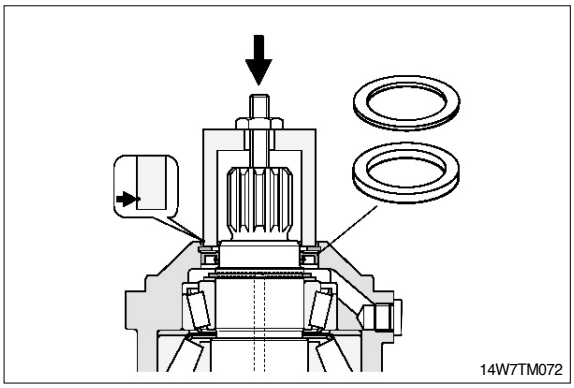


(6) Assemble cover.

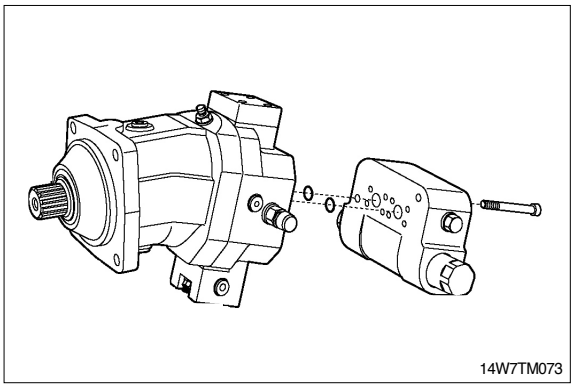


(7) Assemble shaft seal, disc and safety ring.
Press in with assembly sleeve.

※ Take care of press in depth.



(8) Assemble counter balance valve.



GROUP 7 TRANSMISSION

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 propeller shaft mounting nuts(3).

· Tightening torque : 5.9±0.6kgf · m (42.7±4.3lbf · ft)

(5) Remove the travel motor mounting bolt(2).

· Tightening torque : 29.6±3.2kgf · m (214±23.1lbf · ft)

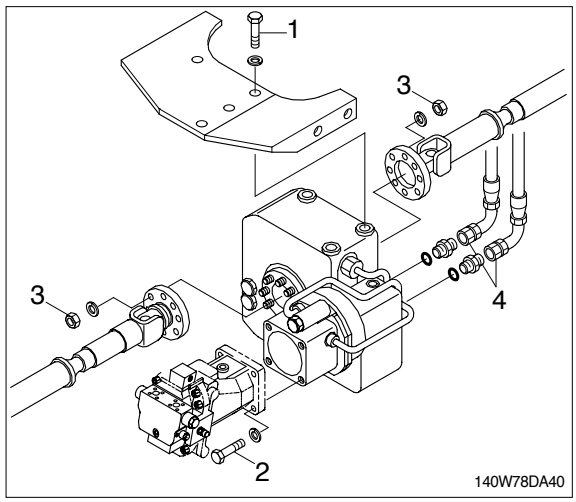
(6) Remove the hoses.

※ Fit blind plugs to the disconnected hoses.

(7) Remove the mounting bolts(2), then remove the transmission device assembly.

· Weight : 130kg(290lb)

· Tightening torque : 39.0±4.2kgf · m (282±30.4lbf · ft)



2) INSTALL

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

(2) Bleed the air from the transmission.

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. GENERAL INSTRUCTIONS

1) GENERAL WORKING INSTRUCTIONS

(1) This manual has been developped for the skilled serviceman, trained by manufacturer.

(2) During all operations, pay attention to cleanliness and skilled working.
Therefore,transmission removed from the machine must be cleaned prior to open them.

(3) We assume that the special tools, specified by manufacturer, will be used.
The special tools are available from manufacturer.

(4) After the disassembly, all components must be cleaned, especially corners, cavities and recesses of housing and covers.

(5) The old sealing compound must be carefully removed.

(6) Check lubricating holes, grooves and pipes for free passage. They must be free of residues, foreign material or protective compounds.

(7) The latter refers expecially to new parts.

(8) Parts which have been inevitably damaged in a disassembly operation, must be generally replaced by new ones, e.g. rotary seal rings, O-rings, U-section rings, cap boots, protective caps etc..

(9) Components such as roller bearings, thrust washers, synchronizing parts etc. which are subject to normal wear in automotive operation, must be checked by the skilled Serviceman.
He will decide if the parts can be reused.

(10) For the heating of bearings etc., hot plates, rod heaters or heating furnaces must be used.

(11) Never heat parts directly with the flame. An auxiliary solution would be to immerse the bearing in a vessel filled with oil, which is then heated with the flame.
In this way, damage to the bearings could be avoided.

(12) Ball bearings, covers, flanges and parts like that must be heated to about 90 to 100°C.

(13) Hot-mounted parts must be reset after cooling in order to assure a proper contact.

(14) Before pressing shafts, bearings etc. in position, both parts must be lubricated.

(15) During to reassembly, all specified adjustment values, testing specifications and tightening torque must be respected.

(16) After the repair, units are filled up with oil.

(17) After the oil filling, the oil level plugs and oil drain plugs must be tightened to the specified tightening torque.

2) IMPORTANT INSTRUCTIONS CONCERNING THE LABOUR SAFETY

(1) In principle, repairers are themselves responsible for the labour safety.

(2) The observance of all valid safety regulations and legal rules is a precondition to prevent damage to individuals and products during the maintenance and repair operations.

(3) Before starting the work, the repairers have to make themselves familiar with these regulations.

(4) The proper repair of these products requires especially trained personnel.

(5) The repairer himself is obliged to provide for the training.

3) LUBRICANT SPECIFICATIONS

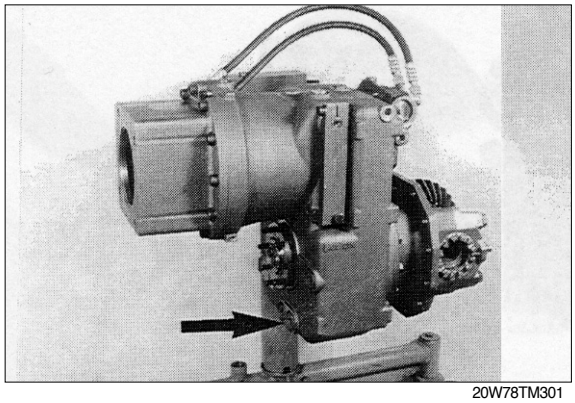
(1) Engine oil : API CD/CE/CF/SF/SG
MIL-L-2104 C/D/E
MIL-L-4615 C/D/E

(2) SAE 10W-30, 15W-40

3. DISASSEMBLY

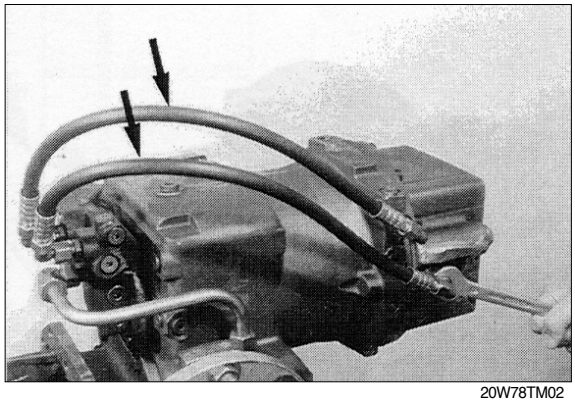
1) REMOVE SHIFTING CLUTCHES

(1) Fasten gearbox in the assembly car.
Loosen screw plug(Arrow) and drain oil.



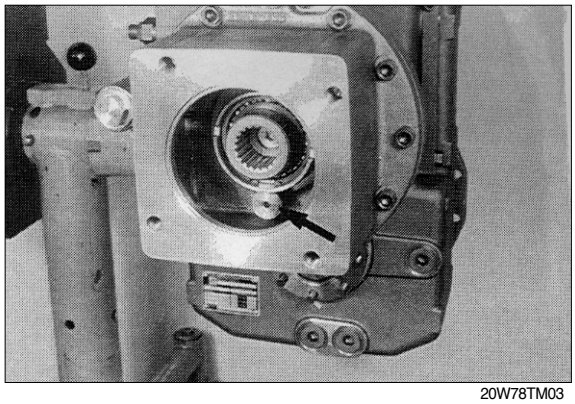
20W78TM301

(2) Remove the two lines, see Arrows.



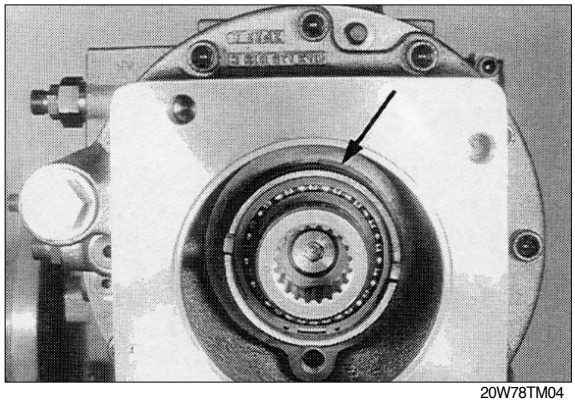
20W78TM02

(3) Remove locking screw, see Arrow.



20W78TM03

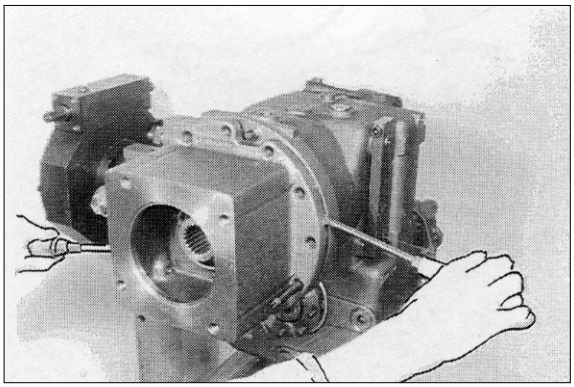
(4) Squeeze out snap ring(Arrow).



20W78TM04

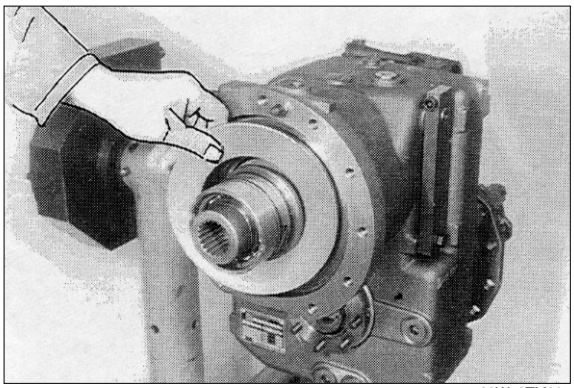
(5) Loosen socket head screws evenly, install two adjusting screws and separate drive casing from the gearbox.

※ Drive casing is spring-loaded.



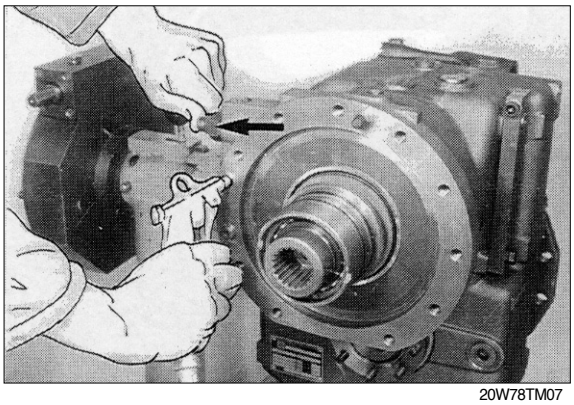
20W78TM05

(6) Remove the two cup springs.



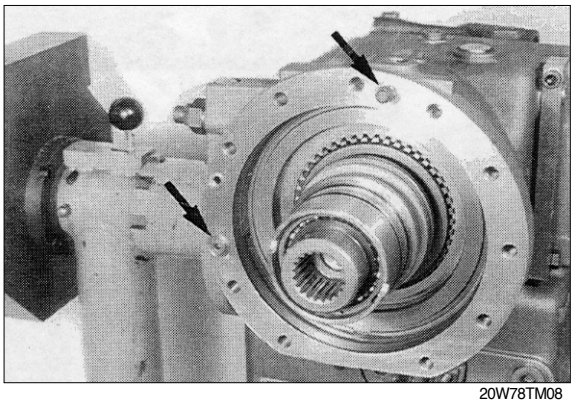
20W78TM06

(7) Close supply line(Arrow) and press piston out of the housing bore, using compressed air.



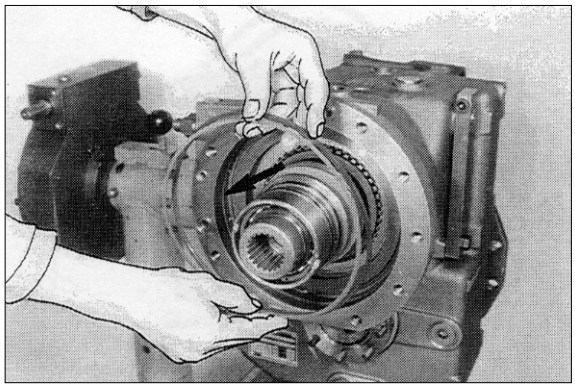
20W78TM07

(8) Remove screw plug and breather(Arrows).



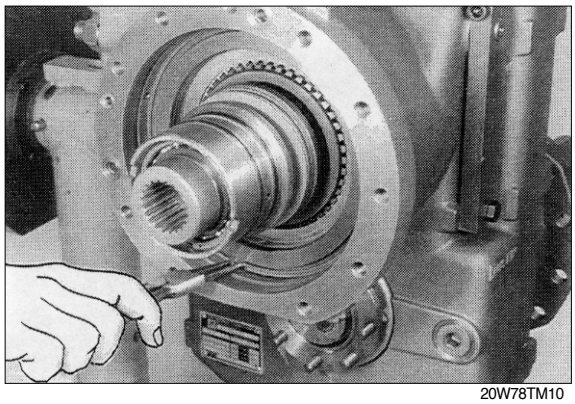
20W78TM08

(9) Remove seal ring and back-up ring from the ring groove of the housing(Arrow).



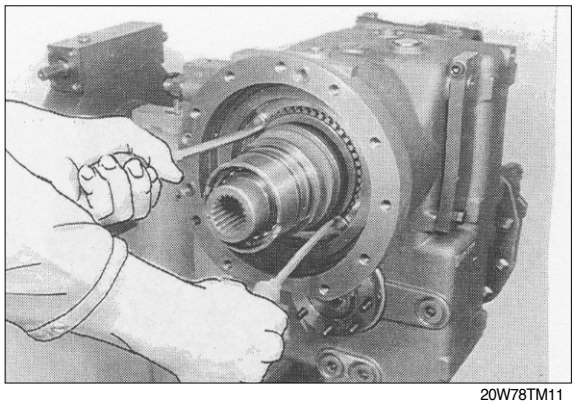
20W78TM09

(10) Squeeze out snap ring.



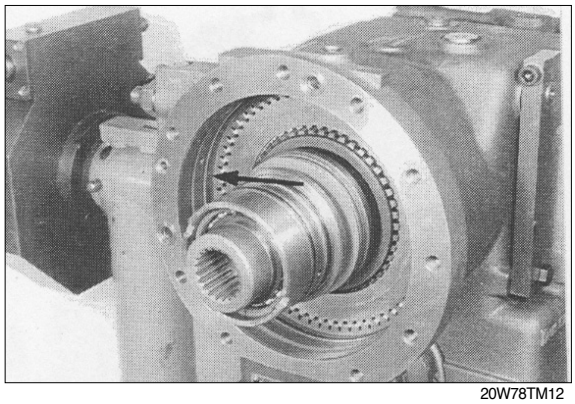
20W78TM10

(11) Pull gasket out of the housing bore, using offset screw driver.



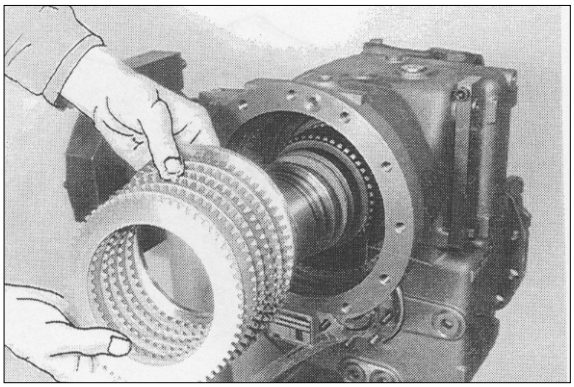
20W78TM11

(12) Remove O-ring(Arrow).



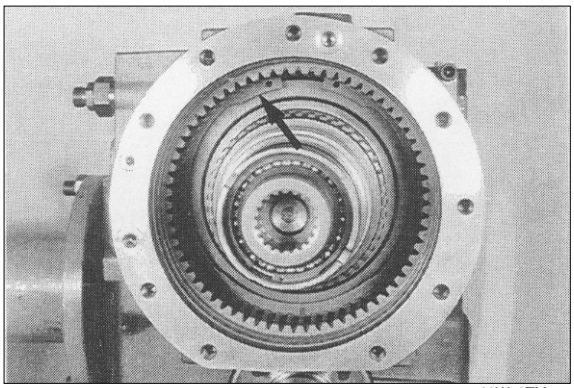
20W78TM12

(13) Remove plate pack and backing plate.



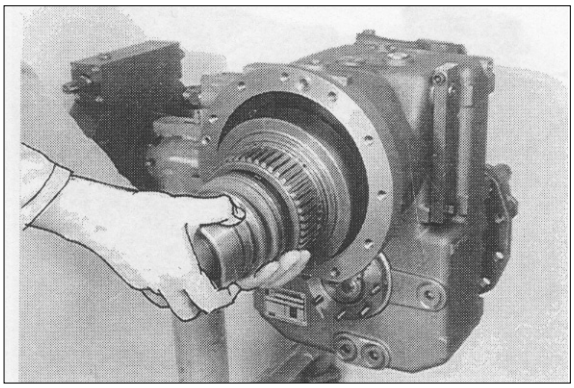
20W78TM13

(14) Squeeze out circlip(Arrow).



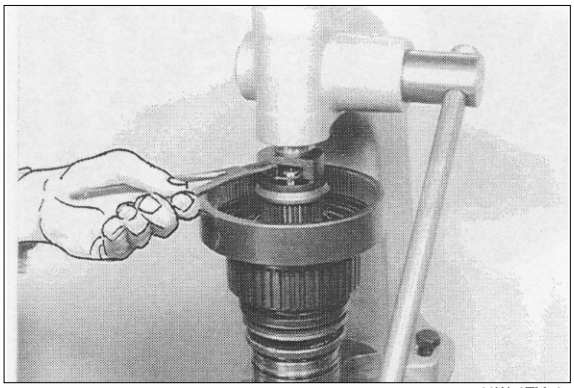
20W78TM14

(15) Remove clutch unit.



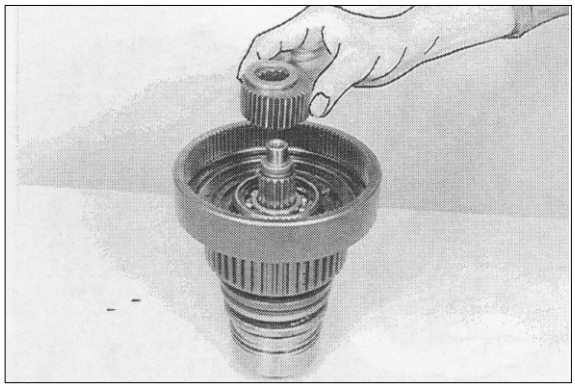
20W78TM15

(16) Fix sun gear axially by means of assembly jig, squeeze out circlip and relax the cup spring pack.



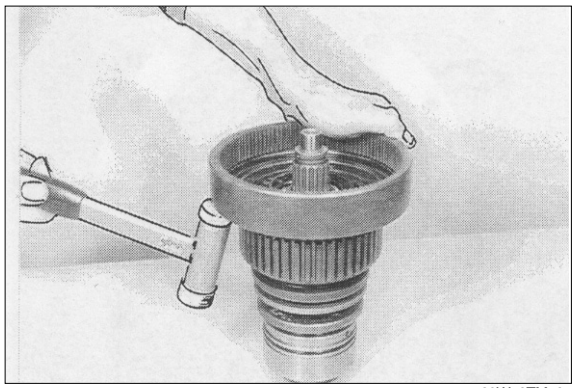
20W78TM16

(17) Remove released disk and sun gear.



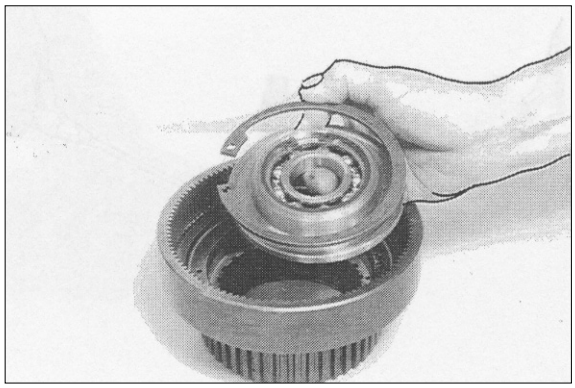
20W78TM17

(18) Separate internal gear from drive shaft.



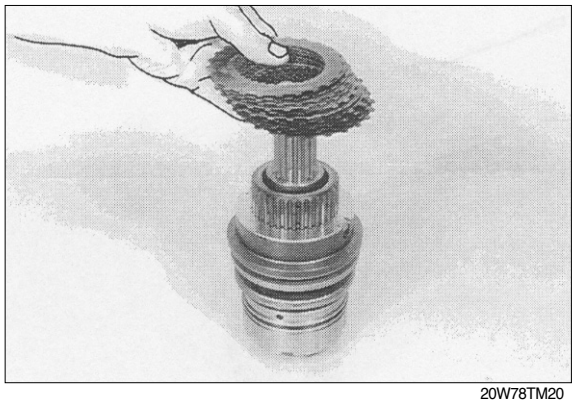
20W78TM18

(19) Squeeze out circlip and remove centering disk.



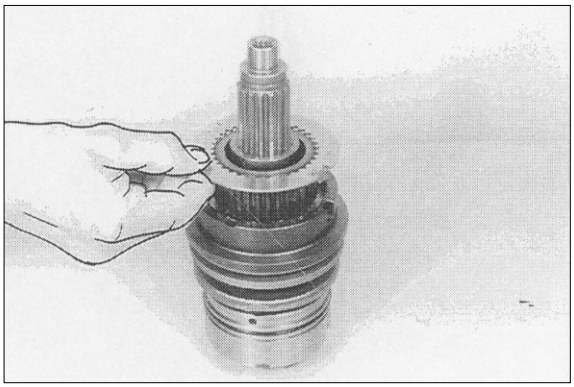
20W78TM19

(20) Remove plate pack.



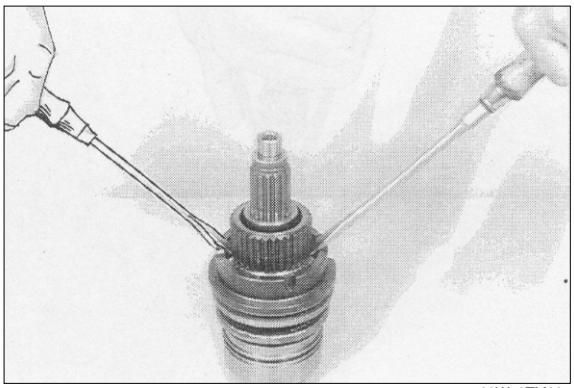
20W78TM20

(21) Remove plate.



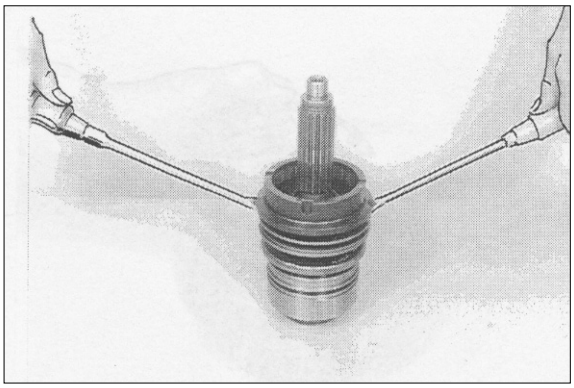
20W78TM21

(22) Pry inner plate carrier out of the piston.



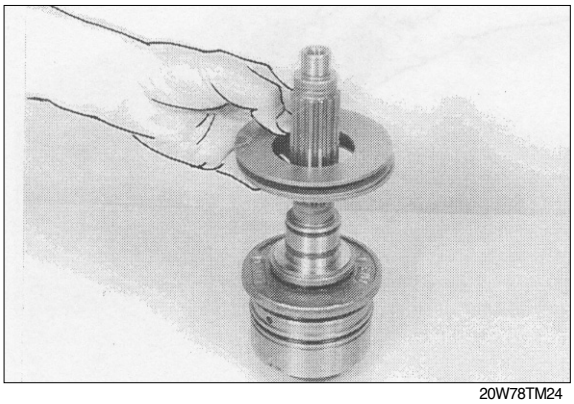
20W78TM22

(23) Pry off piston from the drive shaft.



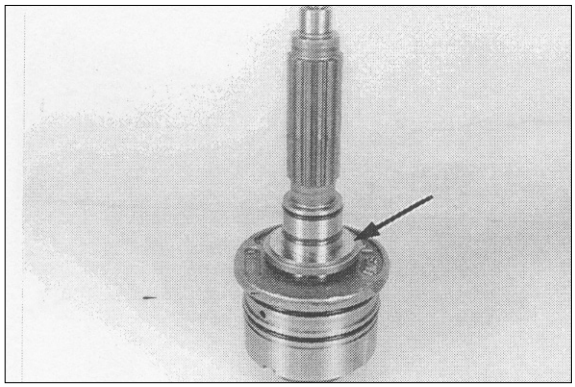
20W78TM23

(24) Remove cup spring pack.

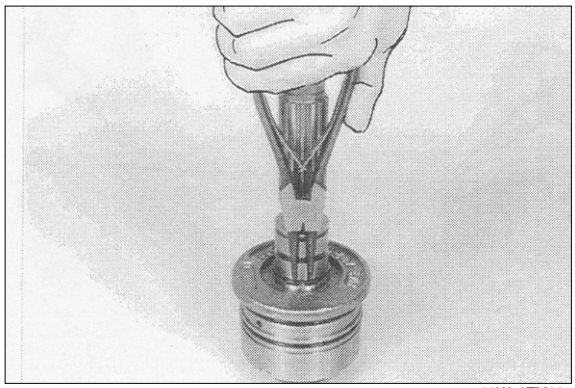


20W78TM24

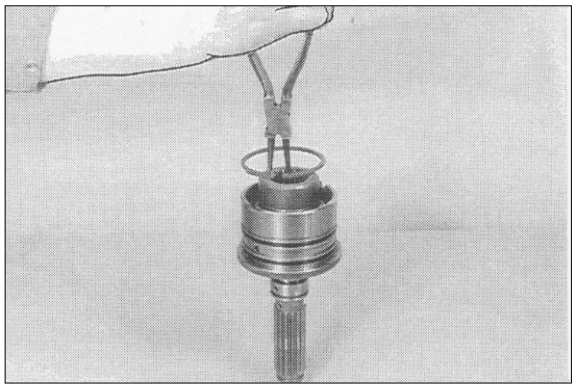
(25) Remove seal ring and O-ring.
Remove disk(Arrow).
※ Renew sealing components at any rate.


20W78TM25

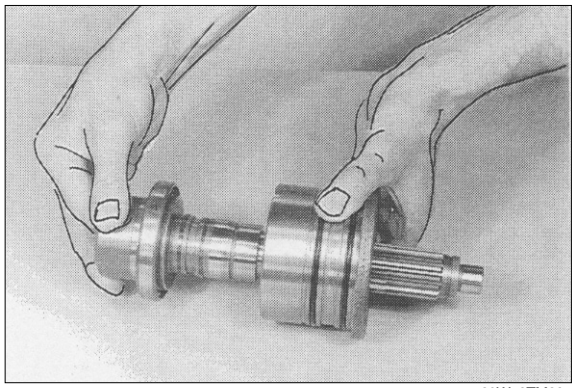
(26) Squeeze out circlip.


20W78TM26

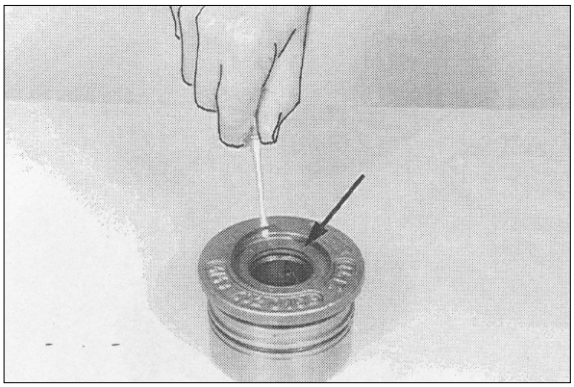
(27) Remove circlip from the ring groove of the guide bush(Ø85㎜).


20W78TM27

(28) Separate guide bush from drive shaft.

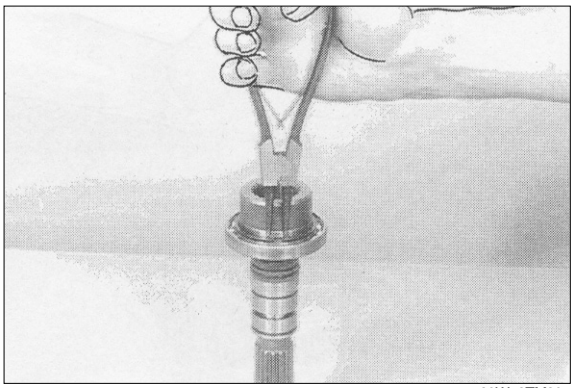

20W78TM28

(29) Squeeze out snap ring and remove shaft seal(Arrow).



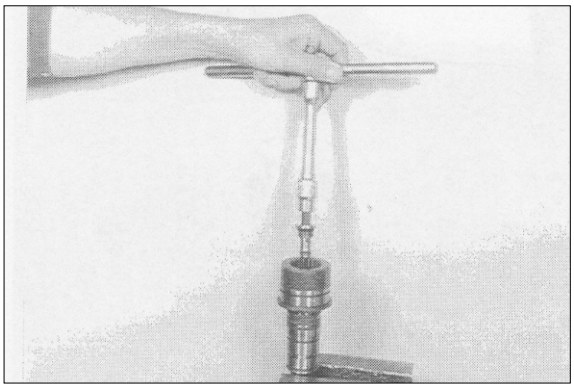
20W78TM29

(30) Squeeze out circlip and press bearing from shaft.



20W78TM30

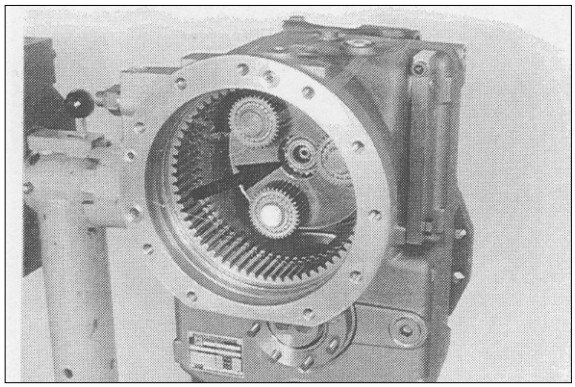
(31) Remove throttle valve.



20W78TM31

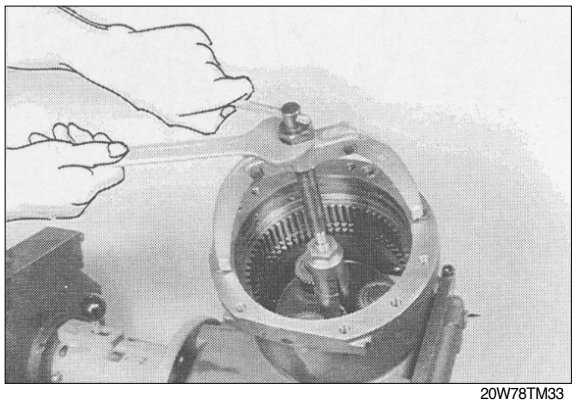
2) REMOVE AND DISASSEMBLE PLANETARY DRIVE

(1) Squeeze out circlip(Arrow).



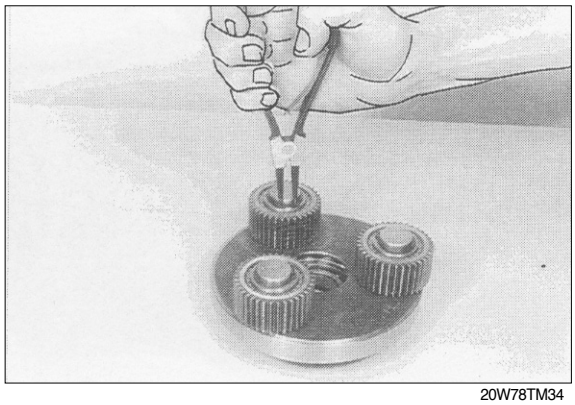
20W78TM32

(2) Tilt housing for 90°.
Separate and remove planetary carrier from helical gear, using internal puller.



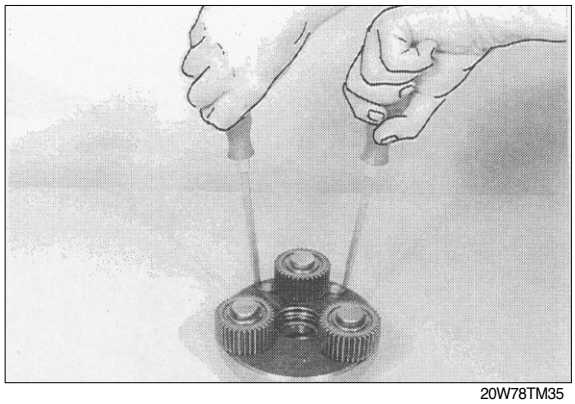
20W78TM33

(3) Squeeze out circlip.



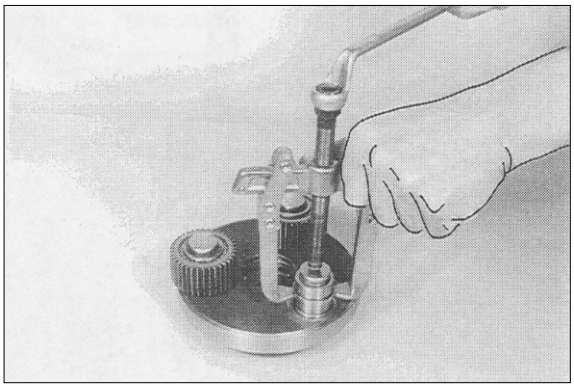
20W78TM34

(4) Pry off planetary gear from planetary shaft, using offset screw driver.
Remove released components.



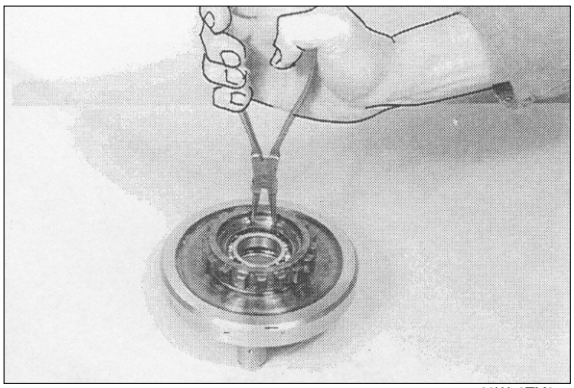
20W78TM35

(5) Pull off bearing inner race.



20W78TM36

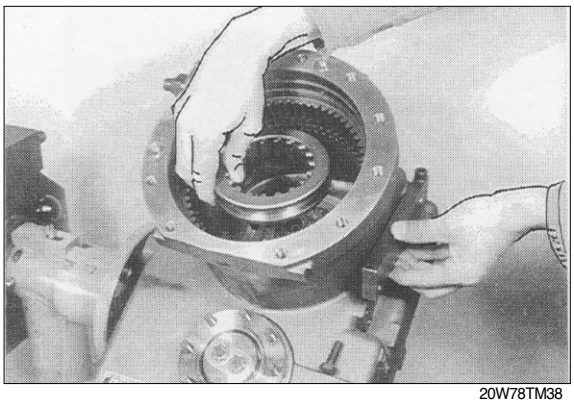
(6) Squeeze out circlip and remove ball bearing.



20W78TM37

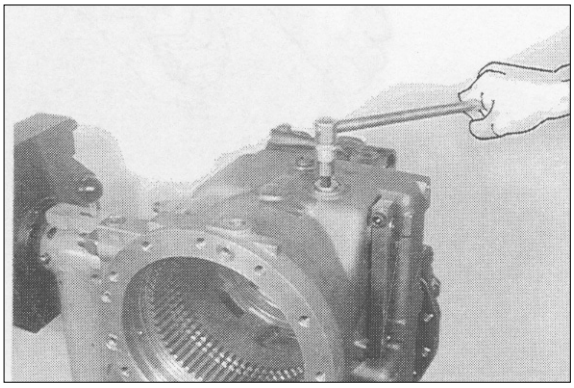
3) REMOVE AND DISASSEMBLE DECLUTCH UNIT AND SPUR GEAR

(1) Loosen hex head screw(shift lever locking) and remove sliding collar along with sliding blocks.



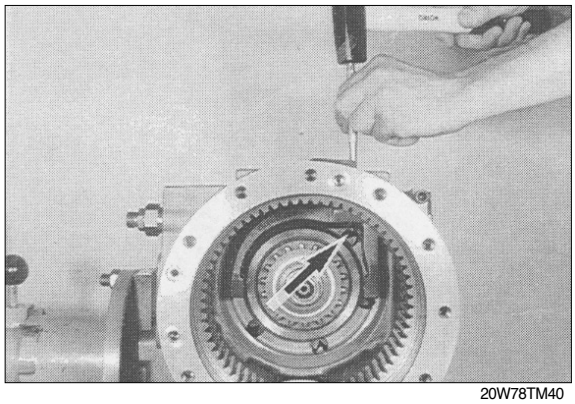
20W78TM38

(2) Loosen screw plug.



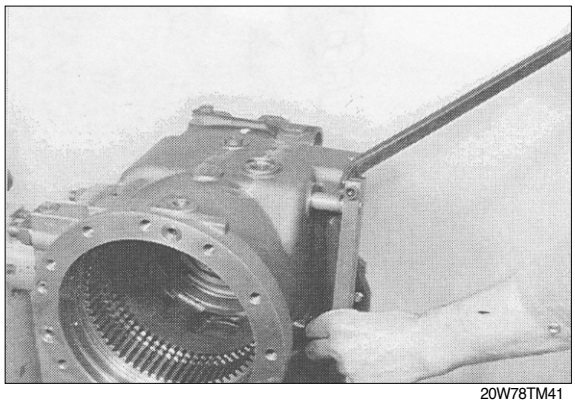
20W78TM39

(3) Drive out roll pin(Arrow).



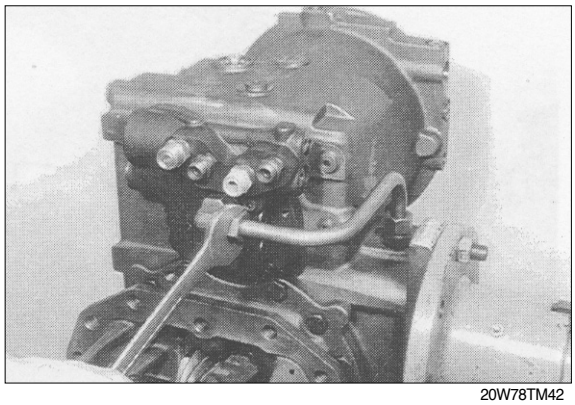
20W78TM40

(4) Pry shift lever out of the housing bore and remove released shift fork.



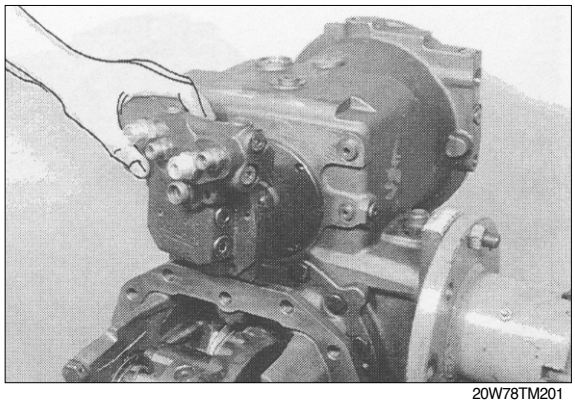
20W78TM41

(5) Remove suction line.



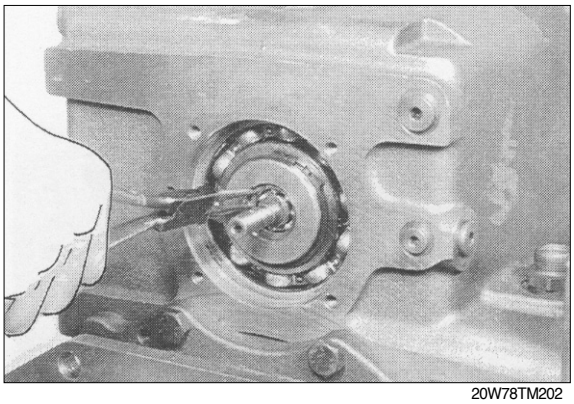
20W78TM42

(6) Loosen socket head screws and separate shift lock from housing.



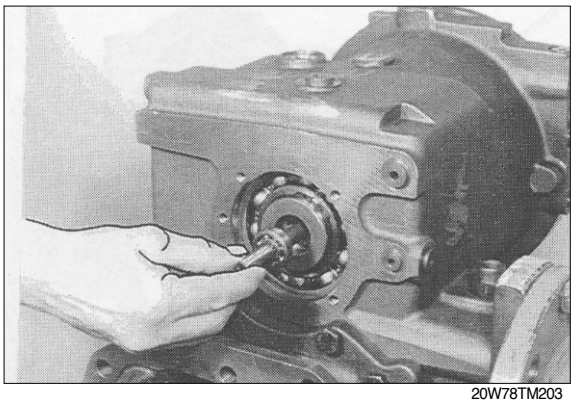
20W78TM201

(7) Squeeze out circlip.



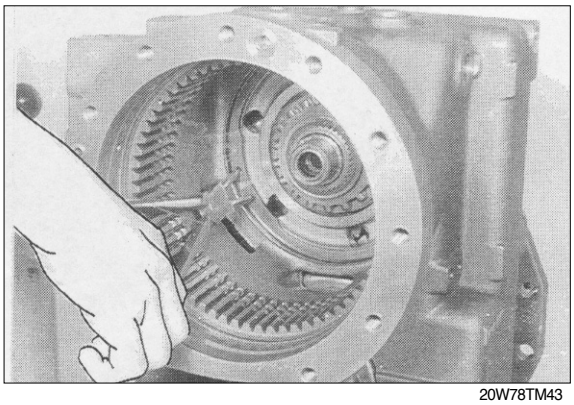
20W78TM202

(8) Remove pump shaft.



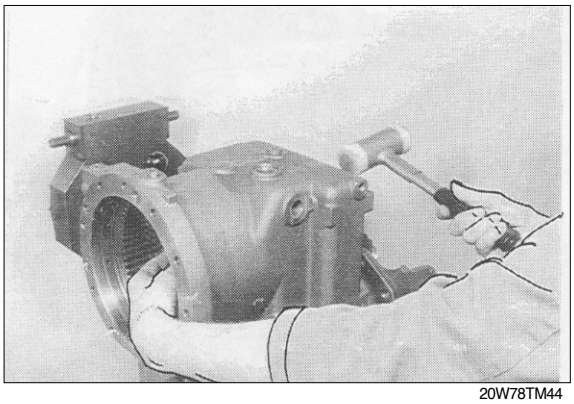
20W78TM203

(9) Squeeze out circlip.

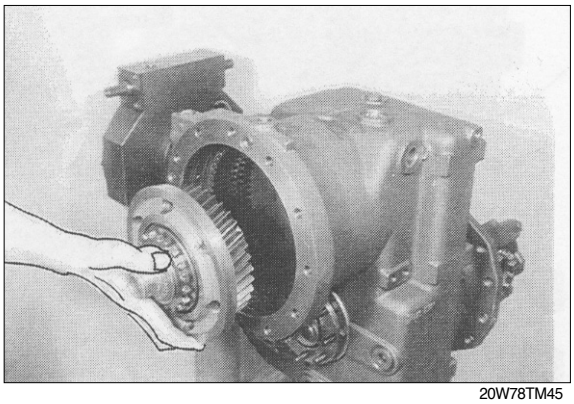


20W78TM43

(10) Pry off helical gear and take it out of the housing.

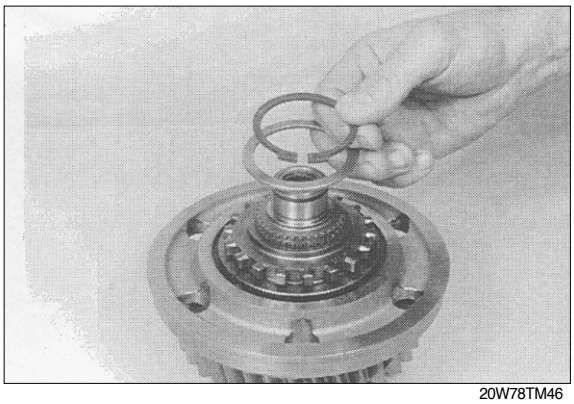


20W78TM44



20W78TM45

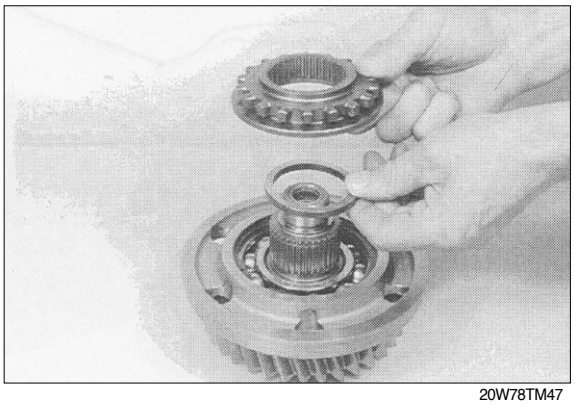
(11) Squeeze out circlip and remove shim.



20W78TM46

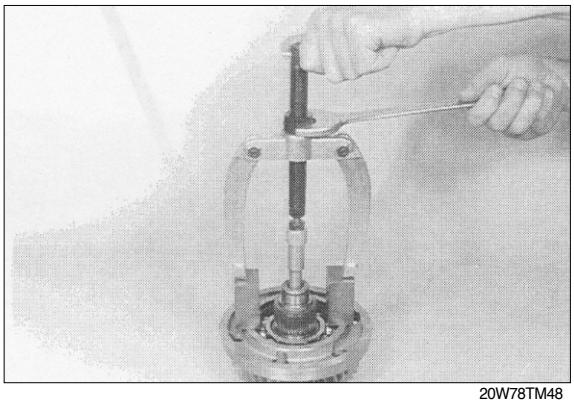
(12) Remove shift dog and spacer.

※ According to the design, with or without spacer, see Parts manual.



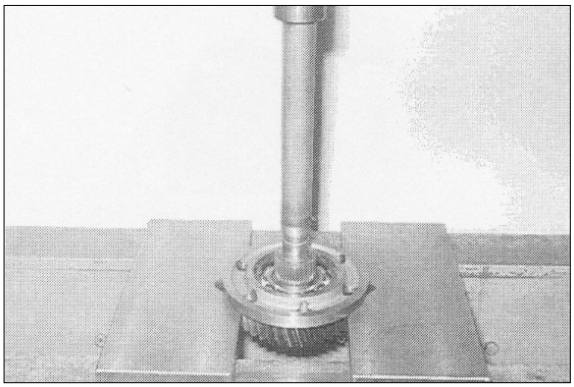
20W78TM47

(13) Pull needle bearing out of the housing bore, using internal puller.



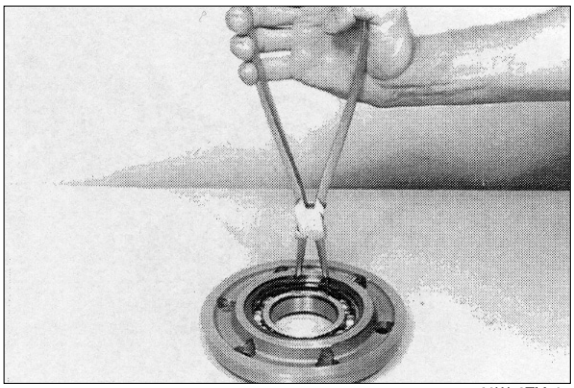
20W78TM48

(14) Press helical gear from bearing cap.



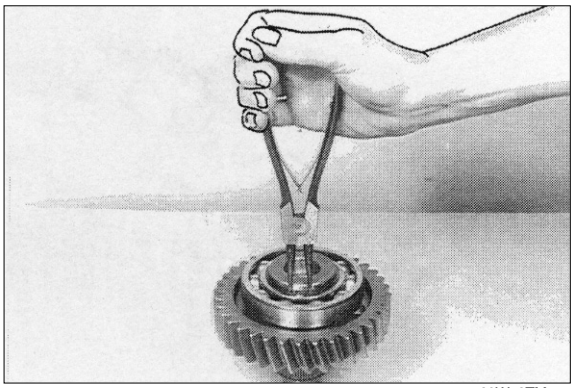
20W78TM49

(15) Squeeze out circlip and press ball bearing out of the bearing cap.



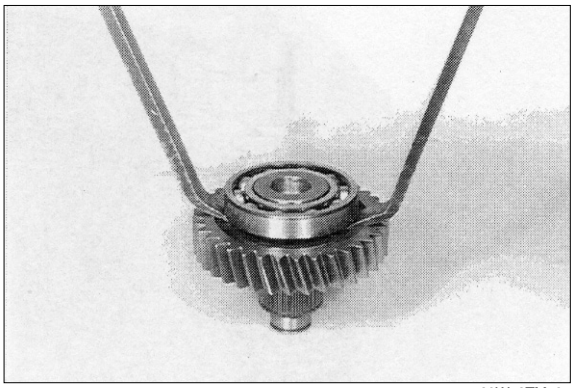
20W78TM50

(16) Squeeze out circlip.



20W78TM51

(17) Pry off ball bearing from helical gear collar.



20W78TM52

4) DISASSEMBLE FINAL DRIVE(Separate gearbox installation)

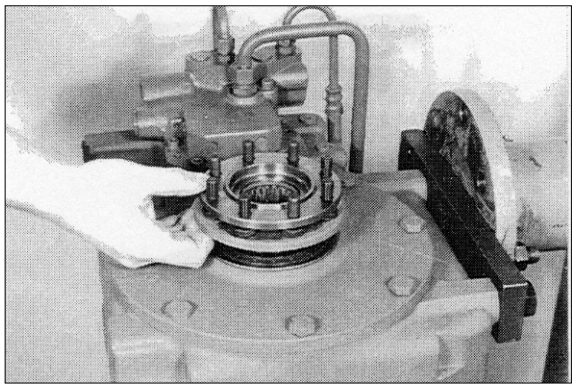
(1) Unlock and loosen hex head screws and remove output flange.

20W78TM53

(2) Pry shaft out of the housing bore.

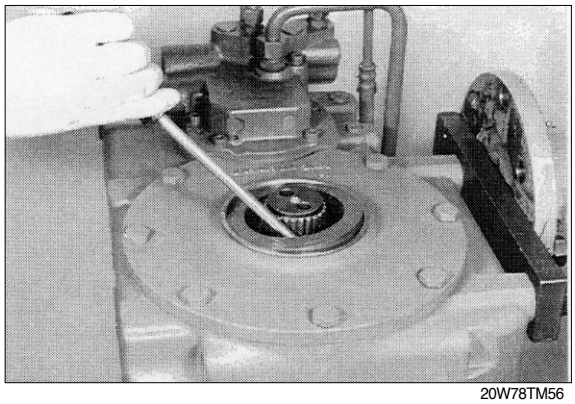
20W78TM54

(3) Tilt housing 180°.
Unlock and loosen hex head screws and remove output flange.



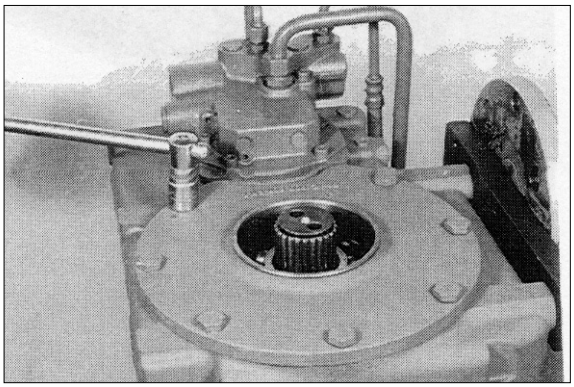
20W78TM55

(4) Remove shaft seal.



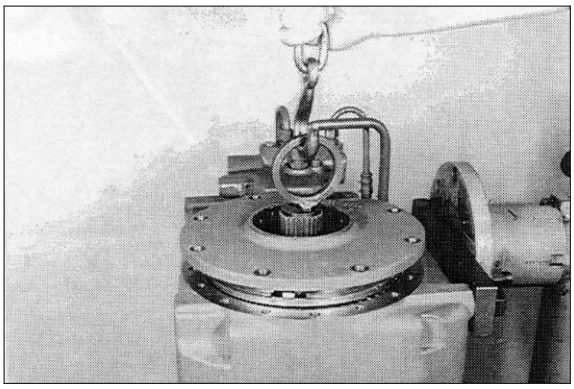
20W78TM56

(5) Loosen hex head screws.



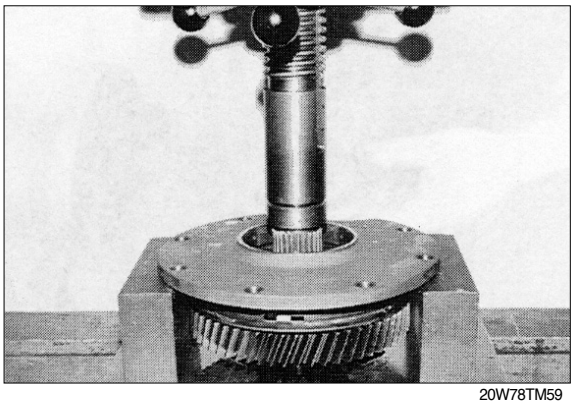
20W78TM57

(6) Separate output gear along with cover from the gear case, using hoist.



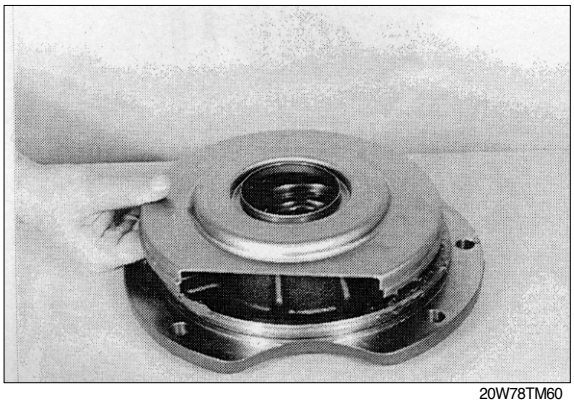
20W78TM58

(7) Press output gear out of the bearing cap, reps. out of the ball bearing.



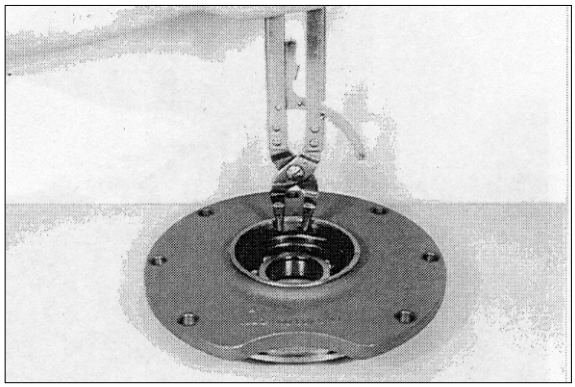
20W78TM59

(8) Remove oil baffle plate.



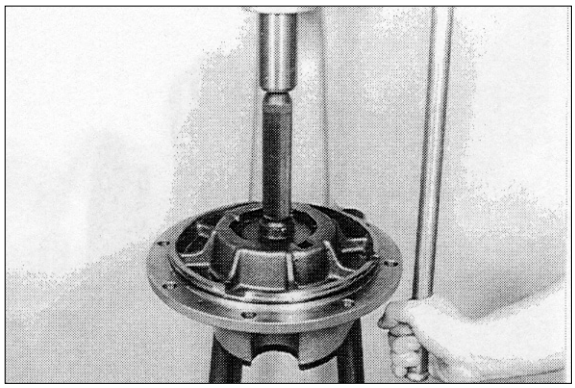
20W78TM60

(9) Squeeze out circlip.



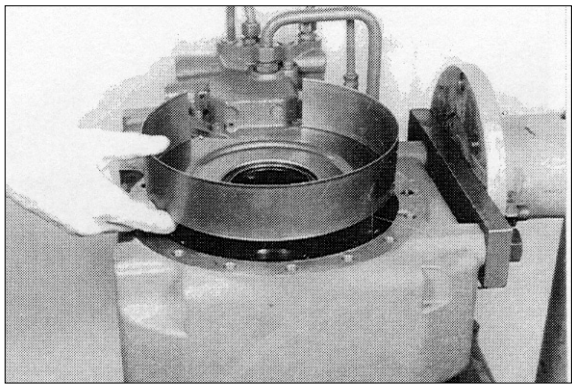
20W78TM61

(10) Press ball bearing out of the bearing bore.



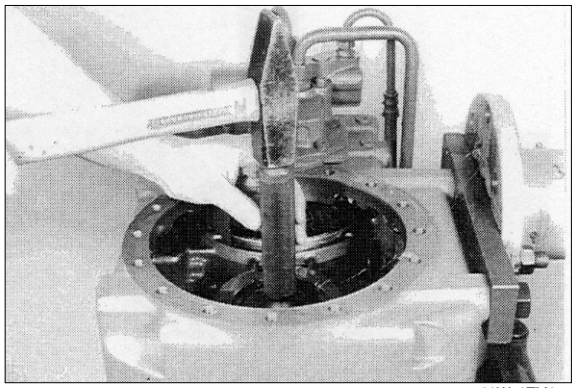
20W78TM62

(11) Remove oil baffle plate.



20W78TM63

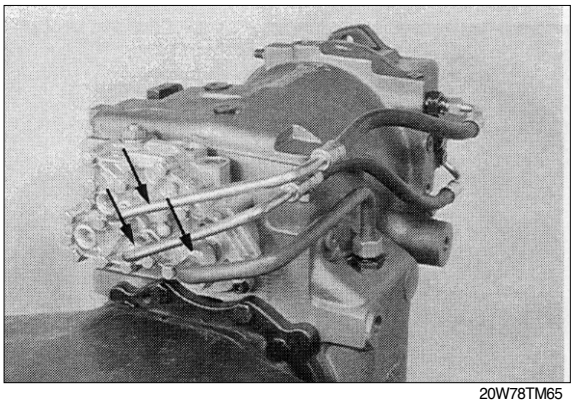
(12) Drive ball bearing out of the bearing bore.



20W78TM64

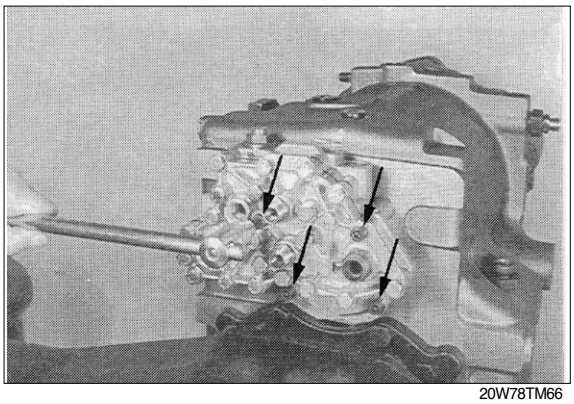
5) DISASSEMBLE ALUMINUM DIE-CAST GEAR BOX CONTROL

(1) Separate oil pipe as well as hose lines from the cover.



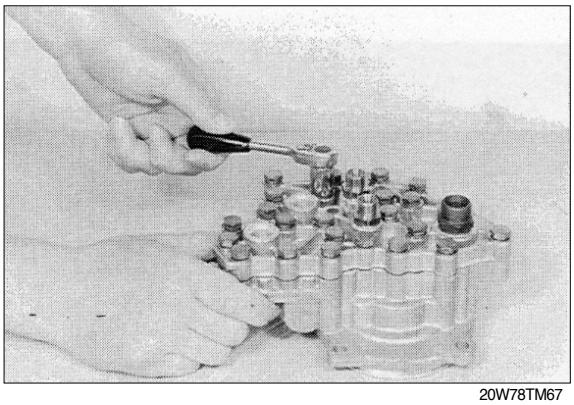
20W78TM65

(2) Loosen socket head screws(4EA, see Arrows) and separate shift lock from transmission case.



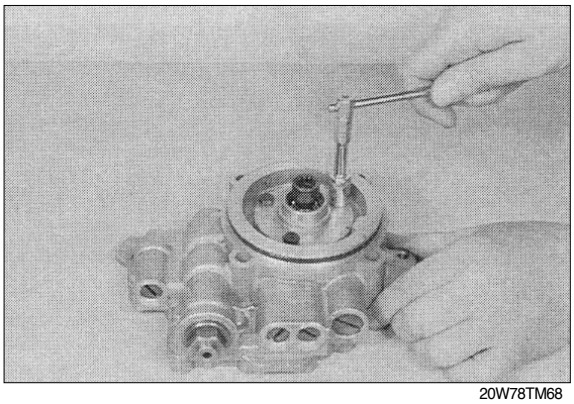
20W78TM66

(3) Loosen all hex head screws and separate cover as well as gasket from the case.



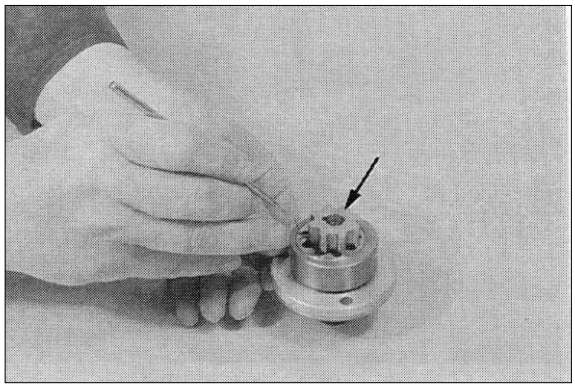
20W78TM67

(4) Loosen hex head screws and separate pump cover from the case.



20W78TM68

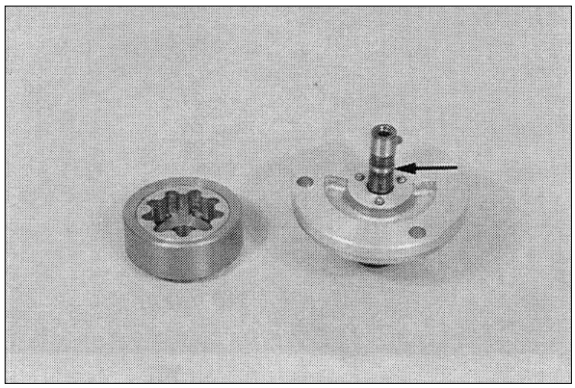
(5) Pull internal rotor(Arrow) from the pump shaft.



20W78TM69

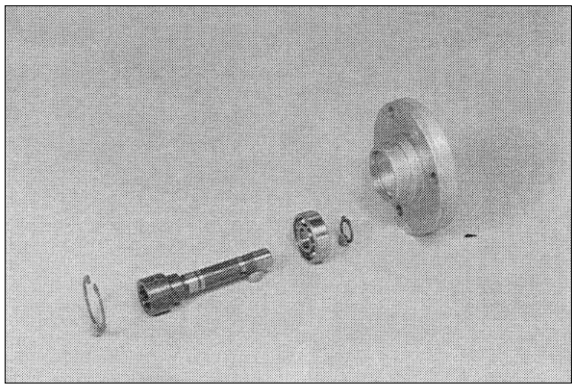
(6) Remove the ball(position see Arrow) and pull the control case along with the external rotor from the pump shaft.

※ Pay attention to the released balls and compression springs.



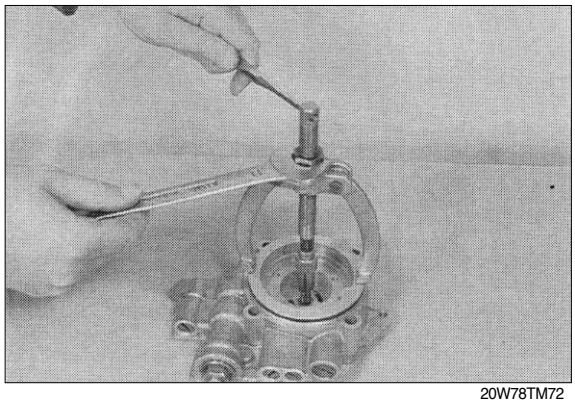
20W78TM70

(7) Remove the pump shaft.



20W78TM71

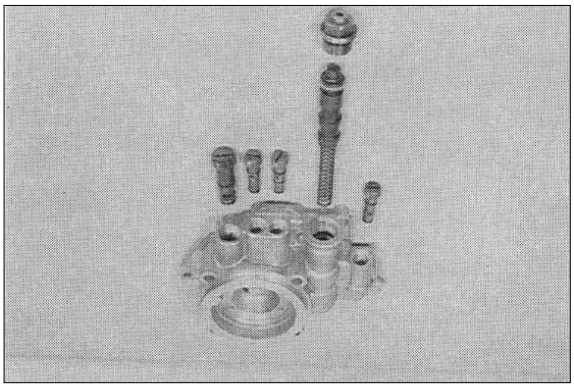
(8) Pull needle cage out of the case bore.



20W78TM72

(9) Remove check valves and spool.

※ Mark the installation position of the single check valves.

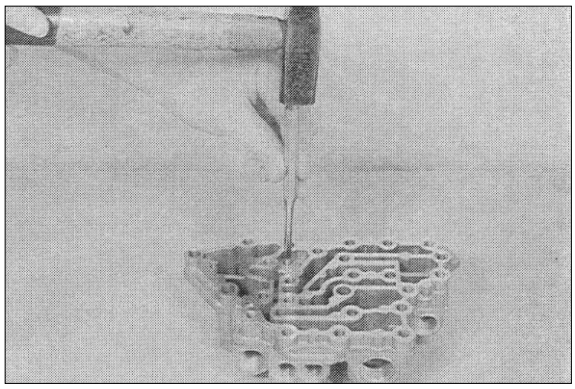


20W78TM73

4. ASSEMBLY

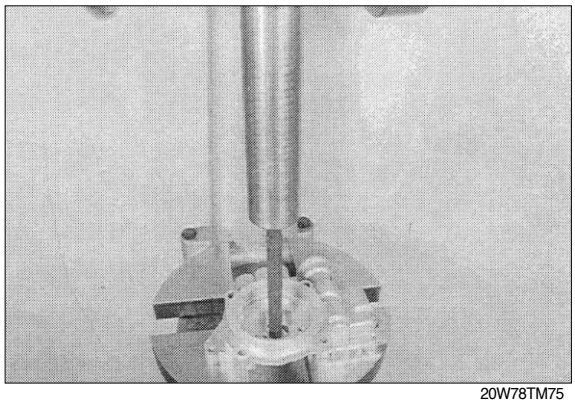
1) REASSEMBLE ALUMINUM DIE-CAST GEAR BOX CONTROL

(1) Wet contact surface of the orifice with loctite and insert orifice until contact is obtained.
Now, clean the orifice by means of compressed air from loctite residues.



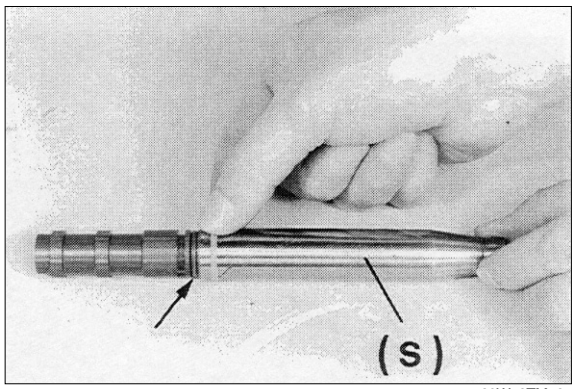
20W78TM74

(2) Install needle cage.
※ By application of the prescribed drift, the required installation depth of 0.2 + 0.5㎜ is obtained.
install the needle cage with the reinforced shell facing the pressing tool.



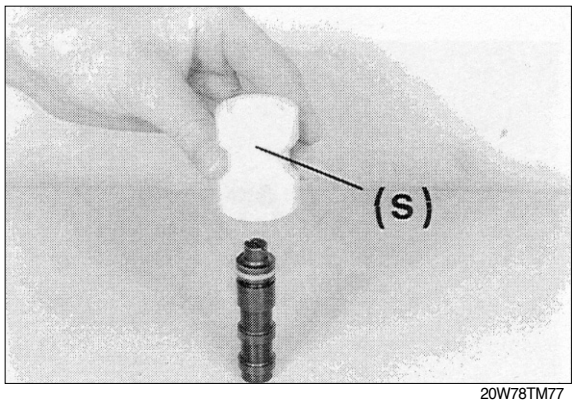
20W78TM75

(3) Install gasket(composed of plastic ring and O-ring).
Insert O-ring(Arrow) into the annular groove of the spool.
Guide the plastic ring by means of installer(S) over the spool and position it on the O-ring.



20W78TM76

(4) Calibrate plastic ring by means of bush (S).



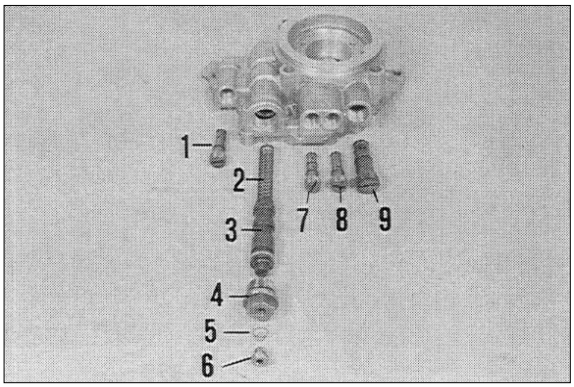
20W78TM77

(5) Install components according to the illustration.

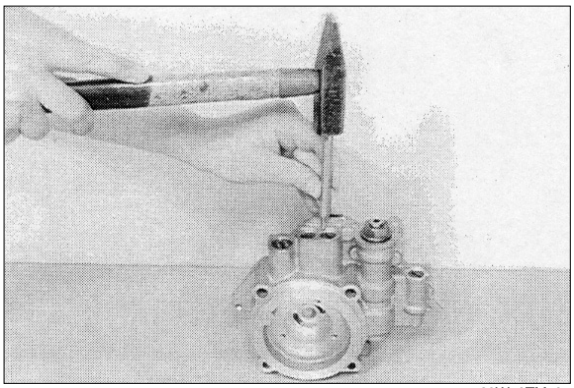
※ Pay attention to the installation position of the different check valves.

Oil components.

1	Check valve	1.0kg · m
2	Compression spring	
3	Spool	
4	Screw plug	5.1kg · m
5	Seal ring	
6	Screw plug	2.0kg · m
7	Check valve	1.0kg · m
8	Check valve	1.0kg · m
9	Pressure limiting valve	1.0kg · m



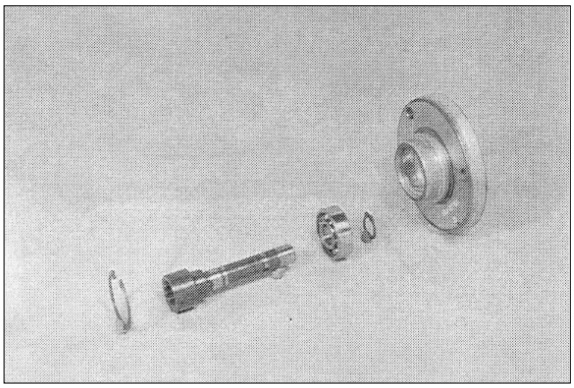
20W78TM78


20W78TM79

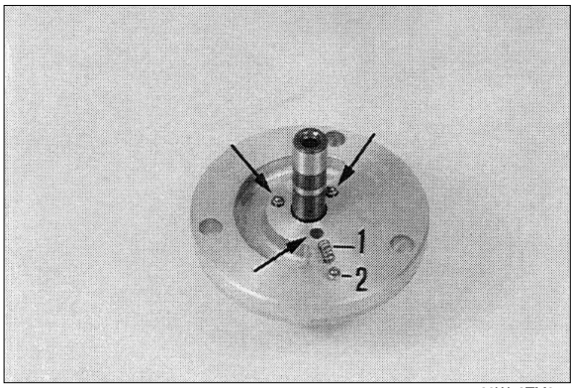
※ Equip all check valves as well as pressure limiting valves with new O-rings.

Secure check valves and pressure limiting valves(items 1, 7, 8 and 9) by centerpunching each of them twice.

Pre-assemble pump cover according to the illustration.


20W78TM80

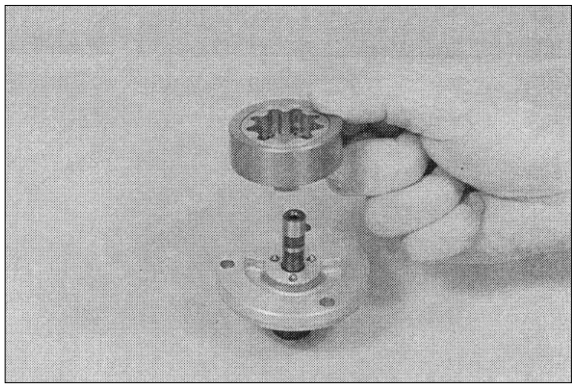
(6) Insert compression spring(1) and balls(2) with grease into the bores(Arrows) of the pump cover.



20W78TM81

(7) Oil pump.

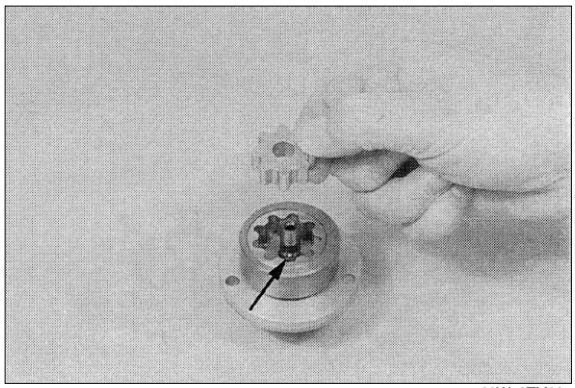
※ The rotor set(Composed of control case, external and internal rotor) may be exchanged only completely.
Assemble control case along with the external rotor.



20W78TM82

(8) Insert ball with grease into the countersinking of the pump shaft(Arrow) and assemble the internal rotor.

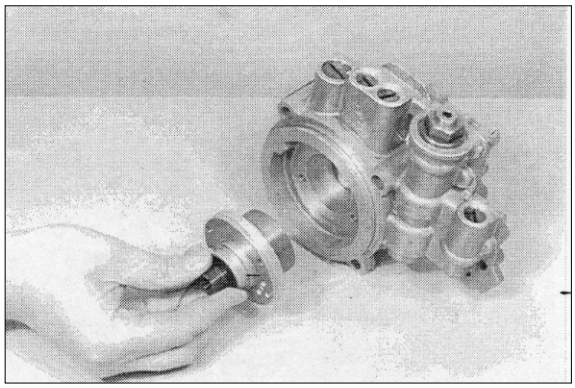
※ The drive of the internal rotor is realized by the ball.
Pay attention to the exact installation position.



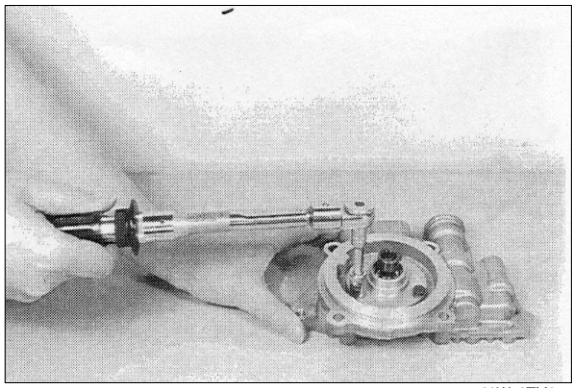
20W78TM83

(9) Insert pre-assembled pump cover into the case bore and fasten it by means of hex head screws(M6).

※ Oil the rotor set.
· Tightening torque : 0.97kgf · m(7.0lb · ft)

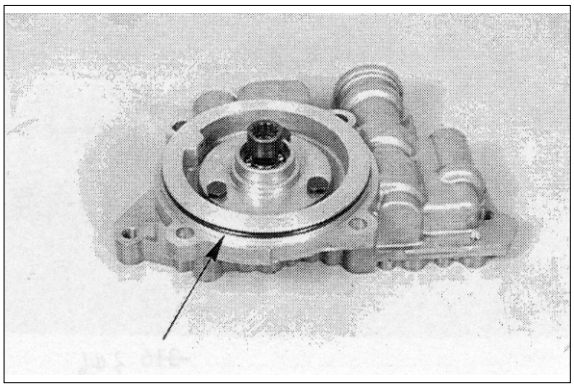


20W78TM84



20W78TM85

(10) Insert O-ring into the annular groove (Arrow) and grease it.



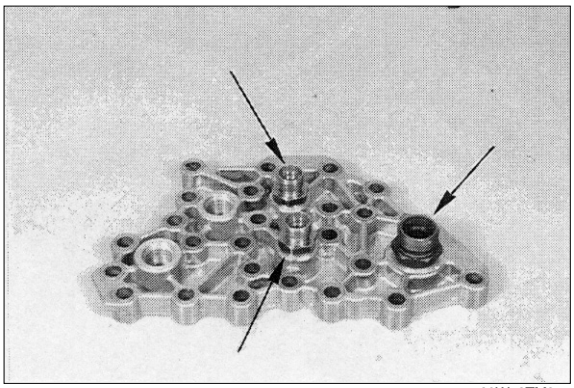
20W78TM86

(11) Install both adapters as well as the threaded socket.

※ Install new O-rings.

· Tightening torque(Adapter) : 2.5kgf · m (18lbf · ft)

· Tightening torque(Threaded socket) : 3.6kgf · m(26.0lbf · ft)



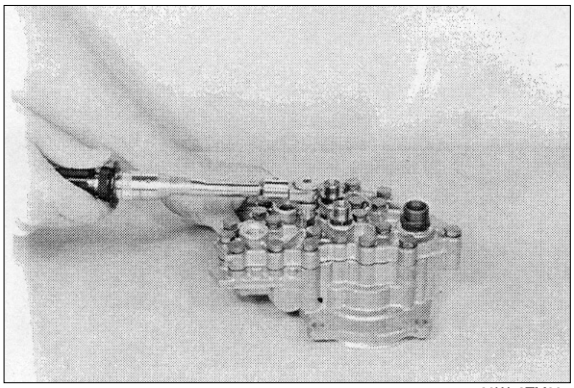
20W78TM87

(12) Install two adjusting screws(M8). Assemble gasket and cover.

20W78TM88

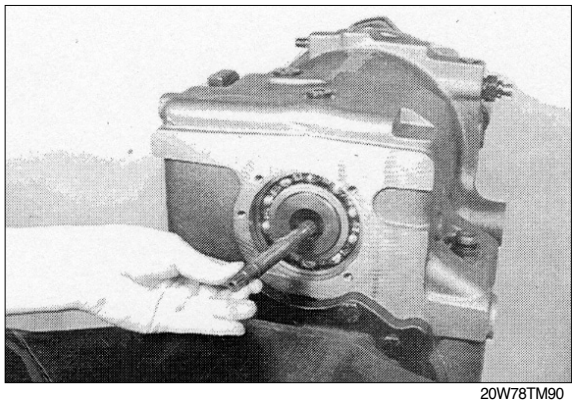
(13) Fasten cover by means of hex head screws(Mount flat washers).

· Tightening torque : 2.0kgf · m(14.7lb · ft)



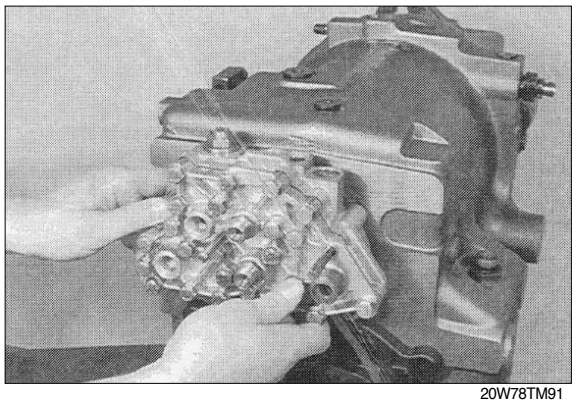
20W78TM89

(14) Introduce pump shaft until the splines are engaged.



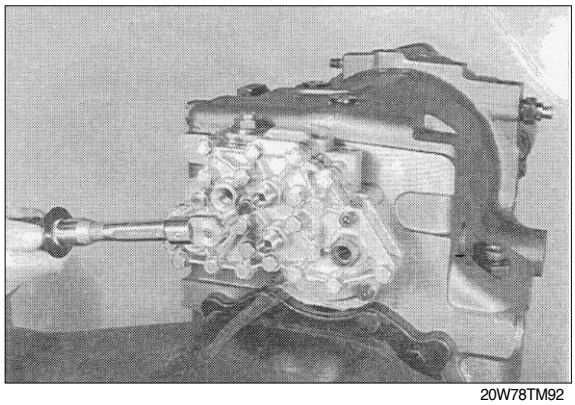
20W78TM90

(15) Install two adjusting screws and place the shift lock against the transmission case until contact is obtained.
Adjusting screw(M8).



20W78TM91

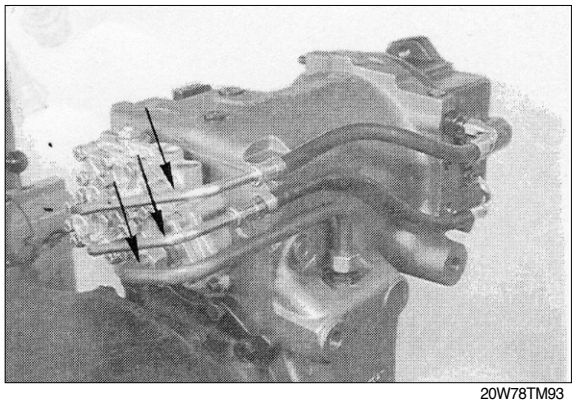
(16) Fasten the shift lock on the transmission case, using socket head screws(mount flat washers).
· Tighten torque : 2.3kgf · m(17.0lb · ft)



20W78TM92

(17) Install oil pipe as well as hose lines (Arrows) according to the figure.

※ Before the unit is put into service, pay attention to the instructions for operation and maintenance.



20W78TM93

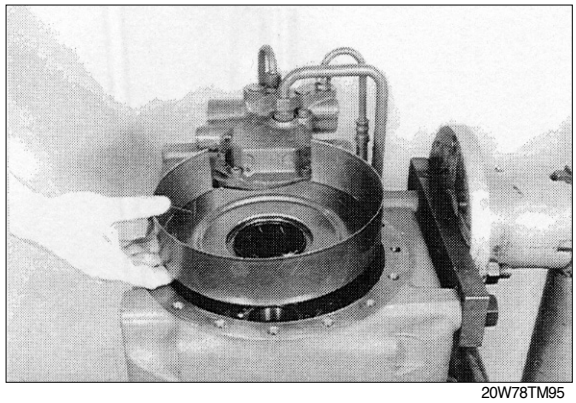
2) REASSEMBLE FINAL DRIVE

(1) Undercool ball bearing and insert it firmly against shoulder.

20W78TM94

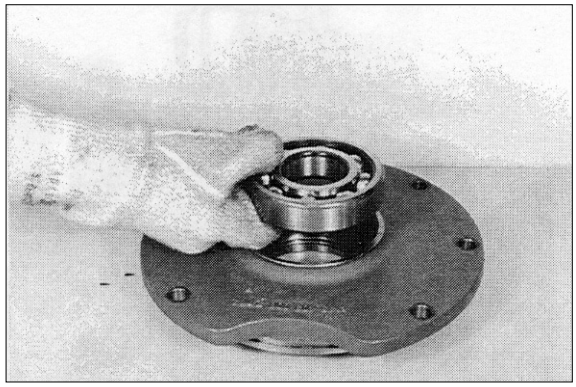
(2) Insert baffle plate firmly against shoulder.

※ Pay attention to the radial installation position.



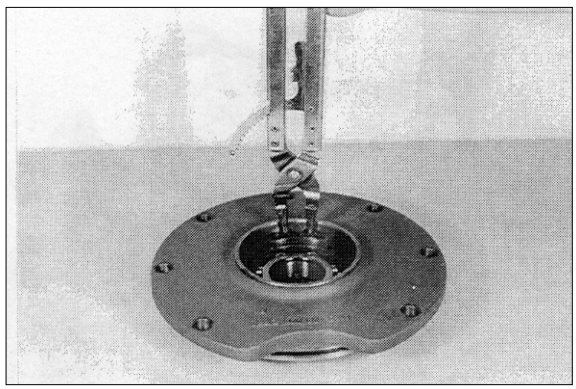
20W78TM95

(3) Undercool ball bearing and insert it in the bore of the bearing cap until contact is obtained.



20W78TM96

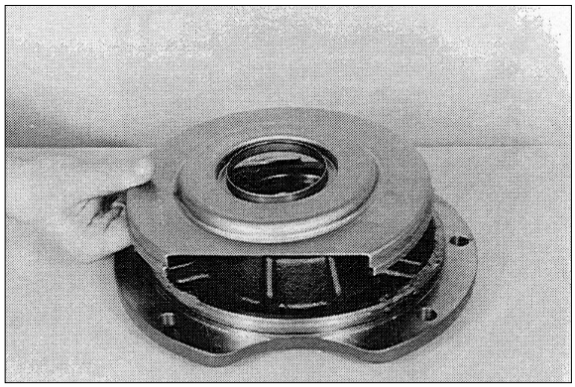
(4) Fix ball bearing by means of circlip.



20W78TM97

(5) Install oil baffle plate.

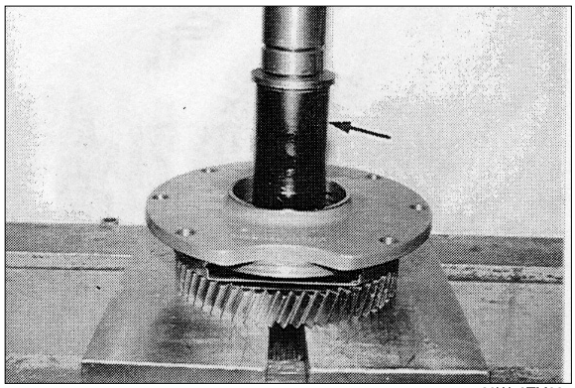
※ Pay attention to the radial installation position.



20W78TM98

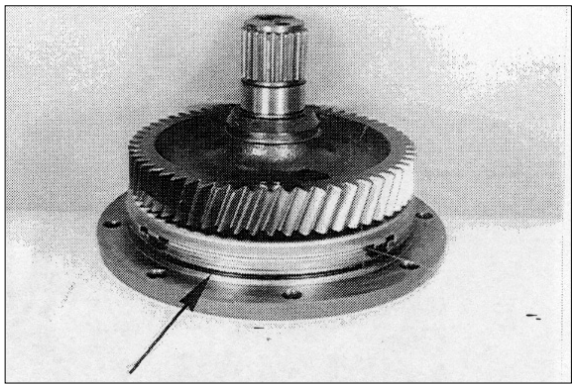
(6) Press bearing cap upon the short side of the output gear.

※ To avoid a damage to the ball bearing, apply pressing sleeve(Arrow) on the bearing inner race.



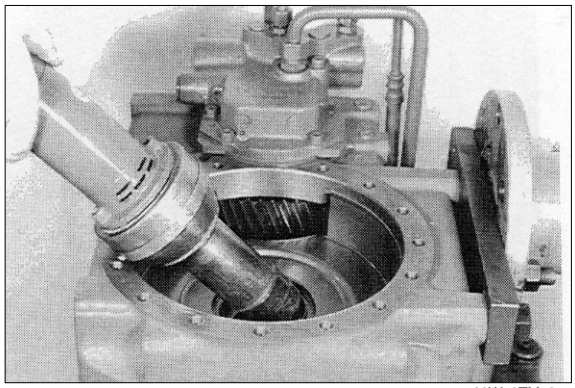
20W78TM99

(7) Insert O-ring(Arrow) in the ring groove and grease it.

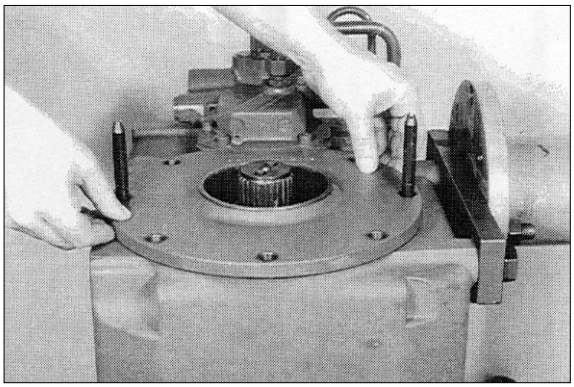


20W78TM100

(8) Heat ball bearing, install two adjusting screws and assemble bearing cap until contact is obtained.

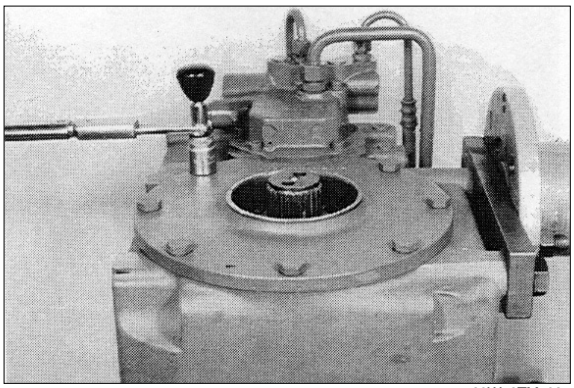


20W78TM101



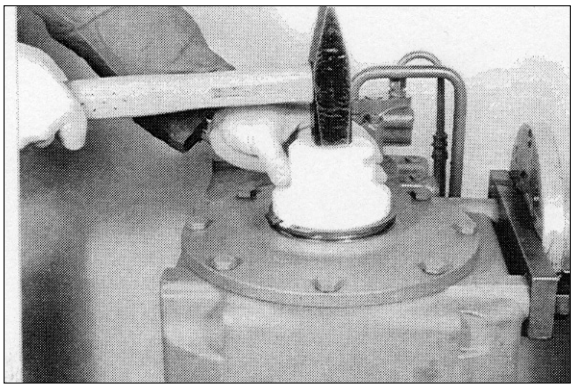
20W78TM102

(9) Fasten bearing cap by means of hex head screws(M12).
· Tightening torque : 8.0kgf · m(58.3lb · ft)



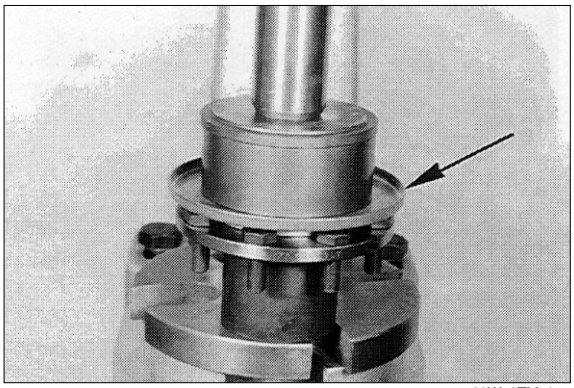
20W78TM103

(10) Install shaft seal.
※ By application of the prescribed driver, the exact installation position is obtained.
If the outer diameter is rubber-coated, wet the sealing surface with spirit.
Otherwise, use sealing compound(Curil T).
Fill cavity between sealing lip and dust lip with grease.



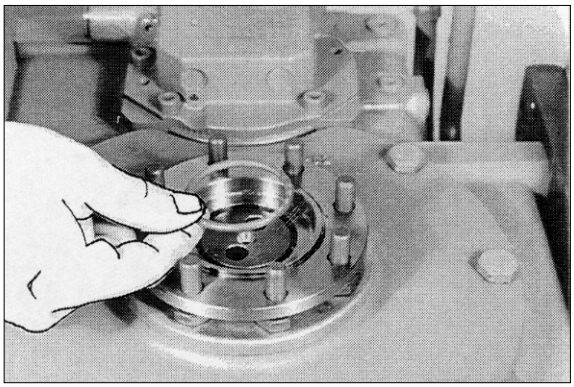
20W78TM104

(11) Insert hex head screws in the bores of the output flange and press dust plate (Arrow) against shoulder.
Pre-assemble the opposite output flange accordingly.

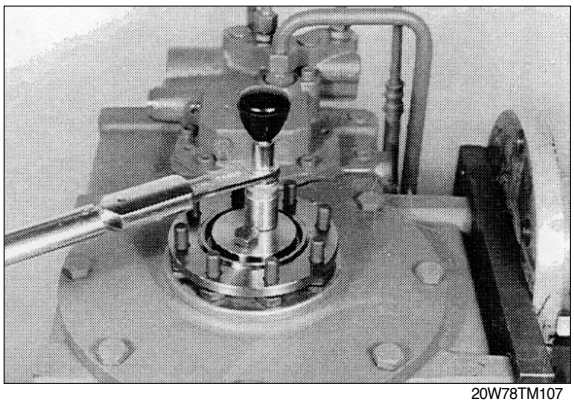


20W78TM105

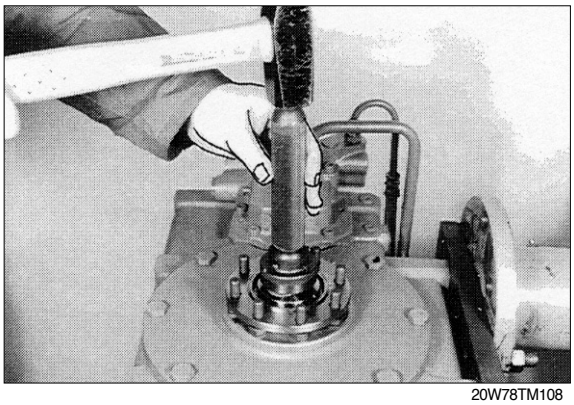
(12) Assemble output flange.
Grease O-ring and insert it in the gap of output flange/output gear.


20W78TM106

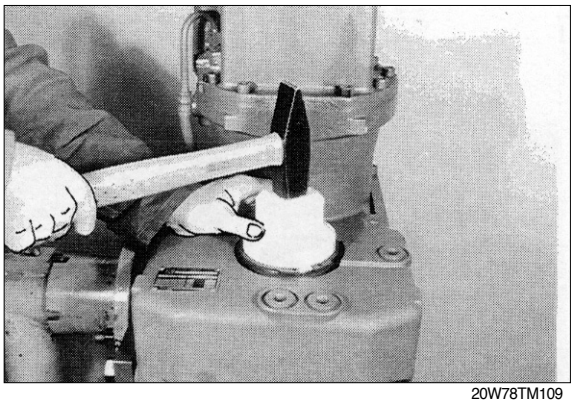
(13) Mount washer and fix output flange by means of hex head screws(M10).
· Tightening torque : 4.7kgf · m(33.9lb · ft)


20W78TM107

(14) Fix hex head screws by means of lock plate.


20W78TM108

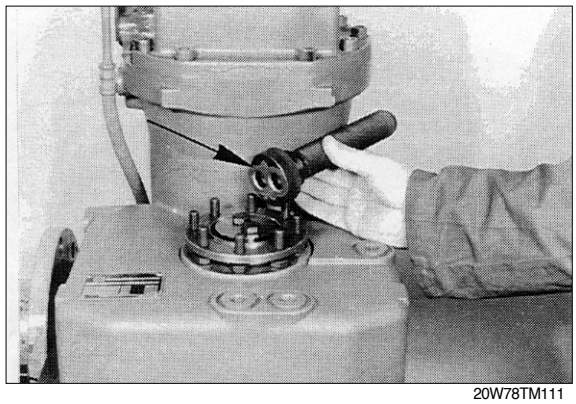
(15) Tilt gear case 180°.
Install shaft seal.
※ By application of the prescribed driver, the exact installation position is obtained.
If the outer diameter is rubber-coated, wet the sealing surface with spirit.
Otherwise, use sealing compound(Curl T).
Fill cavity between sealing lip and dust lip with grease.


20W78TM109

(16) Assemble output flange.
Grease O-ring and insert it in the gap of output flange/output gear.

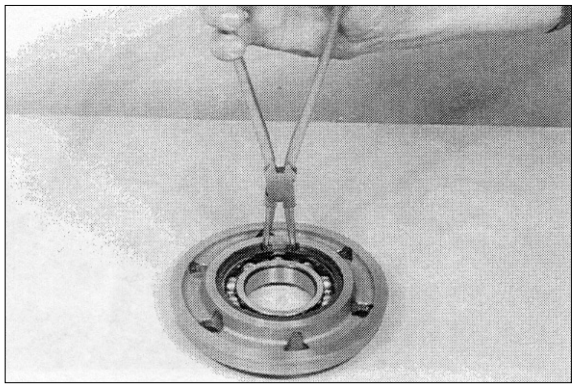

20W78TM110

(17) Mount washer and fasten output flange by means of hex head screws.
Now, fix hex head screws(M10) by means of lock plate(Arrow).
· Tightening torque : 4.7kgf · m(33.9lb · ft)


20W78TM111

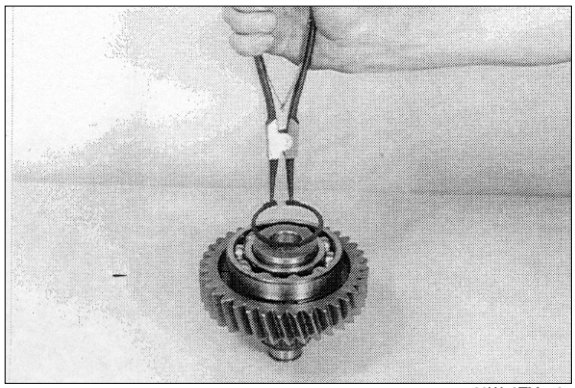
3) REASSEMBLE HELICAL GEAR AND DECLUTCH UNIT

(1) Insert ball bearing into the bearing cover until contact is obtained and fix with circlip.



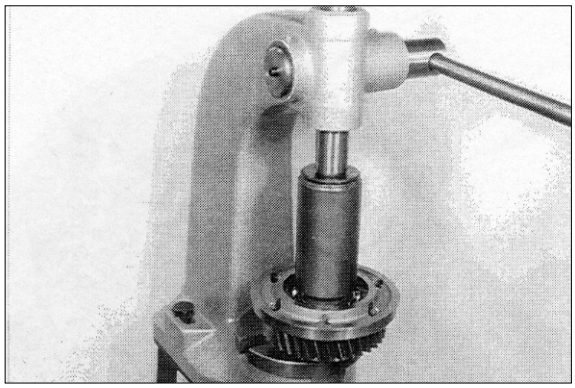
20W78TM112

(2) Press ball bearing over the collar of the helical gear until contact is obtained and fix by means of circlip.



20W78TM113

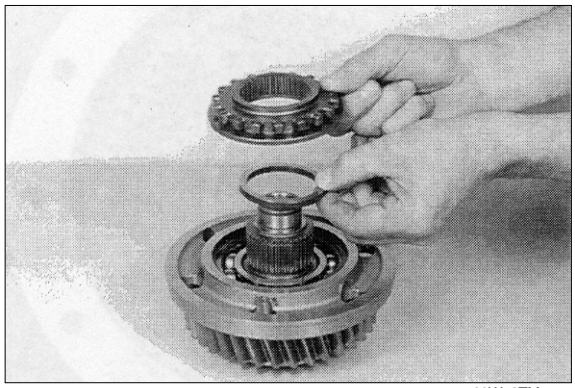
(3) Press bearing cover(Ball bearing) firmly against shoulder with the circlip showing toward above.



20W78TM114

(4) Install spacer and shift dog.

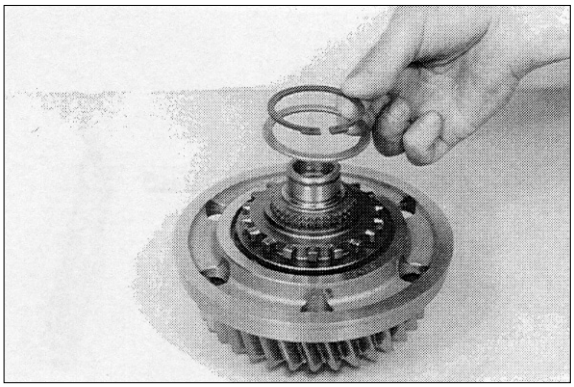
※ According to the design with or without spacer, see corresponding Parts manual.



20W78TM115

(5) Fix shift dog by means of shim and circlip.

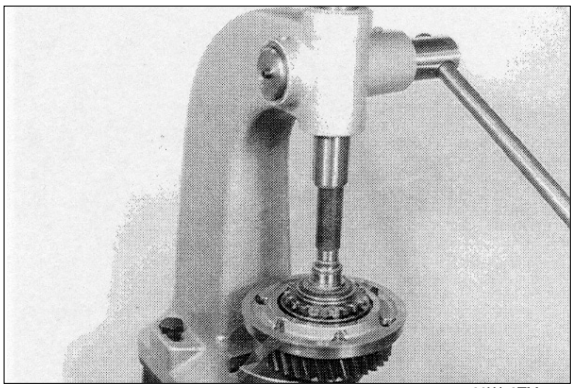
※ Pay attention to the permissible end play max. 0.1㎜.



20W78TM116

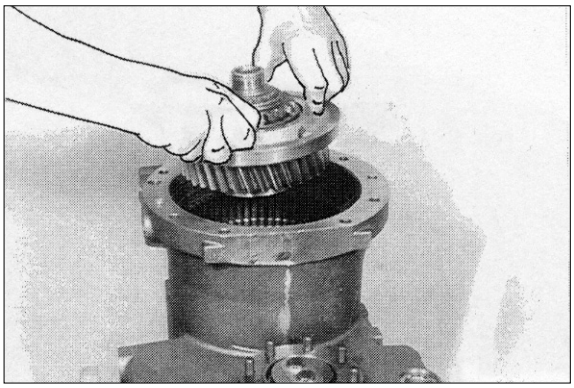
(6) Press needle bearing firmly against shoulder.

※ Pay attention to the installation position-designation showing upward.



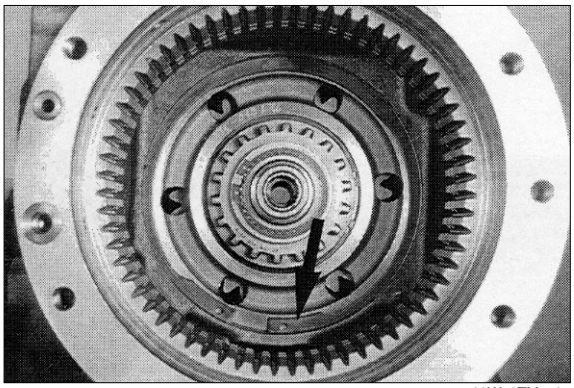
20W78TM117

(7) Insert pre-assembled helical gear into the housing bore.



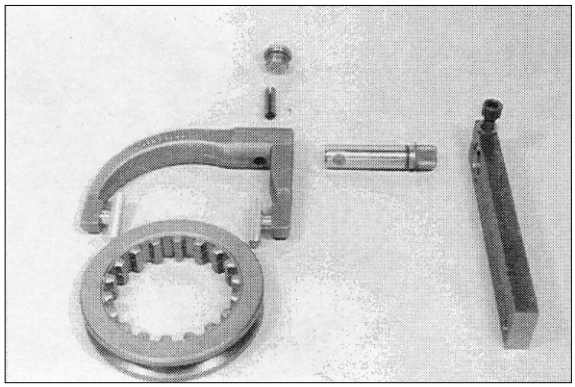
20W78TM118

(8) Fix bearing cover by means of circlip, see Arrow.



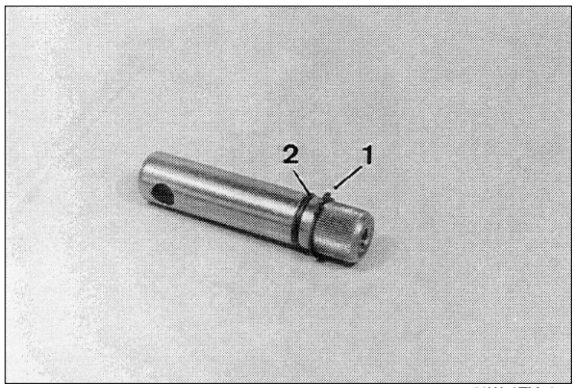
20W78TM119

(9) Figure on the left shows the components of the shift dog assembly.



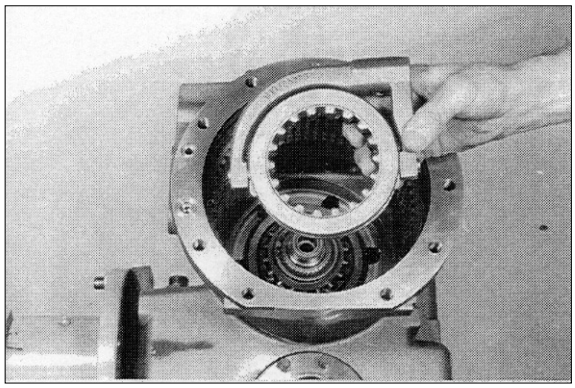
20W78TM120

(10) Squeeze in circlip(1) and install O-ring(2).



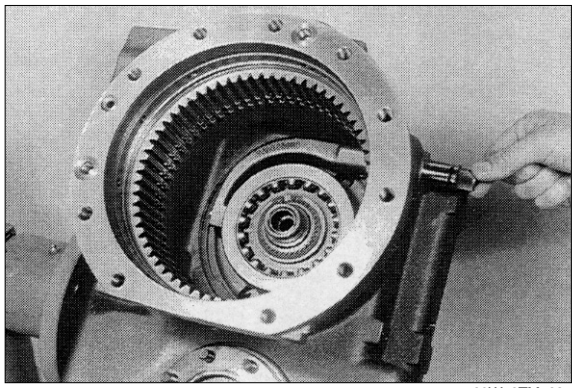
20W78TM121

(11) Insert shift fork and sliding collar.



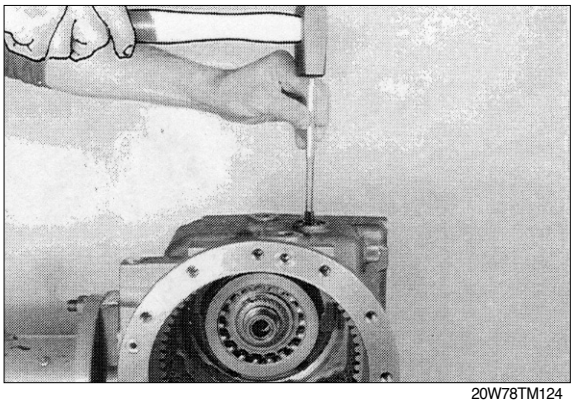
20W78TM122

(12) Introduce shift shaft until contact is obtained.



20W78TM123

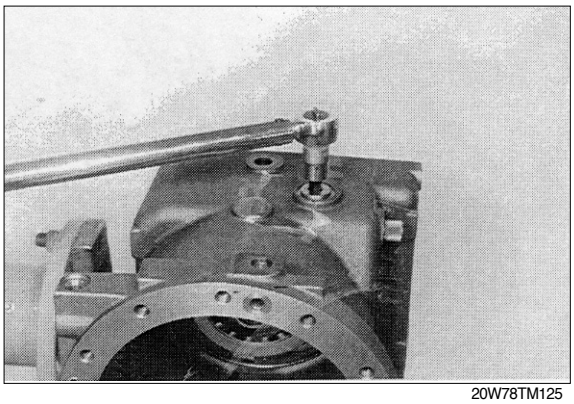
(13) Align shift shaft radially and fix it by driving the roll pin in until it is flush.



20W78TM124

(14) Install screw plug(M22×1.5).
· Tightening torque : 6.1kgf · m(44.2lb · ft)

※ Mount new O-ring.

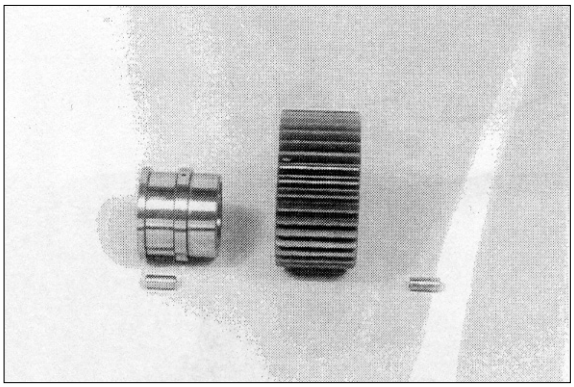


20W78TM125

4) COMPLETE AND INSTALL PLANETARY CARRIER

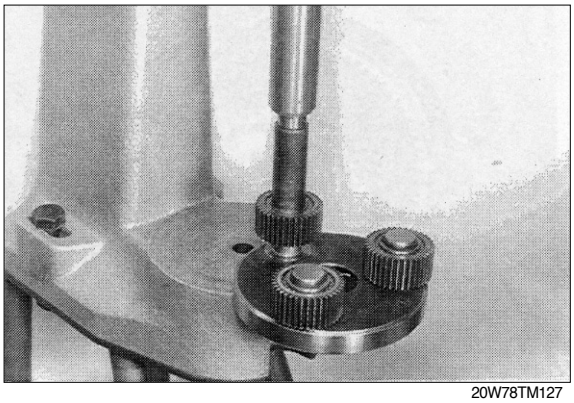
(1) Pre-assemble planetary gear.

※ Install cylindrical rollers with grease.



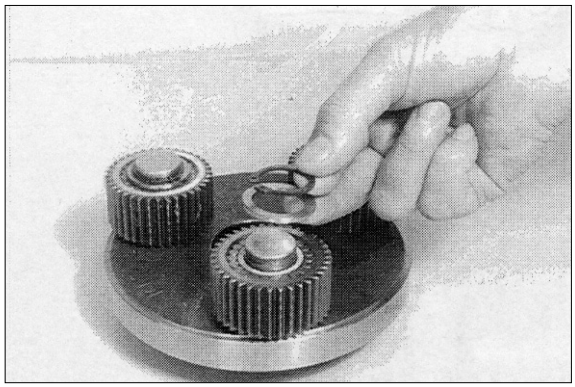
20W78TM126

(2) Press pre-assembled planetary gears firmly against shoulder.



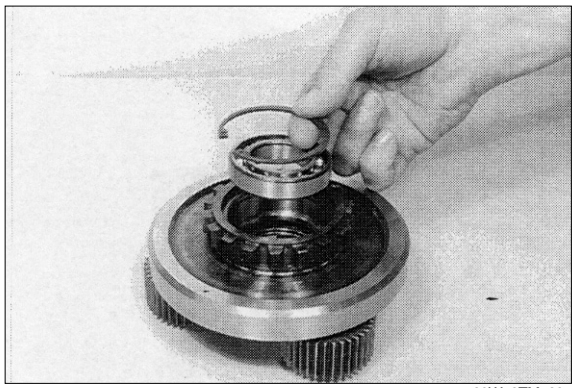
20W78TM127

(3) Install collar shim and circlip.



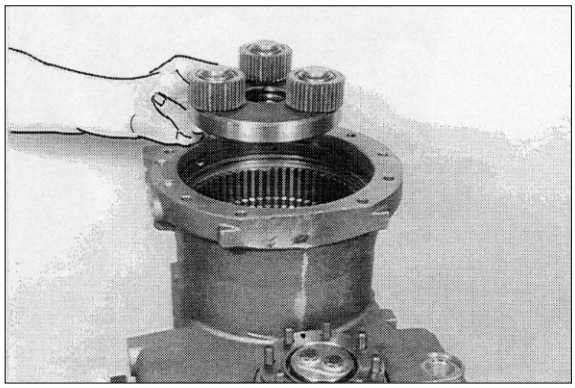
20W78TM128

(4) Insert ball bearing firmly against shoulder and fix with circlip.



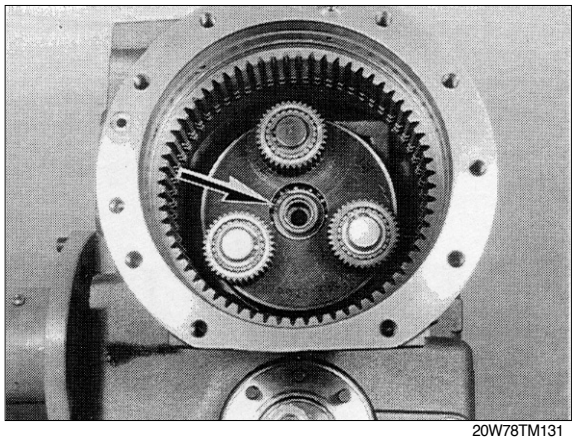
20W78TM129

(5) Heat ball bearing and mount planetary carrier until contact is obtained.



20W78TM130

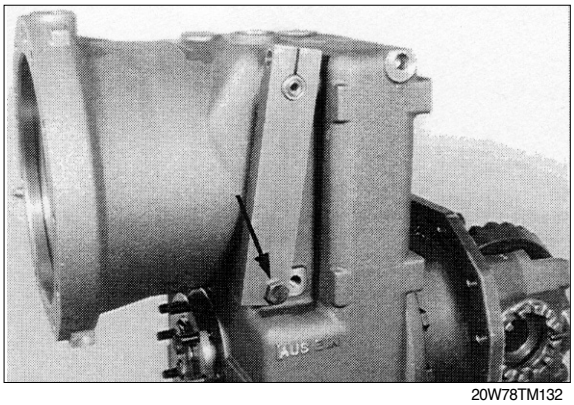
(6) Fix planetary carrier with circlip(Arrow).



20W78TM131

Adjust declutch unit

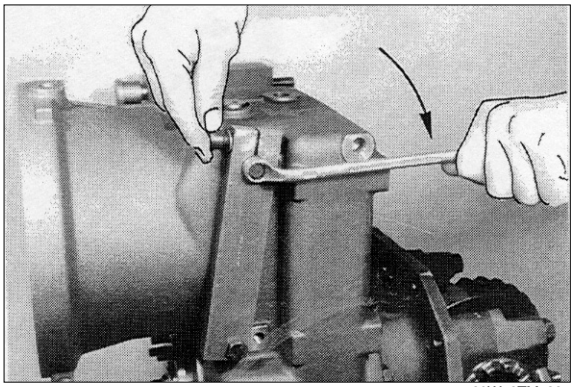
(7) Assemble shift lever and fix it provisionally in the "OFF-Position3" by means of hex head screw(Arrow).



20W78TM132

(8) Bring shift shaft by clockwise rotation to the stop, using auxiliary screw(M8) and jam shift lever by means of socket head screw(M10) and flat washer.

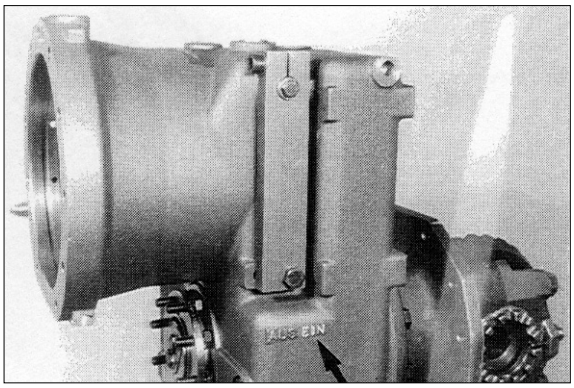
· Tightening torque : 4.7kgf · m(33.9lb · ft)



20W78TM133

(9) Now, bring shift lever in "ON-Position" (Arrow) and fasten by means of hex head screw(M10).

· Tightening torque : 4.7kgf · m(33.9lb · ft)

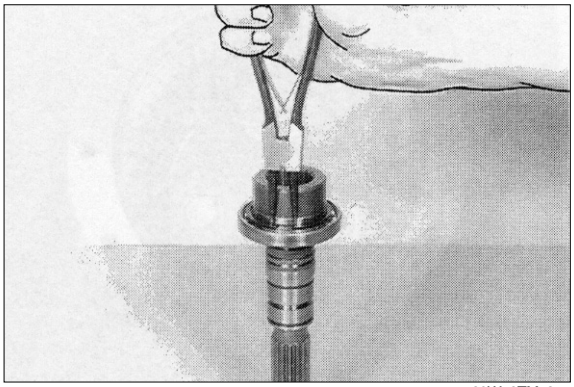


20W78TM134

5) PREASSEMBLE AND INSTALL CLUTCH

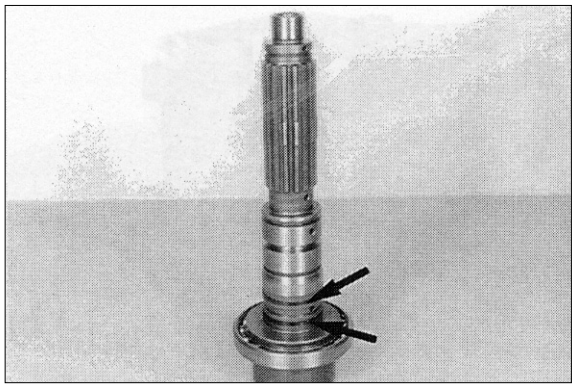
(Road gear)

(1) Press ball bearing firmly against shoulder and fix it by means of circlip.



20W78TM135

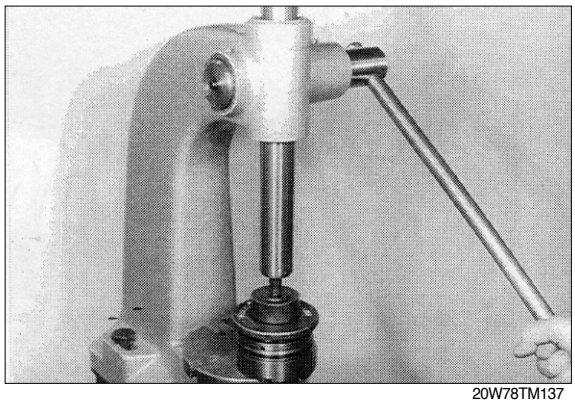
(2) Squeeze in the two rectangular rings (Arrows) and engage them.



20W78TM136

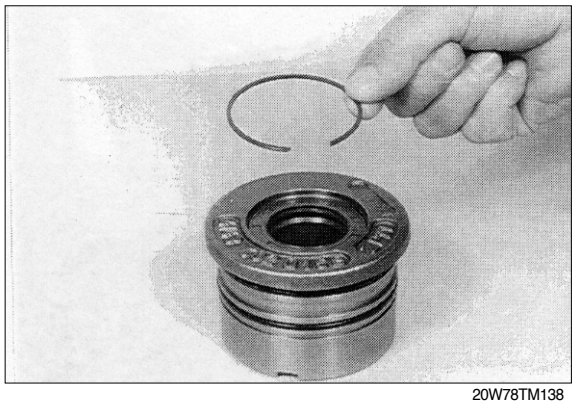
(3) Install shaft seal.

※ By application of the prescribed driver, the exact installation depth is given. Wet outer diameter of shaft seal with spirit. Grease the sealing lip.



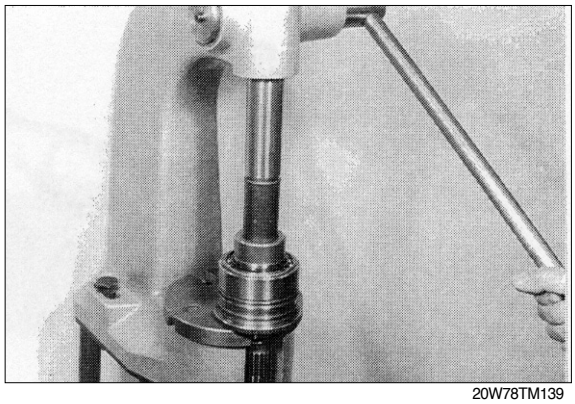
20W78TM137

(4) Fix shaft seal by means of snap ring.



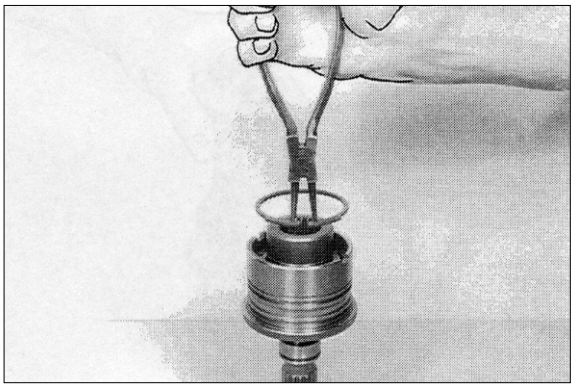
20W78TM138

(5) Grease the two rectangular rings, align them centrically and press the drive shaft into the guide sleeve until contact is obtained.



20W78TM139

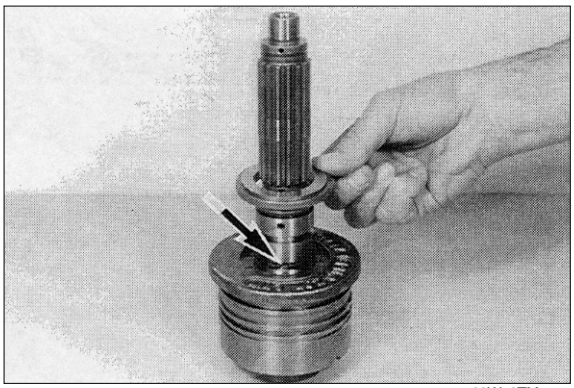
(6) Fix sleeve by means of circlip.



20W78TM140

(7) Squeeze in circlip(Arrow) and replace back-up plate, with the offset plane surface showing upwards.

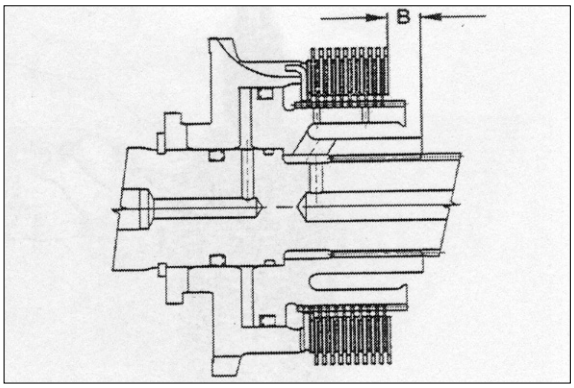
※ Only installation of one new circlip admitted.



20W78TM141

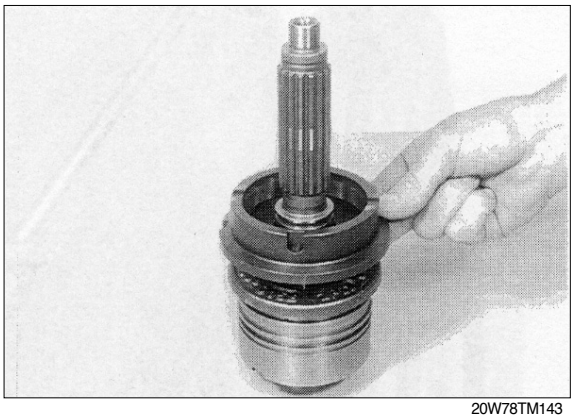
(8) Determine adjustment value "B", follow (9) to (13).

· Adjustment value B with 11 plate pairs = 7.8+0.2mm



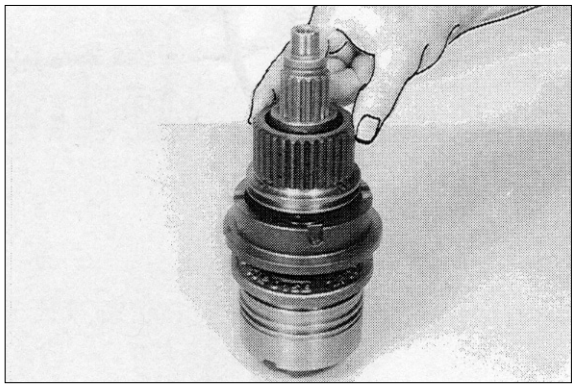
20W78TM142

(9) Replace piston.

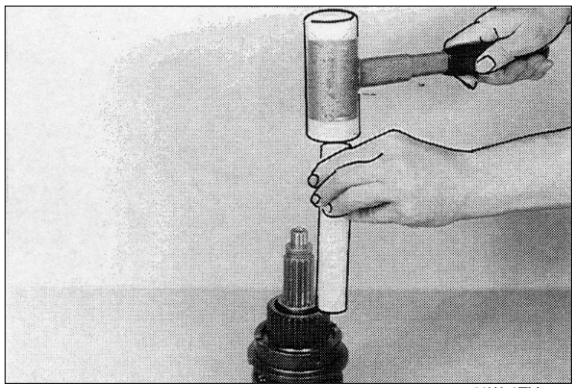


20W78TM143

(10) Assemble plate carrier and tap it against shoulder until contact is obtained.

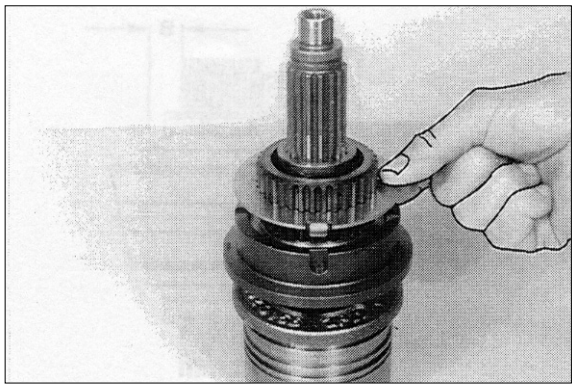


20W78TM144



20W78TM145

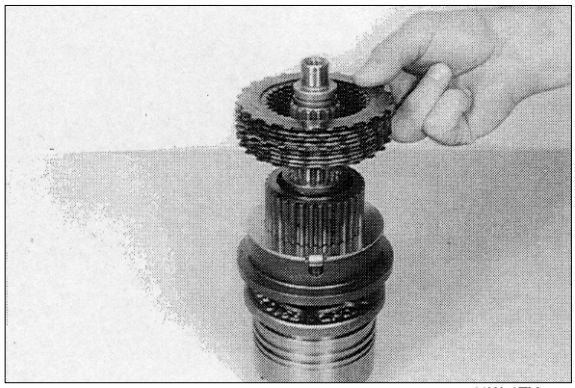
(11) Mount plate.



20W78TM146

(12) Assemble alternating plate pack, starting with one inner plate.

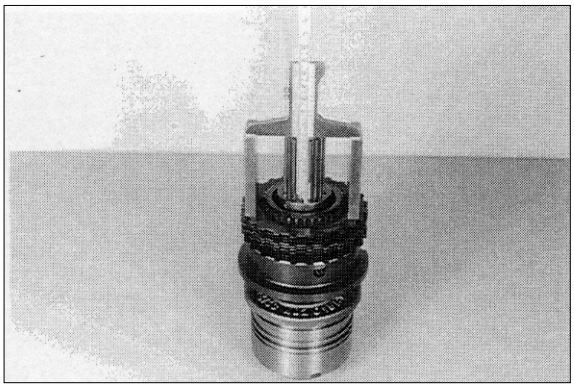
※ Number of inner and outer plates, see corresponding list of parts manual.
For the moment, install the plate pack without oil.



20W78TM147

(13) Determine dimension B from the end face of the inner plate carrier to the outer plate.
· Dimension B e.g. : 7.5㎜

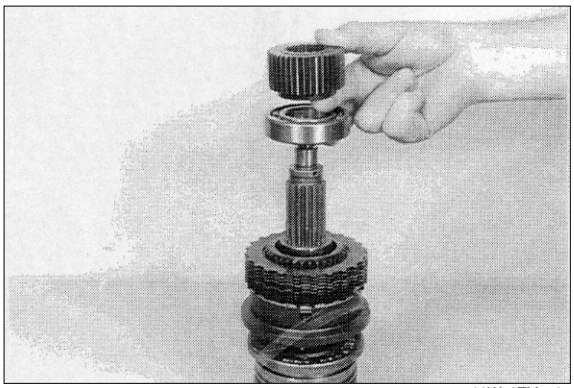
※ Carry out any corrections by means of the corresponding outer plates(s = 1.0, 1.2, 1.4 or 1.8㎜).



20W78TM148

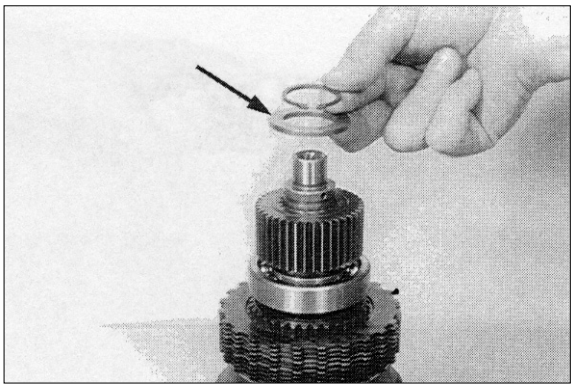
(14) Determine adjustment value "D".

※ The end play of plate carrier, ball bearing and sun gear is determined by means of the shim.
Max end play admitted 0.1㎜.
Install ball bearing and sun gear.



20W78TM149

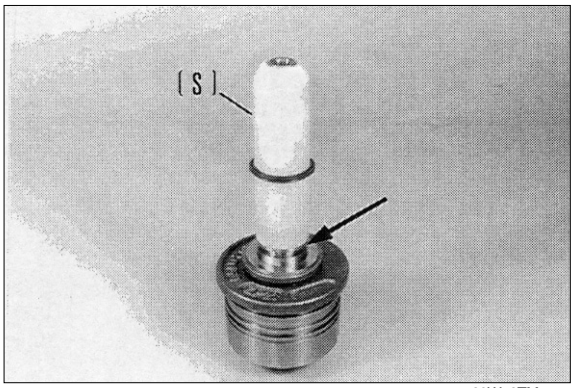
(15) Assemble shim(s = 3.0~3.9㎜, see Arrow), fix it by means of circlip and check end play.
Now, squeeze out circlip again and remove the components again, up to the piston included.



20W78TM150

(16) Squeeze circlip into the ring groove (Arrow) with the sealing lip facing the pressure chamber(toward above).

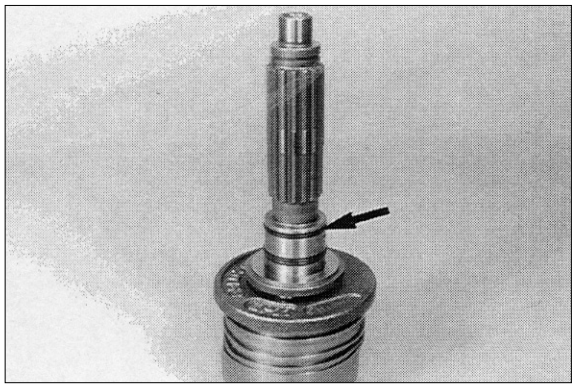
※ Use installer.
Grease sealing lip.



20W78TM151

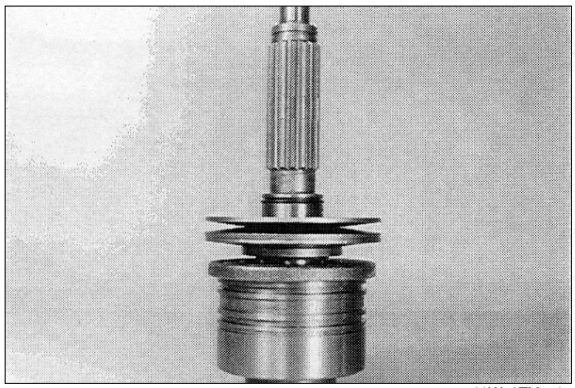
(17) Install O-ring, see Arrow.

※ Grease O-ring.



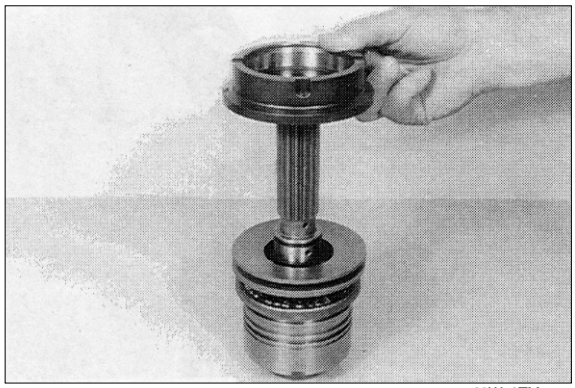
20W78TM152

(18) Pile cup springs according to the figure.



20W78TM153

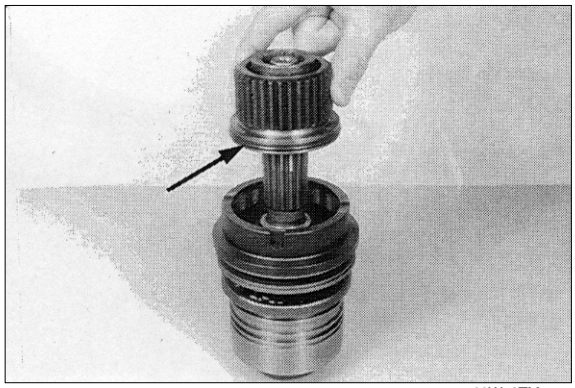
(19) Assemble piston.



20W78TM154

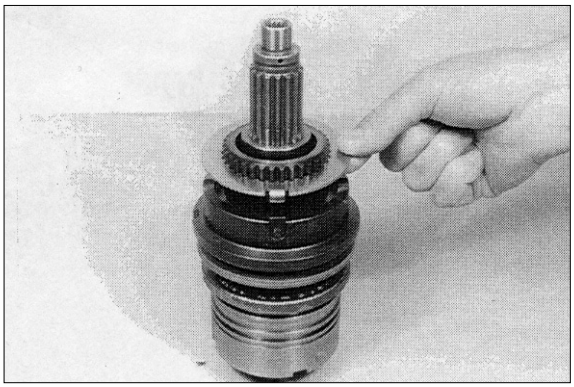
(20) Install seal ring(Arrow) with the sealing lip facing the pressure chamber(Toward below) and insert the inner plate carrier against shoulder, until contact is obtained.

※ Grease seal ring.



20W78TM155

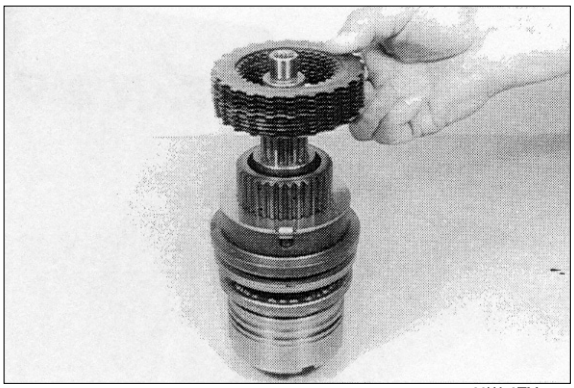
(21) Mount plate.



20W78TM156

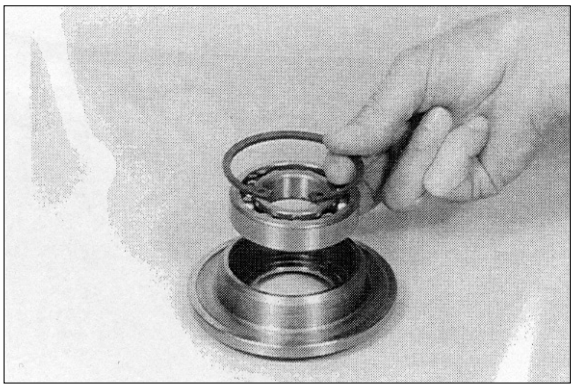
(22) Assemble plate pack alternating, starting with one inner plate.

※ Number of inner and outer plates see corresponding parts manual.
Oil plates prior to the installation.



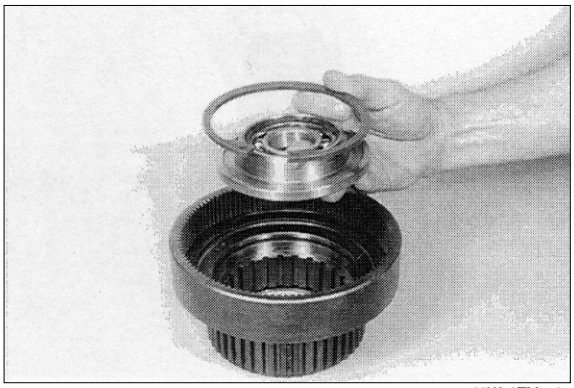
20W78TM157

(23) Insert ball bearing into the centering disk and fix by means of circlip.



20W78TM158

(24) Insert centering disk into the internal gear bore and fix by means of circlip.



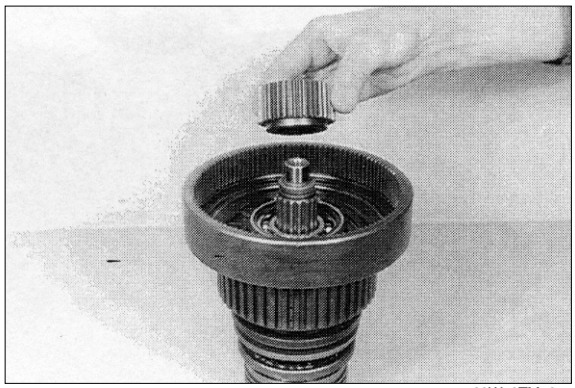
20W78TM159

(25) Align outer plates radially and assemble internal gear until all plates are located.

20W78TM160

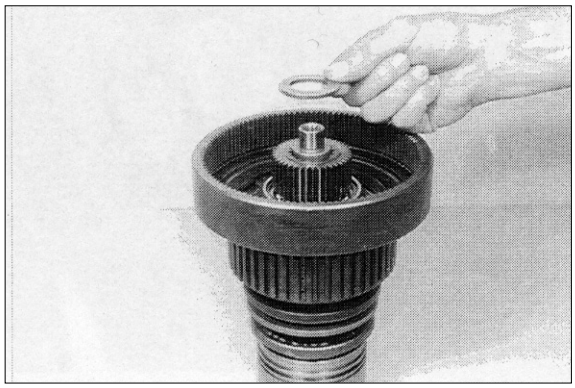
(26) Assemble sun gear.

※ Pay attention to the installation position, see figure.



20W78TM161

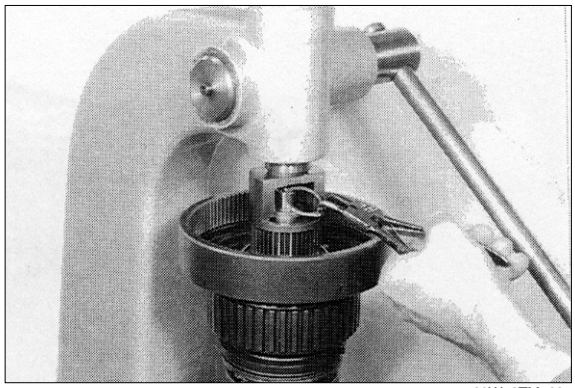
(27) Mount determined shim.



20W78TM162

(28) Preload cup spring pack by means of assembly jig and squeeze in circlip.

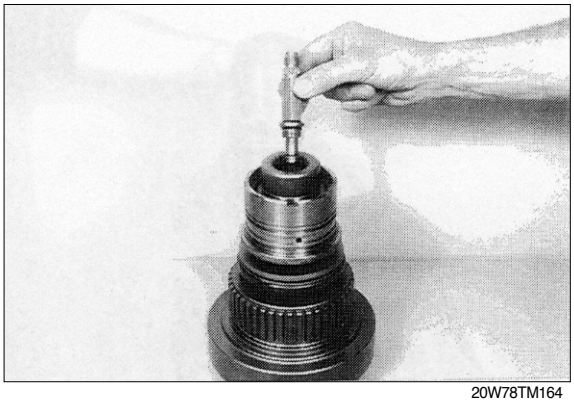
※ Installation of a new circlip admitted only.



20W78TM163

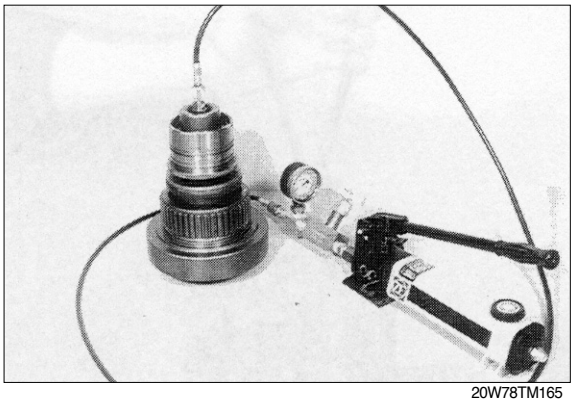
Check tightness and function of the clutch

(29) Install hydraulic connection.



20W78TM164

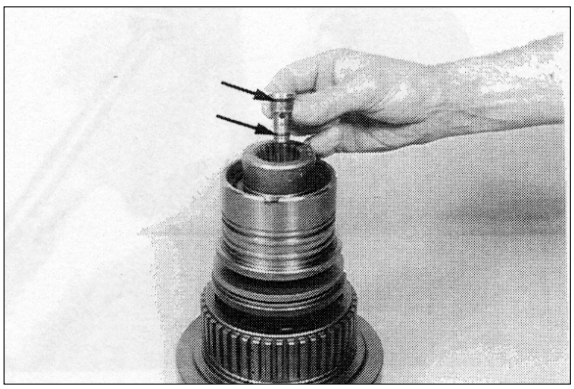
(30) Ventilate the piston area by repeated filling. Build up test pressure p=35bar and close connection to HP-Pump by means of shutoff valve.
During a test period of 3 minutes no pressure drop is admitted.



20W78TM165

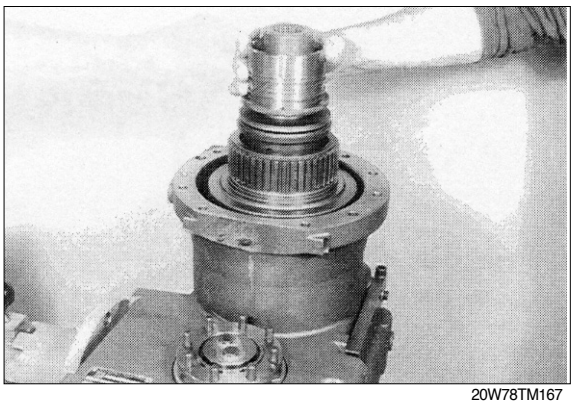
(31) Remove pressure connection and install throttle valve.

※ Install new O-rings, see Arrows.



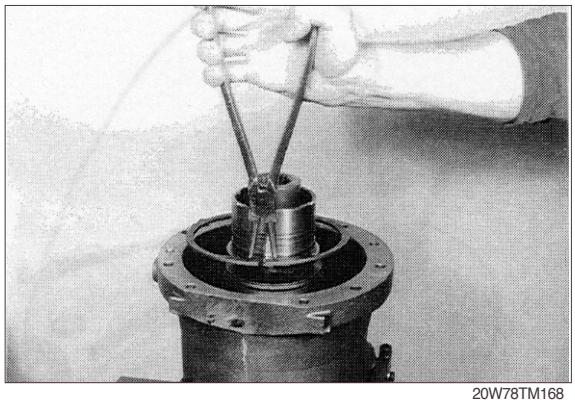
20W78TM166

(32) Introduce pre-assembled clutch.



20W78TM167

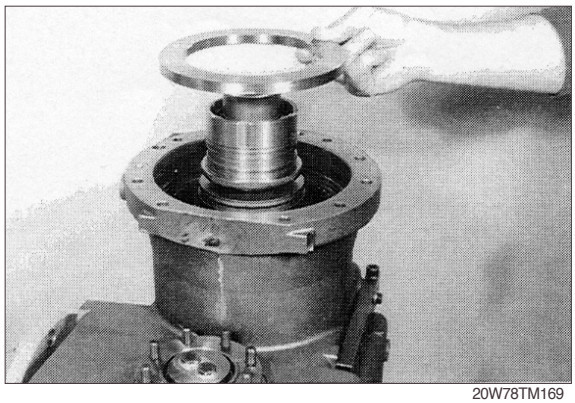
(33) Squeeze in circlip(190×4).



20W78TM168

6) INSTALL BRAKE(Cross-country gear)

(1) Insert backing plate.

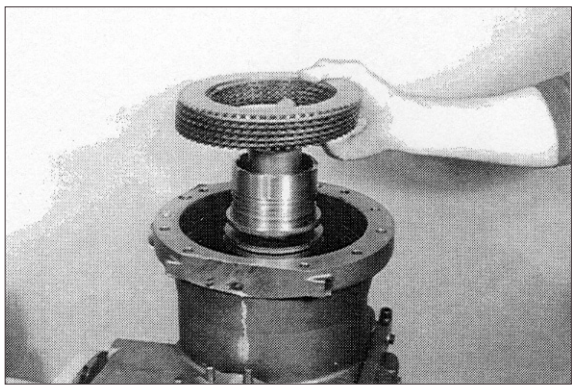


20W78TM169

Determine adjustment dimension "A = 1.4 +0.2mm" following (2) to Example "E".

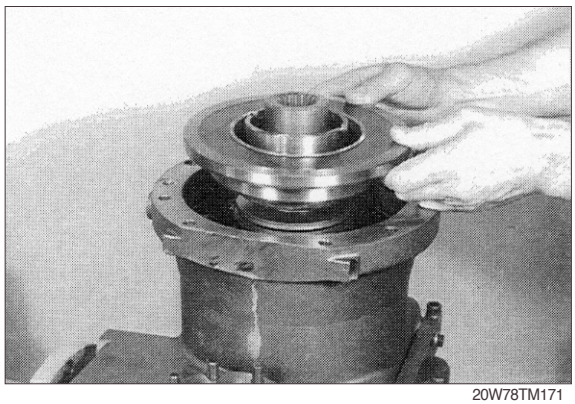
(2) Assemble alternating plate pack, starting with one outer plate.

※ Number of outer and inner plates, see corresponding parts manual.
Oil the plates.



20W78TM170

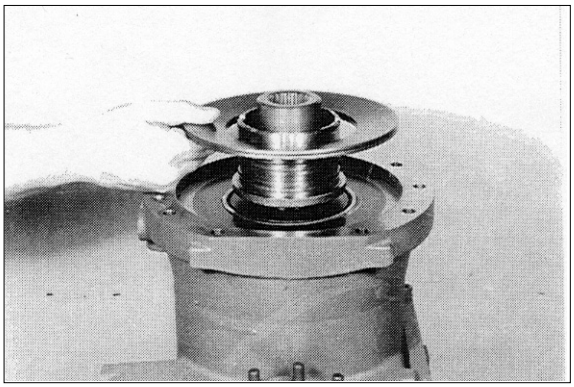
(3) Insert piston firmly against shoulder.



20W78TM171

(4) Insert the two cup springs and align them centrically.

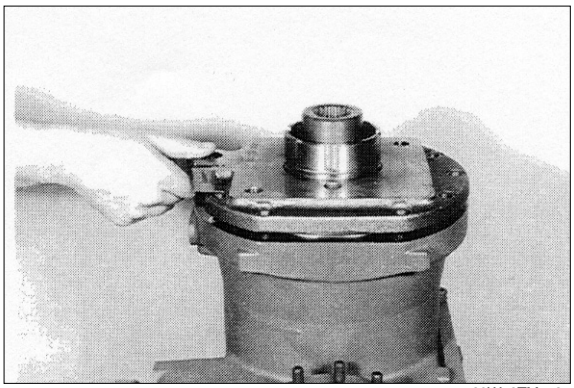
※ Pay attention to the installation position, see figure.



20W78TM172

(5) Assemble measuring cover and pull it evenly against shoulder, using 4 socket head screws(M12).

· Tightening torque : 8.0kgf · m(58.2lb · ft)



20W78TM173

(6) Determine dimension Ⅰ form the plane surface of the measuring cover to the plane surface/piston.

· Dimension Ⅰ e.g. : 32.60mm

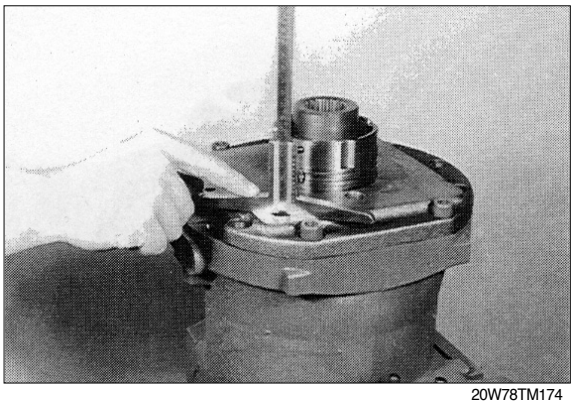
Example D

· Dimension 32.60mm

· Manufacturing dimension measuring cover -20.00mm

· Difference = Dimension X 12.60mm

※ The manufacturing dimension is stamped on the measuring cover and is principally 20.00mm.



20W78TM174

(7) Measure dimension Y from the locating face of the drive casing to the flange-mounted surface.

· Dimension Y e.g. : 11.10mm

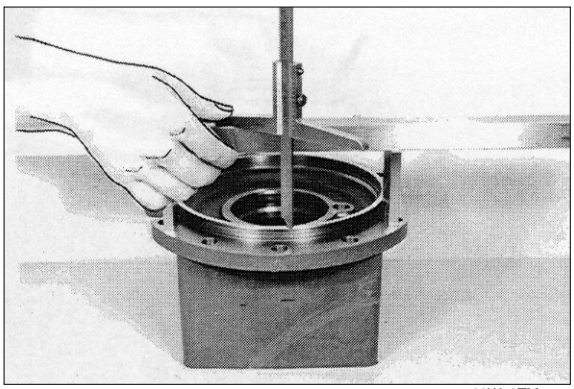
Example E

· Dimension X 12.60mm

· Dimension Y -11.10mm

· Difference adjustment value =1.50mm

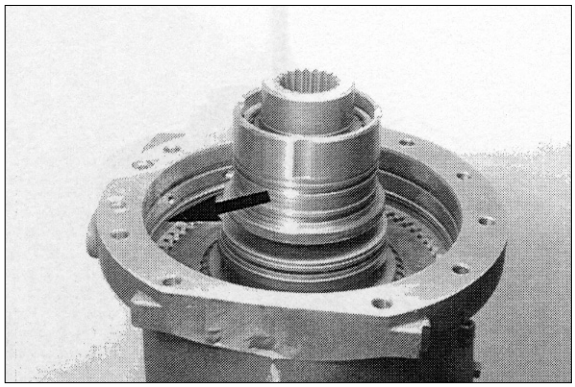
※ Carry out possible corrections with corresponding outer plates(s=3.0, 3.2, 3.5). Now, take off the measuring cover and remove the piston again.



20W78TM175

(8) Insert O-ring in the ring groove of the housing, see Arrow.

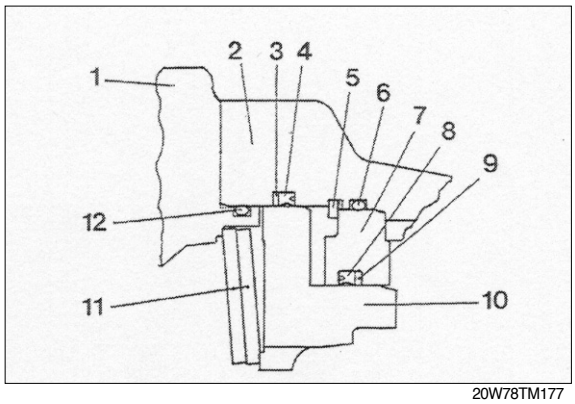
※ Expand O-ring slightly prior to the reassembly to ensure a perfect contact in the recess.



20W78TM176

(9) The Draft on the right shows the installation position of the disk, the piston and its sealing components.

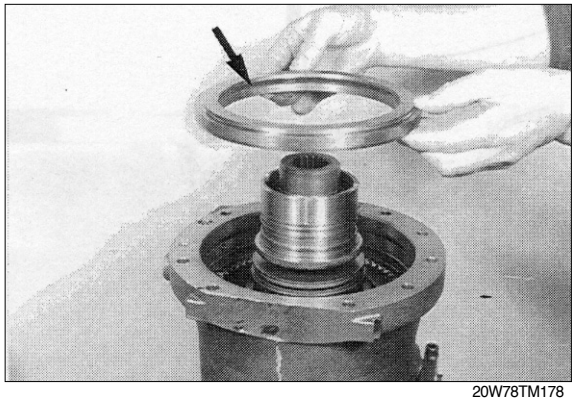
1 Drive casing
2 Clutch disk housing
3,4 Gasket(Back up and U-section ring)
5 Circlip
6 O-ring
7 Disk
8,9 Gasket(U section and back up ring)
10 Piston
11 Cup springs
12 O-ring



20W78TM177

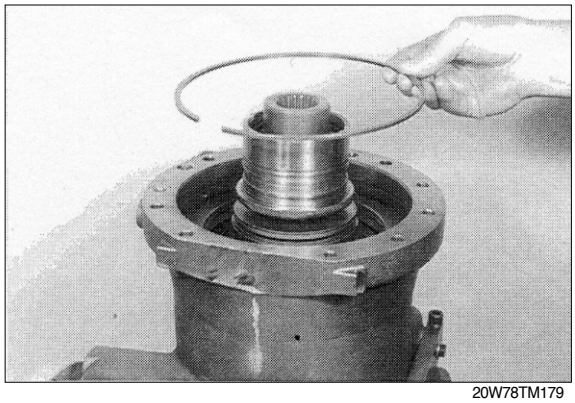
(10) Insert back-up and U-section ring in the ring groove(Arrow) and oil them
Insert disk until contact is obtained.

※ Pay attention to the installation position.



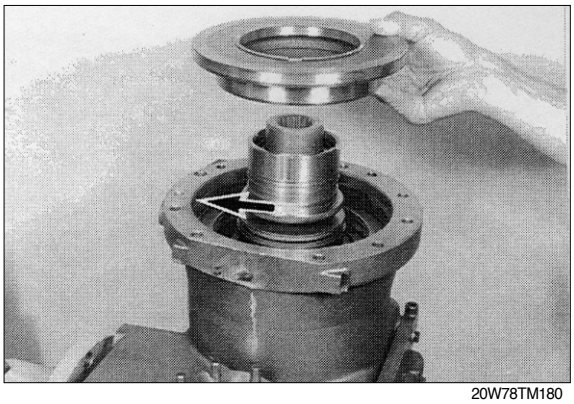
20W78TM178

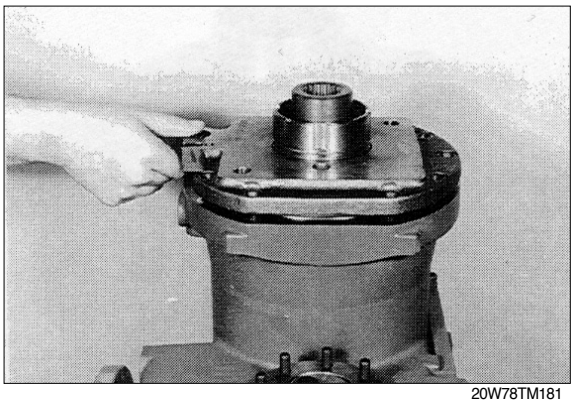
(11) Fix disk by means of snap ring.



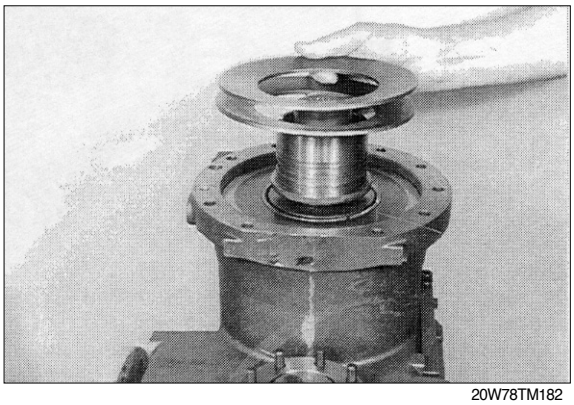
20W78TM179

(12) Insert back-up ring and seal ring in the ring groove of the housing(Arrow) and oil them.
Assemble piston and place it evenly against shoulder, using measuring cover as well as socket head screws. Now, remove measuring cover again.


20W78TM180

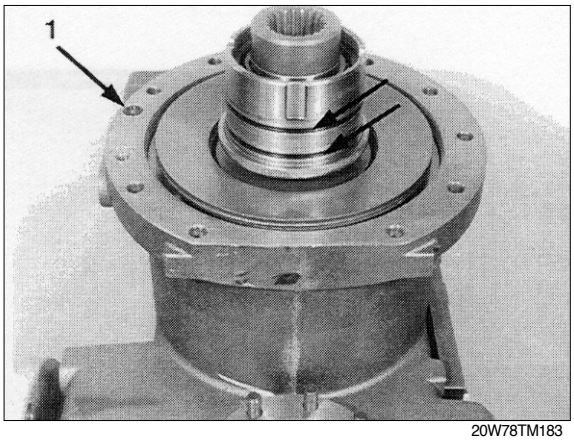

20W78TM181

(13) Insert the two cup springs and align them centrically.
※ Pay attention to the installation position.


20W78TM182

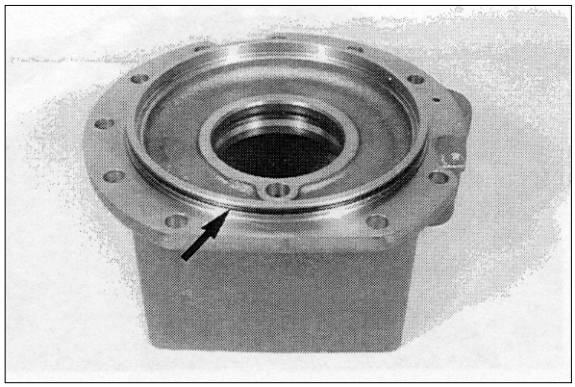
7) INSTALL DRIVE CASING

(1) Insert O-ring(Arrow 1) in the countersinking. Insert the two O-rings in the ring grooves of the guide sleeve, see Arrows.
※ Grease O-rings.



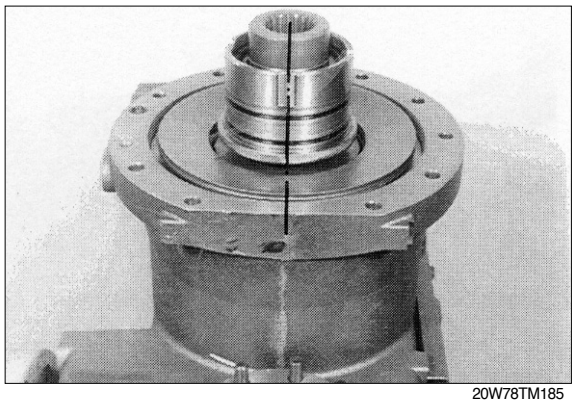
20W78TM183

(2) Insert O-ring into the ring groove of the drive casing and grease.



20W78TM184

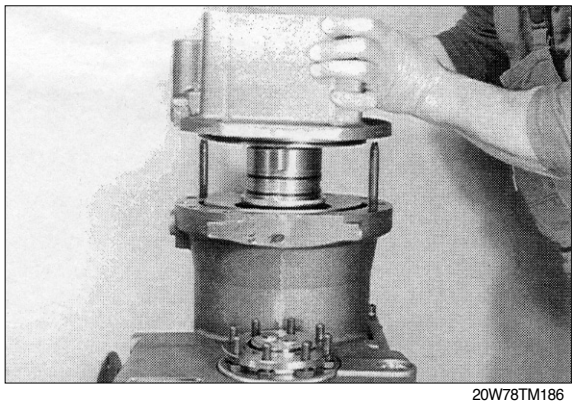
(3) Align guide bush radially.



20W78TM185

(4) Assemble drive casing.

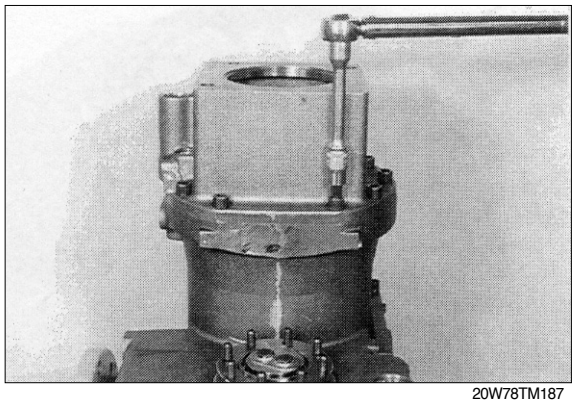
※ Pay attention to a radial installation position.



20W78TM186

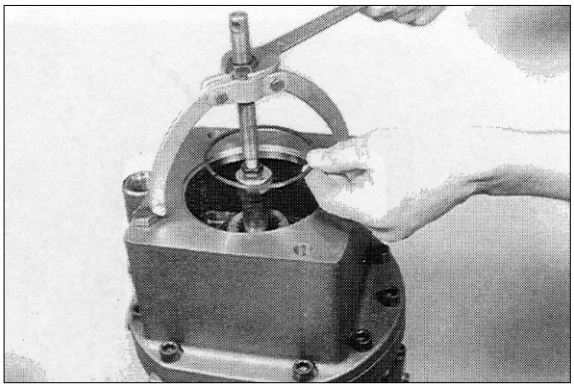
(5) Pull drive casing evenly against shoulder, using socket head screws(M12).

· Tightening torque : 8.0kgf · m(58.2lb · ft)



20W78TM187

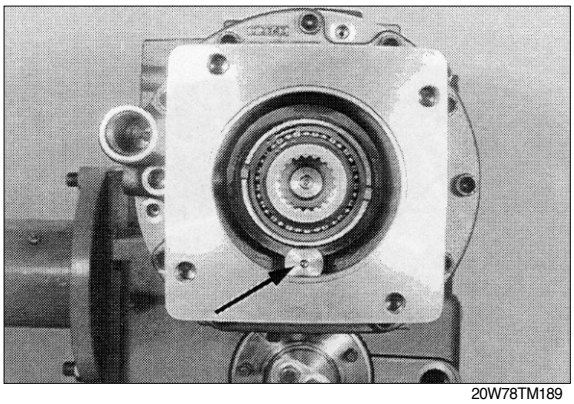
(6) Pull drive shaft, resp. guide bush out of the housing bore, using internal puller, until snap ring(Nominal width = 95㎜) can be engaged.



20W78TM188

(7) Fix guide bush radially by means of screw plug, see Arrow.

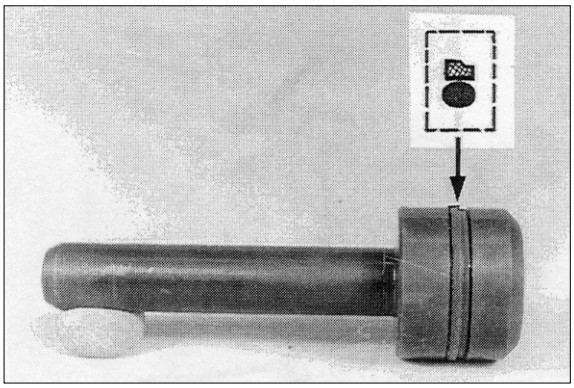
※ Install new CU-ring.



20W78TM189

(8) Insert gasket, composed of O-ring and Turcon-ring into the ring groove of the piston and grease.

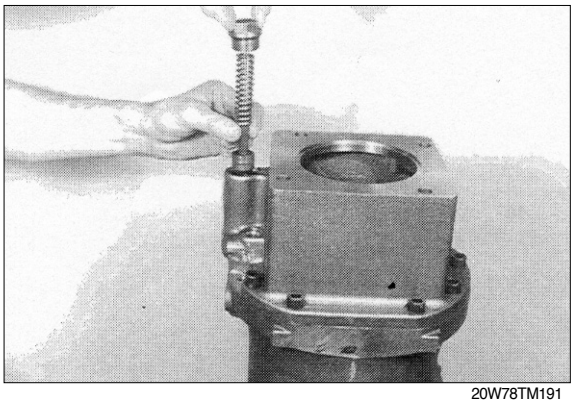
※ Heat Turcon-ring in an oil bath prior to the installation.
Use installer.
Pay attention to the installation position, see figure.



20W78TM190

(9) Insert pre-assembled piston and spring into the housing bore and fix with screw plug.

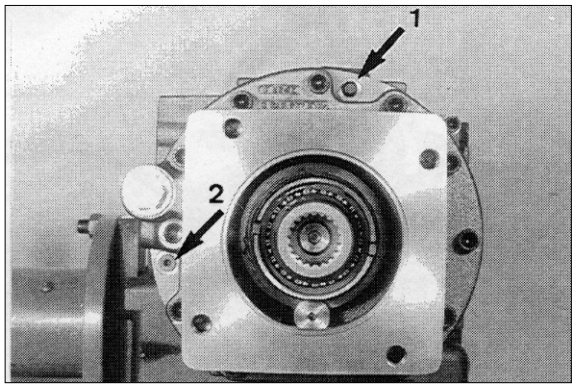
※ Employ new O-ring for screw plug.



20W78TM191

(10) install breather(Arrow 1) and screw plug (Arrow 2).

※ Employ new O-ring for screw plug.

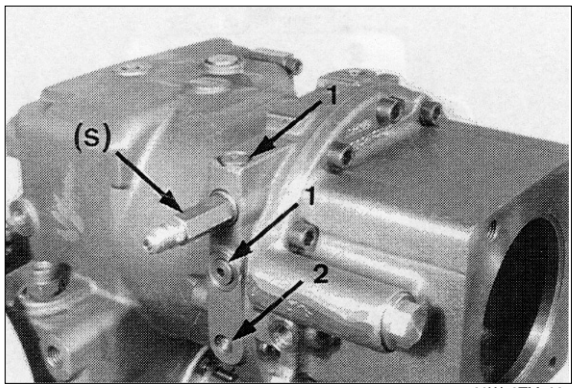


20W78TM192

(11) Install the two screw plugs(1) and shear-off plugs(2).

Check tightness and function of the brake(Cross-country gear).

Install hydraulic connection.

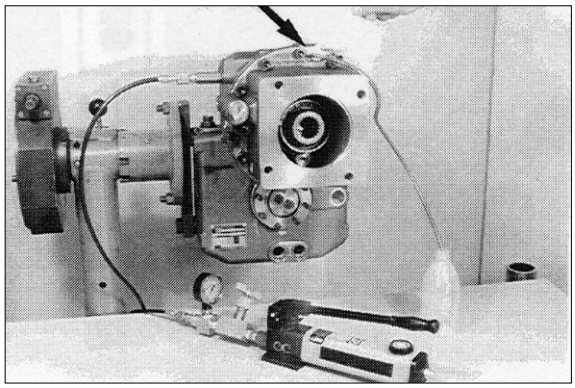


20W78TM193

(12) Ventilate piston chamber by filling it several times.

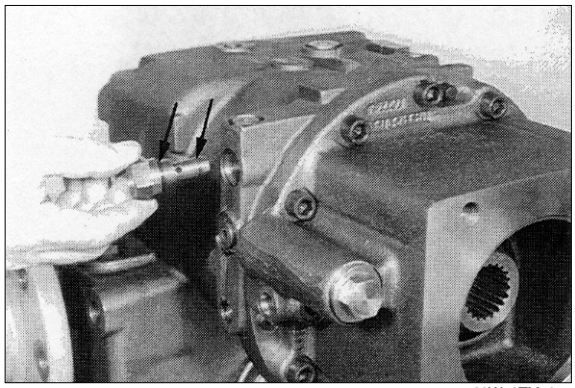
Build up test pressure p=35bar and close connection to HP-Pump by means of shut-off valve.

During a Test of 3 minutes, no pressure drop is admitted.


20W78TM194

(13) Remove the hydraulic connection and install the throttle valve.

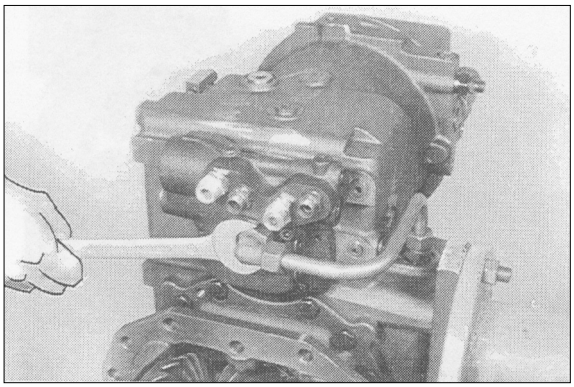
※ Install new O-rings(Arrows).


20W78TM195

8) MOUNT SCREW PLUGS AND OIL LINES

(1) Mount suction pipe

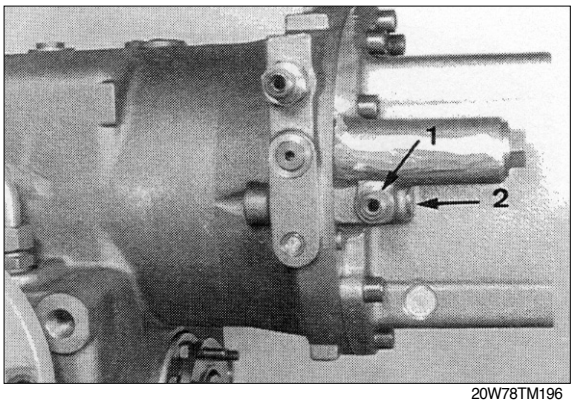
※



20W78TM199

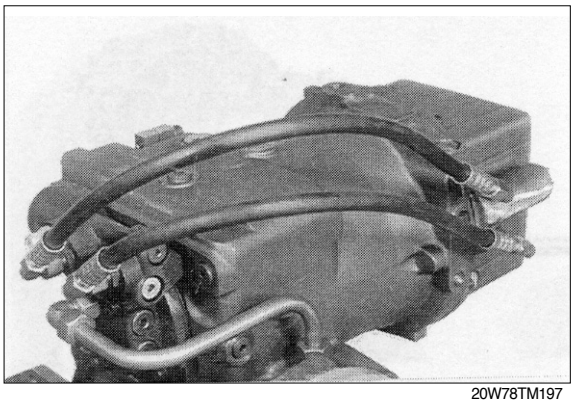
(2) Install connecting plug(Arrow 1, M10) and screw plug(Arrow 2, M14).
- Tightening torque : 1 - 2.5kgf · m (18.4lb · ft)
  2 - 3.6kgf · m (25.8lb · ft)

※ Install new O-rings.
Different position of connecting piece and screw plug according to the Version.



20W78TM196

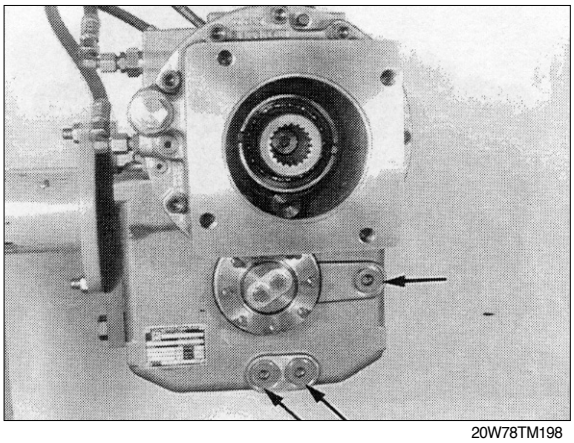
(3) Install delivery lines.



20W78TM197

(4) Install screw plugs(M26 × 1.5), see Arrows.
- Tightening torque : 8.1kgf · m(59.0lb · ft)

※ Before the transmission is put into service, pay attention to the lubrication and maintenance instructions.



20W78TM198

GROUP 8 STEERING 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.

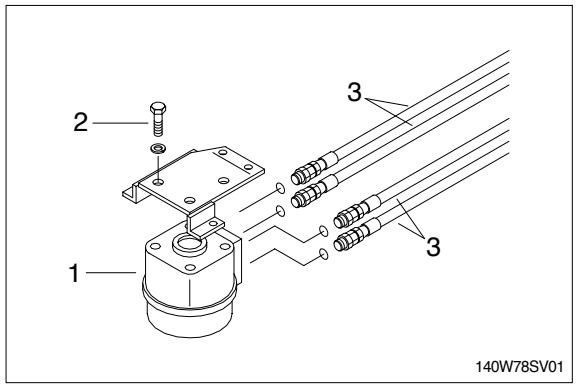
(3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

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

(4) Disconnect steering line hoses(3).

(5) Loosen the hexagon bolt(2) and remove the steering valve assembly(1).

· Tightening torque : 4.8± 0.3kgf · m
(34.7± 2.2lbf · ft)



2) INSTALL

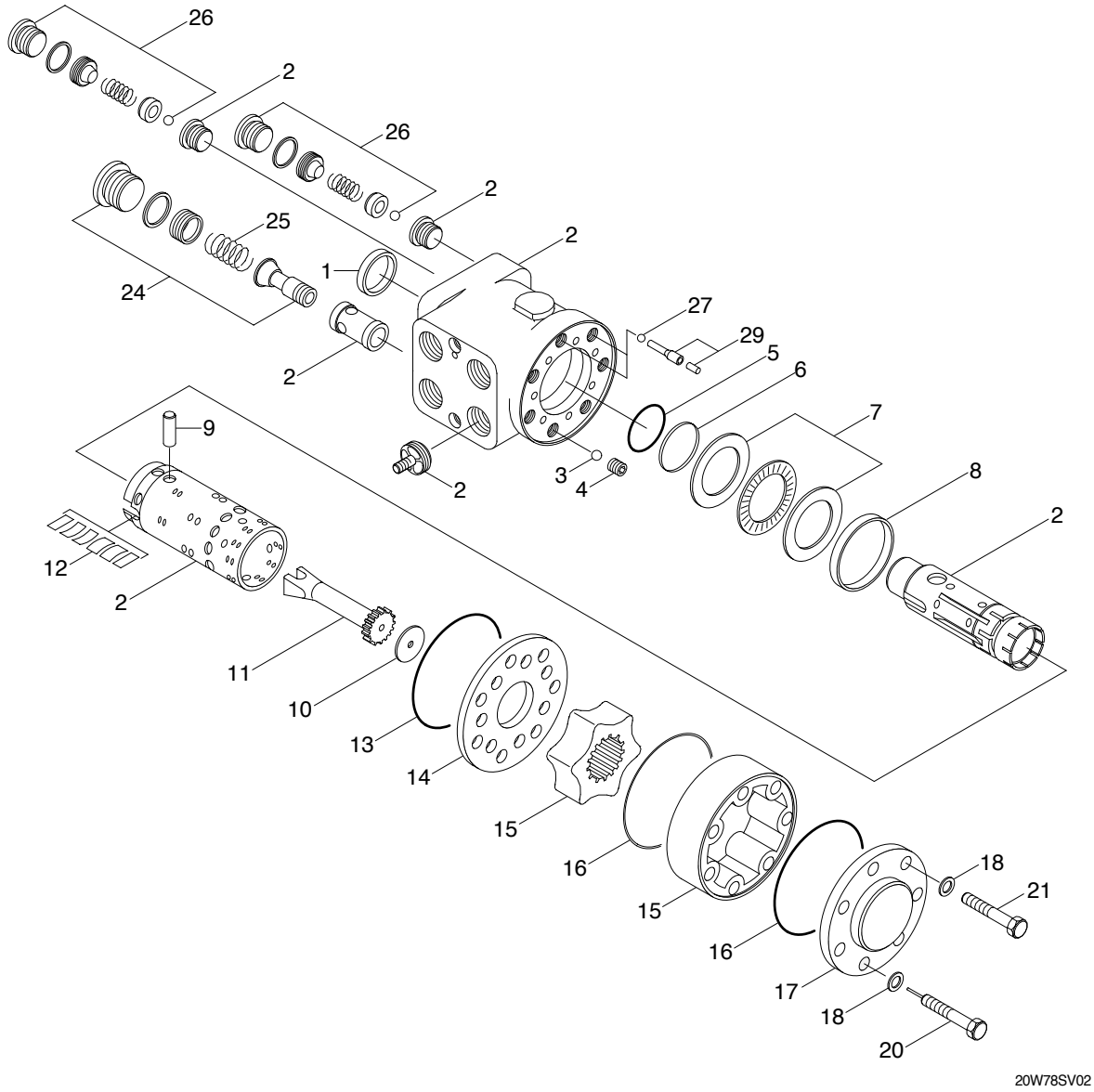
(1) Carry out installation in the reverse order to removal.

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

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

2. STEERING VALVE

1) STRUCTURE

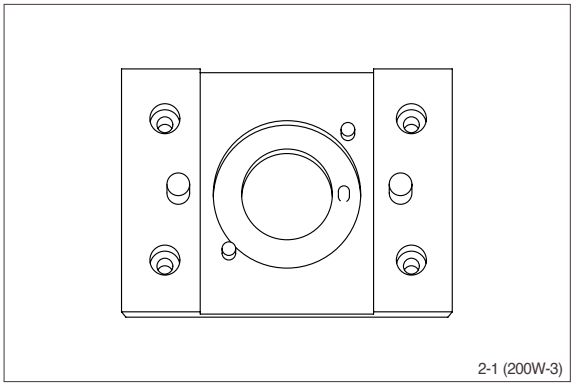


1	Dust seal ring	10	Spacer	18	Washer
2	*Housing assy	11	Shaft	20	Pin screw
3	Ball	12	Spring set	21	Screw
4	Bushing	13	O-ring	24	Relief valve assy
5	O-ring	14	Distributor plate	25	Wire spring
6	Kin ring	15	Gear wheel set	26	Shock valve
7	Bearing assy	16	O-ring	27	Ball
8	Ring	17	End cover	29	Suction valve pin
9	Cross pin				

* Housing, spool and sleeve(Check valve and the seats for relief and dual shock valves are loctited).

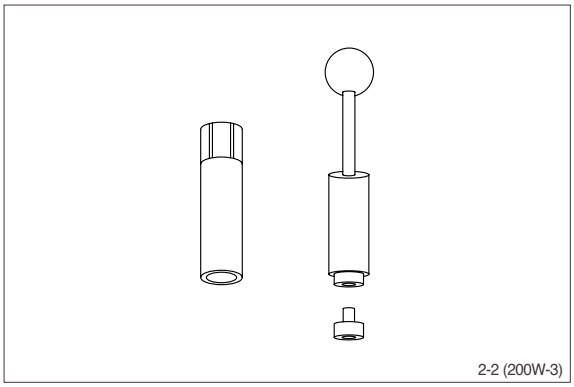
2) TOOLS

(1) Holding tool.



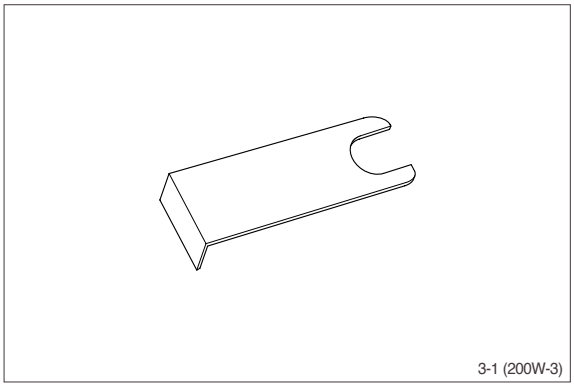
2-1 (200W-3)

(2) Assembly tool for O-ring(5,13,16) and kin-ring(6).



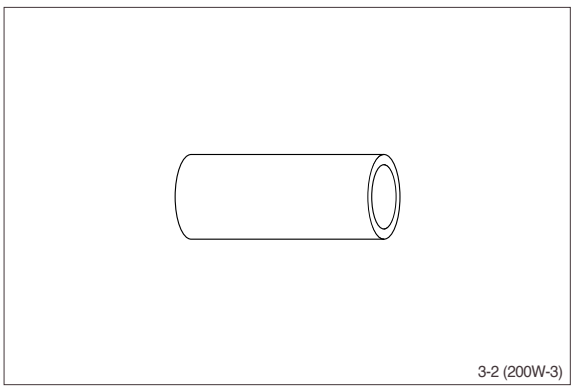
2-2 (200W-3)

(3) Assembly tool for cardan shaft(11).



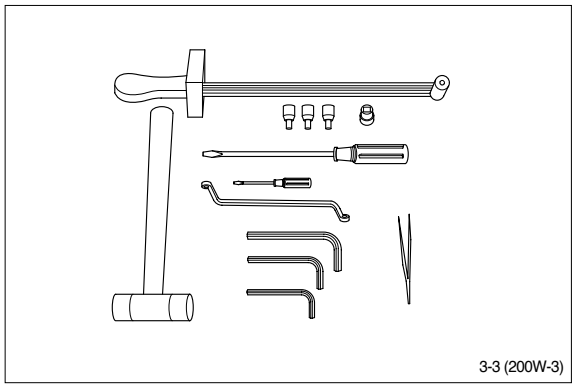
3-1 (200W-3)

(4) Assembly tool for dust seal(1).



3-2 (200W-3)

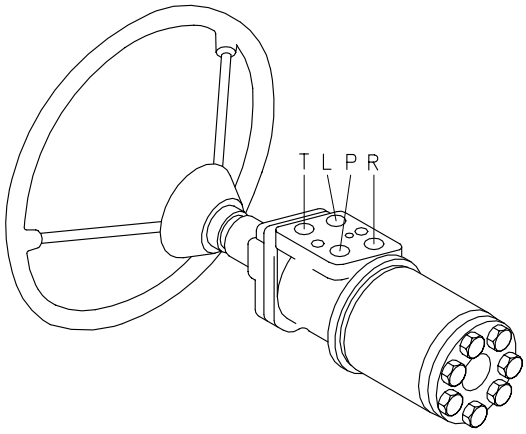
(5) Torque wrench : 0~7.1kgf · m
(0~54.4lbf · ft).
13mm socket spanner.
6, 8mm and 12mm hexagon sockets.
12mm screwdriver.
2mm screwdriver.
13mm ring spanner.
6,8mm and 12mm hexagon socket spanners.
Plastic hammer.
Tweezers.



3-3 (200W-3)

3) TIGHTENING TORQUE AND HYDRAULIC CONNECTIONS

(1) Hydraulic connections



L : Left port
R : Right port
T : Tank
P : Pump

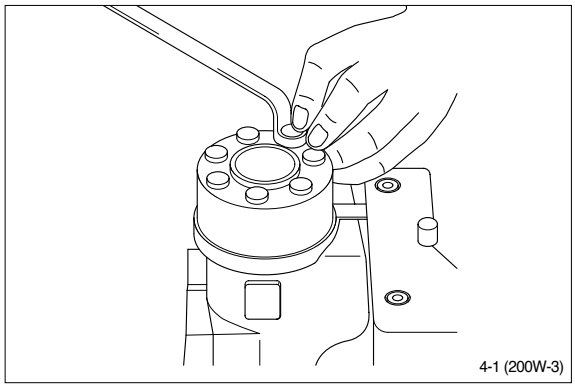
17038SV03

(2) Tightening torque

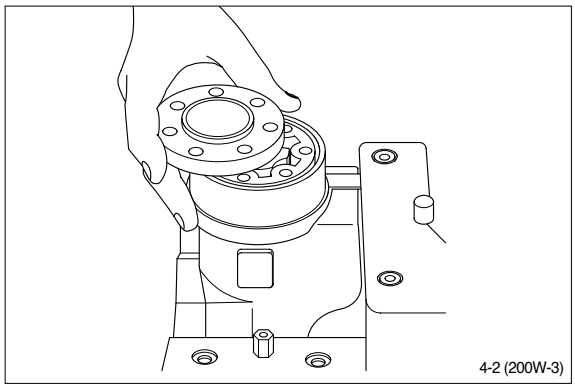
Screwed connection	Max. tightening torque[kgf · m(lbf · ft)]			
	With cutting edge	With copper washer	With aluminum washer	With O-ring
1.4 BSP.F	4.1(29.7)	2.0(14.5)	3.1(22.4)	-
3/8 BSP.F	6.1(44.1)	2.0(14.5)	5.1(36.9)	-
1/2 BSP.F	10.2(73.8)	3.1(22.4)	8.2(59.3)	-
7/16-20 UNF	-	-	-	2.0(14.5)
3/4-16 UNF	-	-	-	6.1(44.1)
M12×1.5	4.1(29.7)	2.0(14.5)	3.1(22.4)	2.0(14.5)
M18×1.5	7.1(51.4)	2.0(14.5)	5.1(36.9)	5.1(36.9)
M22×1.5	10.2(73.8)	3.1(22.4)	8.2(59.3)	7.1(51.4)

4) DISASSEMBLY

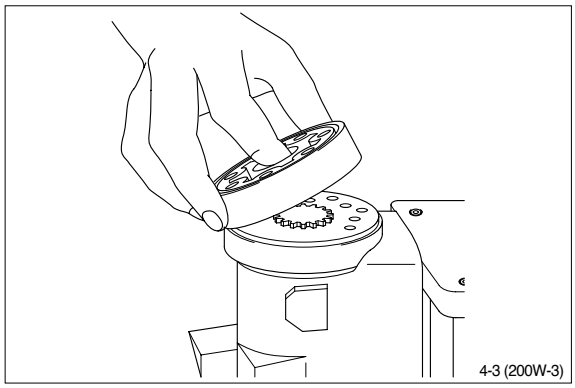
(1) Dissemble steering column from steering valve and place the steering valve in the holding tool.
Screw out the screws in the end cover(6-off plus one special screw).


4-1 (200W-3)

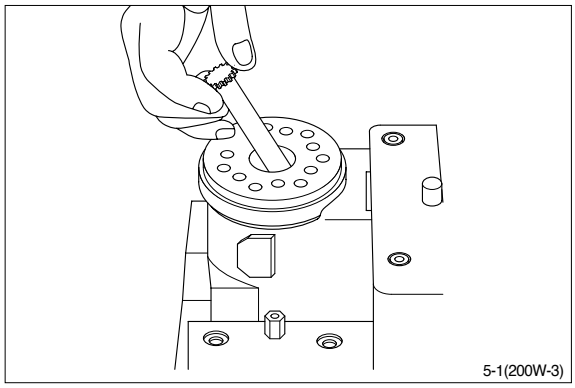
(2) Remove the end cover, sideways.


4-2 (200W-3)

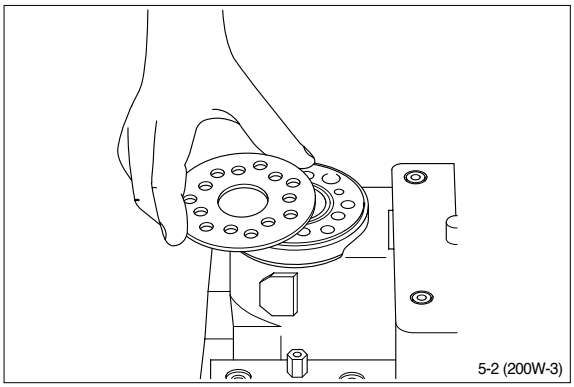
(3) Lift the gearwheel set(with spacer if fitted) off the unit.
Take out the two O-rings.


4-3 (200W-3)

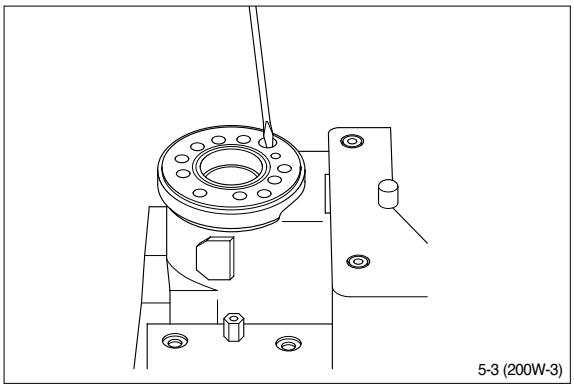
(4) Remove cardan shaft.


5-1(200W-3)

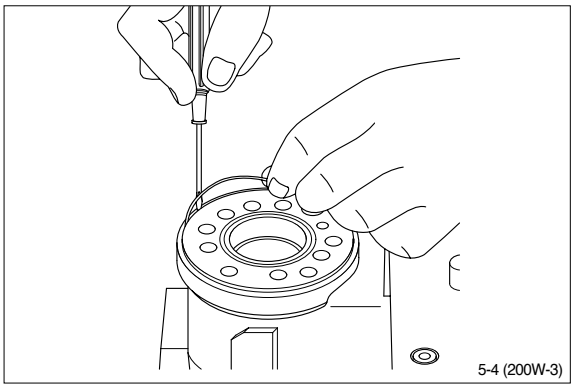
(5) Remove distributor plate.


5-2 (200W-3)

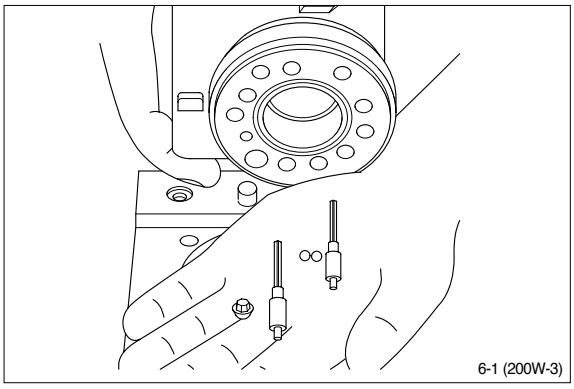
(6) Screw out the threaded bush over the check valve.


5-3 (200W-3)

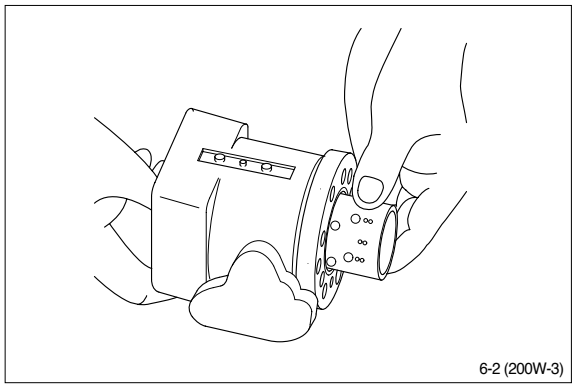
(7) Remove O-ring.


5-4 (200W-3)

(8) Shake out the check valve ball and suction valve pins and balls.

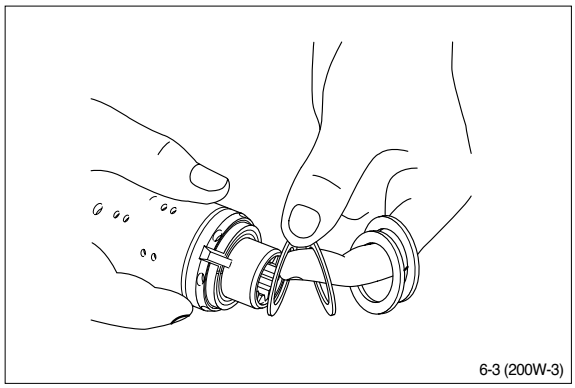

6-1 (200W-3)

(9) Take care to keep the cross pin in the sleeve and spool horizontal. The pin can be seen through the open end of the spool. Press the spool inwards and the sleeve, ring, bearing races and needle bearing will be pushed out of the housing together.



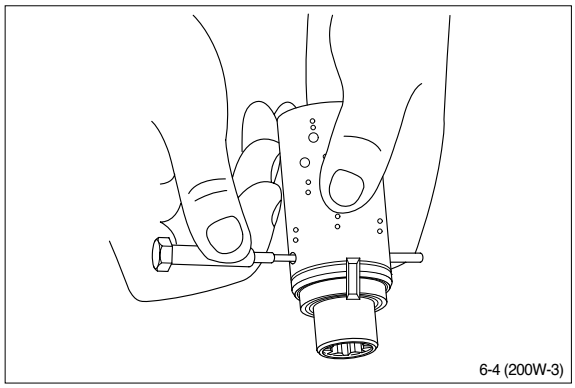
6-2 (200W-3)

(10) Take ring, bearing races and needle bearing from sleeve and spool. The outer(thin)bearing race can sometimes "stick" in the housing, therefore check that it has come out.



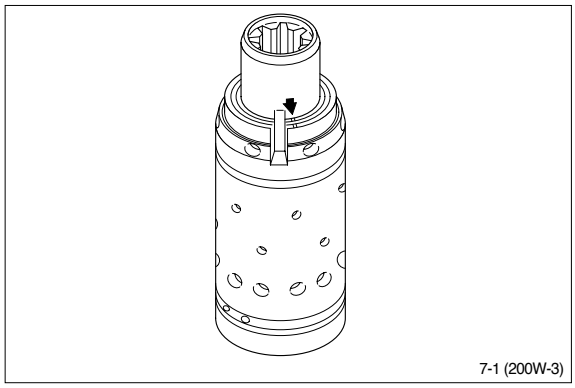
6-3 (200W-3)

(11) Press out the cross pin. Use the special screw from the end cover.



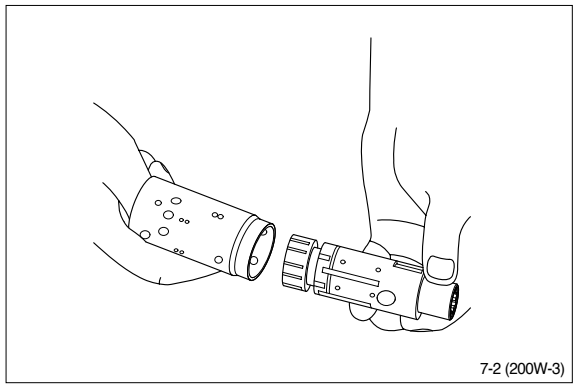
6-4 (200W-3)

※ A small mark has been made with a pumice stone on both spool and sleeve close to one of the slots for the neutral position spring as figure.
If the mark is not visible, remember to leave a mark of your own on sleeve and spool before the neutral position springs are disassembled.



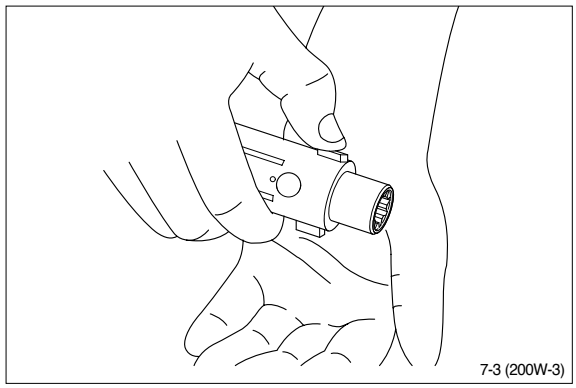
7-1 (200W-3)

(12) Carefully press the spool out of the sleeve.



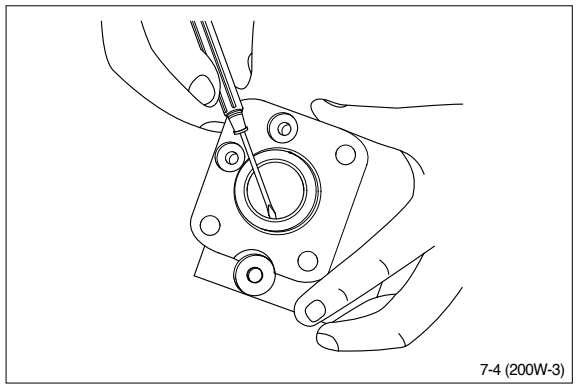
7-2 (200W-3)

(13) Press the neutral position springs out of their slots in the spool.



7-3 (200W-3)

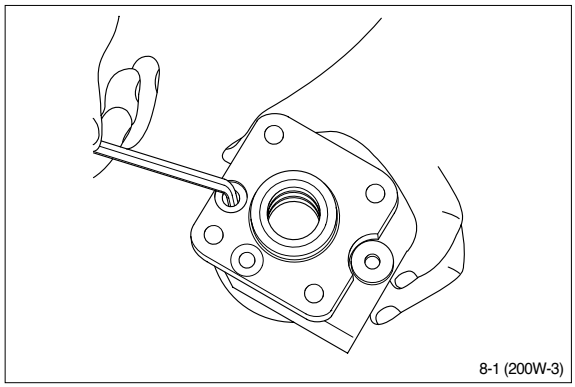
(14) Remove dust seal and O-ring/kin ring.



7-4 (200W-3)

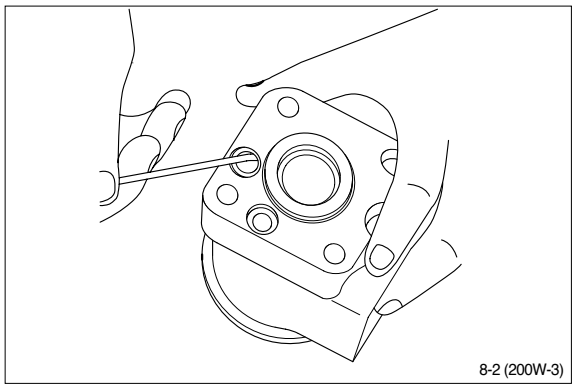
(15) Disassemble the dual shock valve

① Remove plugs from shock valves using a 6㎜ hexagon socket spanner.



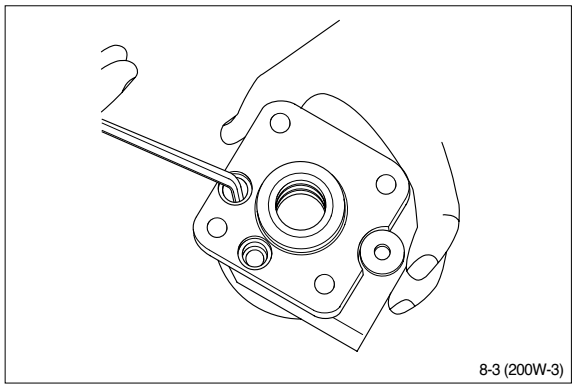
8-1 (200W-3)

② Remove seal washers(2-off).



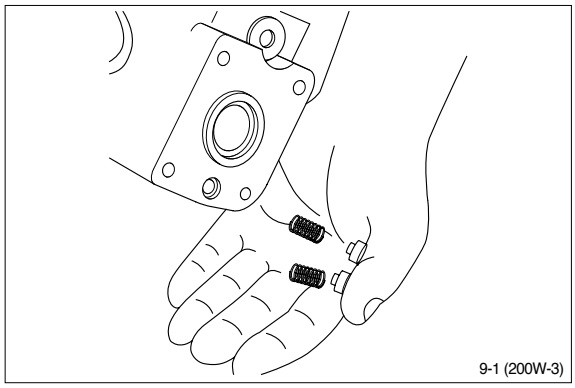
8-2 (200W-3)

③ Unscrew the setting screws using a 6㎜ hexagon socket spanner.



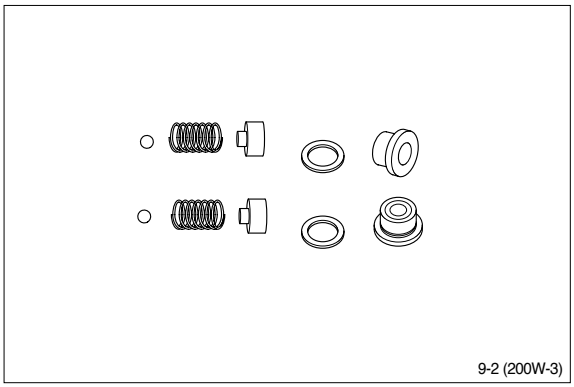
8-3 (200W-3)

④ Shake out the two springs and two valve balls into your hand. The valve seats are bonded into the housing and cannot be removed.



9-1 (200W-3)

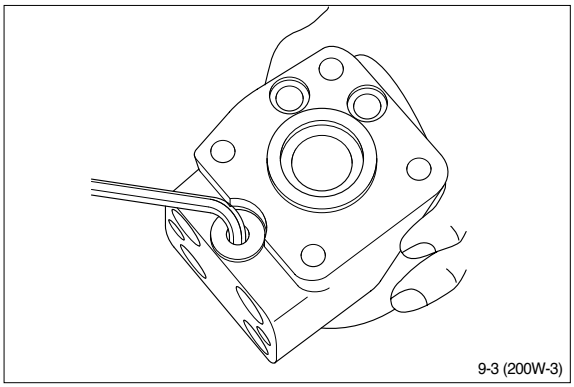
⑤ The dual shock valves are now disassembled.



9-2 (200W-3)

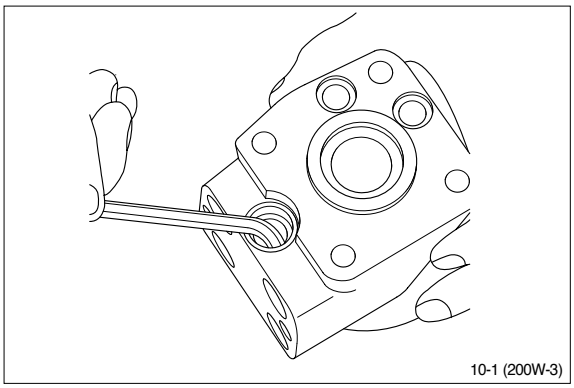
(16) Disassemble the pressure relief valve (cartridge)

① Screw out the plug using an 8mm hexagon socket spanner. Remove seal washers.



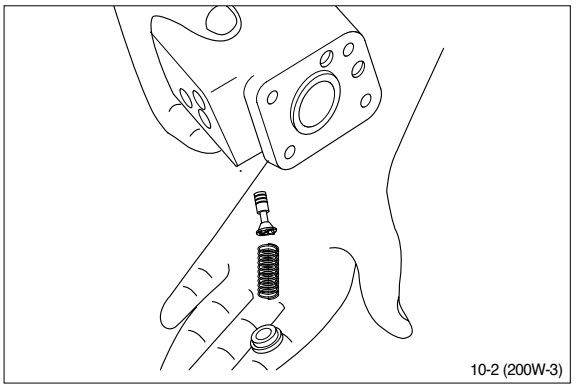
9-3 (200W-3)

② Unscrew the setting screw using an 8mm hexagon socket spanner.



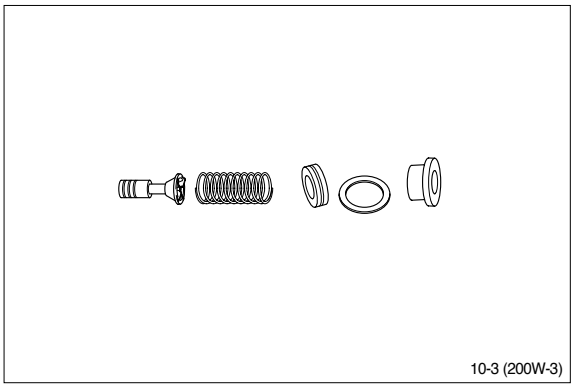
10-1 (200W-3)

③ Shake out spring and piston. The valve seat is bonded into the housing and cannot be removed.



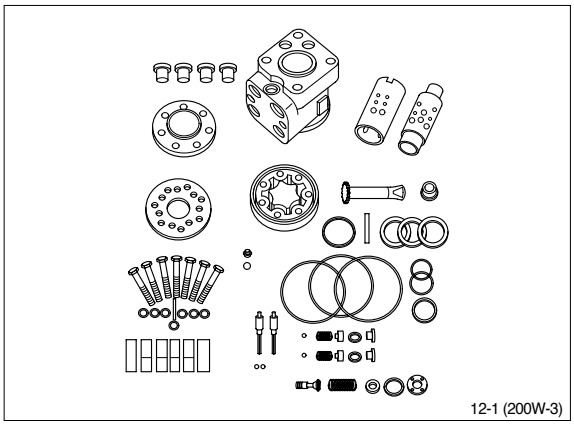
10-2 (200W-3)

④ The pressure relief valve is now disassembled.



10-3 (200W-3)

⑤ The steering valve is now completely disassembled.



12-1 (200W-3)

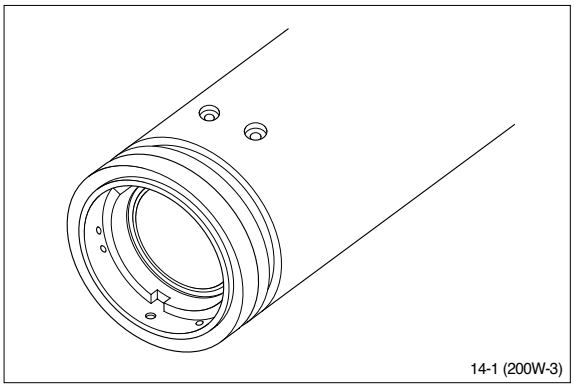
※ **Cleaning**
Clean all parts carefully in shellsol K or the like.

※ **Inspection and replacement**
Replace all seals and washers. Check all parts carefully and make any replacements necessary.

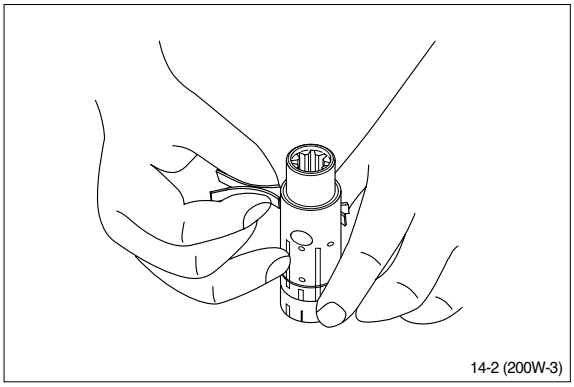
※ **Lubrication**
Before assembly, lubricate all parts with hydraulic oil.

5) ASSEMBLY

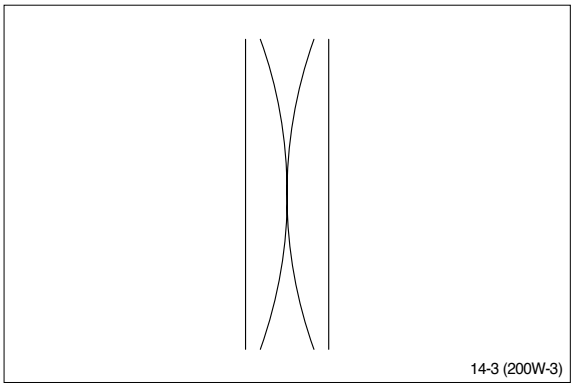
(1) Assemble spool and sleeve.
When assembling spool and sleeve only one of two possible ways of positioning the spring slots is correct. There are three slots in the spool and three holes in the sleeve in the end of the spool / sleeve opposite to the end with spring slots.
Place the slots and holes opposite each other so that parts of the holes in the sleeve are visible through the slots in the spool.


14-1 (200W-3)

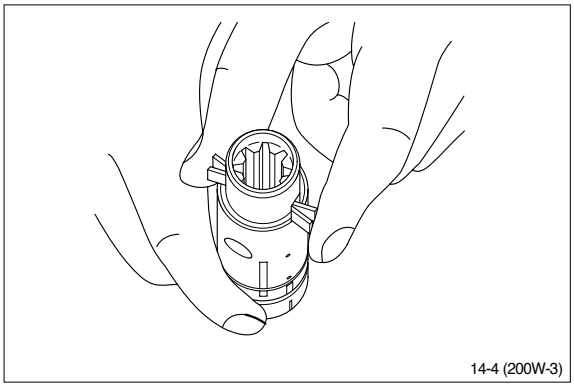
(2) Place the two flat neutral position springs in the slot.
Place the curved springs between the flat ones and press them into place(see assembly pattern).


14-2 (200W-3)

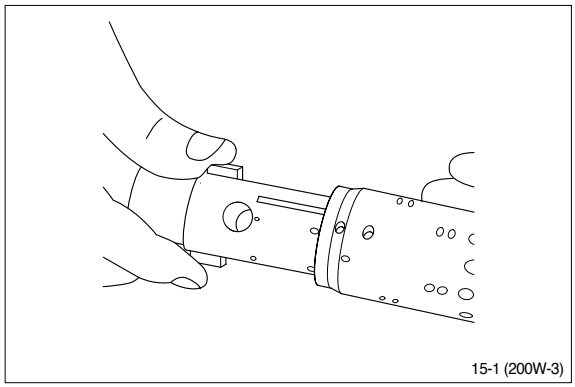
※ Assembly pattern.
· Part no : 150N4035


14-3 (200W-3)

(3) Line up the spring set.

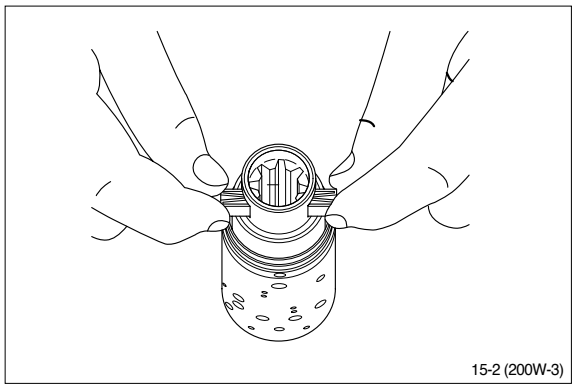

14-4 (200W-3)

(4) Guide the spool into the sleeve. Make sure that spool and sleeve are placed correctly in relation to each other.



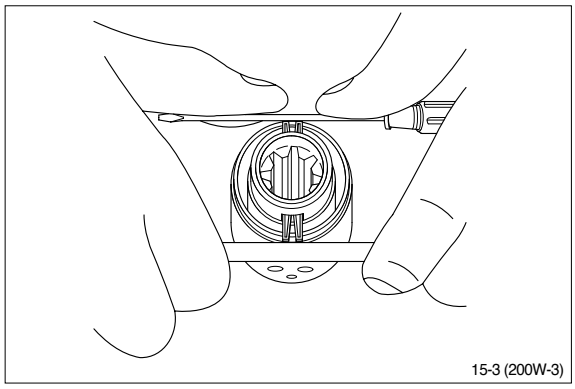
15-1 (200W-3)

(5) Press the springs together and push the neutral position springs into place in the sleeve.



15-2 (200W-3)

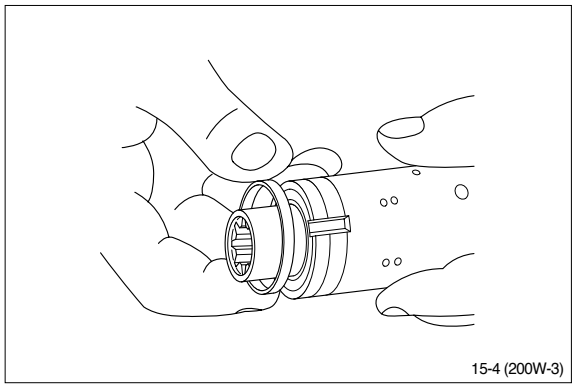
(6) Line up the springs and center them.



15-3 (200W-3)

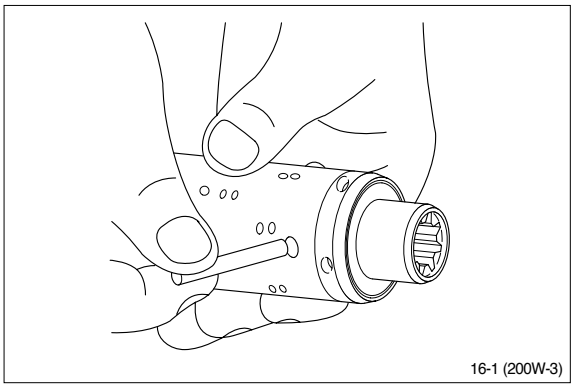
(7) Guide the ring down over the sleeve.

※ The ring should be able to rotate free of the springs.



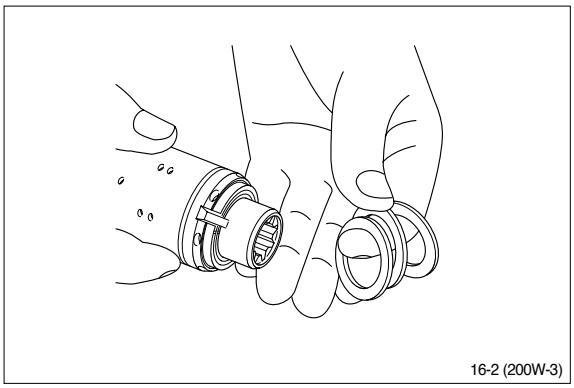
15-4 (200W-3)

(8) Fit the cross pin into the spool / sleeve.



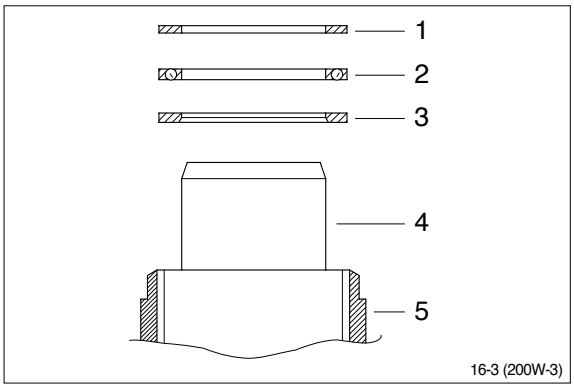
16-1 (200W-3)

(9) Fit bearing races and needle bearing as shown on below drawing.



16-2 (200W-3)

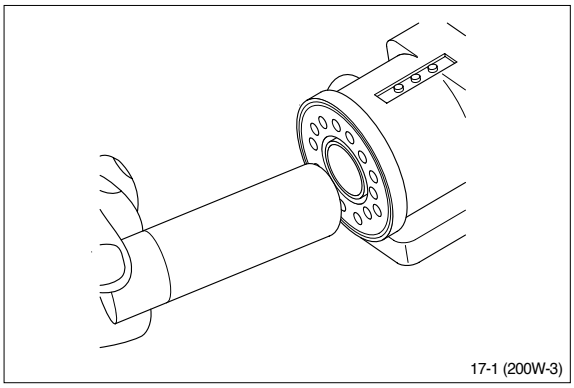
※ Assembly patted for standard bearings
1 Outer bearing race
2 Needle bearing
3 Inner bearing race
4 Spool
5 Sleeve



16-3 (200W-3)

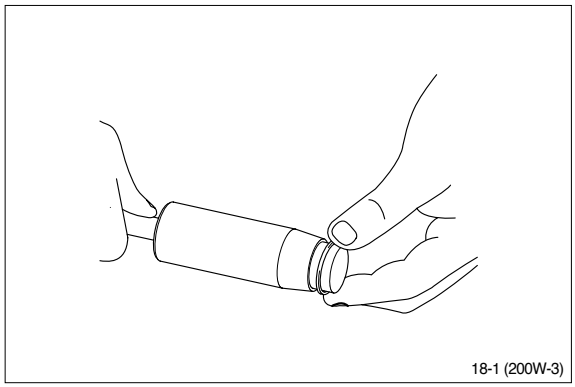
Installation instruction for O-ring/Kin-ring

(10) Turn the steering unit until the bore is horizontal. Guide the outer part of the assembly tool into the bore for the spool / sleeve.

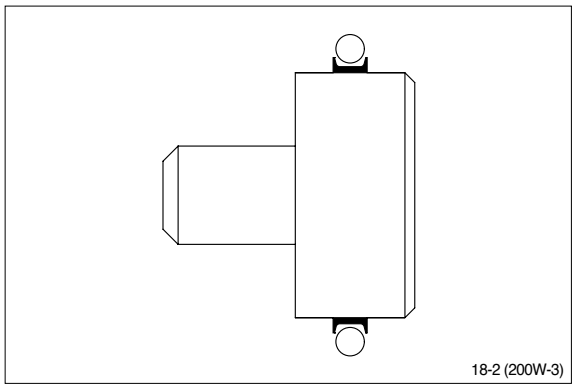


17-1 (200W-3)

(11) Grease O-ring and kin-ring with hydraulic oil and place them on the tool.

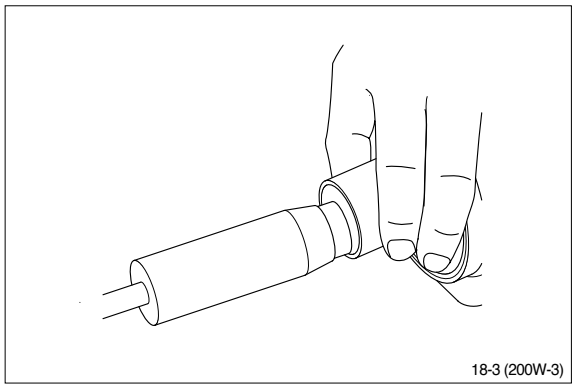


18-1 (200W-3)



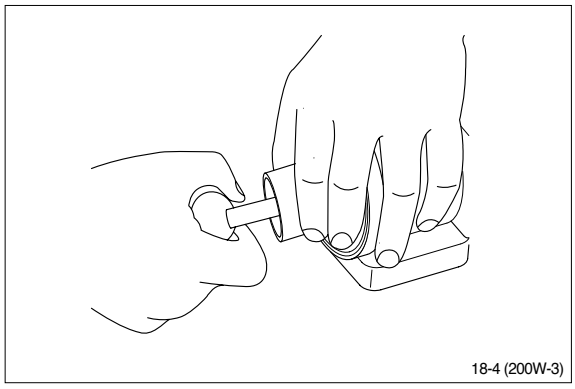
18-2 (200W-3)

(12) Hole the outer part of the assembly tool in the bottom of the steering unit housing and guide the inner part of the tool right to the bottom.



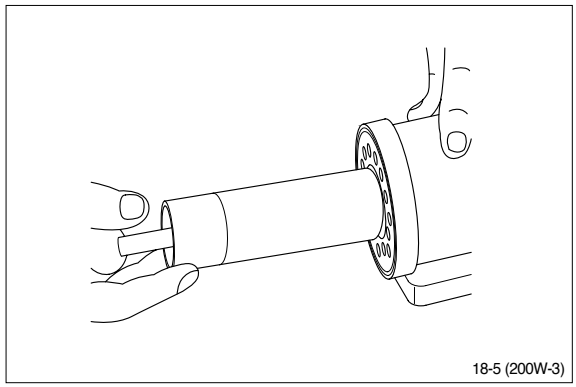
18-3 (200W-3)

(13) Press and turn the O-ring / kin-ring into position in the housing.



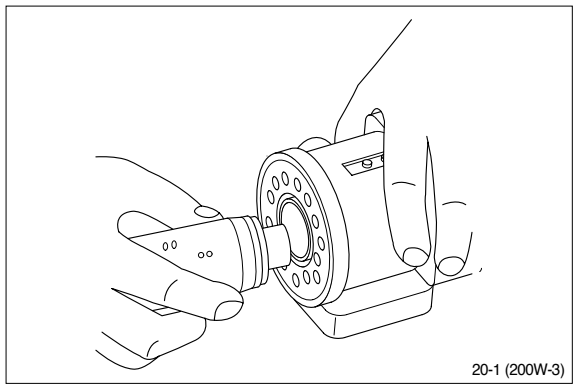
18-4 (200W-3)

(14) Draw the inner and outer parts of the assembly tool out of the steering unit bore, leaving the guide from the inner part in the bore.

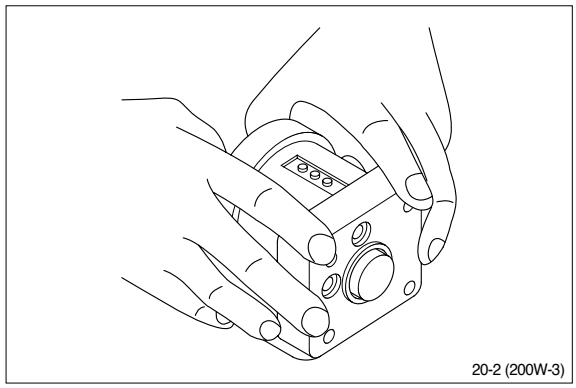

18-5 (200W-3)

(15) With a light turning movement, guide the spool and sleeve into the bore.

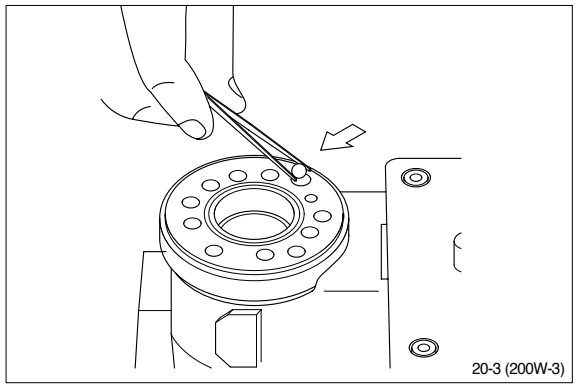
※ Fit the spool set holding the cross pin horizontal.


20-1 (200W-3)

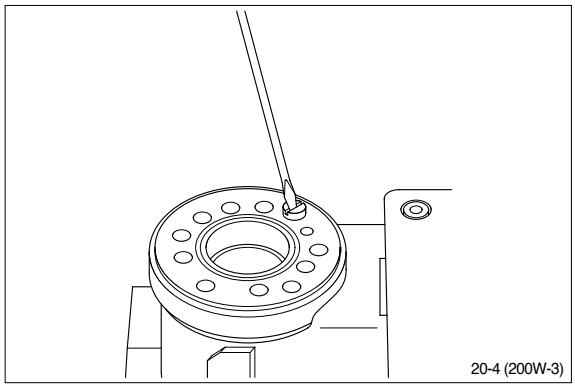
(16) The spool set will push out the assembly tool guide. The O-ring and kin-ring are now in position.


20-2 (200W-3)

(17) Turn the steering unit until the bore is vertical again. Put the check valve ball into the hole indicated by the arrow.

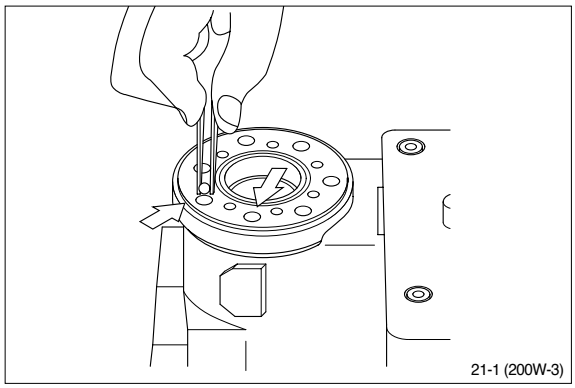

20-3 (200W-3)

(18) Screw the threaded bush lightly into the check valve bore. The top of the bush must lie just below the surface of the housing.

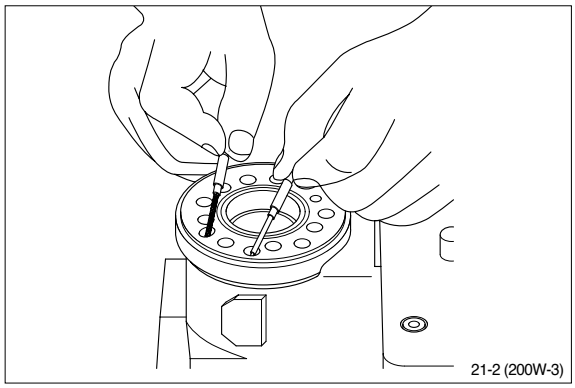

20-4 (200W-3)

Assembly of the two suction valve

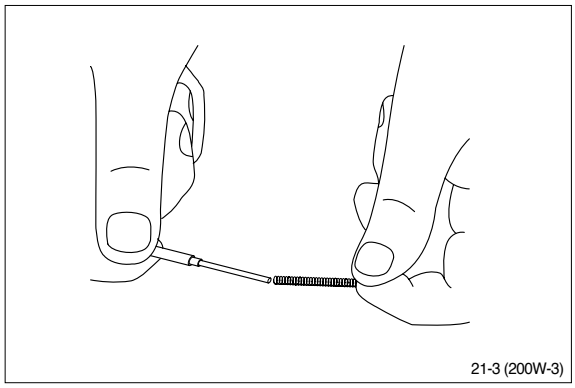
(19) Place a ball in the two holes indicated by the arrows.


21-1 (200W-3)

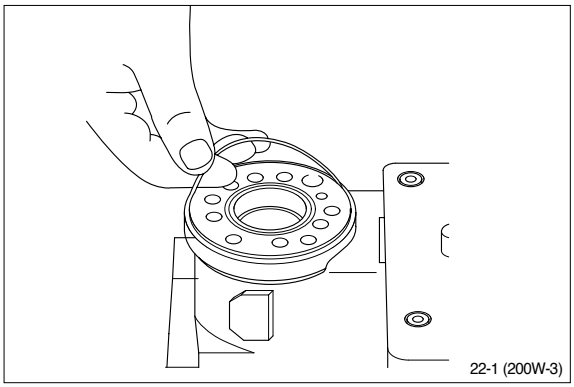
(20) Place a pin in the same two holes.


21-2 (200W-3)

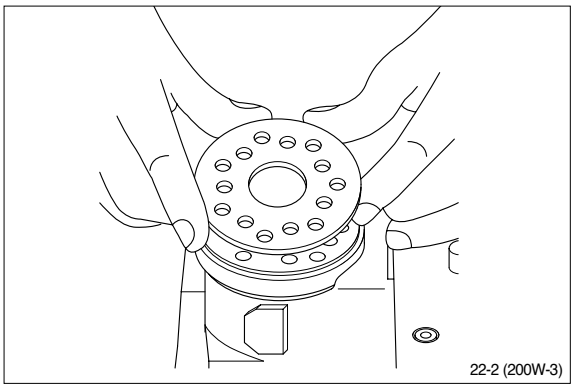
(21) In some cases a spring has to be fitted on the pin before it is placed in the housing.


21-3 (200W-3)

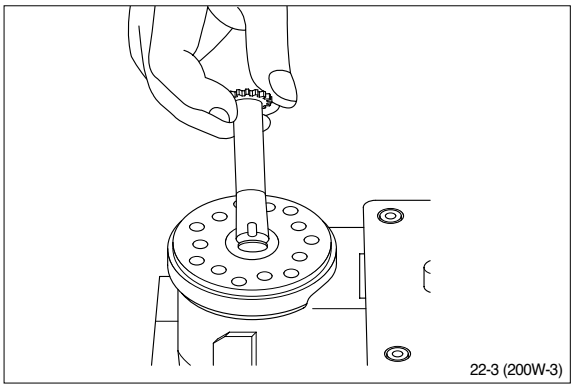
(22) Grease the O-ring with mineral oil approx viscosity 500 cST at 20°C.


22-1 (200W-3)

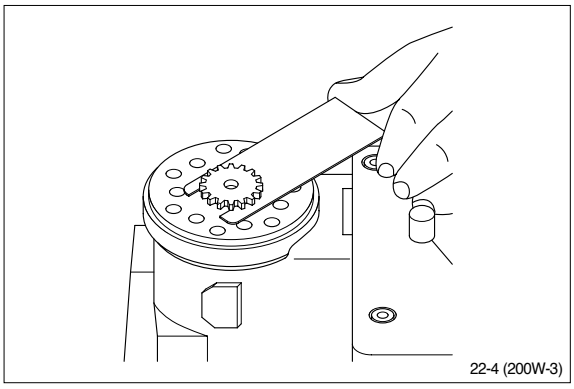
(23) Place the distributor plate so that the channel holes match the holes in the housing.


22-2 (200W-3)

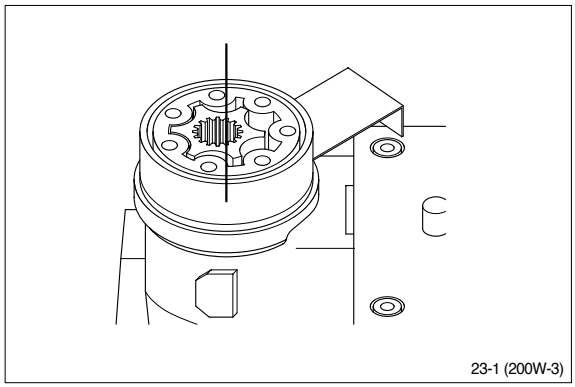
(24) Guide the cardan shaft down into the bore so that the slot is parallel with the connection flange.


22-3 (200W-3)

(25) Place the cardan shaft as shown so that it is held in position by the mounting fork.

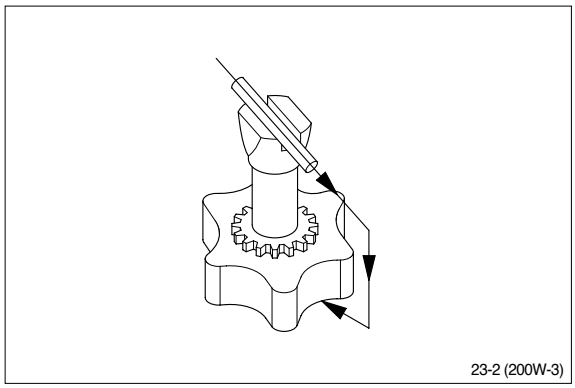

22-4 (200W-3)

(26) Grease the two O-rings with mineral oil approx. viscosity 500 cST at 20°C and place them in the two grooves in the gear rim. Fit the gearwheel and rim on the cardan shaft.



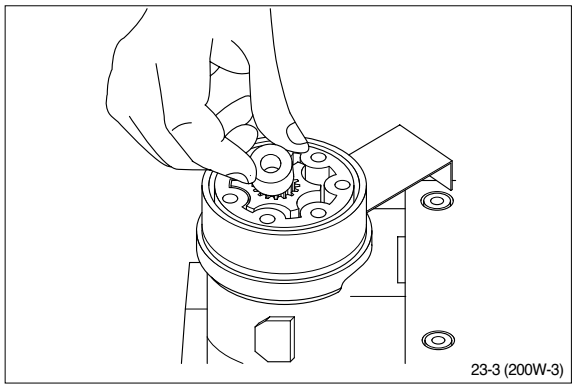
23-1 (200W-3)

(27) Fit the gearwheel(rotor) and cardan shaft so that a tooth base in the rotor is positioned in relation to the shaft slot as shown. Turn the gear rim so that the seven through holes match the holes in the housing.



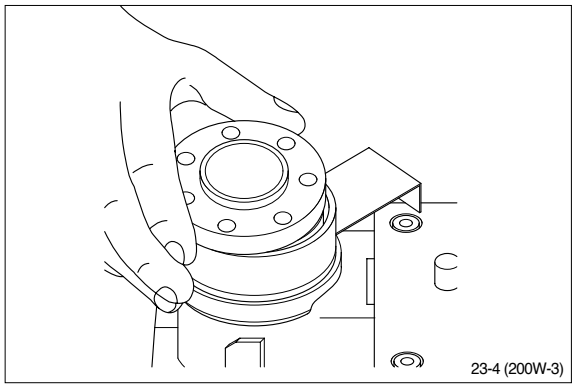
23-2 (200W-3)

(28) Fit the spacer, if any.



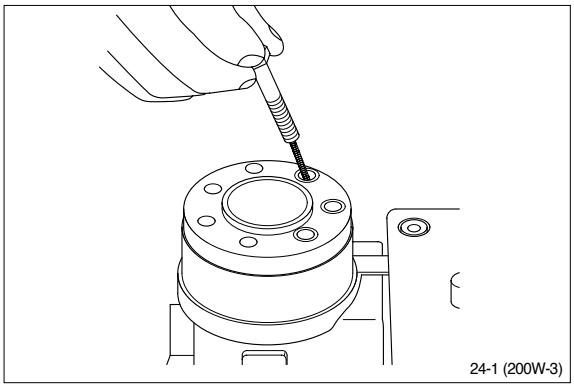
23-3 (200W-3)

(29) Place the end cover in position.



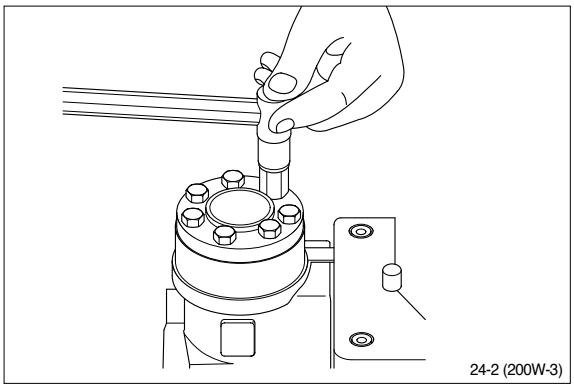
23-4 (200W-3)

(30) Fit the special screw with washer and place it in the hole shown.

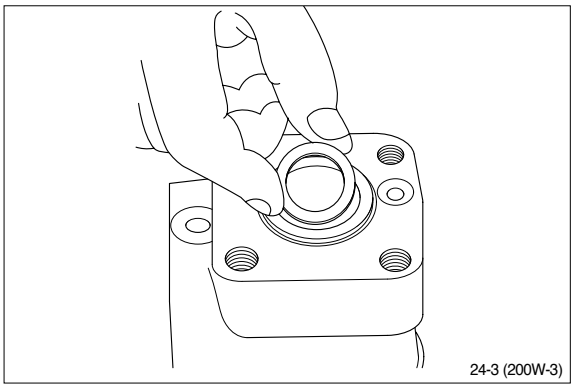

24-1 (200W-3)

(31) Fit the six screws with washers and insert them. Cross-tighten all the screws and the rolled pin.

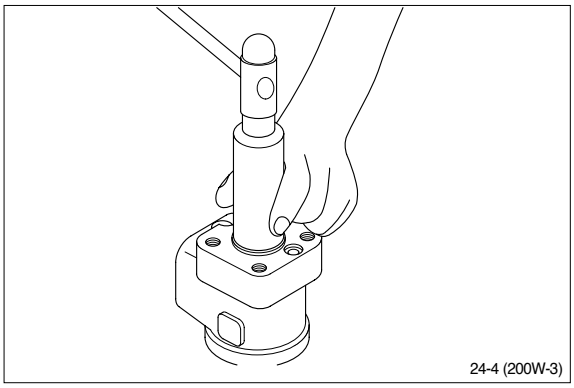
· tightening torque : 3.0±0.6kgf · m
(22.4±4.3lbf · ft)


24-2 (200W-3)

(32) Place the dust seal ring in the housing.
The dust seal ring must be placed only after the pressure relief valve and shock valves have been fitted.

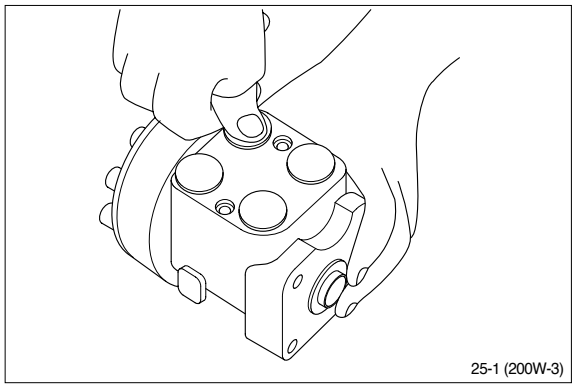

24-3 (200W-3)

(33) Fit the dust seal ring in the housing.


24-4 (200W-3)

(34) Press the plastic plugs into the connection ports.

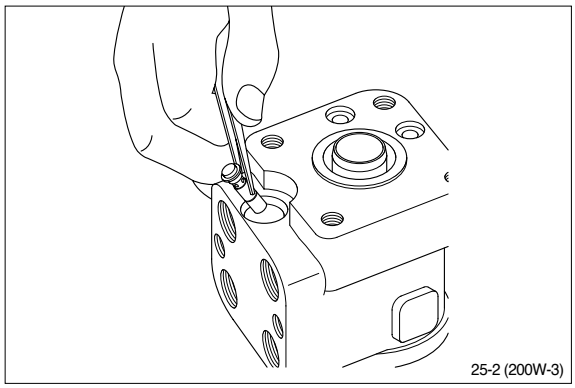
※ Do not use a hammer!



25-1 (200W-3)

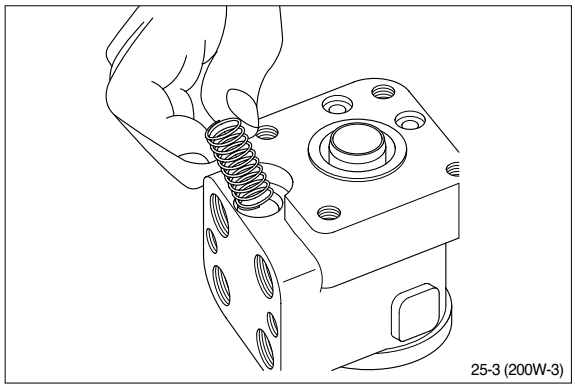
Assembly of the pressure relief valve

(35) Fit the piston.



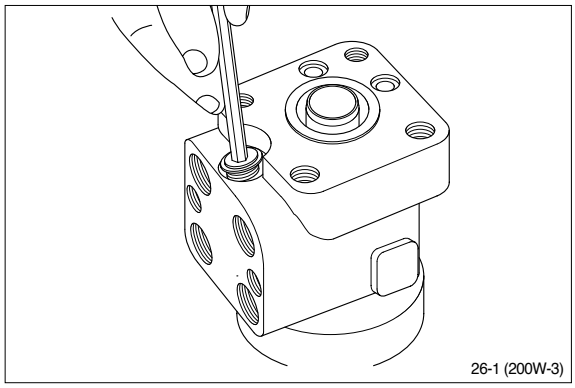
25-2 (200W-3)

(36) Fit the spring.



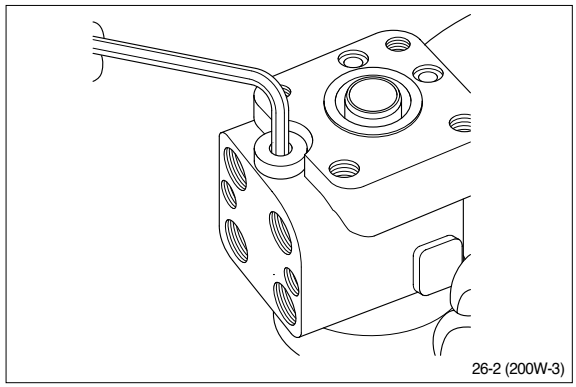
25-3 (200W-3)

(37) Screw in the setting screw with an 8㎜ hexagon socket spanner. Make the pressure setting on a panel or the machine.



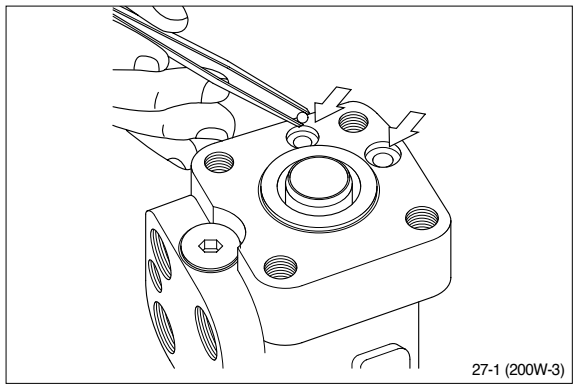
26-1 (200W-3)

(38) Screw plug with dust seal into the housing using an 8㎜ hexagon socket spanner.
· tightening torque : 5.1±1kgf · m
(36.9±7.2lbf · ft)

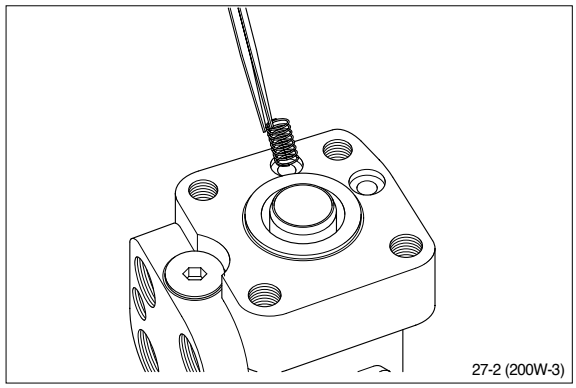

26-2 (200W-3)

Assembly of the dual shock valve

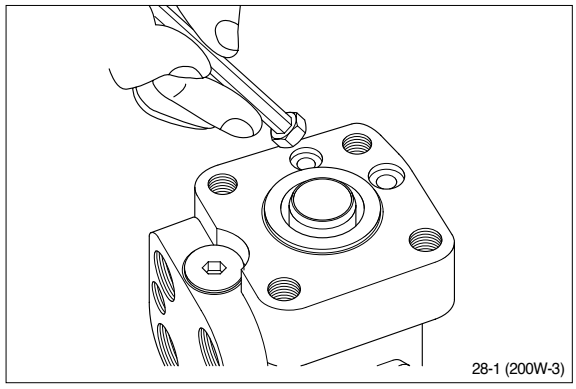
(39) Put a ball in the two holes indicated by the arrows.


27-1 (200W-3)

(40) Place springs and valve cones over the two balls.

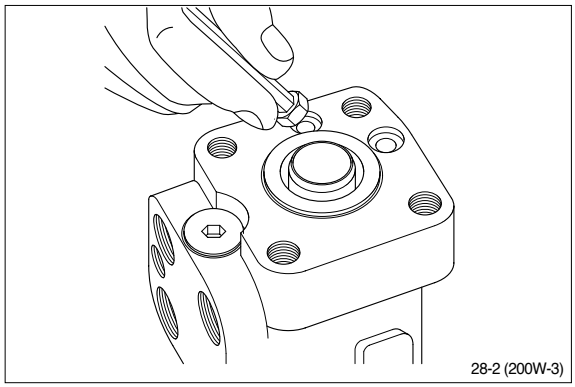

27-2 (200W-3)

(41) Screw in the two setting screws using a 6㎜ hexagon socket spanner. Make the pressure setting on a panel or the machine.


28-1 (200W-3)

(42) Screw plug with seal ring into the two shock valves using a 6㎜ hexagon socket spanner.

· Tightening torque : 3.1㎏f · m
(22.4lbf · ft)


28-2 (200W-3)

Steering valve is now assembled.

GROUP 9 FRONT AXLE AND REAR AXLE

1. REMOVAL FRONT AXLE

1) Front axle mounting bolt(1, M20)
   · Tightening torque : 57.9±8.7kgf · m
   (419±63lbf · ft)

2) Propeller shaft mounting nut(1, M10)
   · Tightening torque : 5.9±0.6kgf · m
   (42.7±4.3lbf · ft)

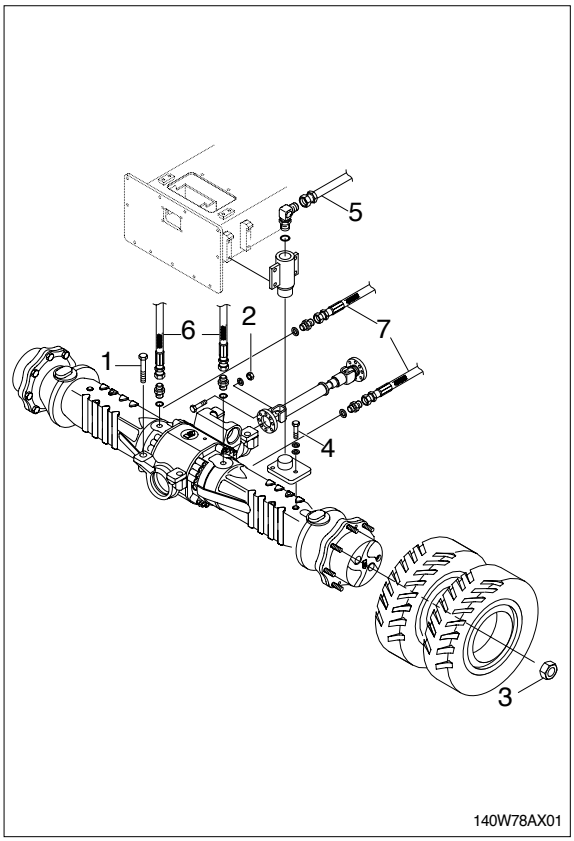
3) Wheel nut(2, M22)
   · Tightening torque : 62±3kgf · m
   (448±21.7lbf · ft)

4) Oscillating cylinder supporting mounting bolt(3, M16)
   · Tightening torque : 12.3±2.5kgf · m
   (88.9±18.1lbf · ft)

5) Pipe assy(4)

6) Hose assy(5)

7) Front axle weight : 445kg(980lb)



140W78AX01

2. REMOVAL REAR AXLE

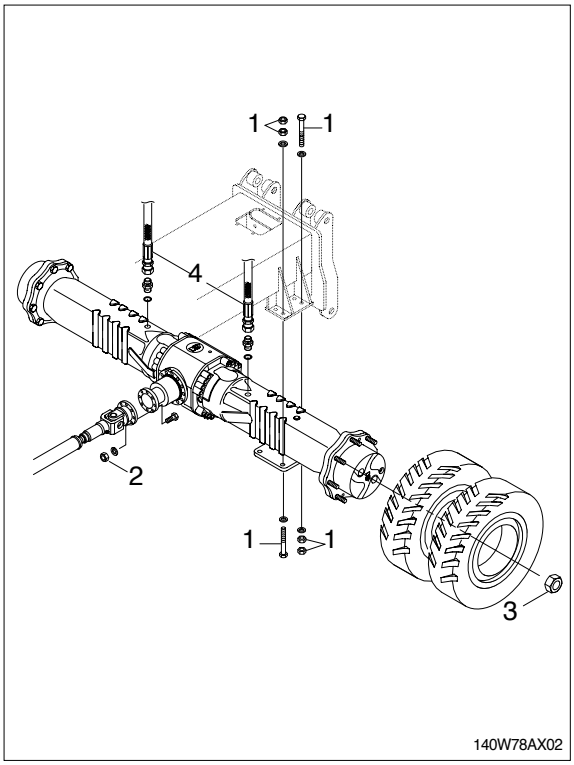
1) Rear axle mounting bolt and nut(1, M20)
   · Tightening torque : 58±6.3kgf · m
   (420±45.6lbf · ft)

2) Propeller shaft mounting nut(2, M10)
   · Tightening torque : 5.9±0.6kgf · m
   (42.7±4.3lbf · ft)

3) Wheel nut(3)
   · Tightening torque : 62±3kgf · m
   (448±21.7lbf · ft)

4) Hose assy(4)

5) Rear axle weight : 380kg(840lb)



140W78AX02

3. GENERAL INSTRUCTIONS

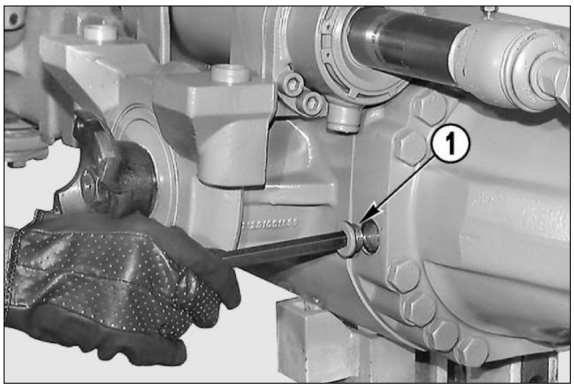
1) During all operations described in this manual, the axle should be fastened onto a trestle, while the other parts mentioned should rest on supporting benches.
2) When removing one of the arms, an anti-tilting safety trestle should be placed under the other arm.
3) When working on an arm that is fitted on the machine, make sure that the supporting trestles are correctly positioned and that the machine is locked lengthways.
4) Do not admit any other person inside the work area; mark off the area, hang warning signs and remove the ignition key from the machine.
5) Use only clean, quality tools; discard all worn, damaged, low-quality or improvised wrenches and tools. Ensure that all dynamometric wrenches have been checked and calibrated.
6) Always wear gloves and non-slip rubber shoes when performing repair work.
7) Should you stain a surface with oil, remove marks straight away.
8) Dispose of all lubricants, seals, rags and solvents once work has been completed. Treat them as special waste and dispose of them according to the relative law provisions obtaining in the country where the axles are being overhauled.
9) Make sure that only weak solvents are used for cleaning purposes; avoid using turpentine, dilutants and toluol-, xylol- based or similar solvents; use light solvents such as kerosene, mineral spirits or water-based, environment friendly solvents.
10) For the sake of clarity, the parts that do not normally need to be removed have not been reproduced in some of the diagrams.
11) The terms RIGHT and LEFT in this manual refer to the position of the operator facing the axle from the side opposite the drive.
12) After repair work has been completed, accurately touch up any coated part that may have been damaged.

4. CHECKING WEAR AND REPLACING THE BRAKING DISKS

1) HOW TO DISASSEMBLE THE BRAKING UNIT

(1) Remove the oil-level plug(1).

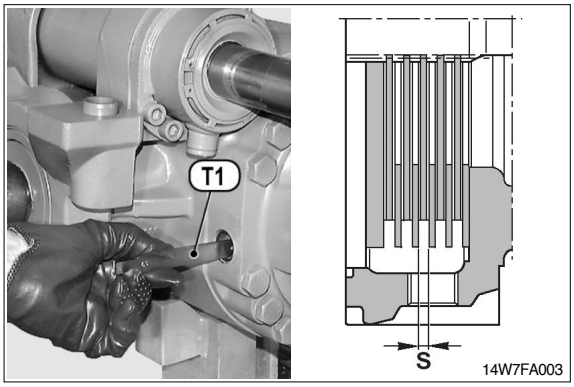
※ **Perform all operations on both arms.**



14W7FA002

(2) Apply the brakes and keeping them under pressure, check the linings “S” between the disk using tool T1.
Minimum “S” : 4.5㎜

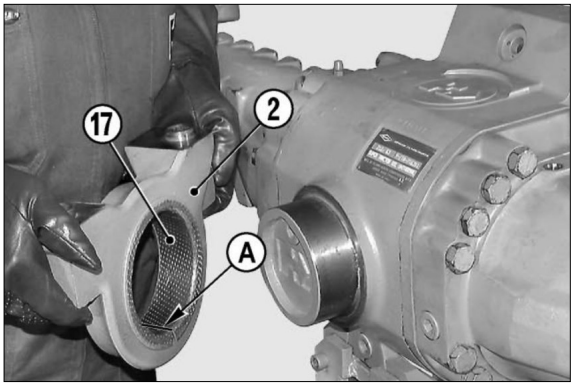
※ **Replace the braking disks and the intermediate disks on both sides if necessary.**



14W7FA003

(3) Remove the swinging support(2) on the side opposite the drive.
NOTE
If the bushing(17) is worn and needs replacing, note down the assembly side of the connection notch“ A ”.

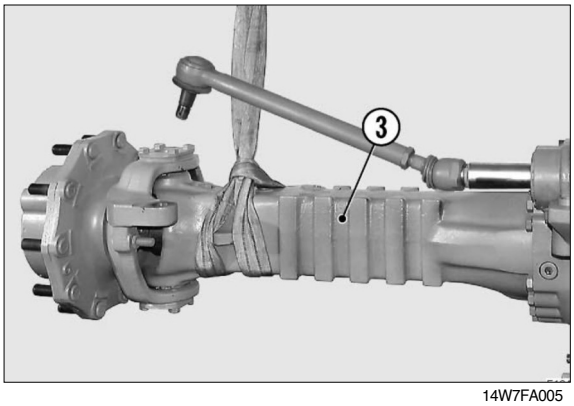
※ **Front axle only**



14W7FA004

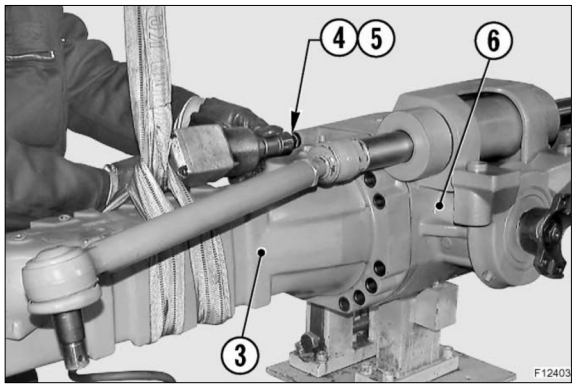
(4) Disconnect the pins of the steering bare from the steering case (See “ HOW TO REMOVE THE STEERING CYLINDER ”).
Sling the arm(3) to be removed and put the rod under slight tension.

※ **Front axle only**



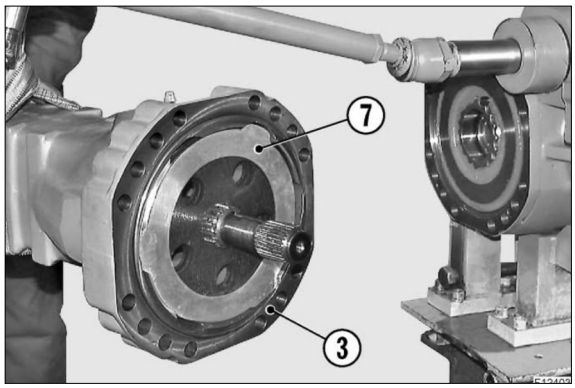
14W7FA005

(5) Unloose and remove the screws(4) and the washers(5) that fix the arm(3) to the central body(6).



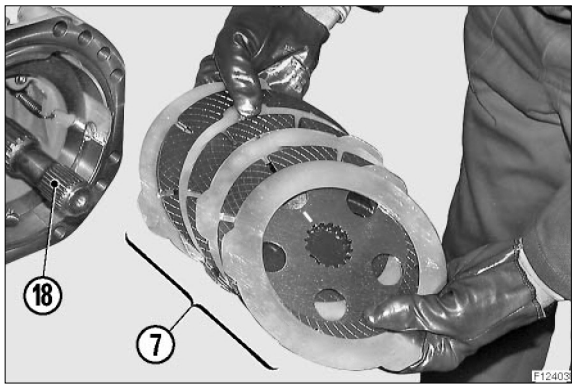
14W7FA006

(6) Remove the arm(3) together with the pack of the braking disks(7).
Place the arm on a bench.



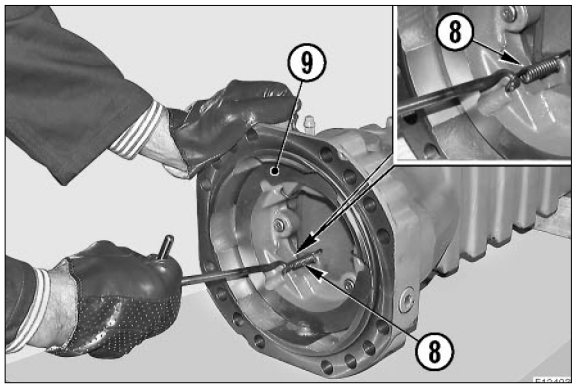
14W7FA007

(7) Remove the braking disks(7) and note down their order of assembly.
NOTE
① If the disks do not need replacing, avoid switching their position.
② Extrack the u-joint(18).



14W7FA008

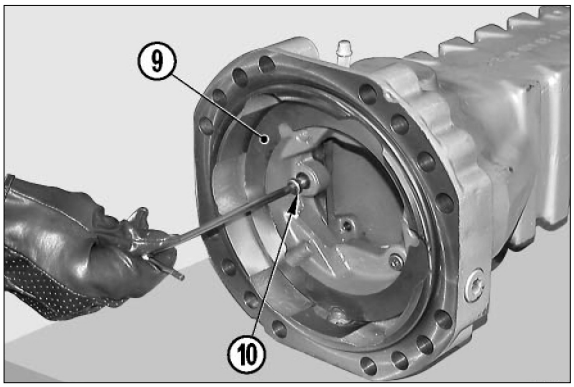
(8) Remove the reversal springs(8) from the piston(9).
NOTE
If the springs(8) are weak or deformed they must be replaced.



14W7FA009

(9) Remove the pin screws(10) guiding the piston(9).

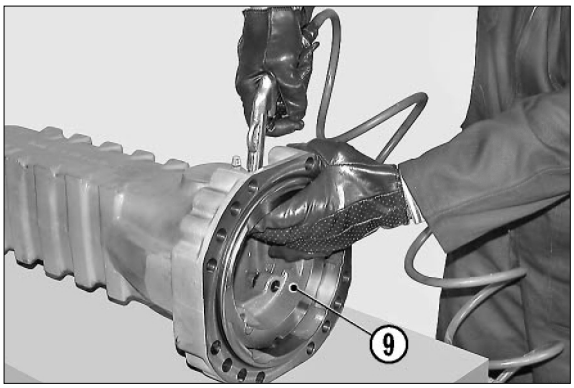
※ **If the screws are to be replaced, note down the different colours for the different brake gap.**
(See " HOW TO ASSEMBLE THE BRAKING UNITS ")



14W7FA010

(10) Slowly introduce compressed air through the connection of the braking circuit in order to extract the entire piston.

※ **Hold on to the piston as it may be suddenly ejected and damaged.**

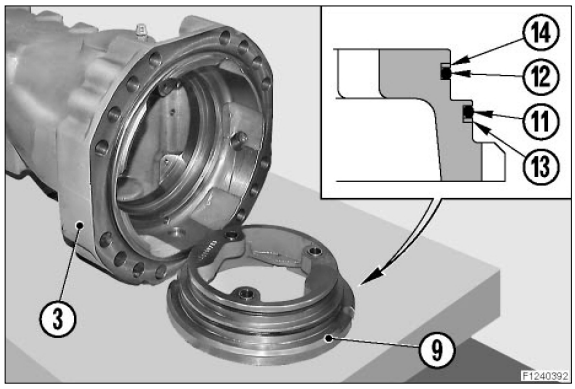


14W7FA011

2) HOW TO ASSEMBLE THE BRAKING UNITS

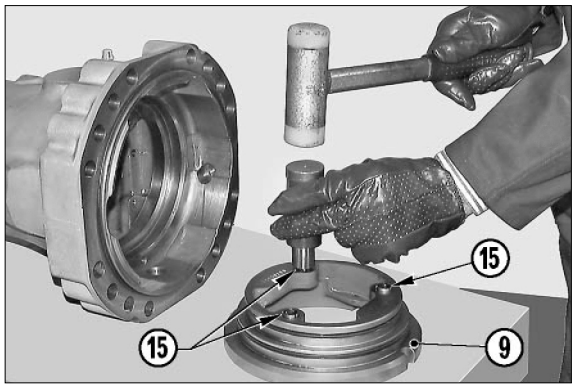
(1) Accurately clean the piston(9) and the seats of slide and seal.
Replace the O-rings(11) and (12) and the anti-extrusion rings(13) and (14); make sure that the assembly side is correct.

※ **Accurately check the positioning of the anti-extrusion rings(13) and (14).**



14W7FA013

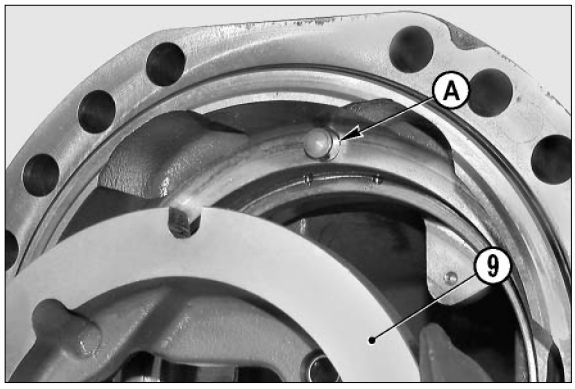
(2) Insert the stroke automatic regulation springs(15); place them in line with the piston(9).



14W7FA014

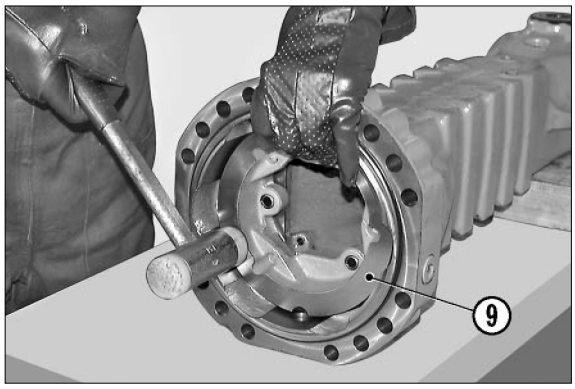
(3) Lubricate the seals(11) and (12) and fit the piston(9) into the arm(3).

※ **Make sure that the piston seat fits into the stop pin(A) inside the arm.**



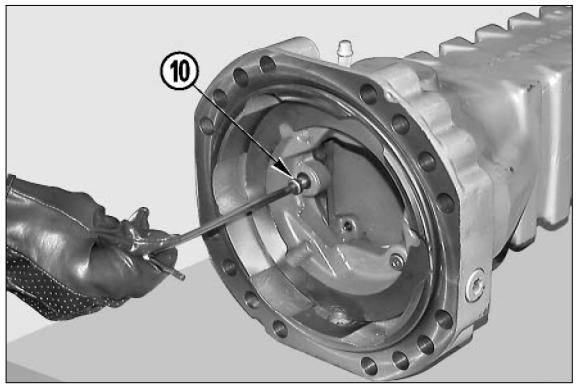
14W7FA015

(4) Assist the insertion of the piston(9) by lightly hammering around the edge with a plastic hammer.



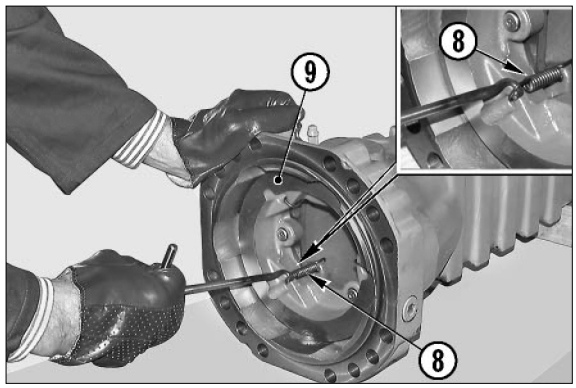
14W7FA016

(5) Fit the pin screws(10) making sure that they are all of the same colour.
White : 1㎜ gap
Yellow : 0.75㎜ gap
Blue : 0.5㎜ gap
Apply loctite 270 to the thread.
· Torque wrench setting : 0.5~0.7kgf · m
(3.7~5.2lbf · ft)



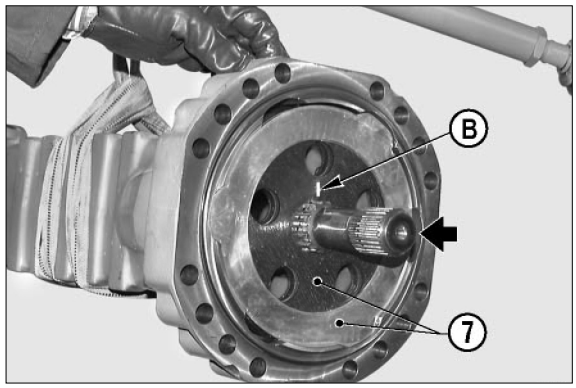
14W7FA017

(6) Fit the reversal springs(8) on the piston(9).
※ **Pay due attention not to deform the connections of the springs.**



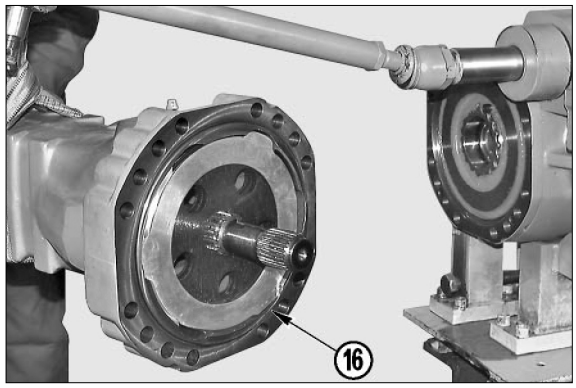
14W7FA018

(7) Slightly lubricate the braking disks(7) and fit them in the arm following the correct sequence; orient them so that the oil circulation holes and the marks " B " are perfectly lined up.
NOTE
When installing the steel discs, the slot corresponding to the oil level cap should always be kept free.



14W7FA019

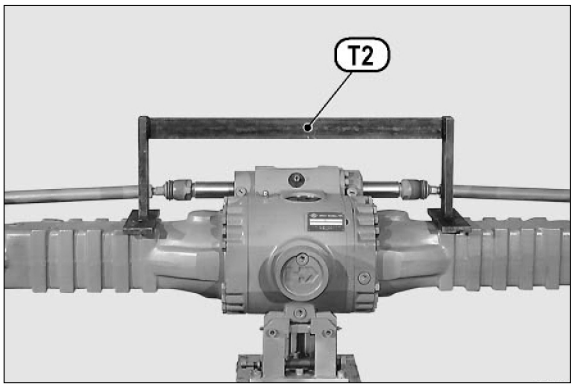
(8) Check that the positioning of the sealing ring(16) on the arm is intact; install the complete arm. Lock it into position using two facing screws(4) and washers(5).



14W7FA020

(9) Check the flatness of the arms using tool T2 and finally lock the arms with the screws(4) and the washer(5) using the cross-tightening methed.

· Torque wrench setting : 30kgf · m(219lbf · ft)



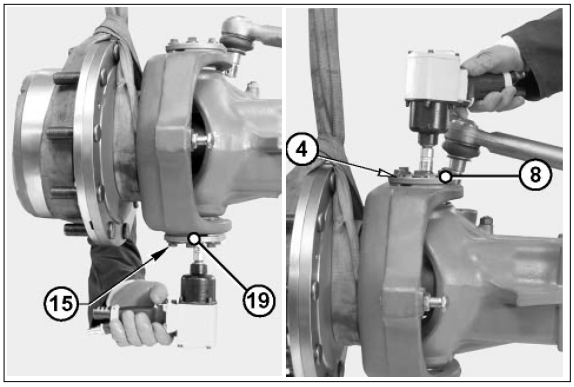
14W7FA021

5. STEERING CASE

※ FRONT AXLE ONLY

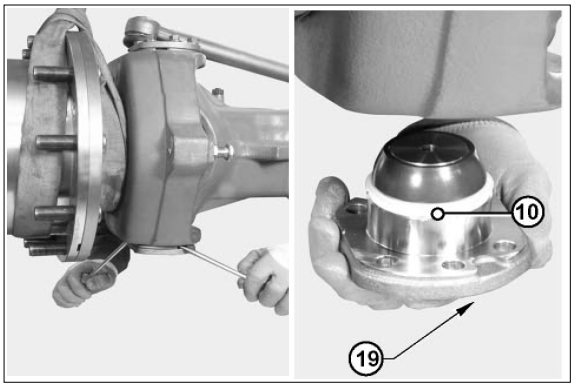
1) HOW TO REMOVE THE COMPLETS STEERING CASE

(1) Unloose and remove the fittin screws(15), (8) from the articulation pin(19), (4).



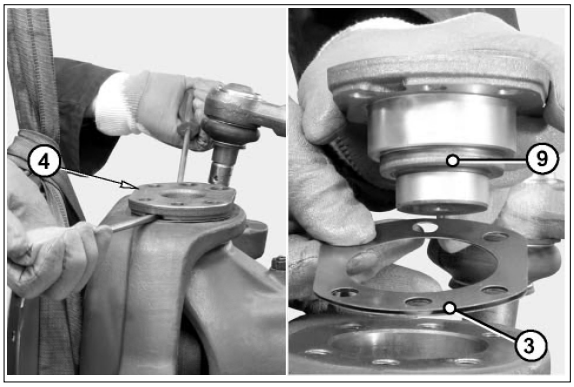
14W7FA023

(2) Remove the bottom articulation(19) pin complete with front sealing ring(10).

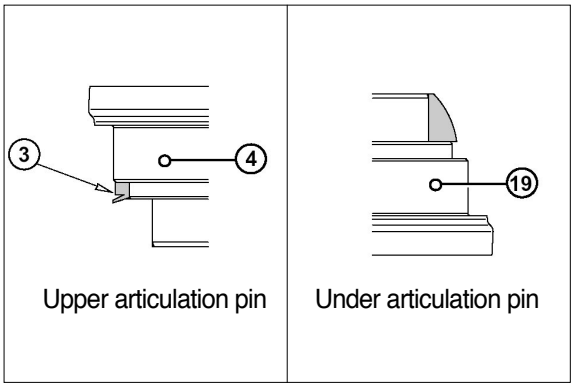


14W7FA024

(3) Using two levers, remove the top articulation pin(4) complete with front seal(9) and shims(3).
Pay attention not to damage the surfaces.

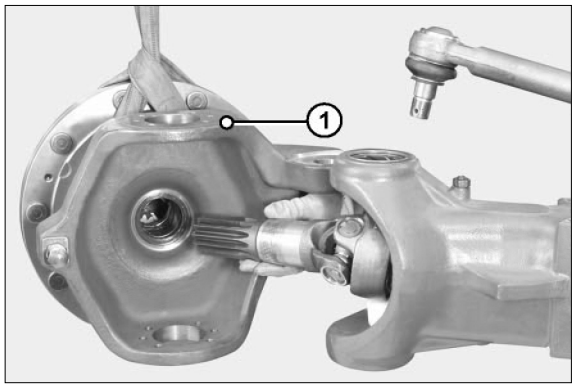


14W7FA025



14W7FA026

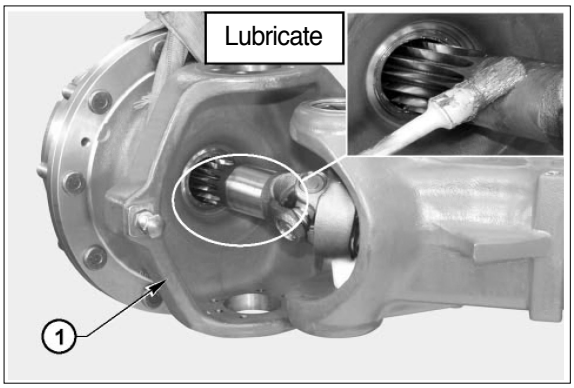
(4) Remove the complete steering case(1).



14W7FA027

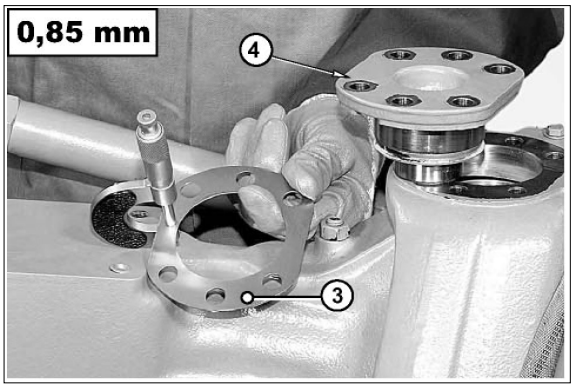
2) HOW TO INSTALL THE COMPLETE STEERING CASE

(1) Lubricate the terminal of the u-joint and install the steering case(1).
Pay due attention not to damage the dust cover rings and the sealing rings.



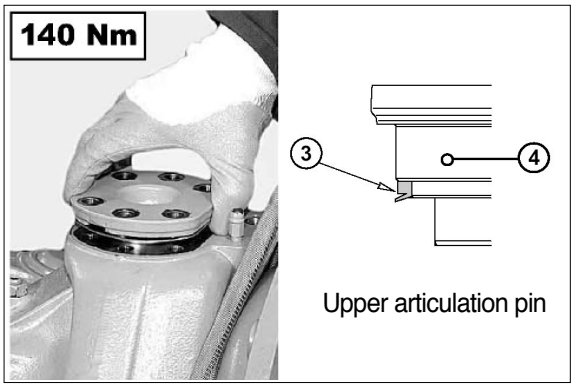
14W7FA028

(2) Prepare a series of shims(3) of 0.85㎜. To be assembled under the upper pin(4).



14W7FA029

(3) Fit a new seal(3) onto the top articulation pin(4). Lubricate and install the unit in the steering case. Position the screws(8) and tight wrench 14㎏f · m(101㏈f · ft).
Check the correct assembly side of the seal(3).

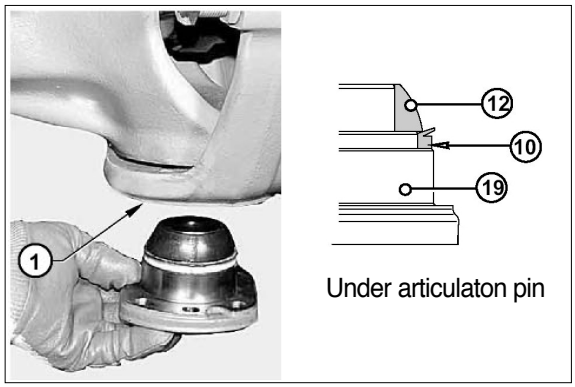


14W7FA030

(4) Lubricate and the unit in the steering case.

14W7FA031

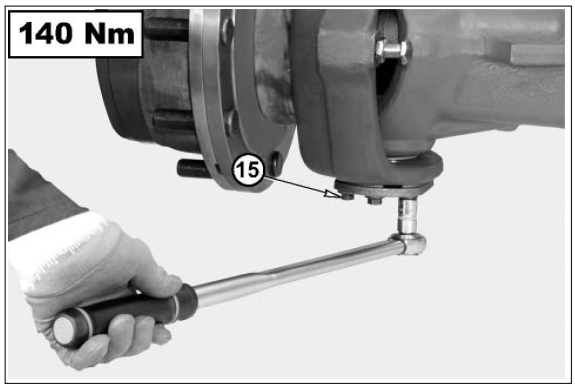
(5) Fit the unit(19) in the steering case(1). Position the screws(15) and tightly tighten. Check for the correct assembly side of the seal(10)



14W7FA032

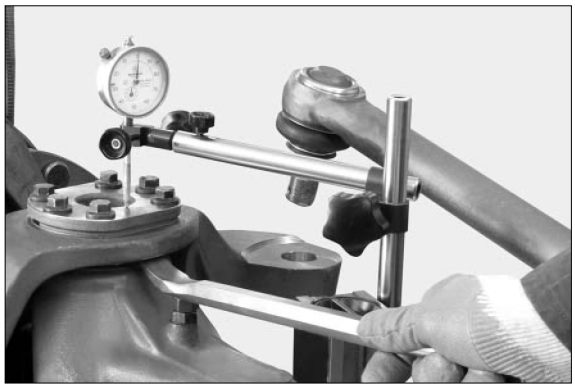
(6) Tighten the new fittin screws(15) of top and bottom articulation pins in sequence using the cross tightening method.

· Torque wrench setting : 14kgf · m(101lbf · ft)



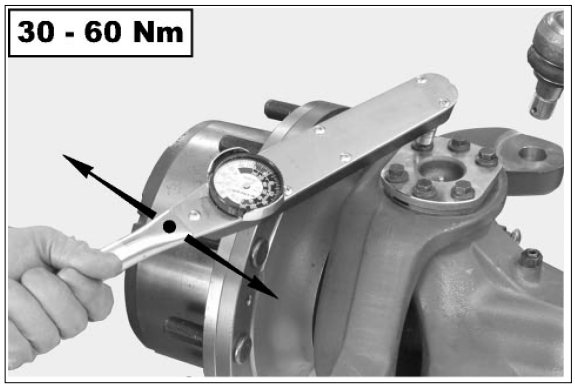
14W7FA033

(7) Check by means of a lever that there is no vertical gap. In case there is any gap, determine the width and reduce it by removing shims.



14W7FA034

(8) Check the torque of the pins, which has to be between 3~6kgf · m(2.2~4.4lbf · ft).
If the preliminary measured value is too high, the shims have to be increased.



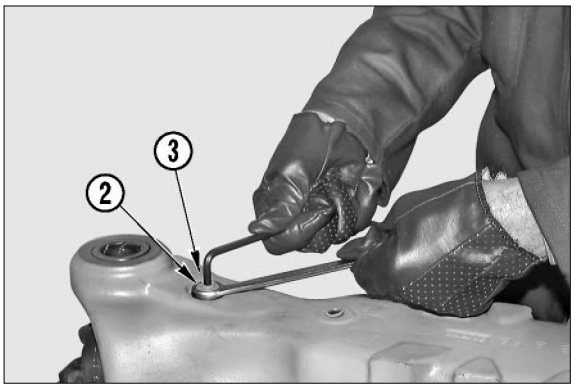
14W7FA035

6. U-JOINT

※ **FRONT AXLE ONLY**

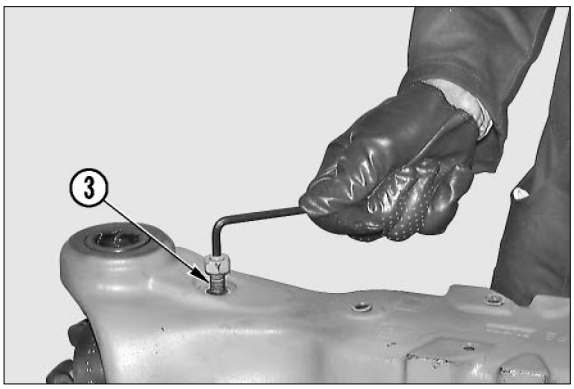
1) HOW TO REMOVE THE U-JOINT

(1) Unloose and remove the top and bottom check nuts(2) from the dowels(3).



14W7FA036

(2) Remove top and bottom check dowels(3) from the bush(13).

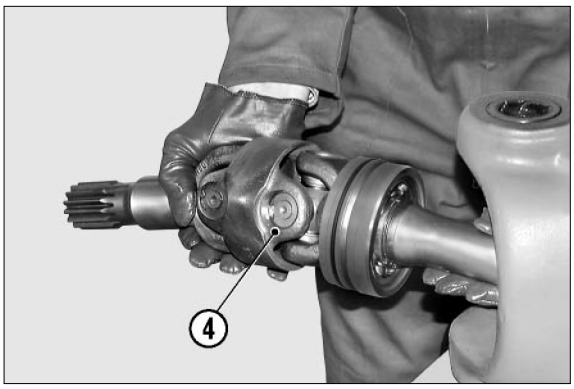


14W7FA037

(3) Remove the entire u-joint(4).

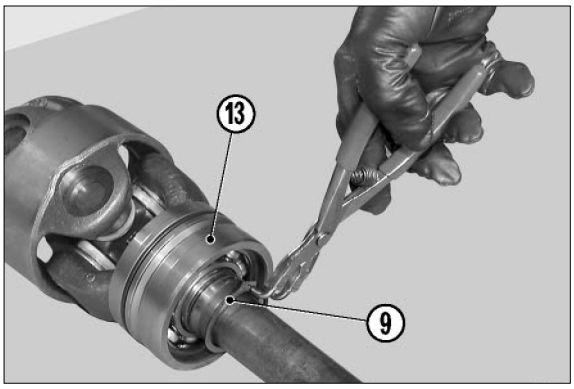
NOTE

To remove the u-joint use, if necessary, a plastic hammer or a lever.



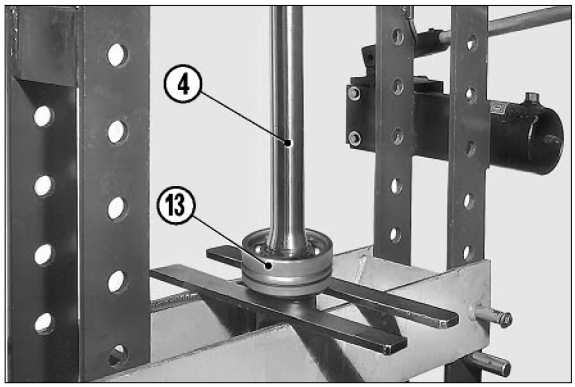
14W7FA042

(4) Remove the snap ring(9) from the bushing unit(13).



14W7FA043

(5) Position the entire u-joint(4) under a press and remove the complete bush(13).

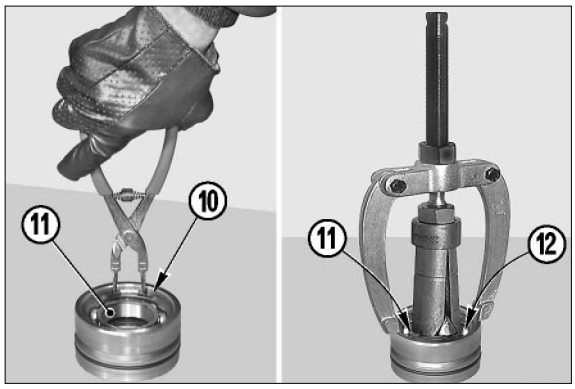


14W7FA044

(6) Remove the snap ring(10) from the bearing(11). Use a puller to remove the bearing(11), the sealing ring(12) and the O-ring(14).

NOTE

Note down the assembly side of the ring(12).



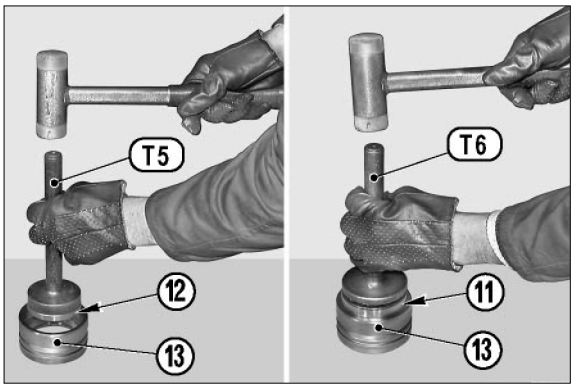
14W7FA045

2) INSTALLATION OF U-JOINT

(1) Using tools T5 and T6, insert the sealing ring(12) and the bearing(11) in the bush(13).

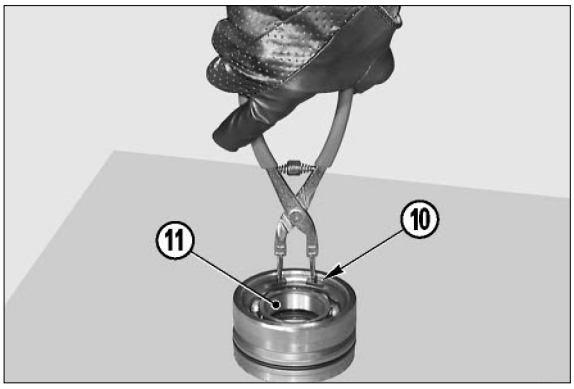
NOTE

Carefully check the assembly side of the seal(12).



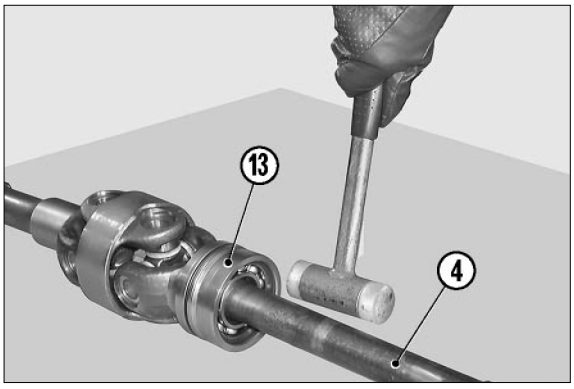
14W7FA050

(2) Fit the snap ring(10) on the bearing(11).



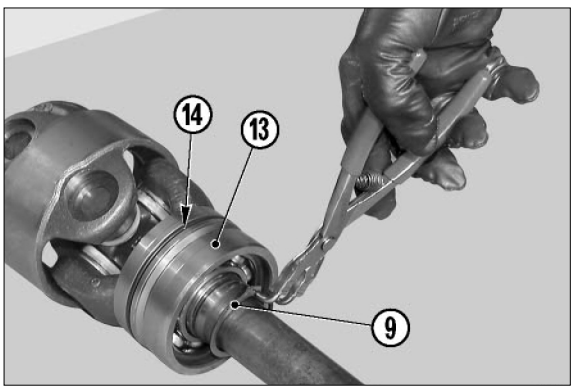
14W7FA051

(3) Heat the bearing in oil at an approx. temperature of 100°C and fit the entire bush(13) on the u-joint(4).



14W7FA052

(4) Fit the check ring(9) on the bushing unit(13); also put the O-ring(14) into position.



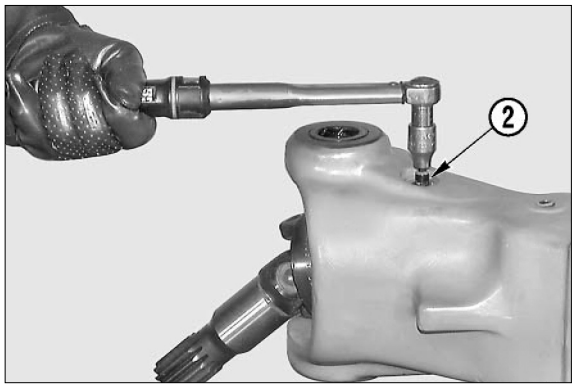
14W7FA053

(5) Insert the u-joint and tighten the top and bottom dowels(2).

· Torque wrench setting : Max 1.5kgf · m (11lbf · ft)

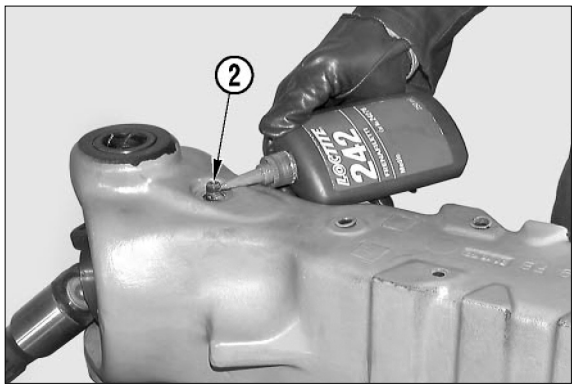
NOTE

For u-joint coming with a bush, centre the point of the check dowels in the slot.



14W7FA054

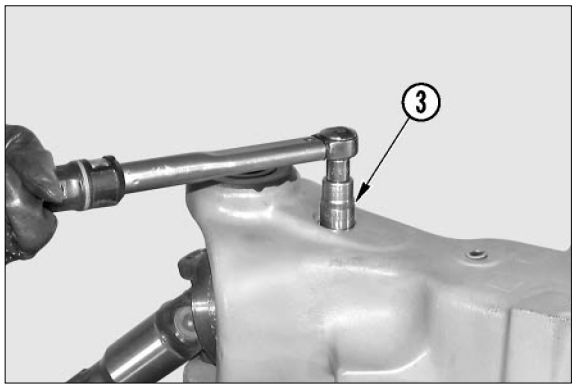
(6) Apply loctite 242 to the jutting parts of the dowels(2).



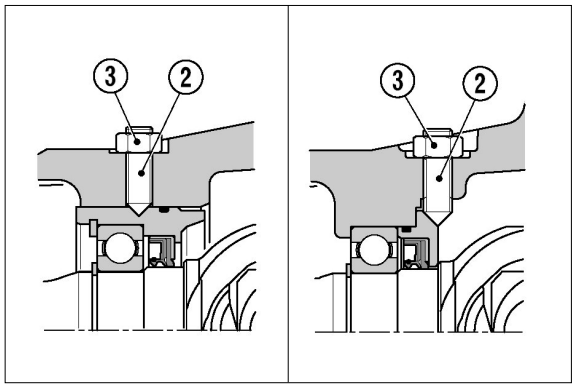
14W7FA055

(7) Screw the check nuts(3) of the dowels(2) and lock them using a dynamometric wrench.

· Torque wrench setting : 12.4kgf · m(90lbf · ft)



14W7FA056



14W7FA057

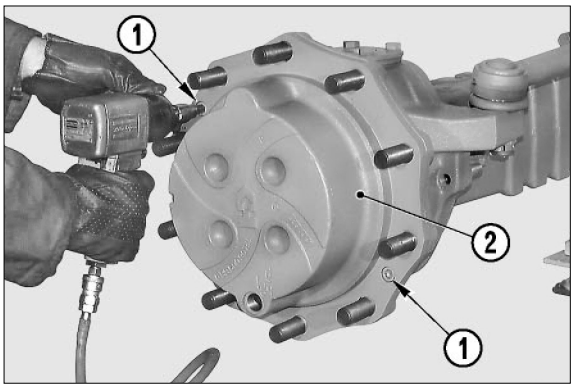
7. THE PLANETARY REDUCTION

1) HOW TO DISASSEMBLE THE PLANETARY REDUCTION

(1) Disconnect the steering bars from the steering case(3).
For details, see " HOW TO REMOVE THE COMPLETE STEERING CASE ".

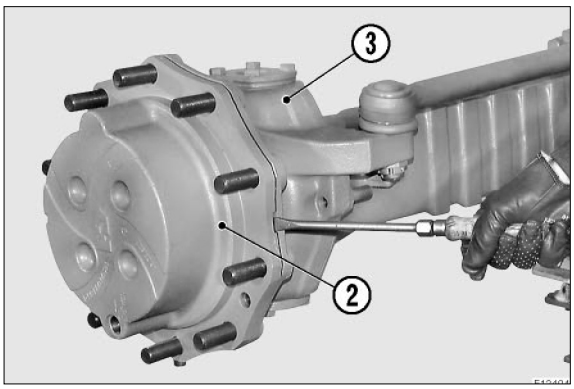
※ **Front axle only.**

Remove the securing screws(1) from the planetary carrier cover(2).



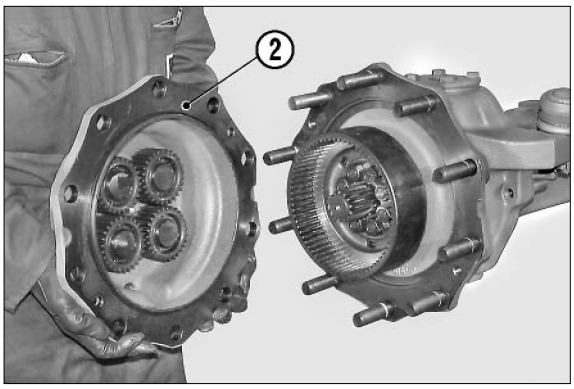
14W7FA058

(2) Disjoint the planetary carrier cover(2) from the steering case(3) by alternatively forcing a screwdriver into the appropriate slots.



14W7FA059

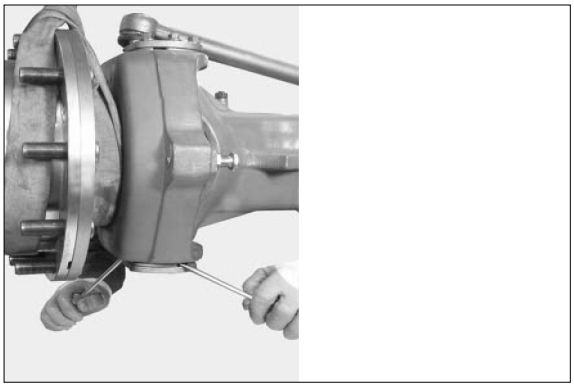
(3) Remove the complete planetary carrier cover(2).



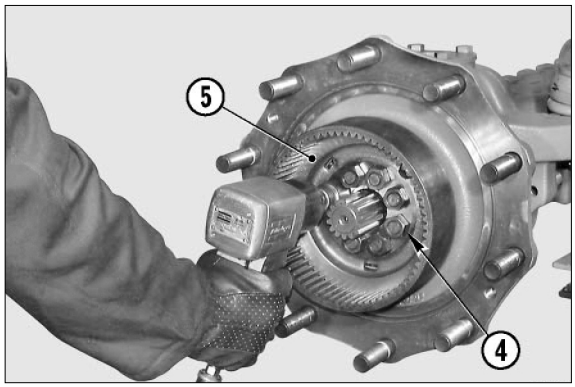
14W7FA060

(4) Remove the complete axle shaft(4).

※ **Rear axle only.**

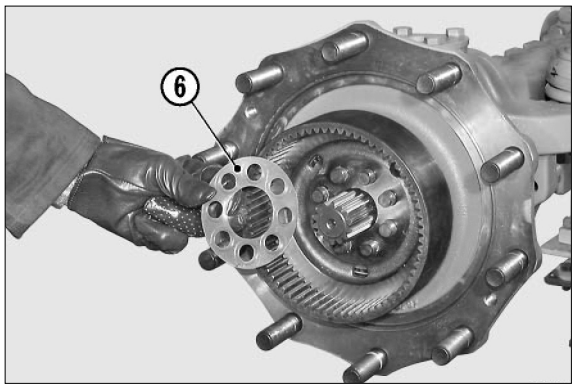

14W7RA024

(5) Unloose and remove the tightening nuts(4) from the crown flange(5).



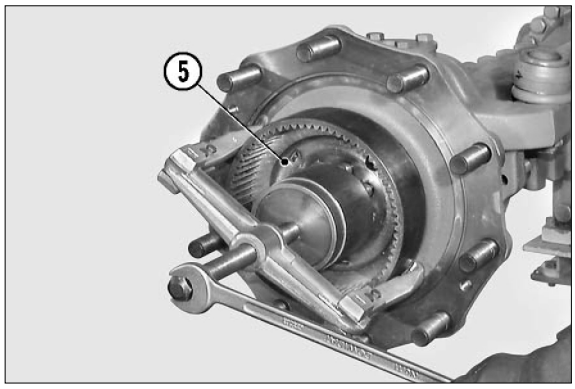
14W7FA061

(6) Remove the safety flange(6).



14W7FA062

(7) Using a puller, remove the complete crown flange(5) by acting on the stud bolts.

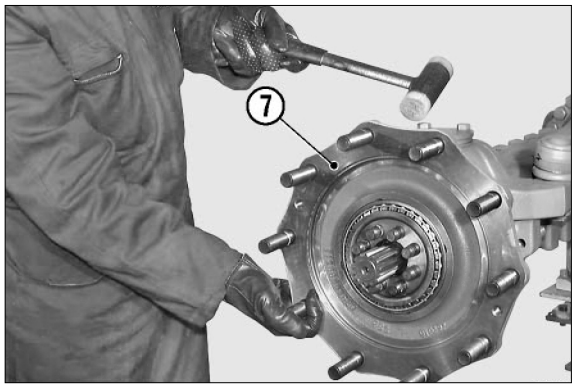


14W7FA063

(8) Partially extract the hub(7) using a plastic hammer.

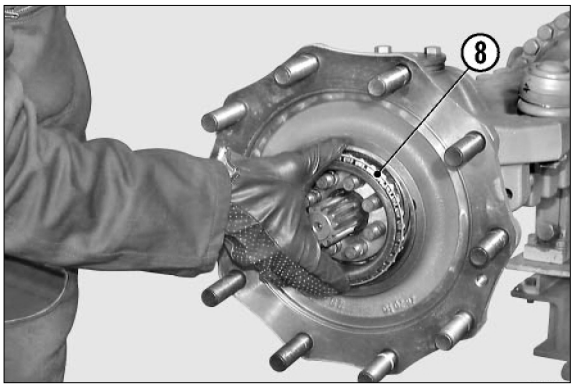
NOTE

Alternately hammer on several equidistant points.



14W7FA064

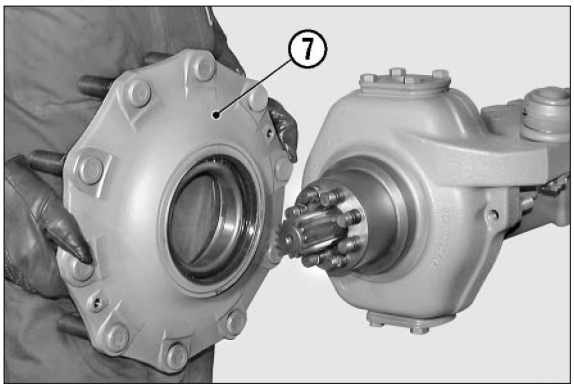
(9) Remove the external bearing(8).



14W7FA065

(10) By hand remove the ecmplete hub(7).

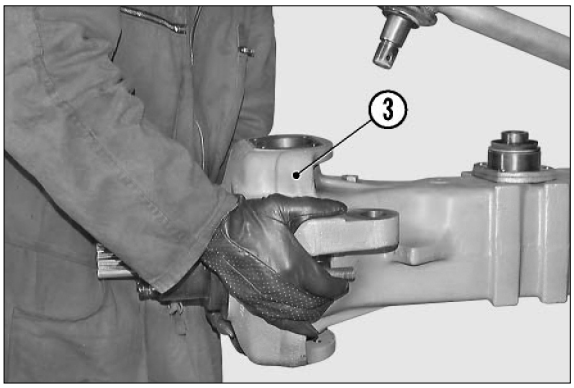
※ **Front axle only**



14W7FA066

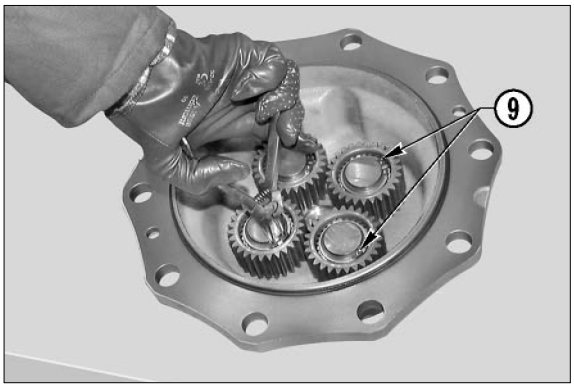
(11) Remove the pins and remove the steering case(3).
For details, see " HOW TO REMOVE THE COMPLETE STEERING CASE ".

※ **Front axle only.**



14W7FA067

(12) Remove the snap rings(9).

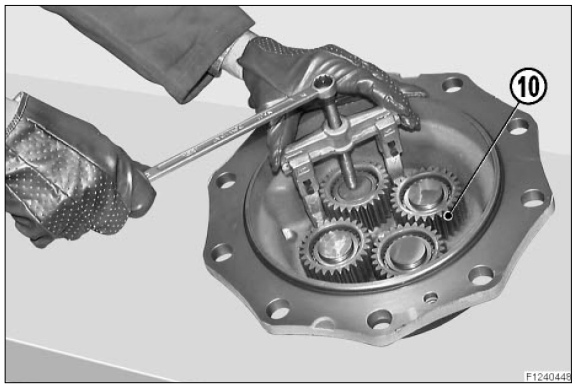


14W7FA068

(13) With the help of a puller, remove the planet wheel gears(10).

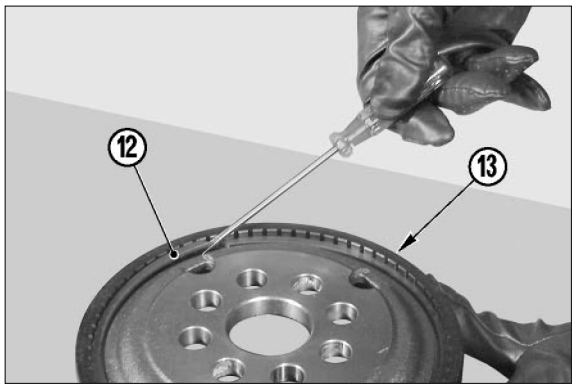
NOTE

Note down the assembly side of planet wheels.



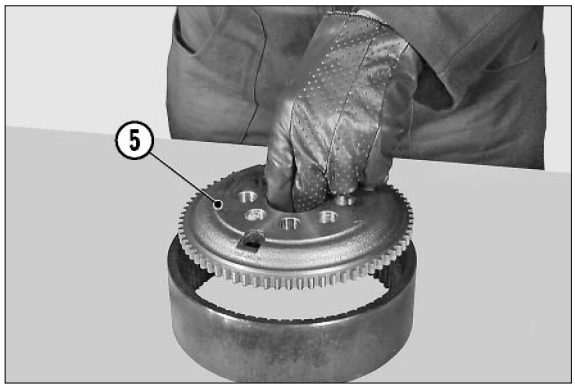
14W7FA069

(14) Remove the snap ring(12) from the crown(13).



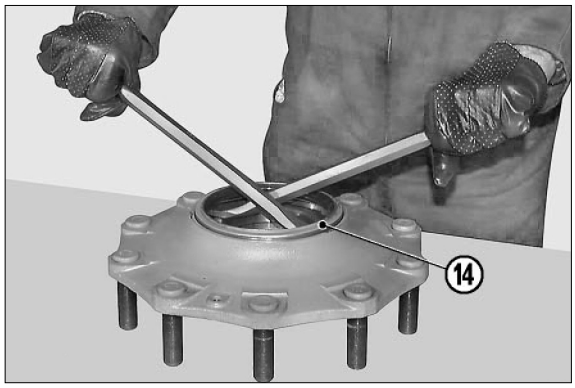
14W7FA070

(15) Remove the crown flange(5).



14W7FA071

(16) Remove the sealing ring from the hub(14).



14W7FA072

(17) Remove the internal bearing(15).

14W7FA073

(18) Remove the external thrust blocks from the bearings(8) and (15) forcing a pin-driver into the appropriate slots on the hub(7).

NOTE

Hammer in an alternate way so as to avoid crawling or deformation of the thrust blocks.

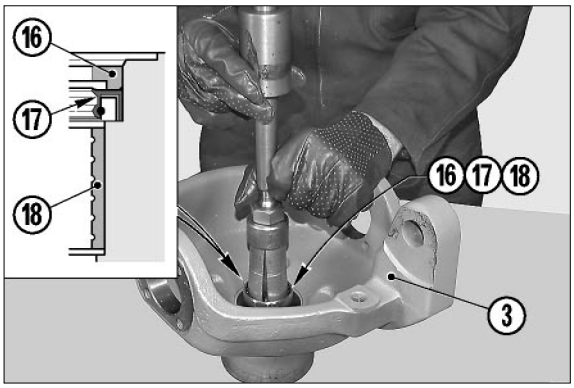
14W7FA074

(19) Use a puller to remove the centring ring(16), the sealing ring(17) and the bearing(18) from the steering case(3).

NOTE

Note down the orientation of both centring ring(16) and sealing ring(17).

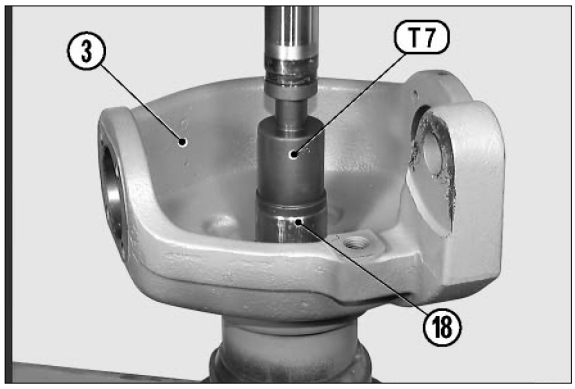
※ **Front axle only.**



14W7FA075

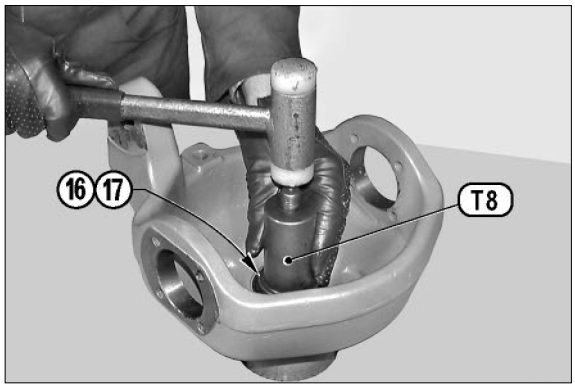
2) ASSEMBLING THE PLANETARY REDUCTION

(1) Lubricate the bushing(18) and the seat of the steering case(3).
Install the bushing(18), using tool T7.
※ **Front axle only.**



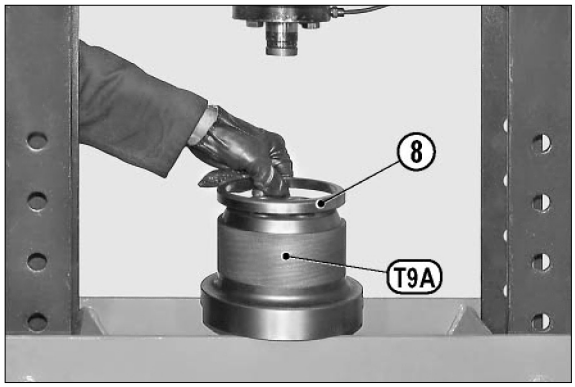
14W7FA077

(2) Lubricate the outer surface of the sealing ring(17) and centring ring(16); fit them into their seat using tool T8.
※ **Front axle only.**



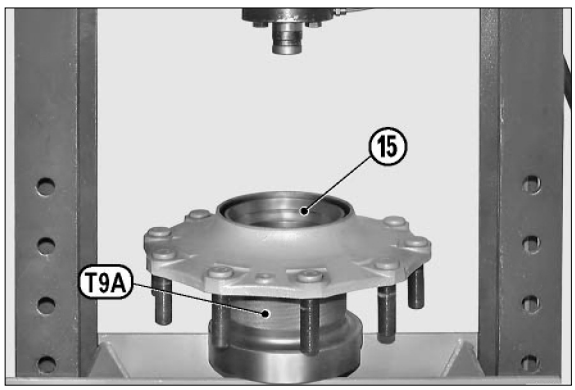
14W7FA078

(3) Position the lower part of tool T9A and the thrust block of the external bearing(8) under the press.



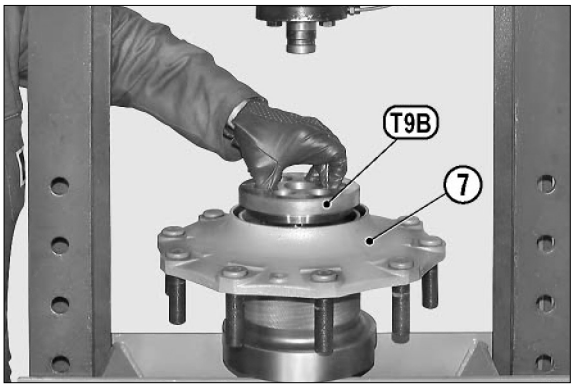
14W7FA079

(4) Lubricate the seats of the bearings and position the hub(7) on tool T9A; position the thrust block of the internal bearing(15).
NOTE
Check that the thrust block is correctly oriented.



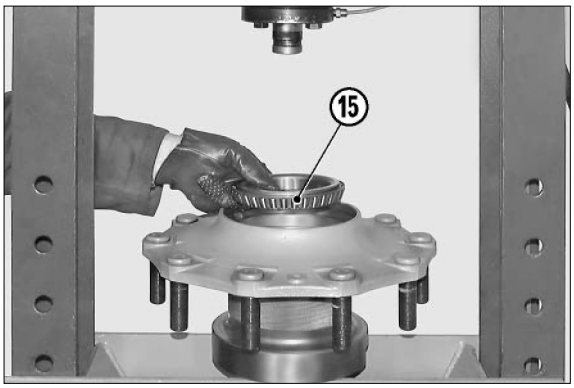
14W7FA080

(5) Position the upper part of tool T9B and press the thrust blocks into the hub(7) all the way down.



14W7FA081

(6) Fit the bearing(15) into the internal thrust block.

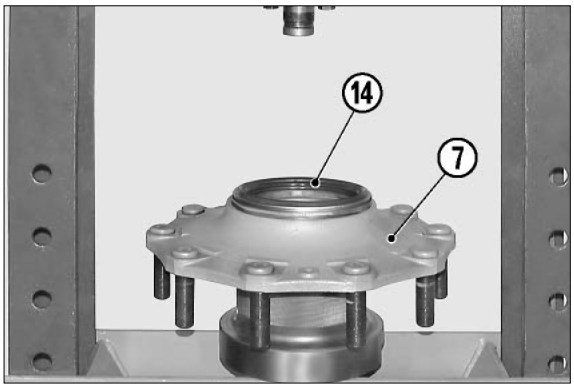


14W7FA082

(7) Apply a repositionable jointing compound for seals to the outer surface of the sealing ring(14). Position the sealing ring(14) in the hub(7).

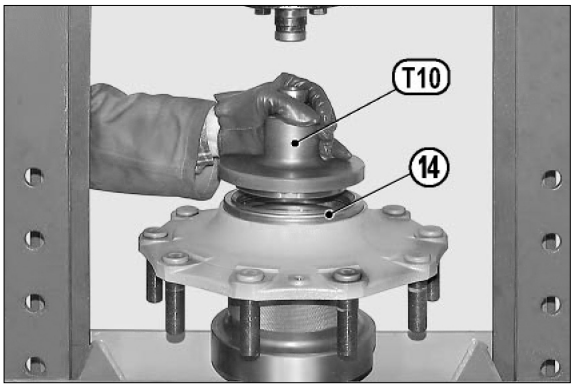
NOTE

Check that the ring(14) is correctly oriented.



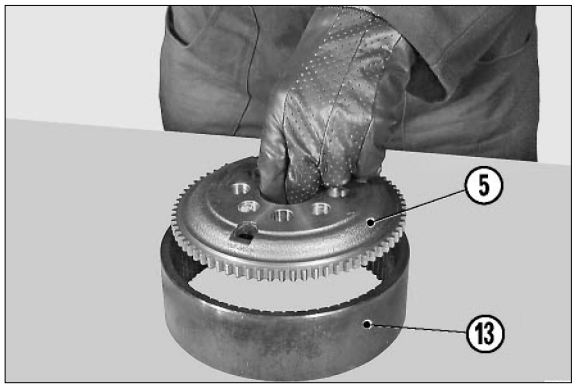
14W7FA083

(8) Position tool T10 and press the sealing ring(14) into its seat.



14W7FA084

(9) Insert the flange(5) in the crown(13).

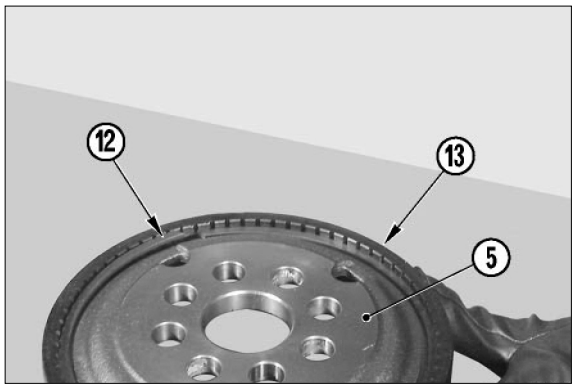


14W7FA085

(10) Insert the snap ring(12) in order to fix the flange(5) in the crown(13).

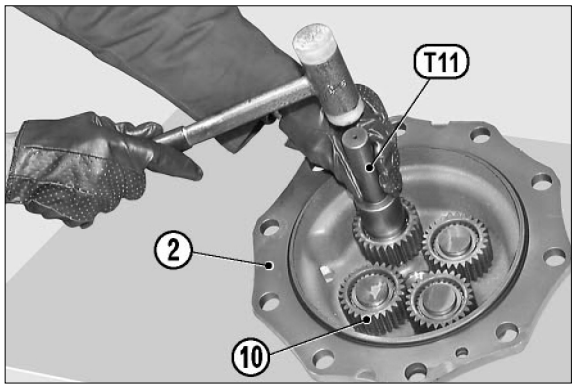
NOTE

Carefully check that ring(12) is properly inserted in the slot of the crown(13).



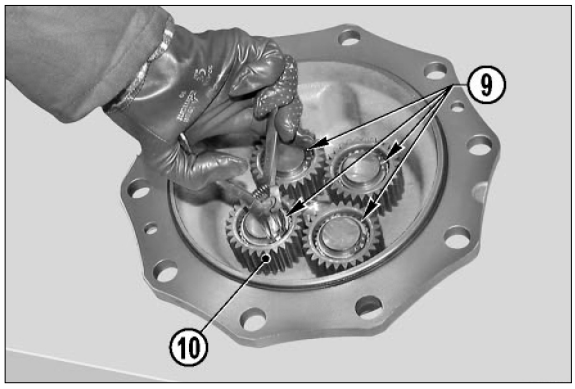
14W7FA086

(11) With the help of tool T11, insert the planet wheel gears(10) into the cover(2). Accurately check the orientation.



14W7FA087

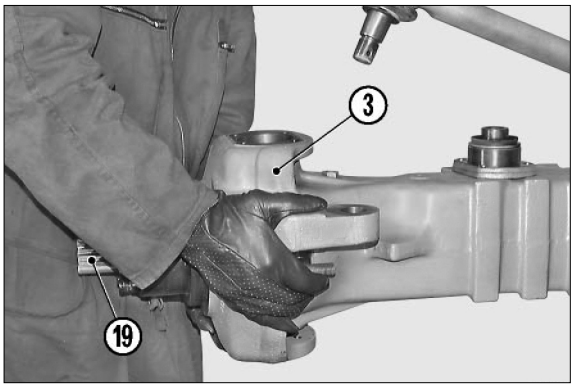
(12) Lock the gears(10) into position by fitting the snap rings(9).



14W7FA088

(13) Fit the steering case(3) onto the u-joint(19) and install the articulation pins. For pin assembly details, see " HOW TO ASSEMBLE THE COMPLETE STEERING CASE ".

※ **Front axle only.**



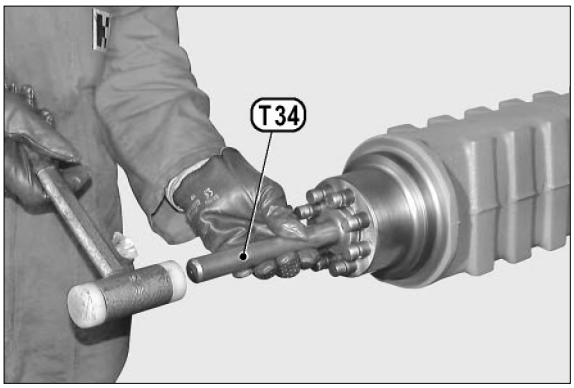
14W7FA089

(14) Lubricate the outer face of the sealing ring(10) and with the help of tool T34, fit in the arm.

NOTE

Accurately check direction of assembly.

※ **Rear axle only.**

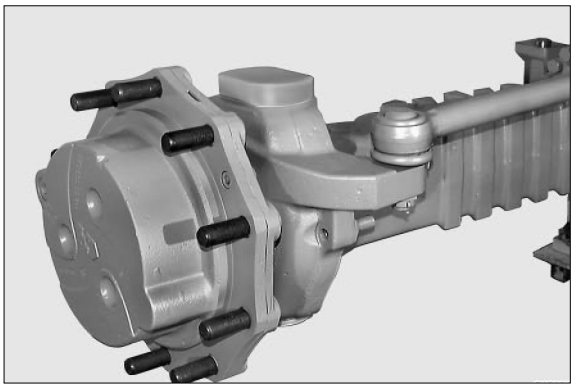


14W7RA051

(15) Connect the steering bars.

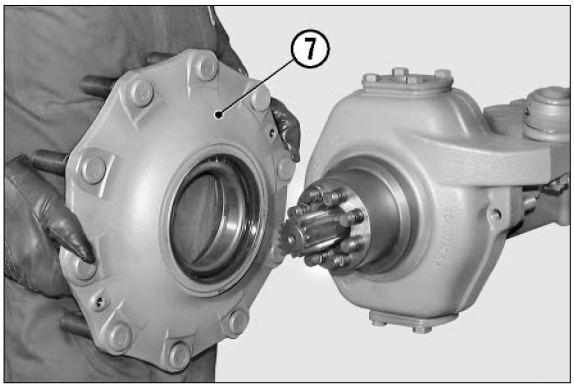
For details, see" HOW TO INSTALL THE COMPLETE STEERING CASE "

※ **Front axle only.**



14W7FA090

(16) Install the hub(7).

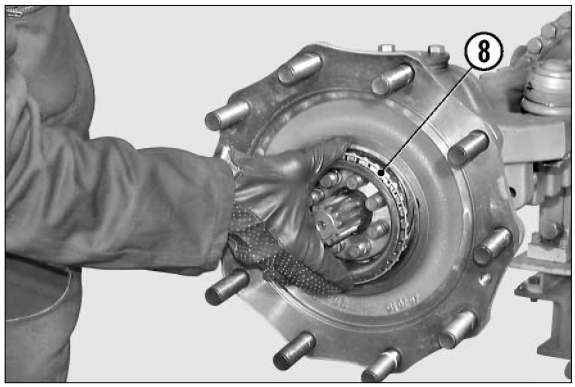


14W7FA091

(17) Install the external bearing(8).

NOTE

Using a plastic hammer, drive the bearing to the limit stop by lightly hammering around the edge.

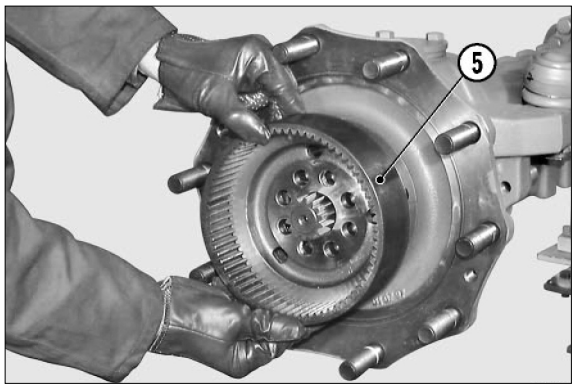


14W7FA092

(18) Fit the complete crown flange(5).

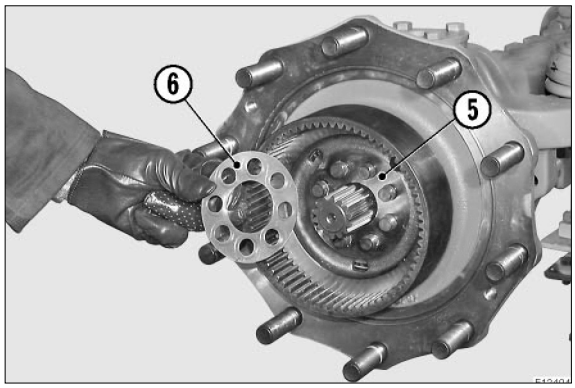
NOTE

In order to fasten the flange(5), use a plastic hammer and alternately hammer on several equidistant points.



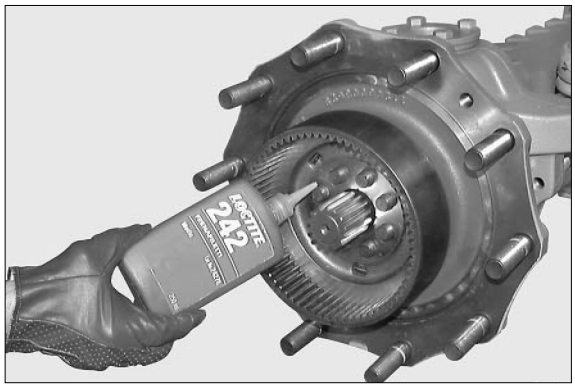
14W7FA093

(19) Apply tecnolube seal 101 grease to the surface of the safety flange(6) which touches the crown flange(5).
Fit the safety flange(6).



14W7FA094

(20) Apply loctite 242 to the studs and fit in the nuts(4).

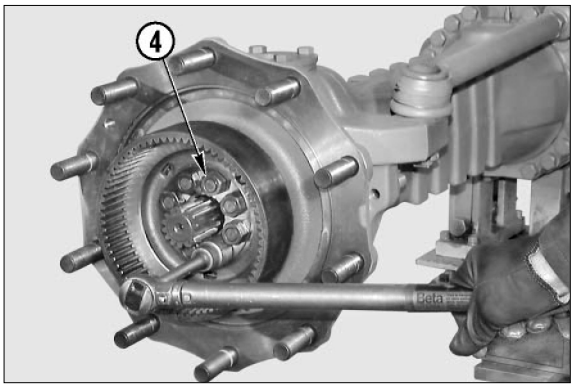


14W7FA095

(21) Cross tighten the nuts(4) in two stages.

· Initial torque wrench setting : 12kgf · m (87lbf · ft)

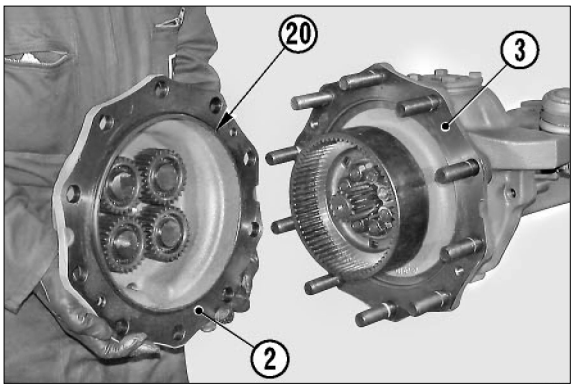
· Final torque wrench setting : 25.5~28.5kgf · m(185~206lbf · ft)



14W7FA096

(22) Fit the planetary carrier cover(2) onto the hub(3).

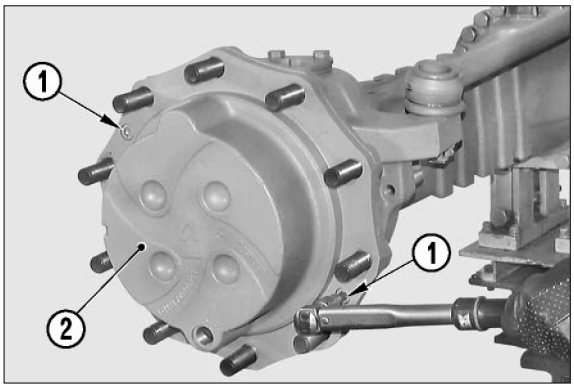
※ **Check that the O-ring(20) is in good condition and in position.**



14W7FA097

(23) Lock the planetary carrier cover(2) by tightening the screws(1).

· Torque wrench setting for screws : 4~5kgf · m(29~36lbf · ft)



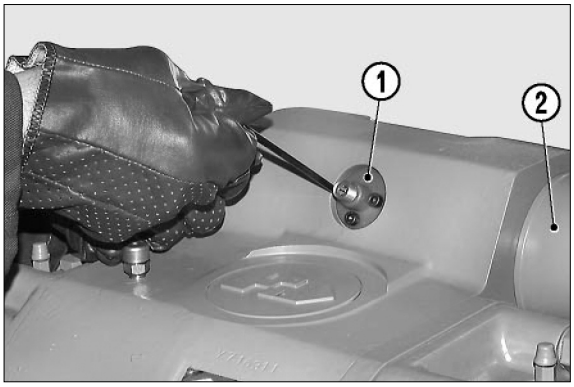
14W7FA098

8. THE STEERING CYLINDER

※ **FRONT AXLE ONLY**

1) HOW TO REMOVE THE STEERING CYLINDER

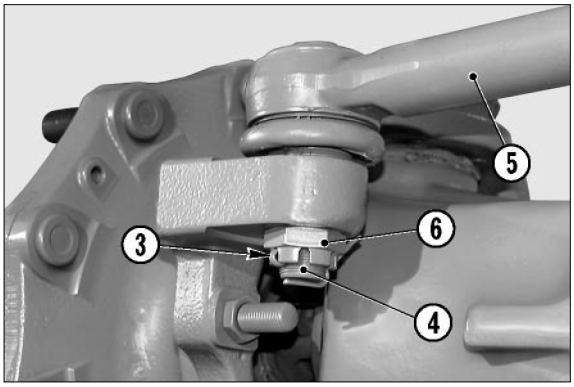
(1) Remove the centring sensor(1) of the steering piston(2), if supplied.



14W7FA099

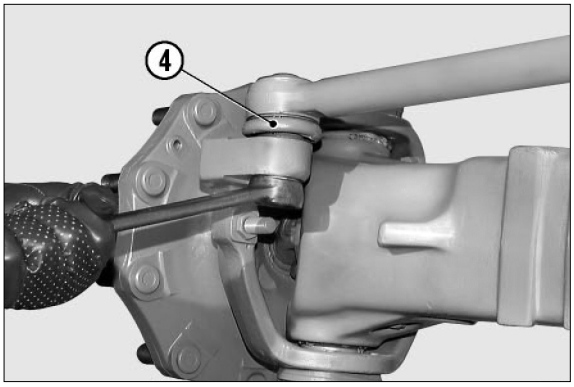
(2) Remove the safety cotter pins(3) from the articulation pins(4) of the steering bars(5).

※ **Dispose of used cotter pins.**



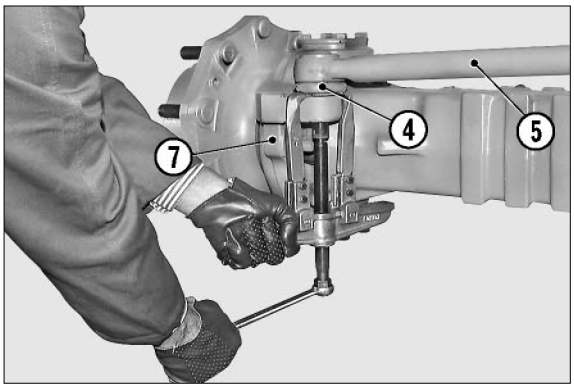
14W7FA100

(3) Remove the castellated nuts(6) that lock the articulation pins(4).



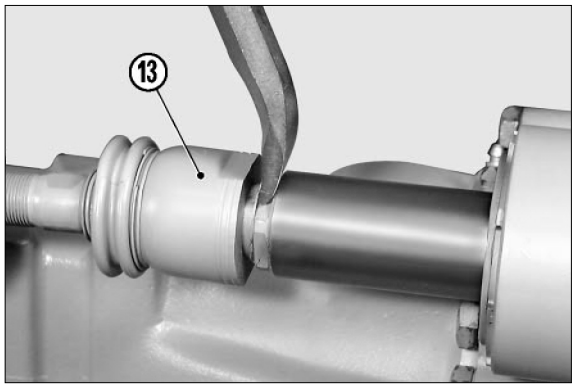
14W7FA101

(4) Disconnect the tapered pins of the articulation (4) from the steering case(7) by means of a puller.



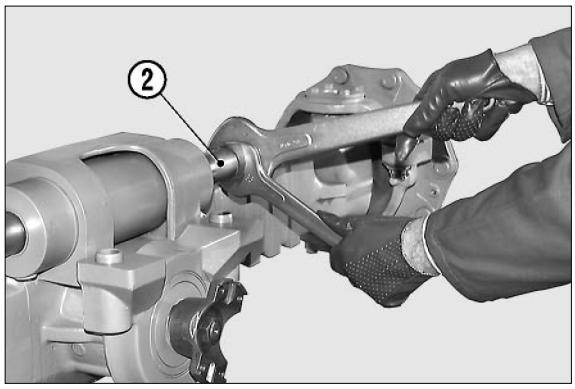
14W7FA102

(5) If the connection of the steering bars includes a safety collar(13), raise the border.



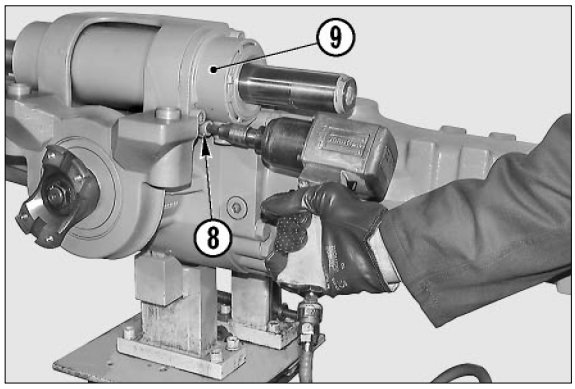
14W7FA103

(6) Disconnect left and right steering bars(5) from the piston(2).



14W7FA104

(7) Remove the securing screws(8) from the steering cylinder(9).

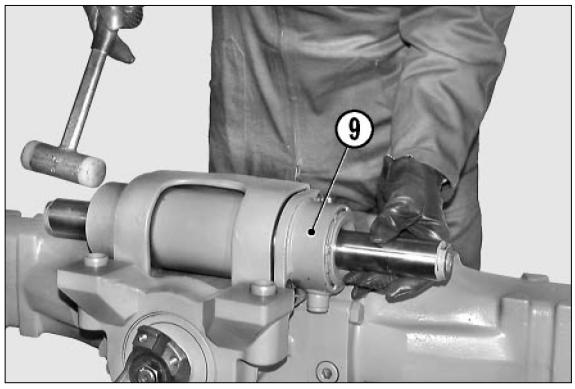


14W7FA105

(8) Extract the cylinder(9) using a plastic hammer.

NOTE

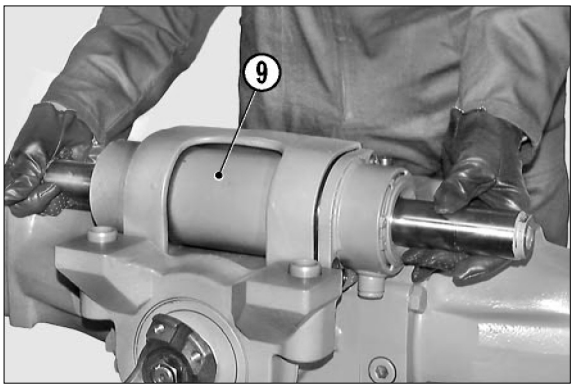
For cylinder disassembly, refer to " HOW TO DISASSEMBLE THE STEERING CYLINDER ".



14W7FA106

2) HOW TO INSTALL THE STEERING CYLINDER

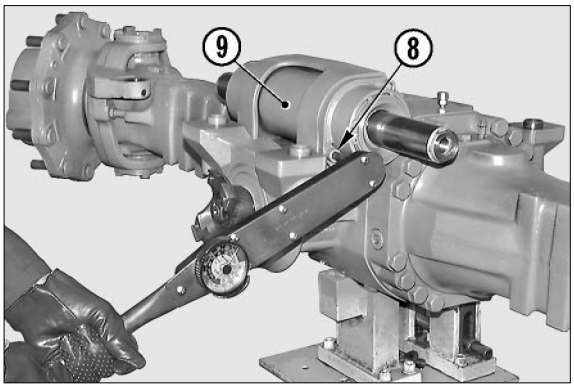
(1) Check that the O-rings(15) of the axle unit are in good condition; lubricate the seats of the seals(15) and fit the steering cylinder(9) into its seat.



14W7FA108

(2) Lock the cylinder by cross-tightening the screws(8).

· Torque wrench setting : 11~13kgf · m
(80~94lbf · ft)



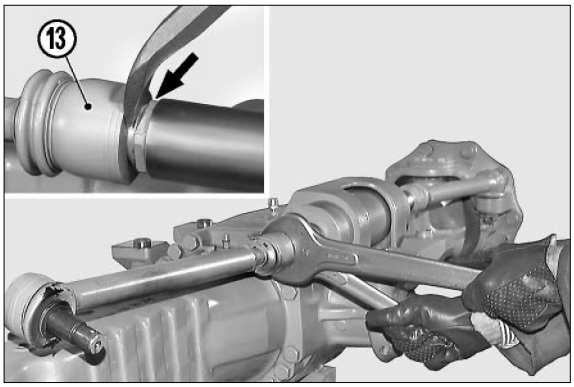
14W7FA109

(3) Apply loctite 242 to the thread and connect the steering bars by screwing the terminals onto the piston stem.

· Torque wrench setting : 24~27kgf · m
(174~195lbf · ft)

NOTE

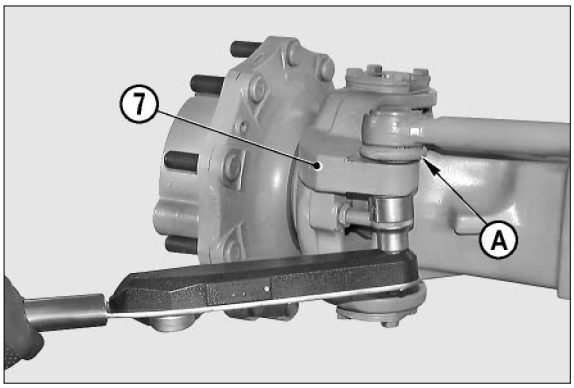
Versions with coupling require that the rim of the articulation(13) is riveted onto the surfaces of the piston stem.



14W7FA110

(4) Insert the pins(4) in the steering case(7) and lock into position using a torque wrench setting of 26~29kgf · m(188~210lbf · ft).
Find the position of the notching in relation to the hole of the cotter pins and tighten the nut(6) further.

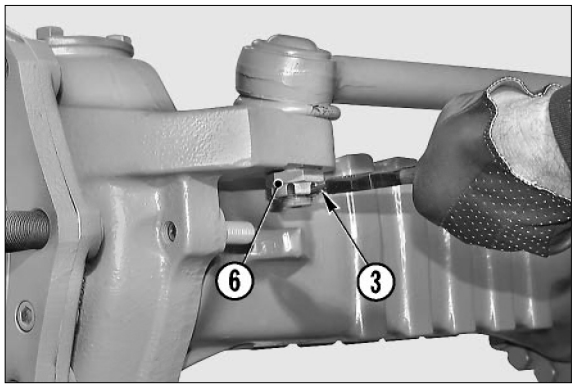
※ **Check that rubber guards(A) are intact.**



14W7FA111

(5) Insert the cotter pins(3) and bend the safety stems.

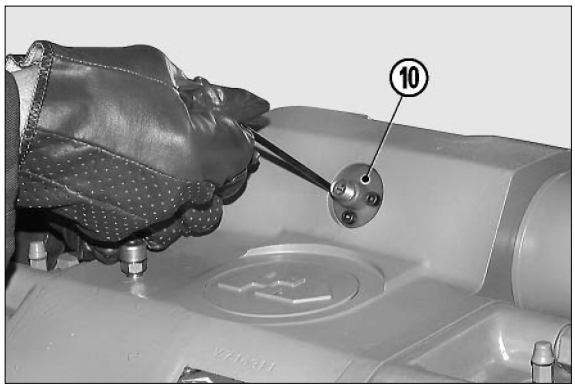
※ **Use new cotter pins.**



14W7FA112

(6) Install the proximity(1) for checking piston contring-if applicable and tighten the screws(10).

· Torque wrench setting : 0.5~0.6kgf · m (3.6~4.3lbf · ft)

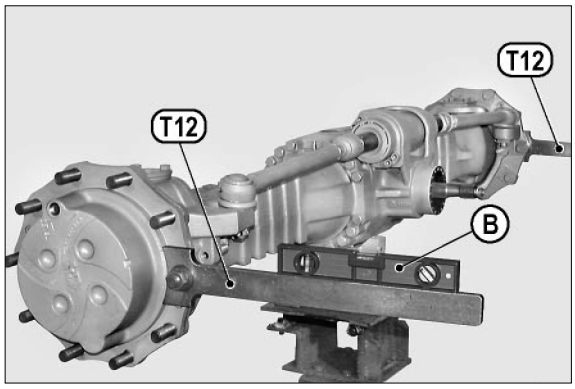


14W7FA113

(7) Apply tools T12 to the hubs and lock them.

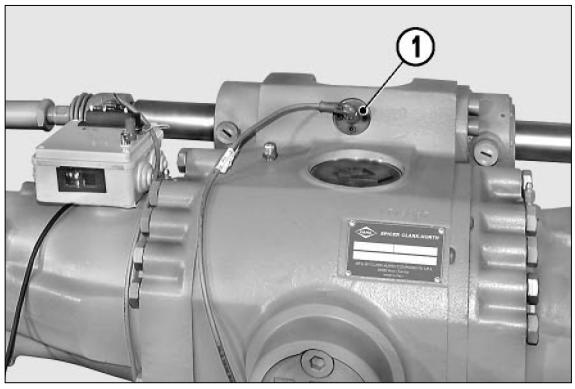
Using a level " B " check that tools are perfectly flat and parallel to each other.

※ **Eliminate the action of the negative brake, if fitted.**



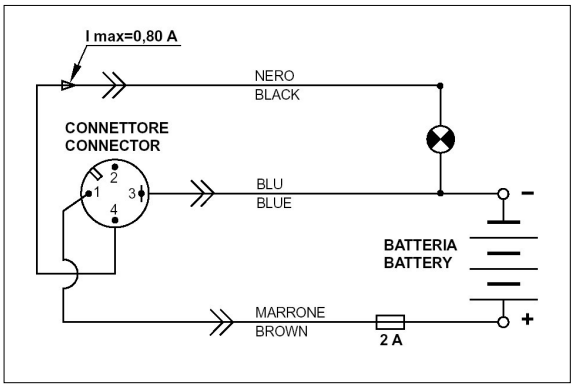
14W7FA114

(8) Connect the sensor(1) to the inspection device according to either diagram.



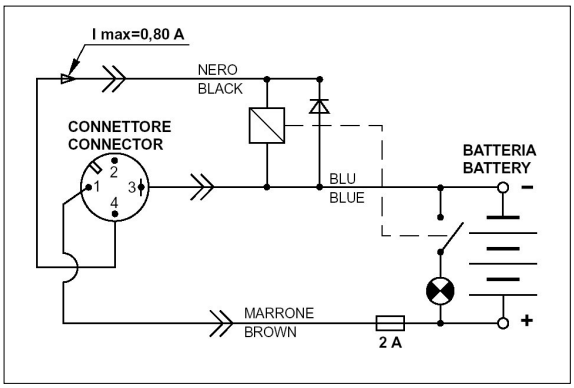
14W7FA115

(9) Sensor connection card, **STANDARD** version.



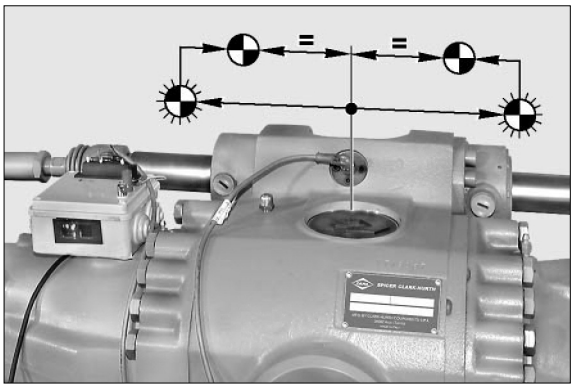
14W7FA116

(10) Sensor connection card, **OPTIONAL** version.



14W7FA117

(11) Centre the piston by slowly moving it first in one direction then in the other and position it half way on the stroke, which is determined by the switching on and off of the signal lamp of the inspection device in the reversal stage.

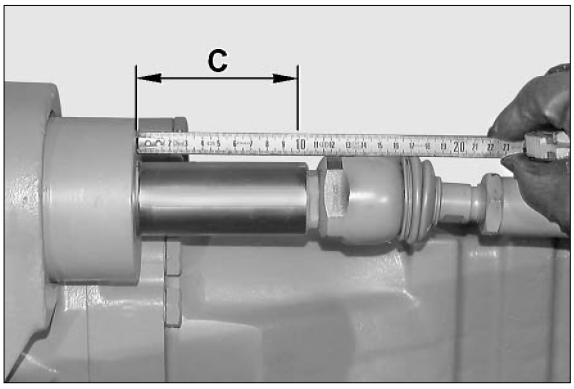


14W7FA118

(12) Inspect jut " C " on one side of the piston and note down the size for checking later adjustments.

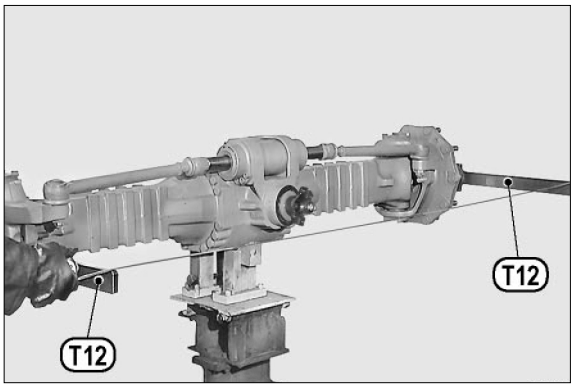
NOTE

If cylinders come without a sensor, the centring of the piston must be carried out on the basis of the maximum stroke.



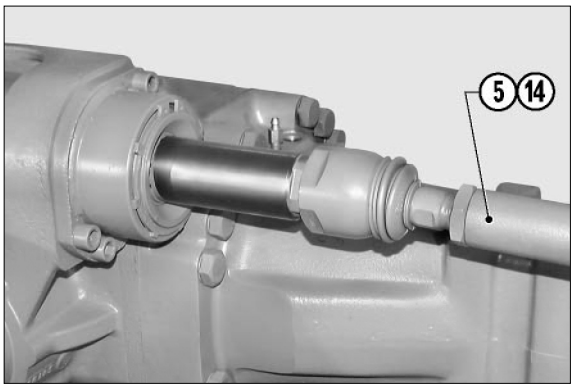
14W7FA119

(13) Without moving the piston, check front and rear size at the edge of tools T12.
Max. difference : 0.6~0.7mm.
NOTE
In order to check the rear size, rotate the bevel pinion and check that tools T12 are flat.



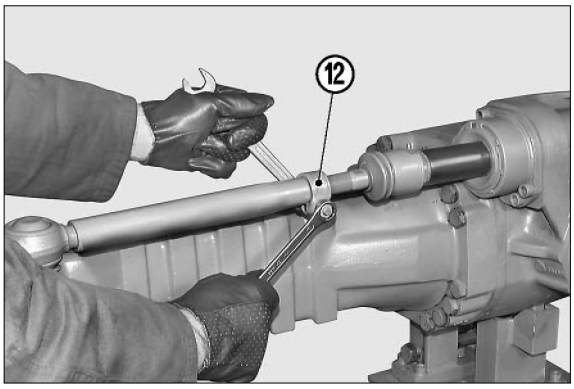
14W7FA120

(14) If necessary, adjust convergency without moving the centring of the piston and adjust the length of the steering bars(5) or (14).
NOTE
With a half turn of screw, the front size is reduced by about 3mm, whereas the rear one is increased by about 3mm.



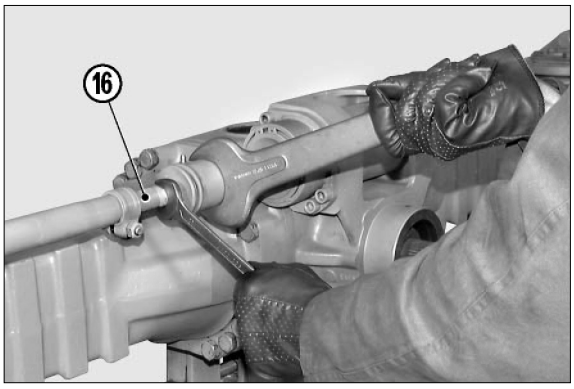
14W7RA121

(15) Convergency adjustment on units with collar.
Unloose the nuts on the collars(12).



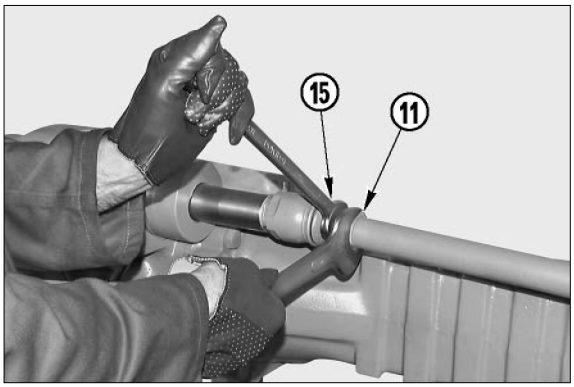
14W7FA122

(16) Rotate the ball-and-socket joints(16) until convergency has been obtained.
Check that articulations move easily and lock the collars(12).
· Torque wrench setting for nuts :
4.2~5.2kgf · m(30~38lbf · ft)



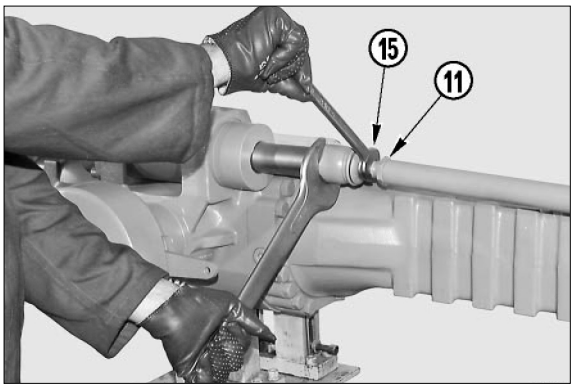
14W7FA123

(17) Convergency adjustment on alternative versions.
Unloose the nuts(11) and screw them onto the ball-and-socket joints(15).



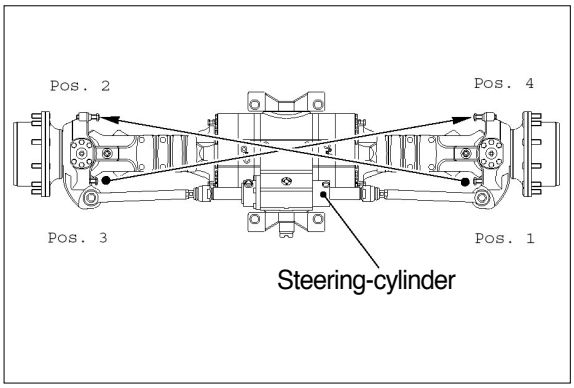
14W7FA124

(18) Hold the articulations still and rotate the ball-and-socket joints(15).
Once the convergency has been adjusted, lock the nuts(11).
· Torque wrench setting for nuts :
30~33kgf · m(216~240lbf · ft)



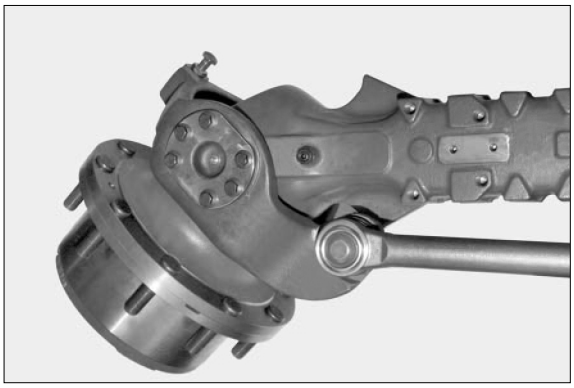
14W7FA125

(19) ADJUSTING THE STEERING ANGLE
Loosen the nut of the of the adjusting srews on cylinder side.
NOTE
Perform the same operations on both sides (see diagram).

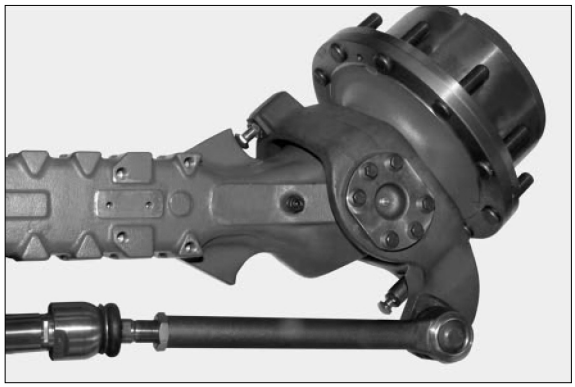


14W7FA126

(20) Perform one full steering operation until the adjusted screw leans against the arm stop.

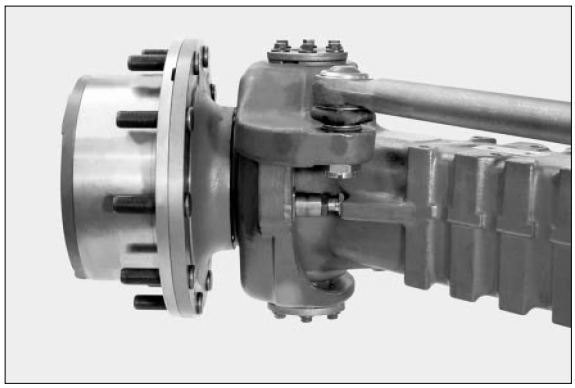

14W7FA127

(21) Perform one full steering operation until the adjusted screw leans against the arm stop.



14W7FA128

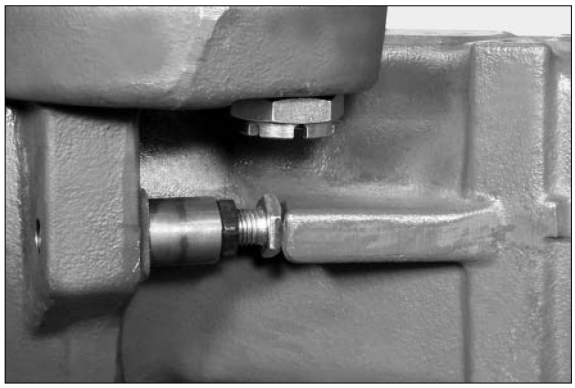
(22) As you hold the adjusted screw in position against the arm stop, adjust the screw opposite, on non-cylinder side, until it leans against the arm stop.



14W7FA129

(23) **IMPORTANT**

The screws must lean against the respective arm stops all at the same time.

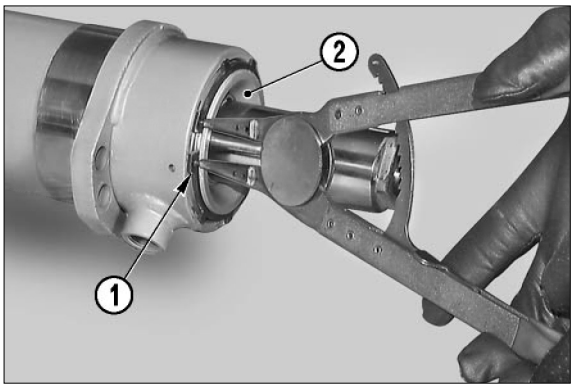


14W7FA130

Steering angle	Distance(mm)
40°	30
37°	37
36°	39.4
35°	41.8
30°	53.3
29°	38.2

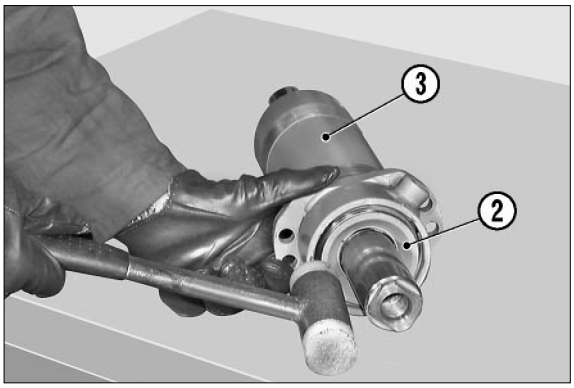
3) HOW TO DISASSEMBLE THE STEERING CYLINDER

(1) Remove the snap ring(1) from the cylinder head(2).



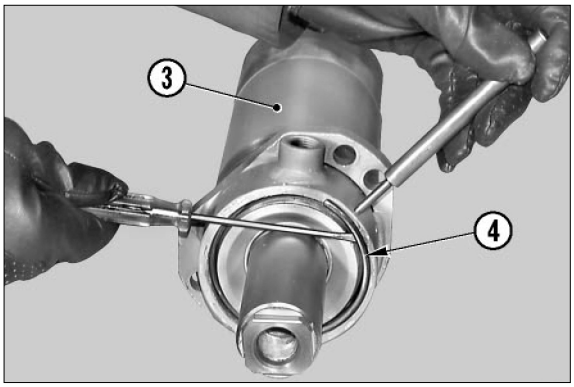
14W7FA131

(2) With the help of a plastic hammer, push the head(2) inside the cylinder(3).
NOTE
The head should line up with the edge of the cylinder.



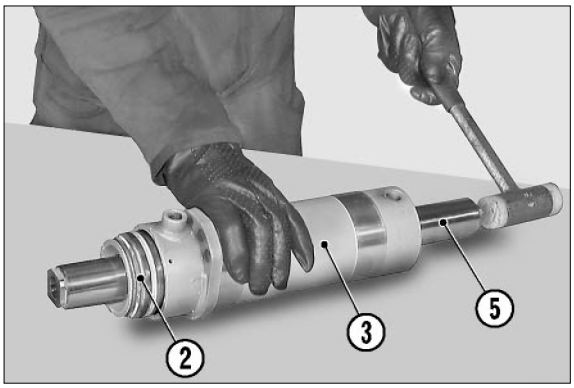
14W7FA132

(3) With the help of a drift, apply pressure to the stop ring(4) that is placed inside the cylinder(3) and extract the ring using a screwdriver.



14W7FA133

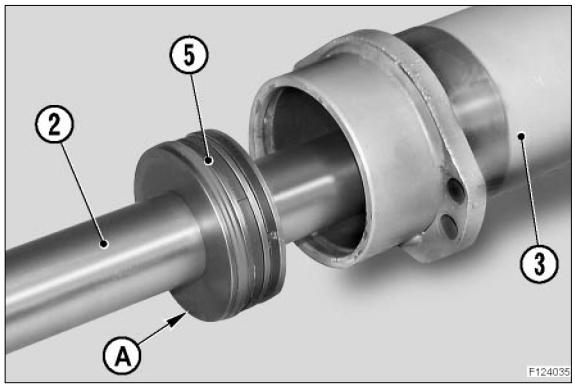
(4) Hammer the piston(5) on the rear of the head(2) using a plastic hammer.
Continue hammering until the head(2) is ejected from the cylinder(3).



14W7FA134

(5) Disassemble the cylinder unit(3) by extracting first the head(2), then the piston(5).

※ **Note down the assembly side of the piston(5). The bevelled part " A " of the piston is oriented towards the head(2).**



14W7FA135

(6) Remove all seals, anti-extrusion rings and scraper rings from head(2), cylinder(3) and piston(5).

NOTE

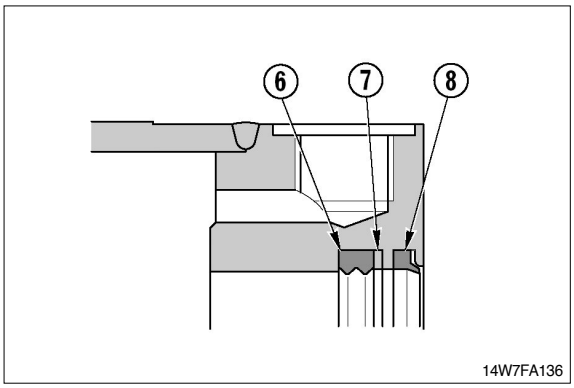
① All seals must be replaced every time the unit is disassembled.

② Particular attention must be paid not to damage the seats of both seals and piston slide.

4) HOW TO ASSEMBLE THE STEERING CYLINDER

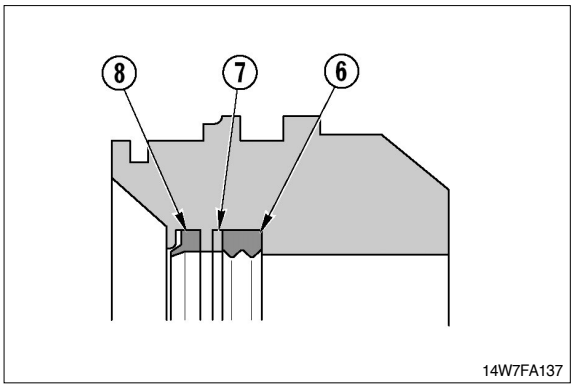
(1) After applying grease, install the sealing ring(6) of the shaft, the anti-extrusion ring(7) and the scraper ring(8) inside the cylinder(3).

※ **Thoroughly check that positioning of the anti-extrusion ring(7) is correct.**



(2) After applying grease, install the sealing ring(6) of the shaft, the anti-extrusion ring(7) and the scraper ring(8) in the head(2).

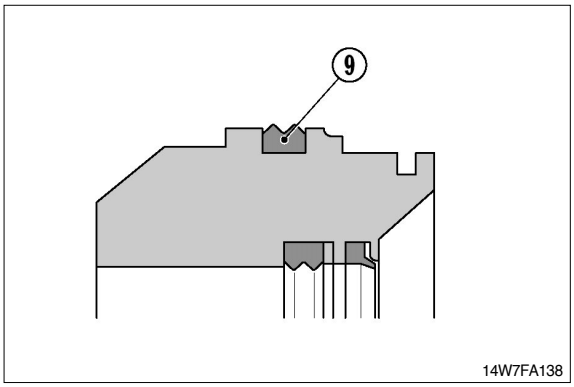
※ **Thoroughly check that positioning of the anti-extrusion(7) ring is correct.**



(3) Fit the seal(9) onto the outside of the head(2).

※ **In order to facilitate assembly, apply grease to the outer surface of the piston.**

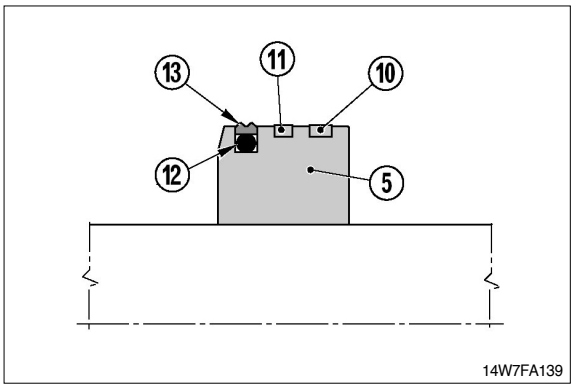
※ **Do not roll the seal(9) up.**



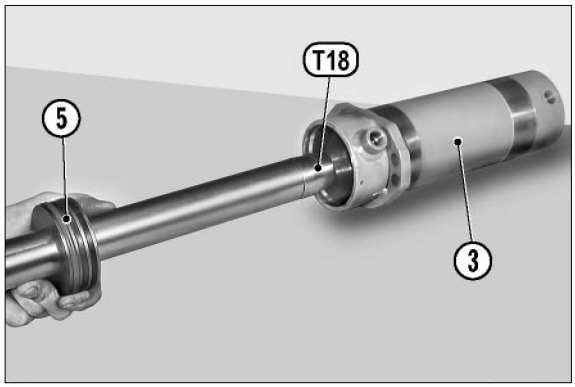
(4) Prepare the piston(5) fitting it with the guide ring(10), the magnetic ring(11), the O-ring(12) and the seal(13).

※ **In order to facilitate assembly, apply grease.**

※ **If a centering sensor is not fitted, then the magnetic ring(11) should be replaced by another guide ring(10).**

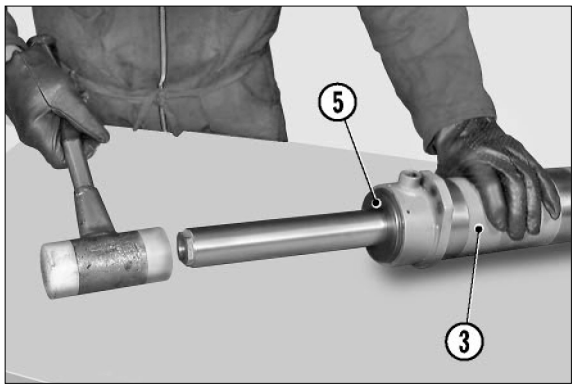


(5) Apply tool T18 to the shaft on the opposite side of the head(2) and centre it on the cylinder(3) so that it fits into the piston(5).
NOTE
Apply a little grease to seals and cylinder.



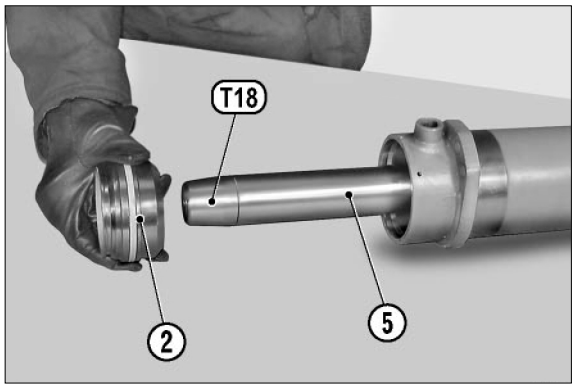
14W7FA140

(6) Push the piston(5) into the cylinder for 100mm using a plastic hammer.



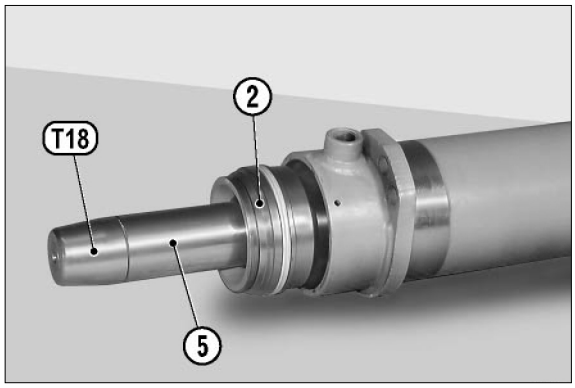
14W7FA141

(7) Remove tool T18 and apply it to the opposite side of the piston(5).



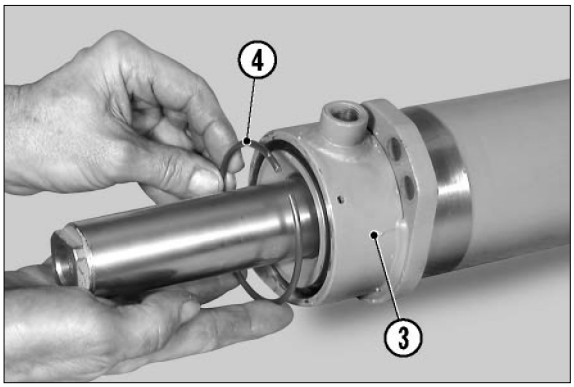
14W7FA142

(8) Apply grease to head(2) seals, fit the head onto the piston and push it into the cylinder(3) using a plastic hammer.
NOTE
Insert the head as to line it up with the edge of the cylinder.



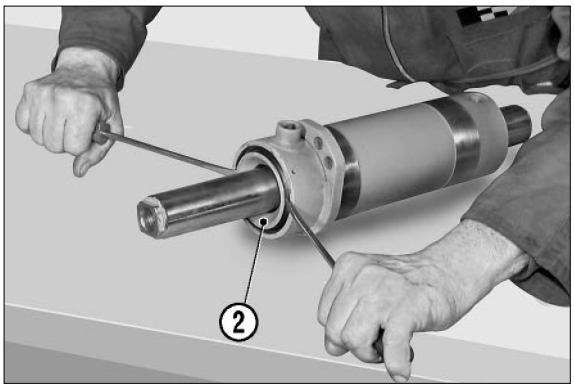
14W7FA143

(9) Insert the stop ring(4) ensuring that it fits into the seat of the cylinder(3).



14W7FA144

(10) Apply pressure to the head using two screwdrivers or levers until the head is fastened onto the stop ring(4).

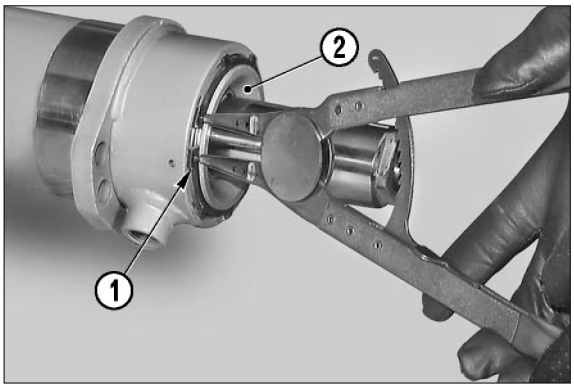


14W7FA145

(11) Fit the snap ring(1) on the head(2).

※ **Make sure that the snap ring(1) is securely fastened in its seat.**

※ **If necessary, force it into its seat using a drift and a hammer.**

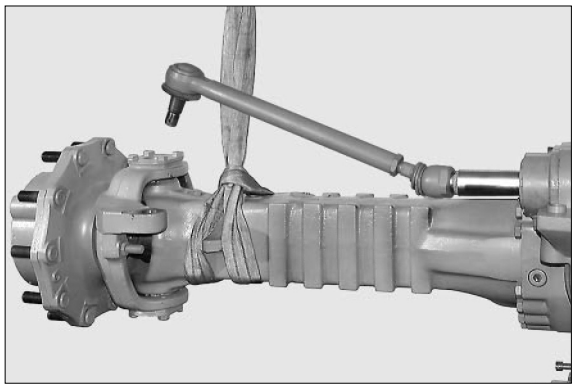


14W7FA146

9. THE DIFFERENTIAL UNIT

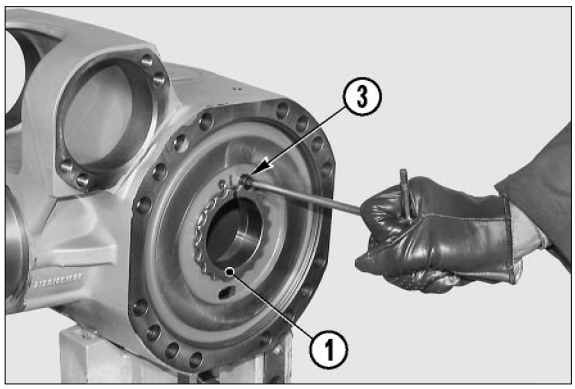
1) HOW TO REMOVE THE DIFFERENTIAL UNIT

(1) Remove the complete arms.
For details, see“ CHECKING WEAR AND REPLACING THE BRAKING DISKS ”.



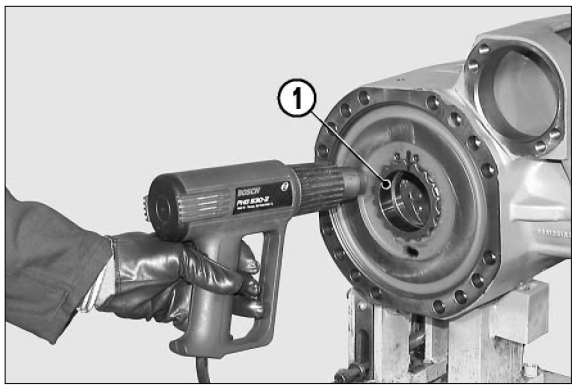
14W7RA109

(2) Mark the position of the ring nuts(1). Remove the fittin screws(3) from the ring nuts(1).



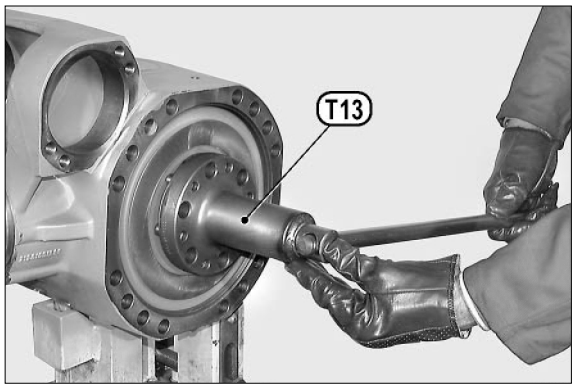
14W7RA110

(3) Uniformly heat the ring nuts(1) up to a temperature of 80。C.



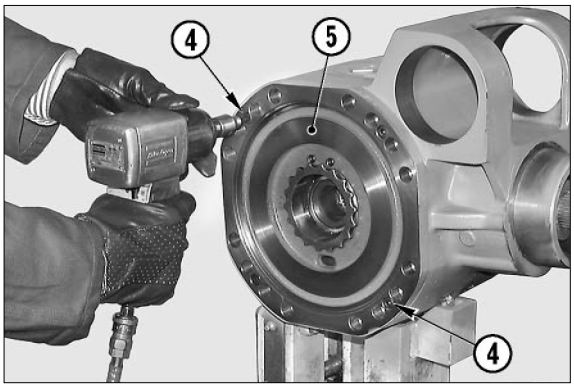
14W7RA111

(4) Apply tool T13 and remove the ring nuts.
NOTE
Accurately clean the threaded portions on ring nuts of body and cover.



14W7RA112

(5) Remove the fittin screws(4) from the middle cover(5).

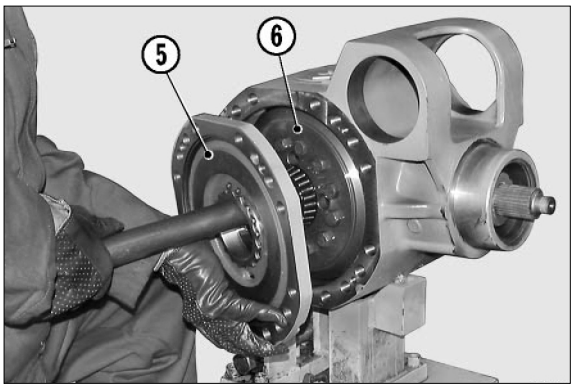


14W7RA113

(6) Insert a screw-driver in the opposing slots then force and remove the middle cover(5) and the complete differential unit(6).

NOTE

Support the pieces using a rod.

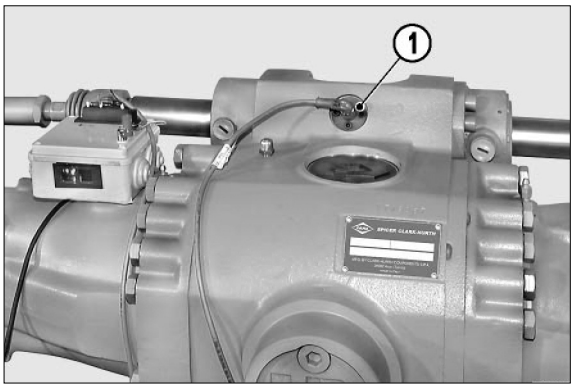


14W7RA114

(7) If the bearings need replacing, extract the external thrust blocks of the bearings(7) and (8) from middle cover(5) and central body(2).

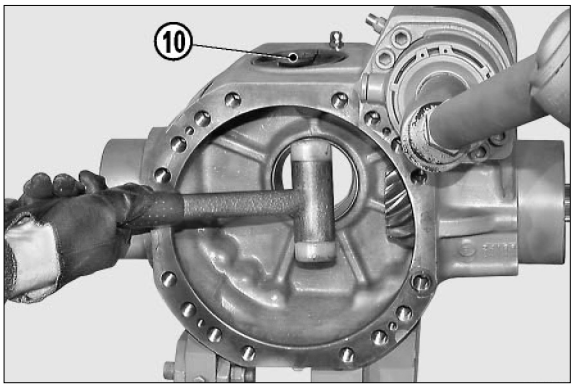
NOTE

Accurately check the O-ring(9).



14W7RA115

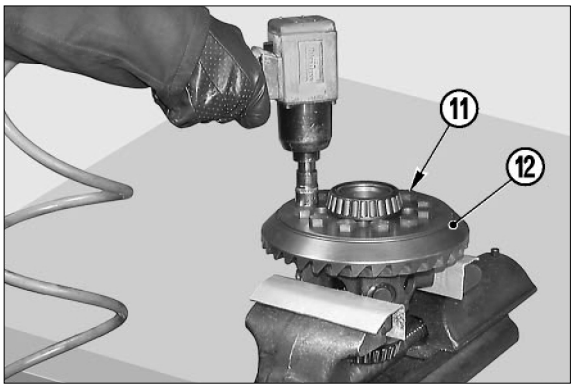
(8) Remove the top plug(10).



14W7RA116

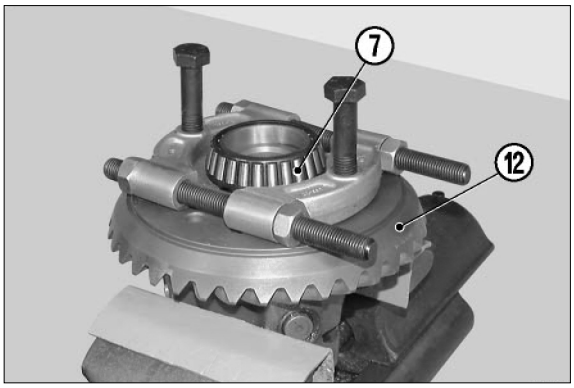
2) HOW TO DISASSEMBLE THE DIFFERENTIAL UNIT

(1) Remove the fittin screws(11) from the crown(12).



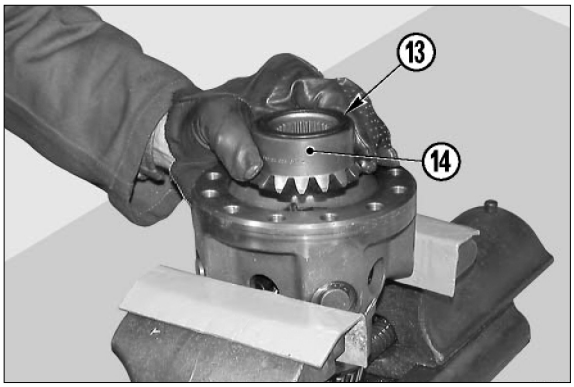
14W7RA117

(2) If the bearing need replacing, extract the bearing(7) and remove the crown(12).



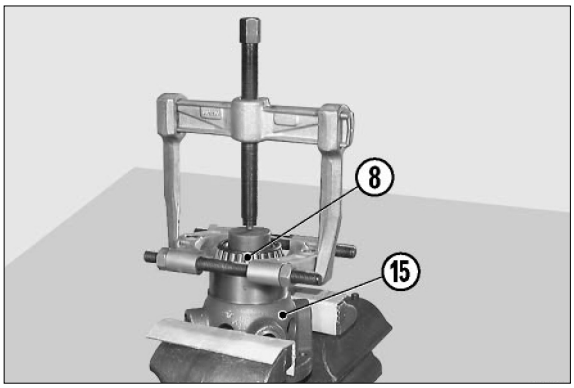
14W7RA118

(3) Remove the shim washer(13) and the planetary gear(14).



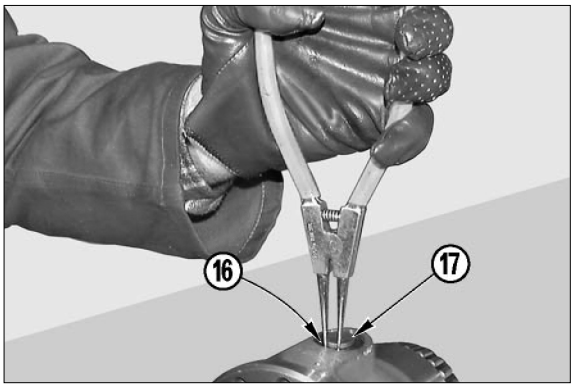
14W7RA119

(4) If the bearing need replacing, extract the bearing(8) from the differential carrier(15).



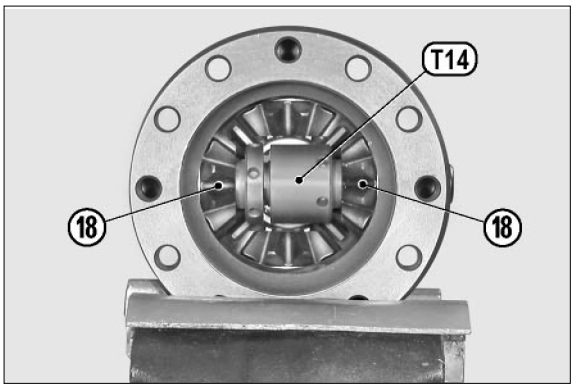
14W7RA120

(5) Remove the snap rings(16) from the two pins(17) of the planet wheel gears(18).



14W7RA121

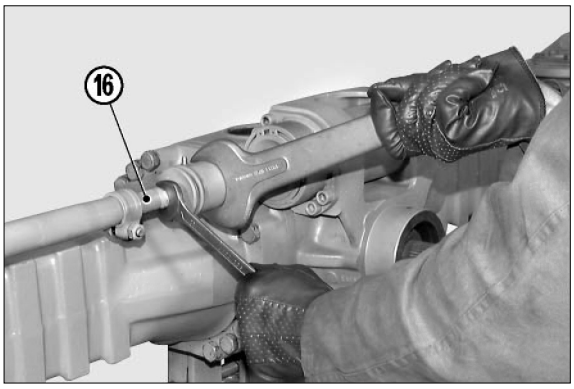
(6) Insert tool T14 between the planet wheel gears(18).



14W7RA135

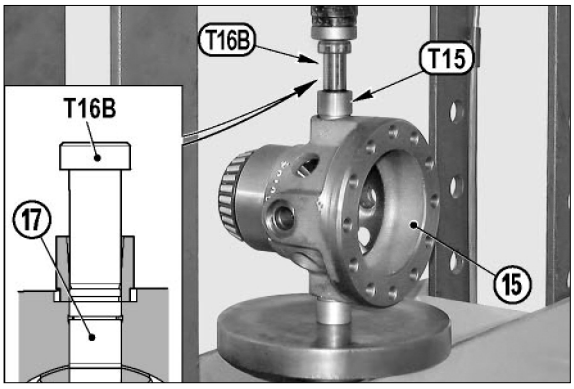
(7) Force tool T14 in-between the planet wheel gears(18) using two pin-drivers.

※ **Make sure that tool T14 is perfectly lined up with the pins(17) when locked.**



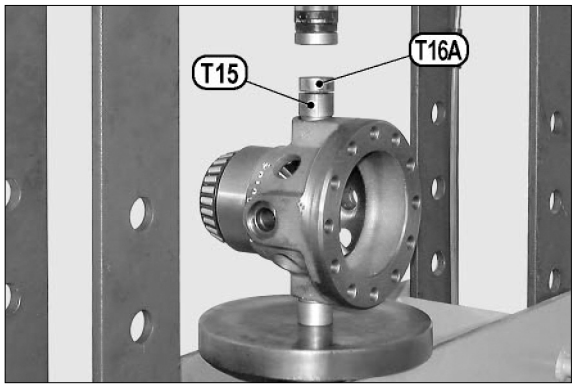
14W7RA123

(8) Place the differential carrier(15) under a press, position bush T15 and insert gudgeon T16A. Press T16A pin to limit position.



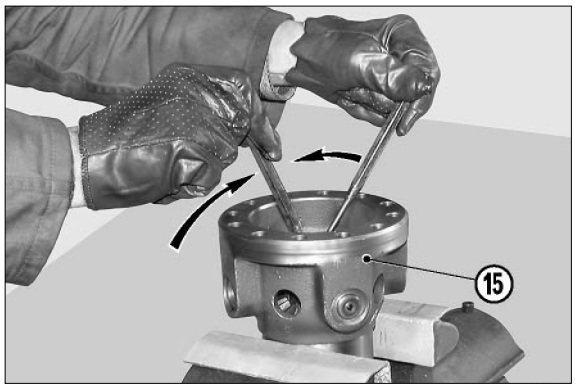
14W7RA124

(9) Remove gudgeon T16A and bush T15.
NOTE
In this condition the tool T14 contains pin(17).



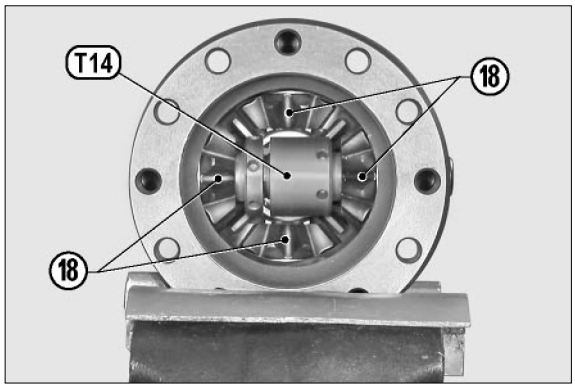
14W7RA125

(10) Remove tool T14 together with the pin(17) of the planet wheel.



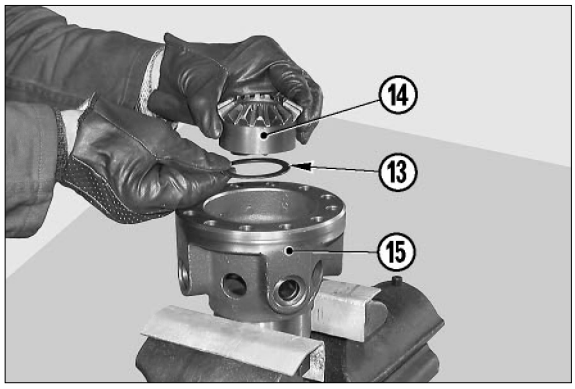
14W7RA126

(11) Leave the released planetary gear in position and again lock tool T14.
Repeat the operations for the extraction of the pin of the 2nd planet wheel(17).
Repeat the operations for all other pins.



14W7RA127

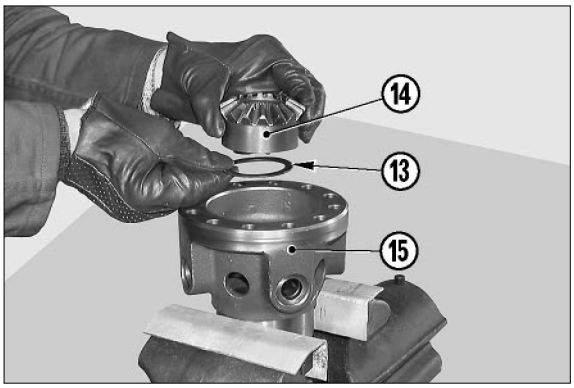
(12) Remove tool T14 and remove the last two planet wheel gears(18), the 2nd differential unit gear(14) and the relative shim washer(13) from the differential carrier.



14W7RA128

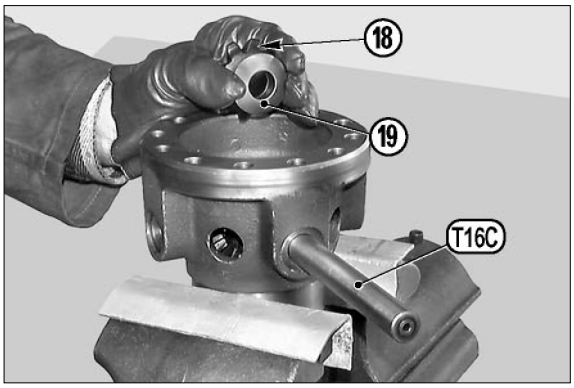
3) HOW TO ASSEMBLE THE DIFFERENTIAL UNIT

(1) Insert the shim washer(13) and the planetary gear(14) in the differential carrier(15).



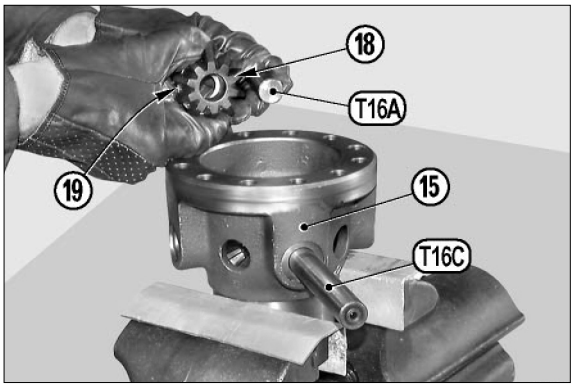
14W7RA128

(2) Position the shim washer(19) and the first planet wheel gear(18). Hold them in position using bar T16C.



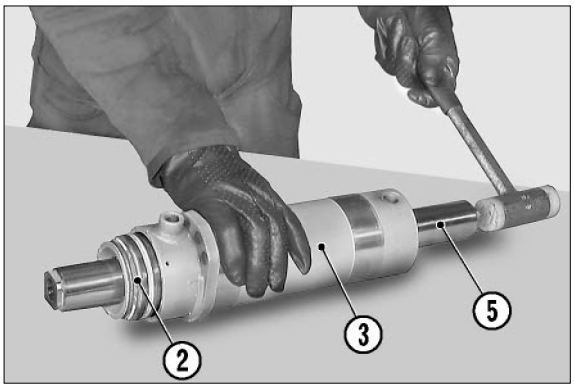
14W7RA132

(3) With the help of gudgeon T16A, position the second planet wheel gear(18) and the relative shim washer(19).



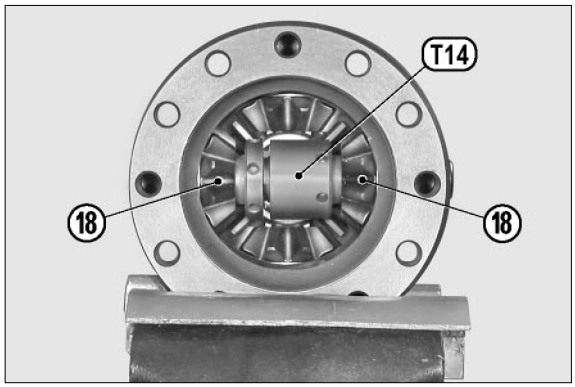
14W7RA133

(4) Insert tool T14 between the two planetary gears(18). Line up the entire unit by pushing bar T16C all the way down until gudgeon T16A is ejected.



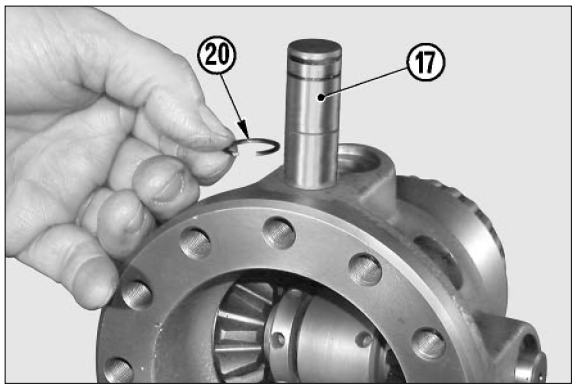
14W7RA134

(5) Lock tool T14 behind the planet wheel gears(18).
After locking, remove bar T16C.



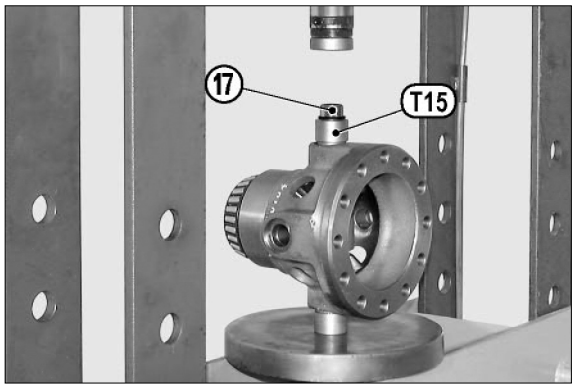
14W7RA135

(6) Fit the snap rings(20) onto the pins(17).



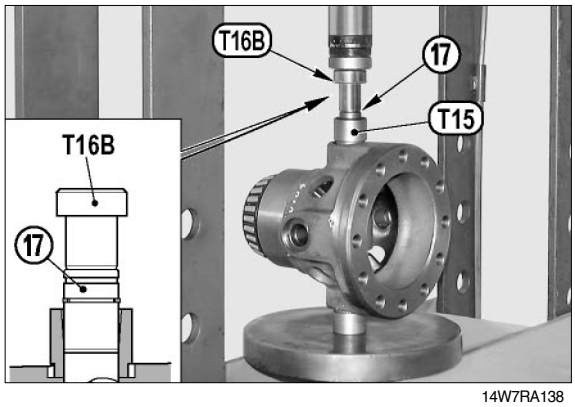
14W7RA136

(7) Place the differential carrier(15) under the press, position bush T15 and insert the planet wheel pin(17).



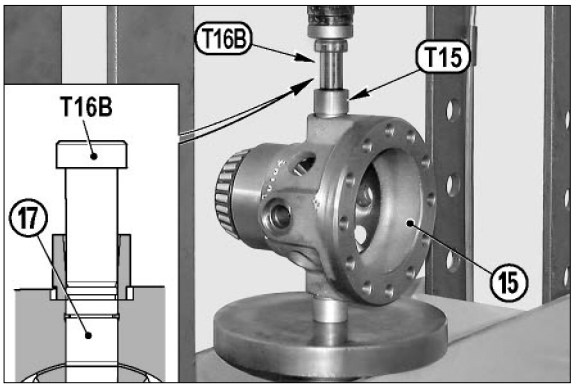
14W7RA137

(8) Put gudgeon T16B on top of the planet wheel pin(17).



14W7RA138

(9) Press T16B pin all the way down.

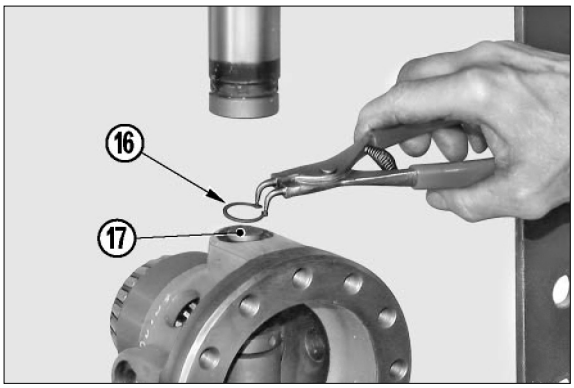


14W7RA139

(10) Remove gudgeon T16B, bush T15 and fit the snap ring(16) on the pin(17).

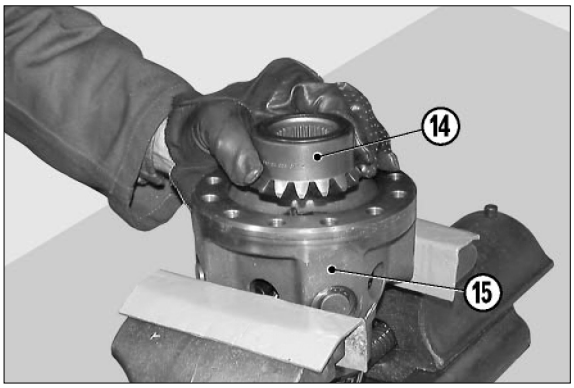
※ **Make sure that the snap ring centres the seat and that it rests on the surface of the differential carrier.**

Repeat the operations on the other planet wheel pin or planet wheel axle.



14W7RA140

(11) Position the second planetary gear(14) in the differential carrier(15).

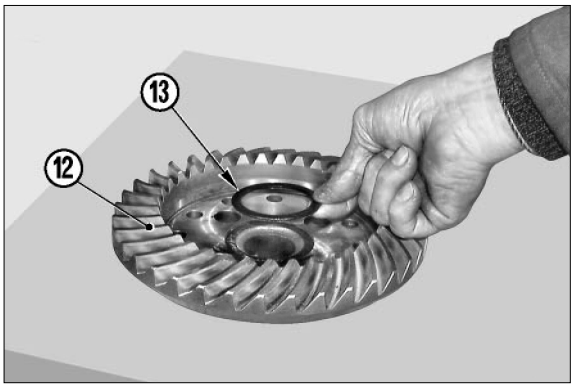


14W7RA141

(12) Position the shim washer(13) on the crown(12).

NOTE

In order to hold the shim washer(13) in position, apply grease to it.



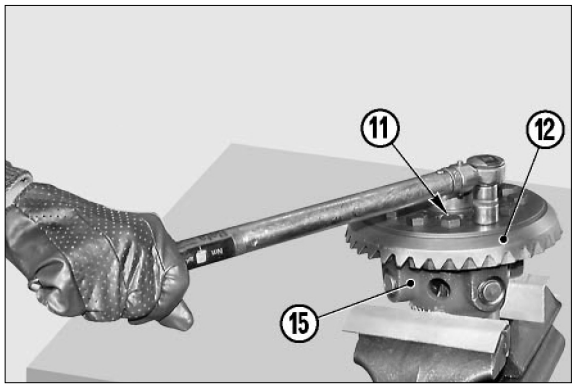
14W7RA142

(13) Position the crown(12) on the differential carrier(15) and lock it with screws(11) applied with loctite 242.

· Torque wrench setting for screws :
13~14kgf · m(94~101lbf · ft)

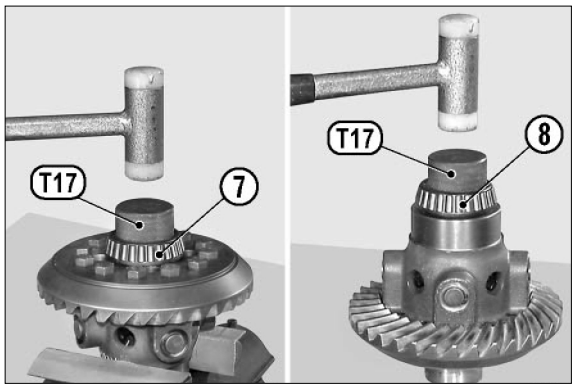
NOTE

Secure the screws using the cross-tightening method.



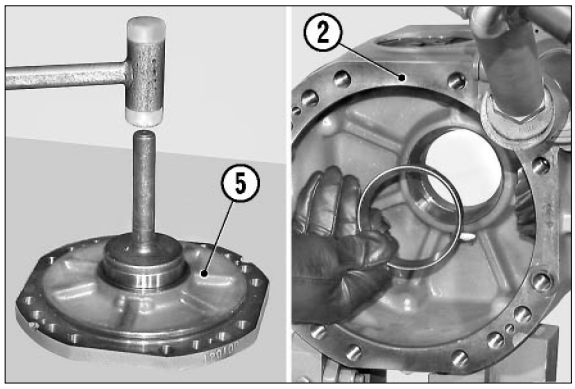
14W7RA143

(14) Install the bearings(7) and (8) using tool T17.



14W7RA144

(15) If the bearings are replaced, insert the external thrust blocks in the middle cover(5) and in the central body(2).



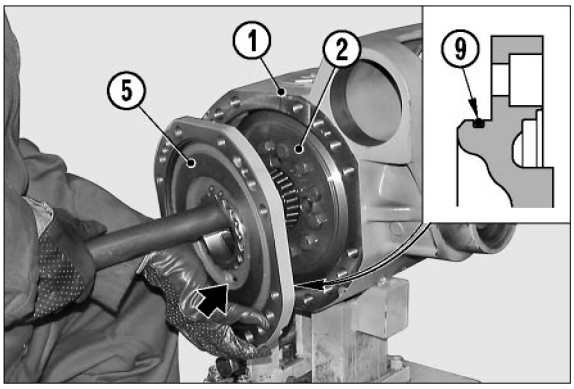
14W7RA145

4) HOW TO INSTALL THE DIFFERENTIAL UNIT

(1) Position the differential unit(6) in the central body(2) with the help of a bar and fit the middle cover(5).

NOTE

Thoroughly check the state of the O-ring(9) and make sure that the cover is fitted with the oil discharge in the lower position.

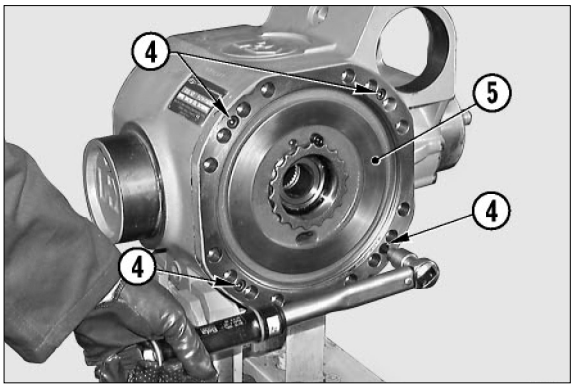


14W7RA146

(2) Lock the middle cover(5) with screws(4).

· Torque wrench setting for screw :

2.4~2.6kgf · m(17~19lbf · ft)

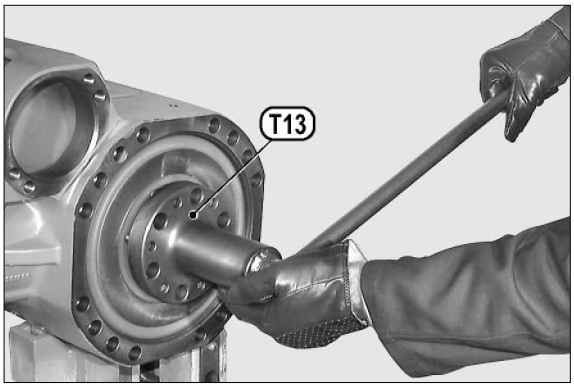


14W7RA147

(3) Tighten ring nuts on the crown side until clearance between pinion and crown is zero, then lock the crown; go back 1/4-1/2 turn.

NOTE

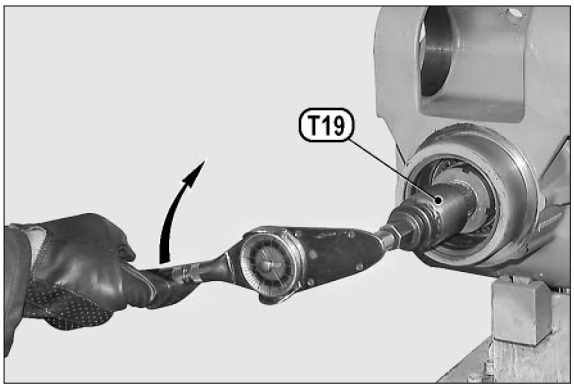
If the ring nuts(1) are removed, spread them with loctite 242.



14W7RA148

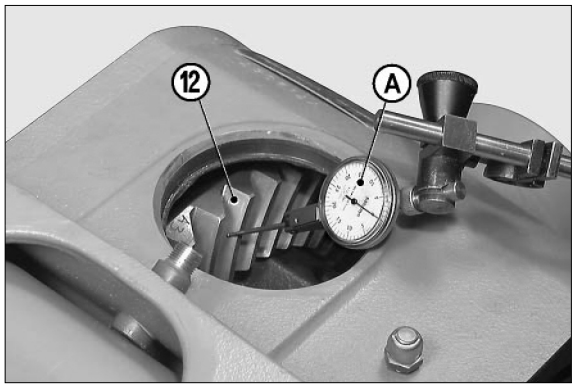
(4) Pre-set the bearings by means of the ring nut situated on the opposite side of the crown, so as to increase pinion torque up to 0.14~0.21kgf · m(1~1.5lbf · ft).

※ **If bearings are not new, check the static torque; if bearings are new, check the continuous torque.**



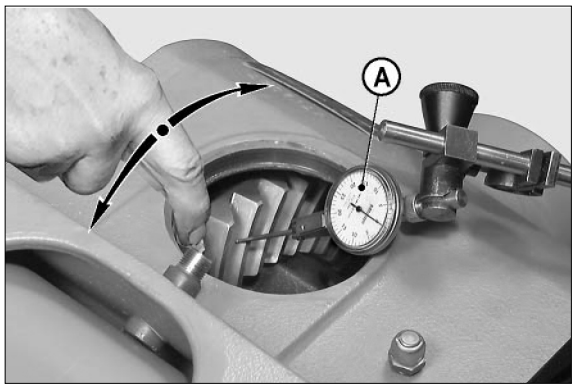
14W7RA149

(5) Introduce a comparator with rotary key " A "through the top plug hole(10).
Position the comparator on the centre of one of the teeth of the crown(12), pre-set it to 1mm and reset it.



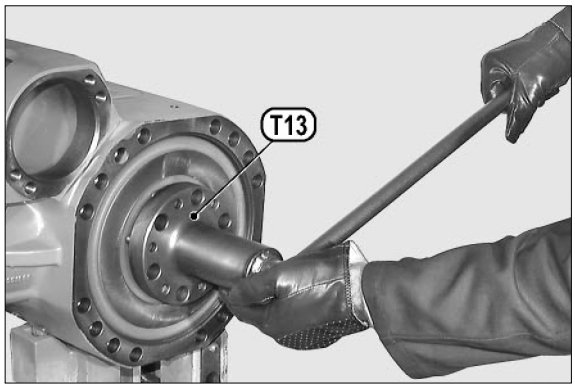
14W7RA150

(6) Manually move the crown(12) in both directions in order to check the existing backlash between the pinion and the crown.



14W7RA151

(7) Adjust the backlash between the pinion and the crown by unloosing one of the ring nuts(1) and tightening the opposite to compensate.
Normal backlash : see table.



14W7RA152

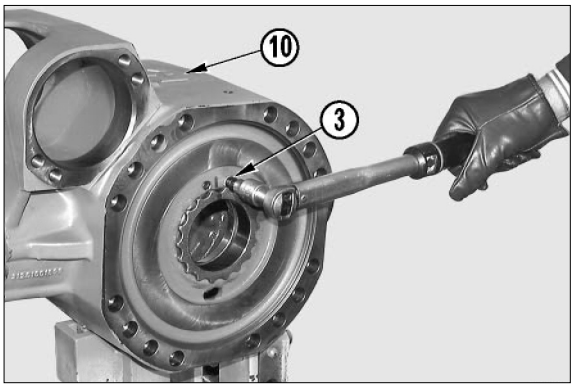
(8) Difference between MIN and MAX clearance for whole circumference should not exceed 0.09mm.

Ratio	Clearance	
	Min	Max
9÷34	0.18	0.23
9÷35	0.13	0.18
11÷31	0.20	0.28
11÷35	0.13	0.18
12÷35	0.13	0.18
12÷41	0.15	0.20
14÷32	0.18	0.23
14÷36	0.15	0.20
14÷41	0.15	0.20
15÷32	0.18	0.23
15÷47	0.13	0.18

(9) Apply loctite 242 to the screws(3), fit them into one of the two holes and tighten.

· Torque wrench setting : 2.4~2.6kgf · m (17~19lbf · ft)

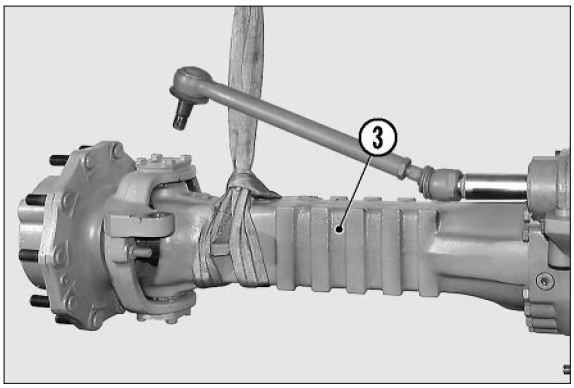
Fit the top plug(10) after applying repositionable jointing compound for seals to the rims.



14W7RA152

(10) Re-install the complete arms.

For details, see“ CHECKING WEAR AND REPLACING THE BRAKING DISKS ”.

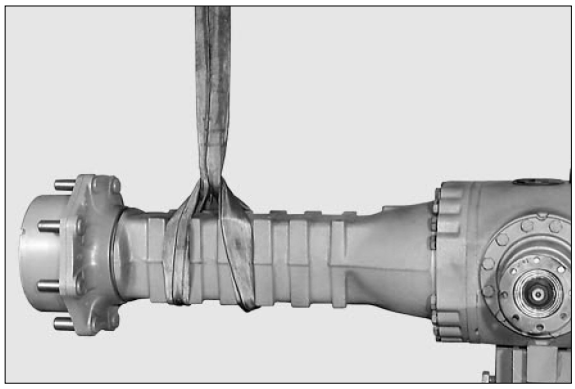


14W7RA153

10. THE BEVEL PINION

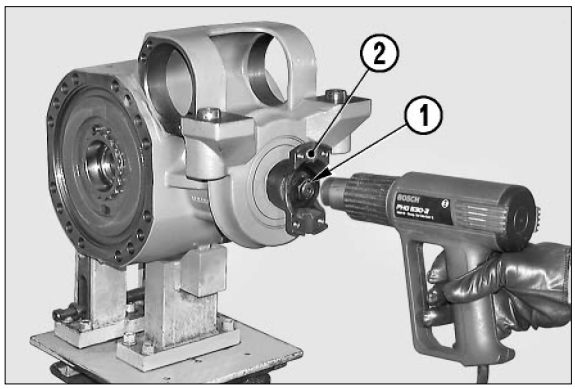
1) HOW TO REMOVE THE BEVEL PINION

(1) Remove the complete arms and the differential unit.
For details, see“ CHECKING WEAR AND REPLACING THE BRAKING DISKS ”and “ REMOVING THE DIFFERENTIAL UNIT ”.



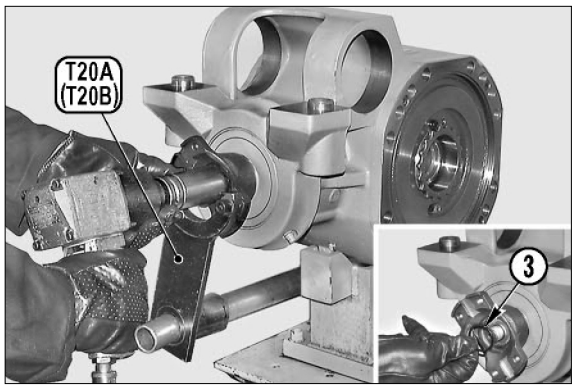
14W7RA061

(2) If disassembly is awkward, heat the check nut(1) of the flange(2) at 80。C.
NOTE
Heating is meant to unloose the setting of loctite on the nut(1).



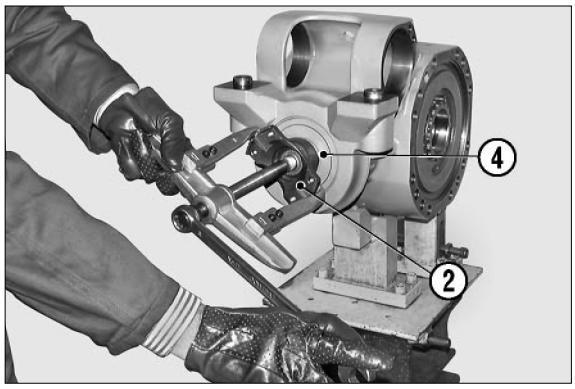
14W7RA062

(3) Position tool T20A(or T20B), so as to avoid pinion rotation.
Unloose and remove the nut(1); also remove the O-ring(3).



14W7RA063

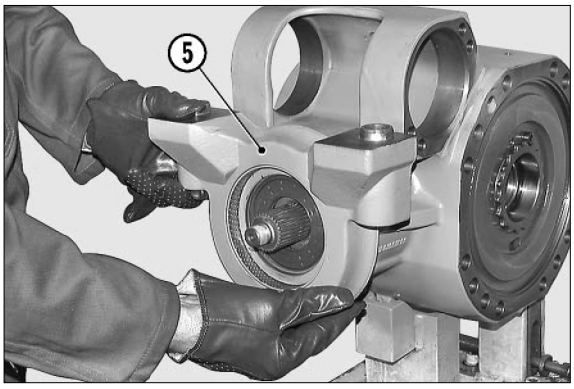
(4) Remove the flange(2) complete with guard(4) by means of a puller.



14W7RA064

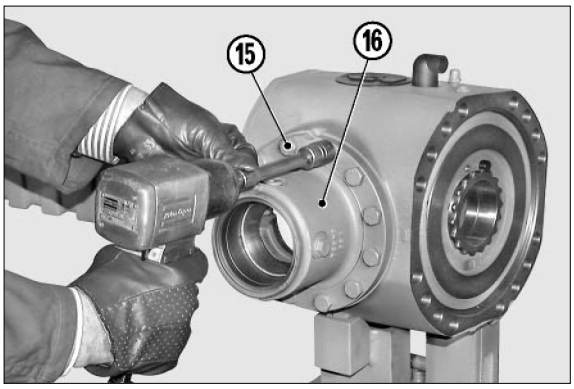
(5) Remove the swinging support(5).

※ **Front axle only**



14W7RA065

(6) Remove the sealing ring(6).

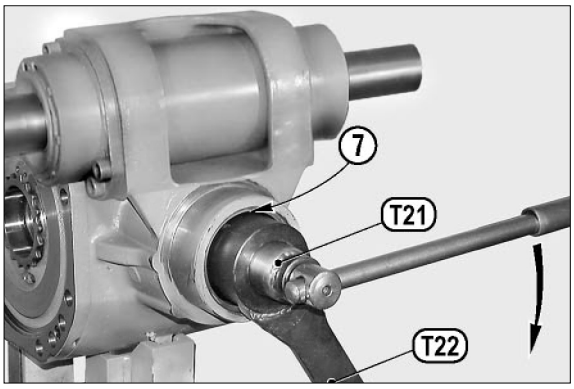


14W7RA066

(7) Position wrench T22 onto the ring nut(7) and apply bar hoid T21 to the pinion(8). Stop wrench T22 and rotate the pinion so as to release and remove the ring nut(7).

NOTE

If disassembly proves awkward, weld the ring nut at approx. 80。C.

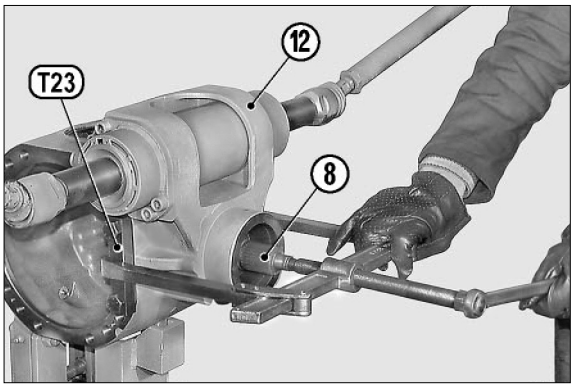


14W7RA070

(8) Apply blocks T23 and, with the help of a puller, extract the pinion(8) complete with the internal bearing(9), the distance piece(10) and shims(11).

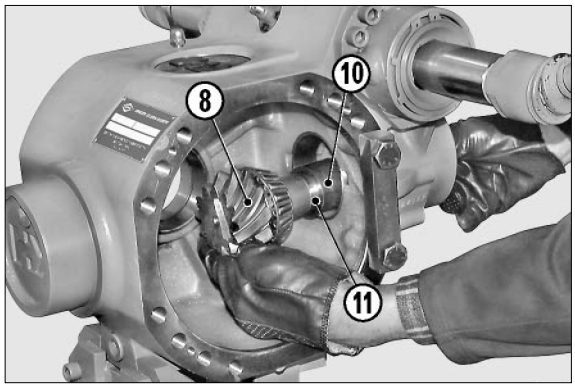
NOTE

The thrust blocks of the bearings remain in the central body(12).



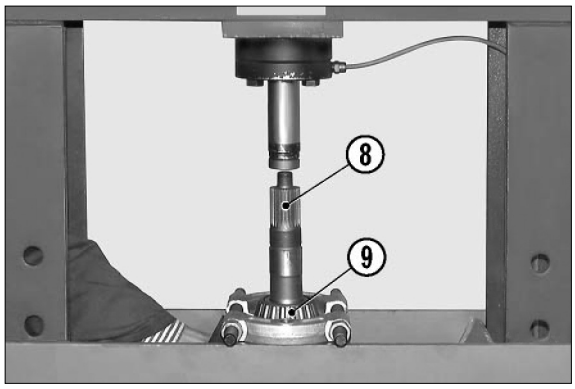
14W7RA071

(9) Remove the pinion(8), shims(11) and distance piece(10).



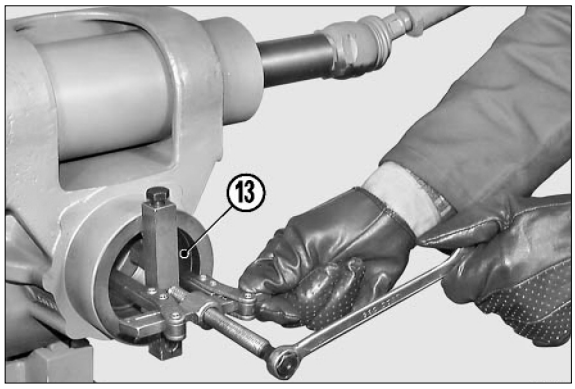
14W7RA072

(10) Using a puller and a press, remove the inner bearing(9) from the pinion(8).



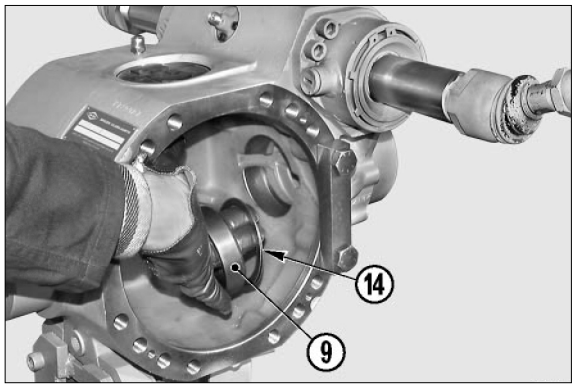
14W7RA073

(11) Remove the thrust block of the extemal bearing(13).



14W7RA074

(12) Insert a drift in the appropriate holes and remove the thrust block of the internal bearing(9) as well as the shim washers (14).

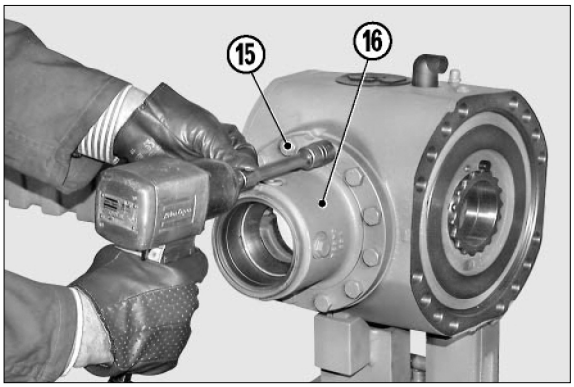


14W7RA075

(13) ONLY IF NECESSARY

※ **Rear axle only.**

Unloose and remove the screws(15) locking the support(16), remove the whole support.



14W7RA067

2) HOW TO INSTALL AND ADJUST THE BEVEL PINION

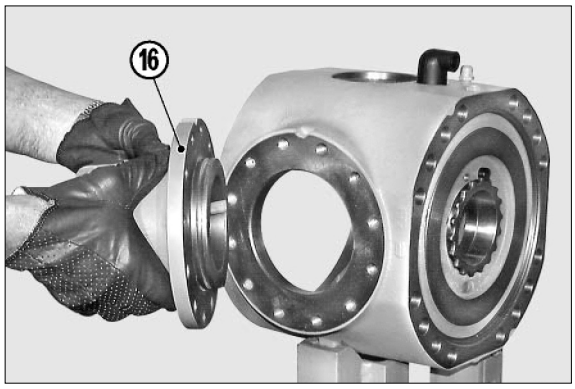
(1) ONLY IF HAS BEEN REMOVED

Fit support(16), including O-ring(20), onto the intermediate body.

NOTE

① The cavity located on the outer diameter must face upwards.

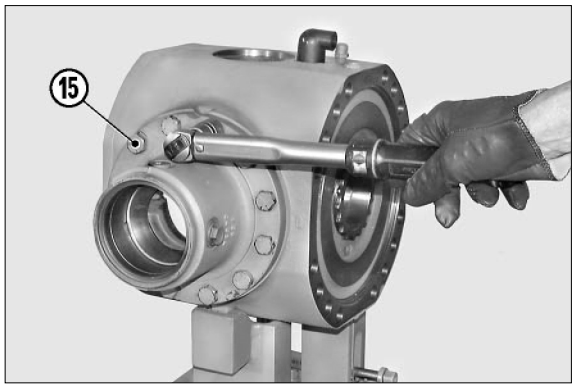
② Check and lubricate the O-ring(20).



14W7RA076

(2) Fasten support with screws(15) previously coated with loctite 270.

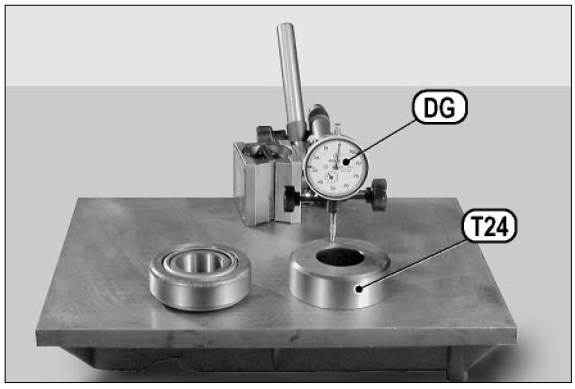
Tighten using the criss-cross method to a tightening torque of 9~10kgf · m(65~72lbf · ft)



14W7RA077

(3) Using a surface plate, reset a centesimal comparator " DG " and place it on the measurement ring T24 (with a thickness of 30.2mm).

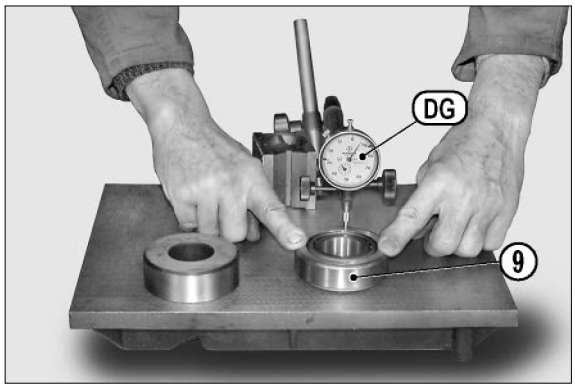
Preset the comparator to approx. 2mm



14W7RA078

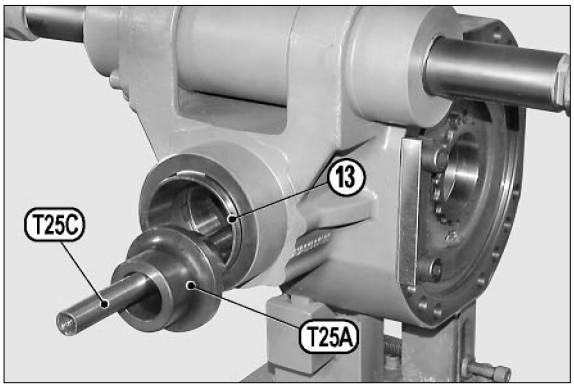
(4) Bring the internal bearing(9), complete with its thrust block, under the comparator " DG ". Determine overall thickness" D "of the bearing checking the discrepancy between this size and the size of the measurement ring.

※ **Press the thrust block in the centre and take several measurements while rotating the thrust block.**



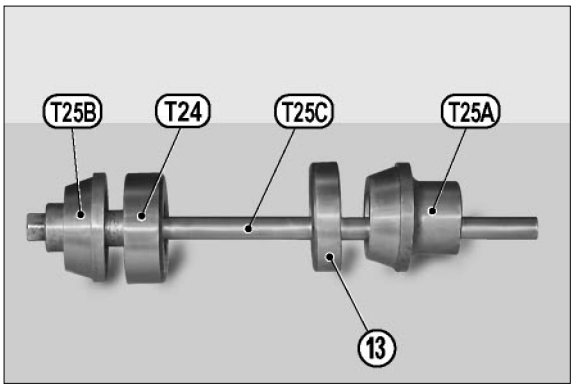
14W7RA079

(5) Partially insert the thrust block of the external bearing(13).



14W7RA080

(6) Install tension rod T25C, measurement ring T24 and front guide tool T25A on the thrust block of the external bearing(13).

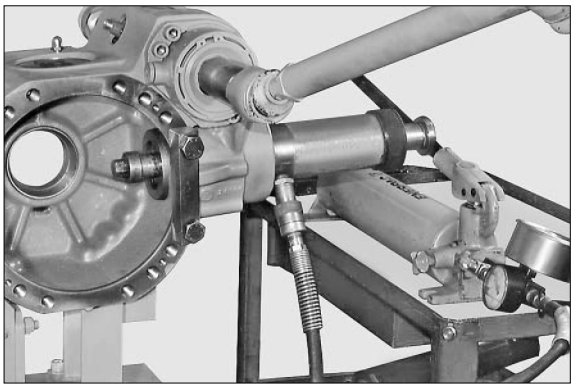


14W7RA081

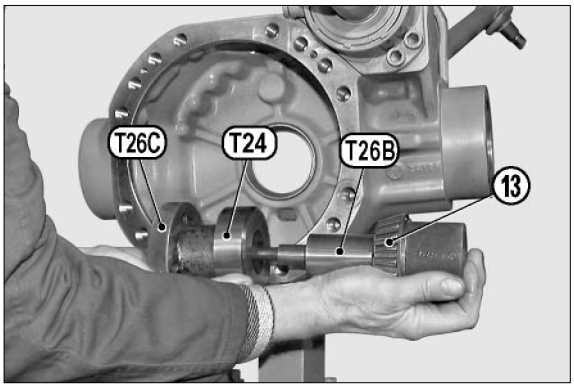
(7) Connect the tension rod to the press and move the thrust block of the external bearing(13) into its seat. Disconnect the press and remove the tension rod.

NOTE

Before starting the next stage, make sure that the thrust block has been completely inserted into its seat.

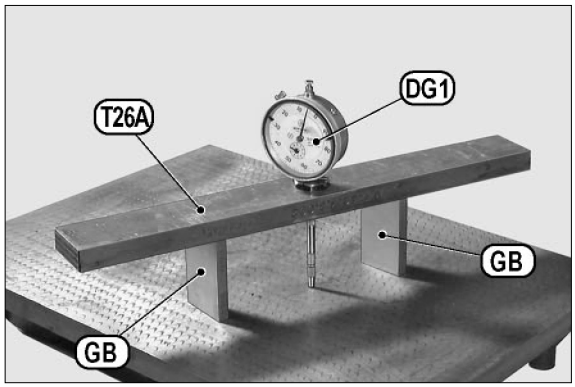

14W7RA082

(8) Insert tool T26B complete with external bearing(13), measurement ring T24 and gauged ring nut T26C.
Manually tighten.



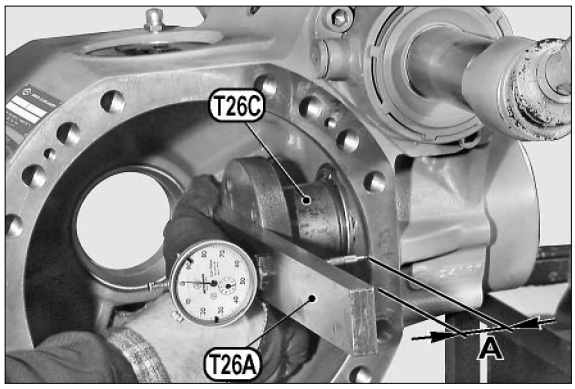
14W7RA083

(9) Fit a centesimal comparator " DG1 " with long stem into bar T26A; when the bar rests on two size-blocks " GB " of 57mm, reset the comparator.
Preset the comparator to approx. 2mm and reset.



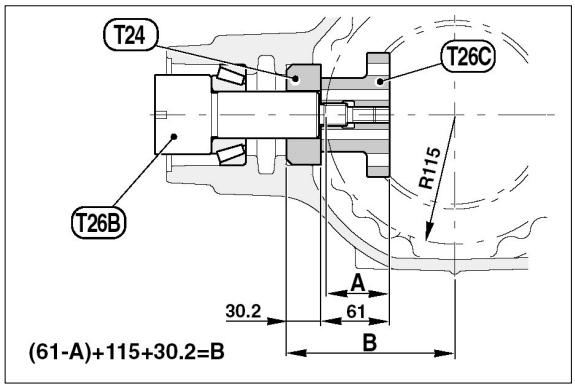
14W7RA084

(10) Lay bar T26A on gauged nut T26C and take the size " A " at about 57mm corresponding to the maximum diameter of arms centering.



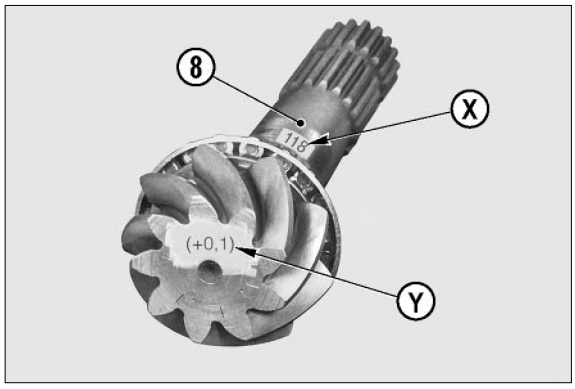
14W7RA085

(11) Calculate size " B " which will be the first useful valve for calculating the size of the shims(14) that are to be inserted under the thrust block of the internal bearing(9).



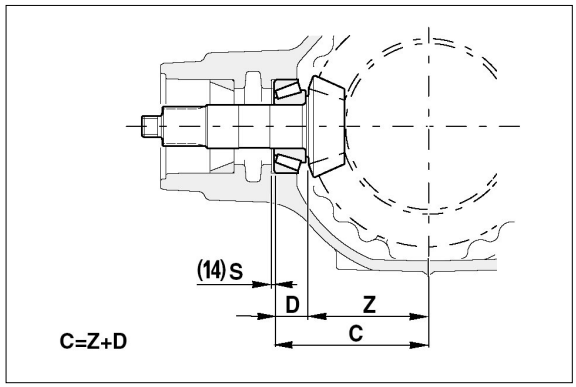
14W7RA086

(12) Check the norminal size(X) marked on the pinion and add or subtract the indicated variation(Y) so as to obtain size" Z ".
e.g; Z=118+0.1=118.1
Z=118-0.2=117.8



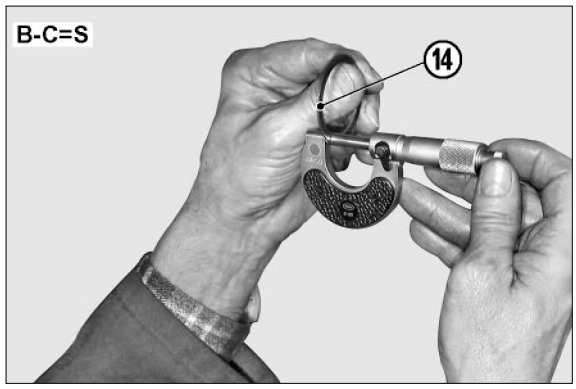
14W7RA087

(13) Calculate size " C " which represents the second value for calculating the size of the shims " S " that are to be placed under the thrust block of the internal bearing(9).



14W7RA088

(14) Calculate the difference between sizes " B " and " C " so as to obtain the size " S " of the shim(14) that will go under the thrust block of the internal bearing(9).

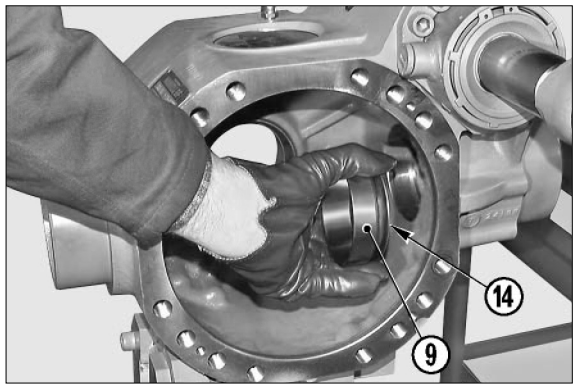


14W7RA089

(15) Insert shim " S "(14) and the thrust block of the internal bearing(9) in the central body.

NOTE

To hold shim " S "(14) in position, apply grease.

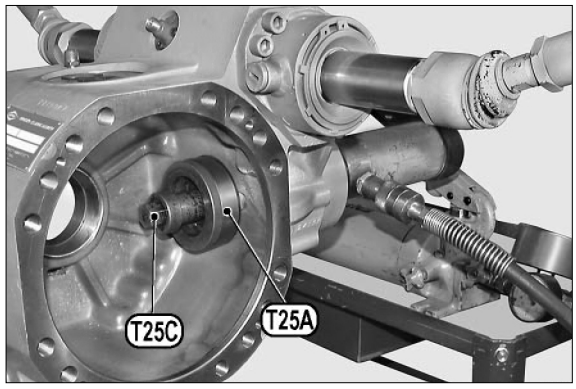


14W7RA090

(16) Position tool T25A and tension rod T25C. Connect the tension rod to the press, fasten the thrust block and then remove the tools.

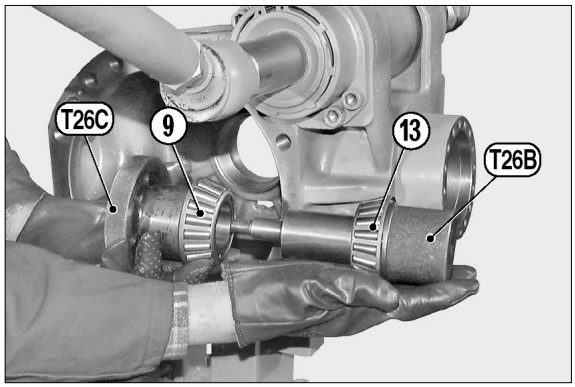
NOTE

Before going on to the next stage, make sure that the thrust block has been completely inserted.



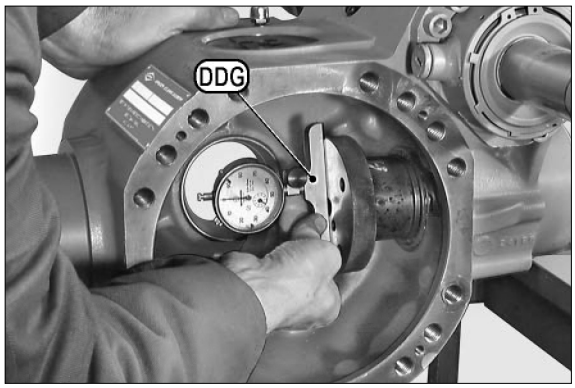
14W7RA091

(17) Position tools T26C and T26B complete with tapered bearings(9) and (13); manually tighten until a rolling torque has been obtained.



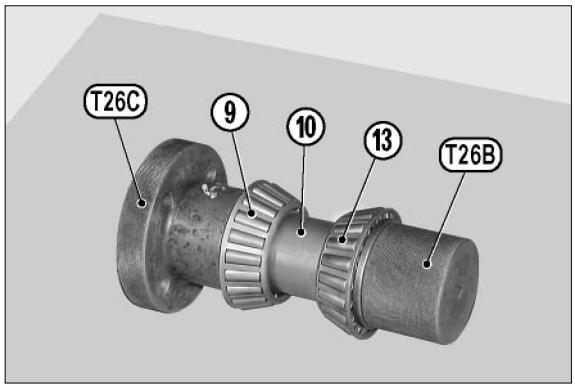
14W7RA092

(18) Insert the stem of a depth comparator " DDG " in either side hole of tool T26C; reset the comparator with a presetting of approx. 3mm.



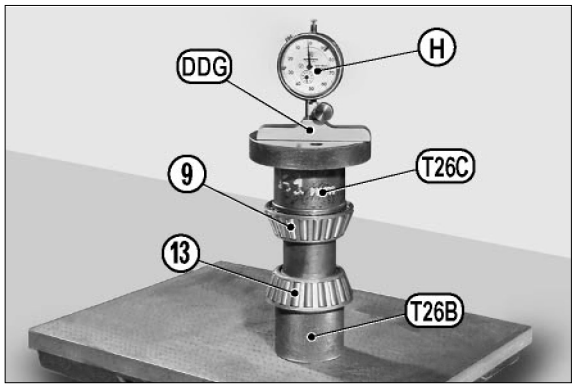
14W7RA093

(19) Remove the comparator and release tools and bearings from the central body.
Re-install all and insert the distance piece(10) between bearings(9) and (13); manually tighten the whole pack.



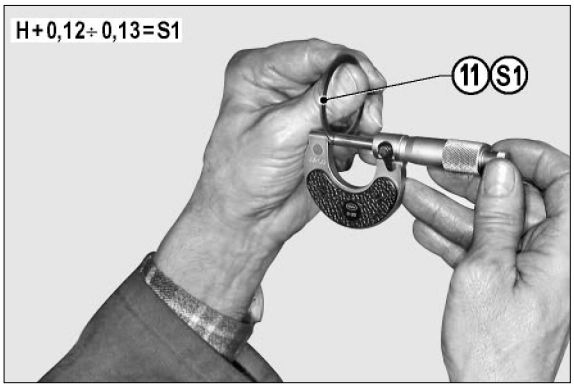
14W7RA094

(20) Insert depth comparator " DDG " into tool T26B-T26C and measure variation " H " in relation to the zero setting performed back at point d.



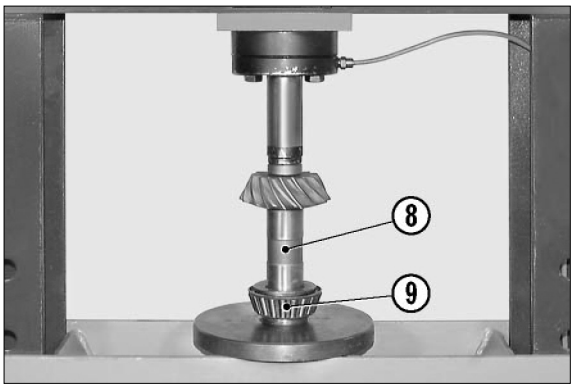
14W7RA095

(21) The variation is to be added to a set value of 0.12~0.13mm, so as to obtain the size of shim " S1 "(11) which will be inserted between the external bearing(13) and the distance piece(10) and subsequently, to determine the preload for the bearings.



14W7RA096

(22) Position the internal bearing(9) and the pinion(8) under a press; force the bearing onto the pinion.

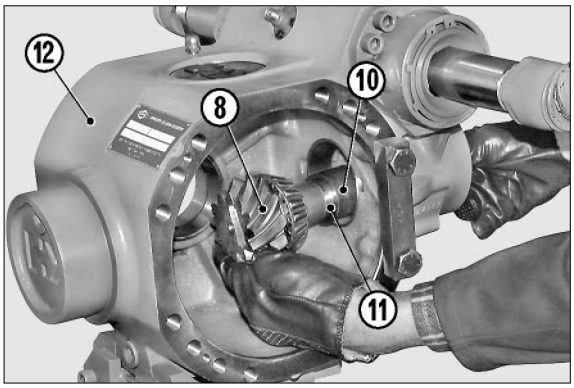


14W7RA097

(23) Fit the pinion(8), shim " S1 "(11) and distance piece(10) in the main body(12).

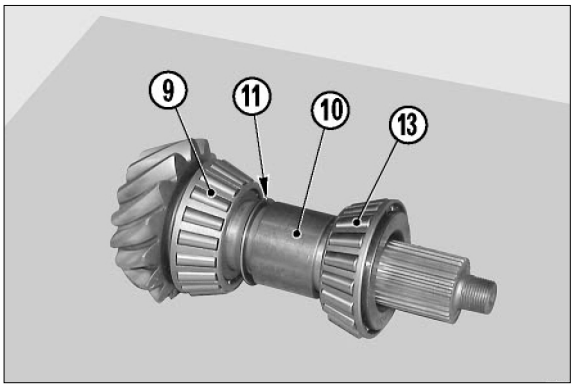
NOTE

The finer shims must be placed in-between the thicker ones.



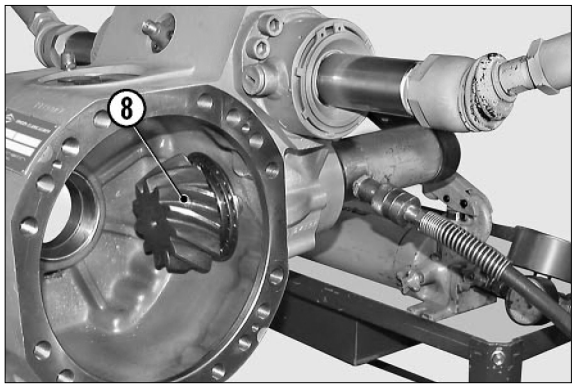
14W7RA098

(24) Insert the external bearing(13) in the central body in order to complete the pack arranged as in the figure.



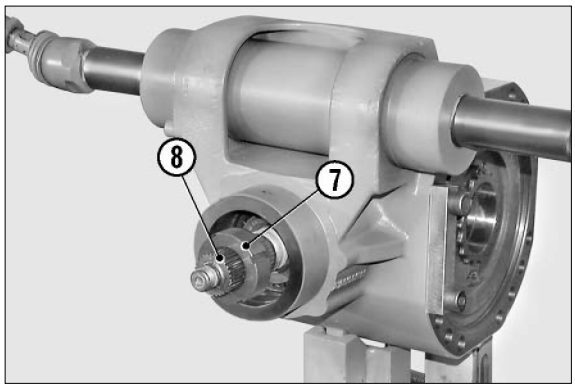
14W7RA099

(25) Connect the pinion(8) to the tie rod T28A and T28B; connect the tie rod T28C (see special tools) to the press and block.



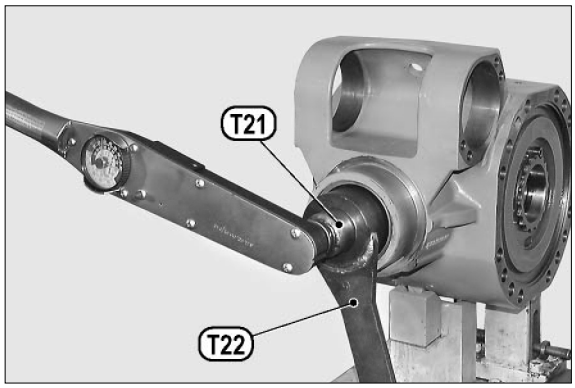
14W7RA100

(26) Apply loctite 242 to the thread of the ring nut(7) and screw the nut onto the pinion(8).



14W7RA101

(27) Apply special wrench T22 to the ring nut(7) and bar-hold T21 to the pinion(8). Lock the wrench T22 and rotate the pinion using a dynamometric wrench, up to a minimum required torque setting of 50kgf · m(362lbf · ft)



14W7RA102

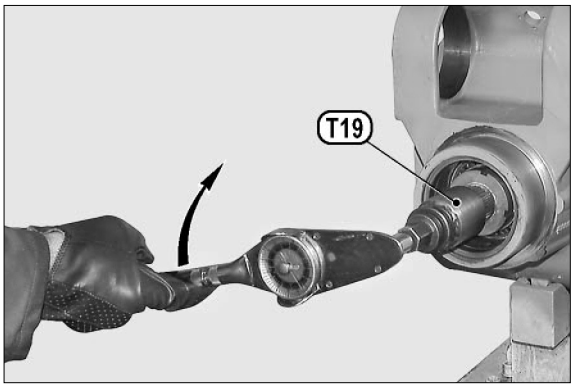
(28) Apply onto the pinion(8) the bar-hold and with the help of a torque metre, check the torque of the pinion(8).

· Torque : 12~17kgf · m(87~123lbf · ft)

※ **If torque exceeds the maximum value, then the size of shim " S1 "(11) between the bearing(13) and the distance piece(10) needs to be increased.**
If torque does not reach the set value, increase the torque setting of the ring nut(7) in different stages to obtain a maximum value of 57kgf · m(412lbf · ft).

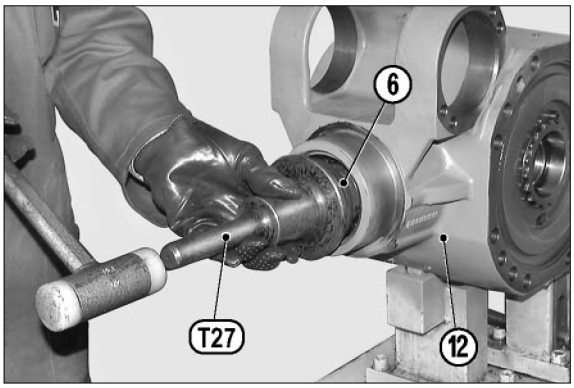
※ **If torque does not reach the minimum value, then the size of shim " S1 "(11) needs to be reduced.**

※ **When calculating the increase or decrease in size of shim " S1 ", bear in mind that a variation of shim(11) of 0.01mm corresponds to a variation of 0.06kgf · m(0.43lbf · ft) in the torque of the pinion(8).**



14W7RA103

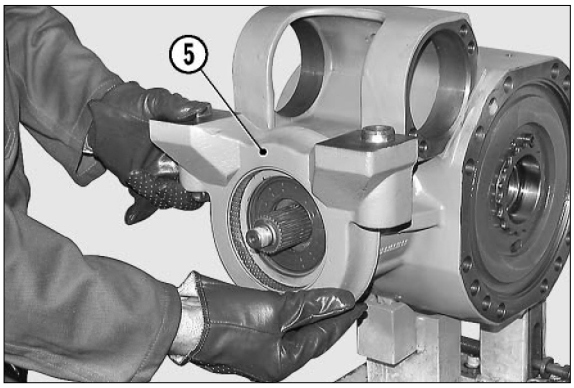
(29) Lubricate the outer surface of the new sealing ring(6) and fit it onto the central body(12) using tool T27.



14W7RA104

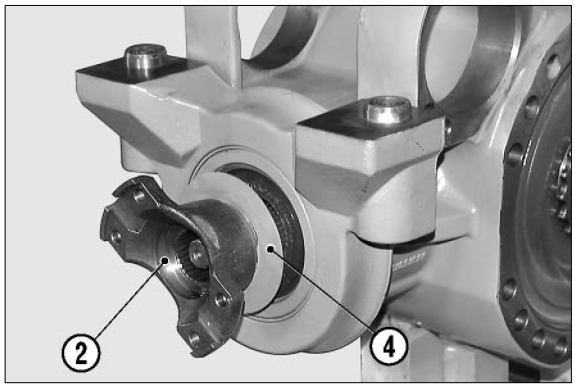
(30) Install the swinging support(5).

※ **Front axle only.**
NOTE
Check that it is properly oriented.



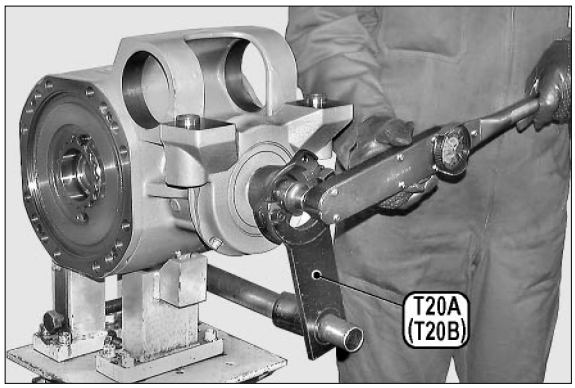
14W7RA105

(31) Fit the flange(2) complete with the guard(4) and fasten it.
For keying the flange(2), use a plastic hammer if necessary.
NOTE
Make sure that the guard(4) is securely fastened onto the flange and that it is not deformed.



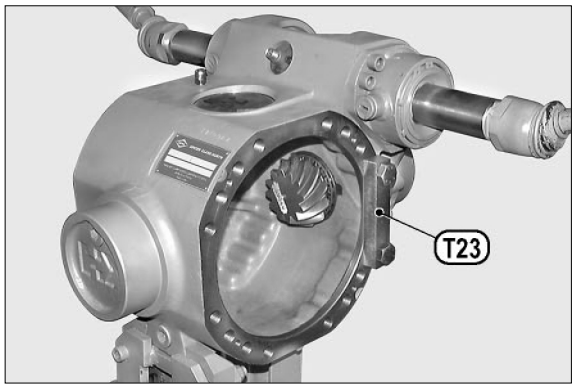
14W7RA106

(32) Apply loctite 242 to the threaded part of the pinion(8). Position tool T20A(or T20B) and fasten it in order to avoid rotation.
Insert O-ring(3) the nut(1) and tighten it using a dynamometric wrench.
· Torque wrench setting : 28~31kgf · m
(203~224lbf · ft)



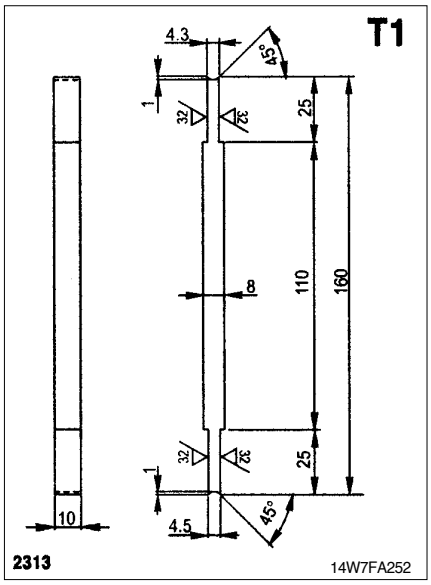
14W7RA107

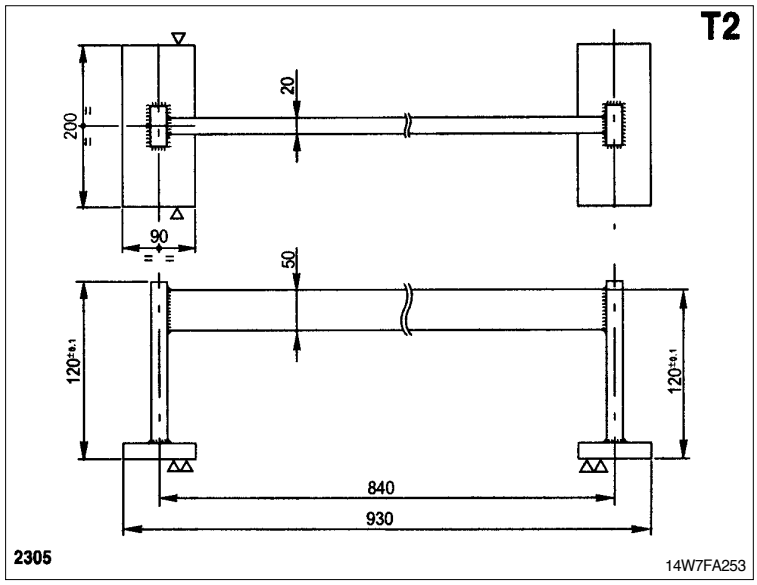
(33) Remove blocks T23(used for extracting the pinion) and re-install the arms.
For details, see“ CHECKING WEAR AND REPLACING THE BRAKING DISKS ”.

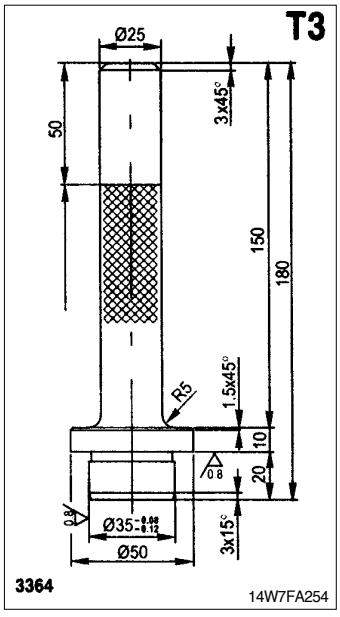


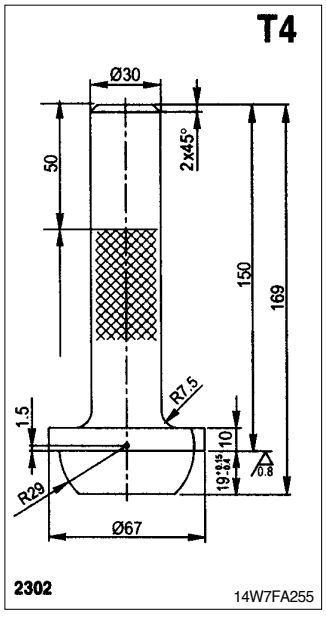
14W7RA108

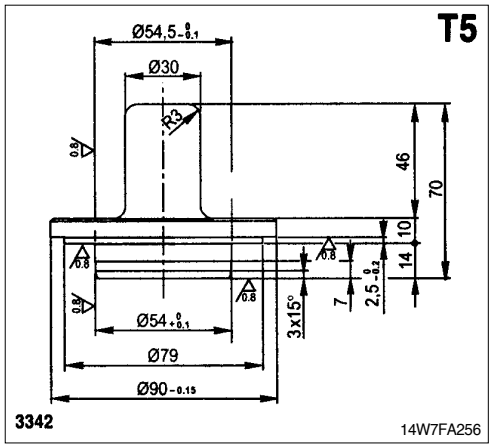
11. SPECIAL TOOLS

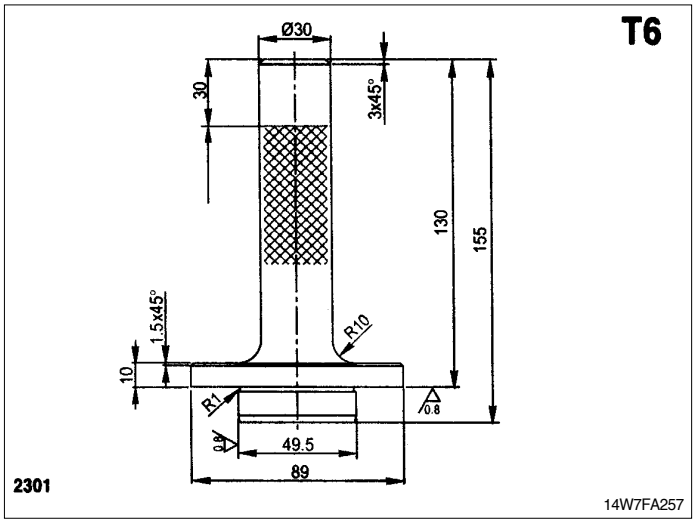


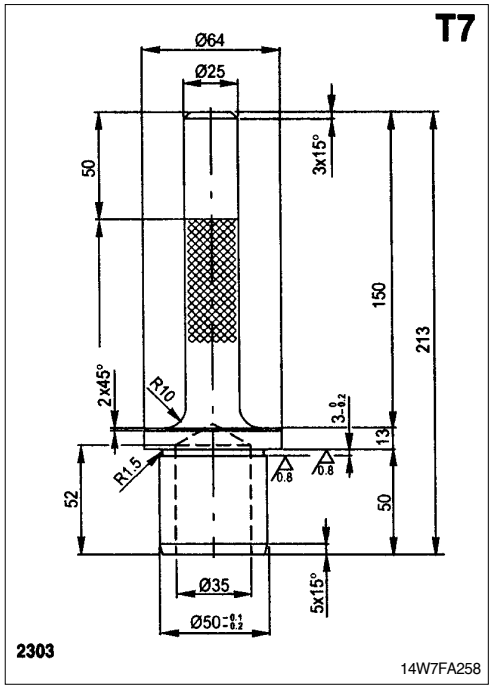


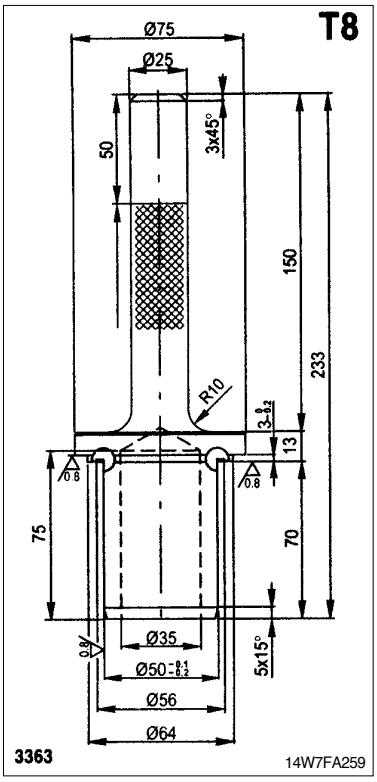


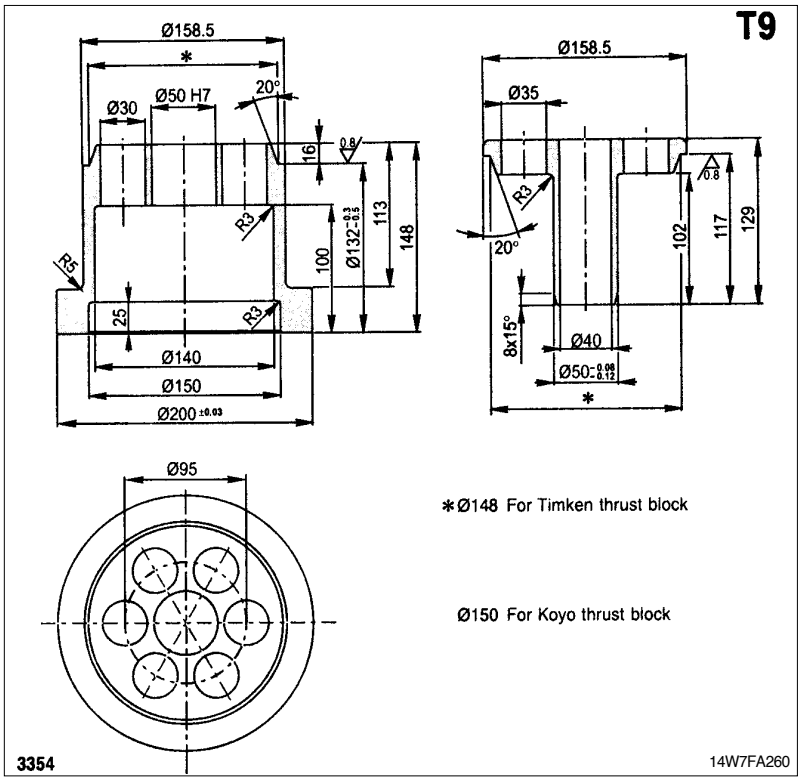


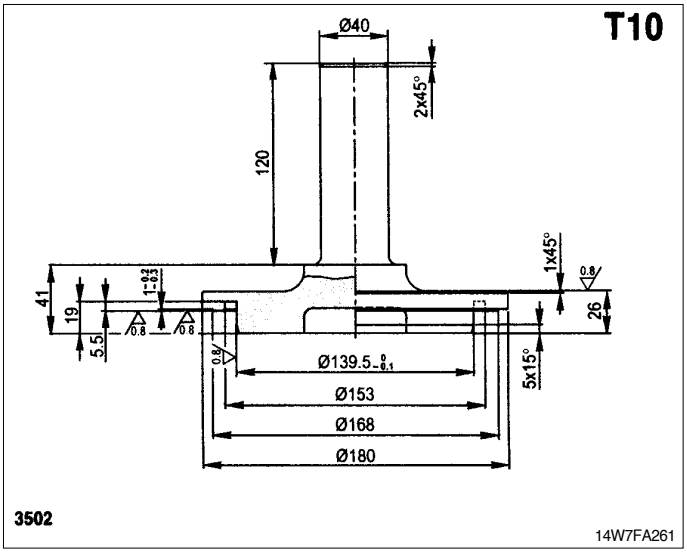


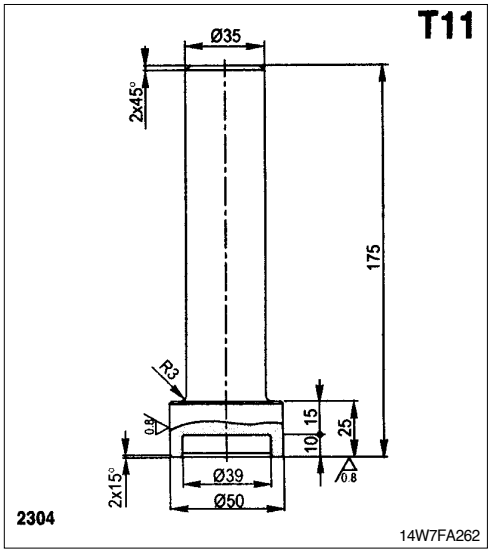


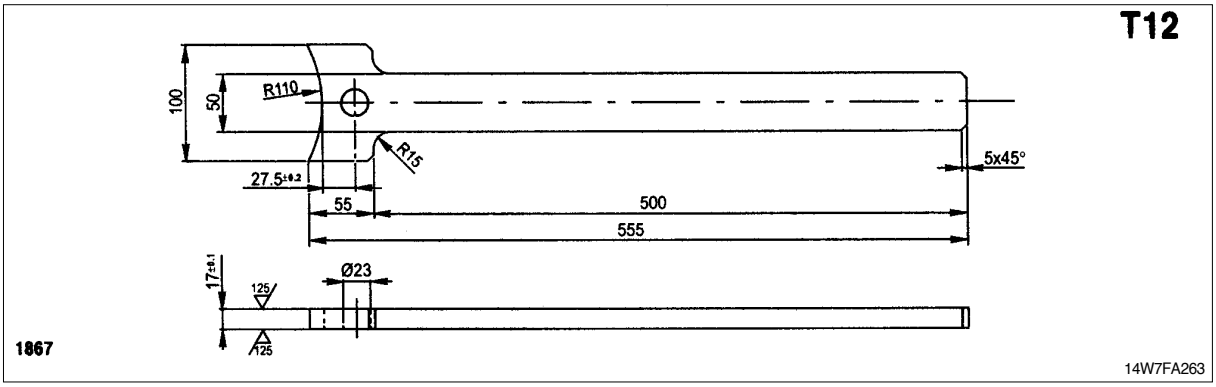



T8
Ø75
Ø25
50
3x45°
150
233
R10
3-0.2
13
0.8
75
70
Ø35
0.8
Ø50-0.1-0.2
5x15°
Ø56
Ø64
3363
14W7FA259

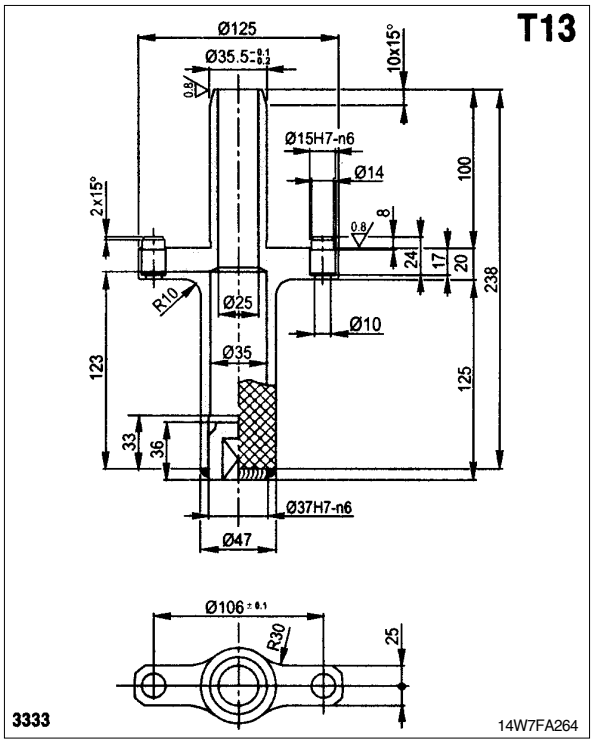

T9
Ø158.5
*
Ø50 H7
20°
Ø30
16
0.8
R3
100
Ø132-0.3-0.5
113
148
25
Ø140
Ø150
Ø200 ±0.03
Ø95
3354
Ø158.5
Ø35
R3
20°
0.8
102
117
129
8x15°
Ø40
Ø50-0.08-0.12
*
*Ø148 For Timken thrust block
Ø150 For Koyo thrust block
14W7FA260


T10
Ø40
2x45°
120
1x45°
0.8
41
19
1-0.2-0.3
0.8
0.8
5.5
26
0.8
Ø139.5-0-0.1
5x15°
Ø153
Ø168
Ø180
3502
14W7FA261


T11
Ø35
2x45°
175
R3
0.8
10
15
25
0.8
2x15°
Ø39
Ø50
2304
14W7FA262

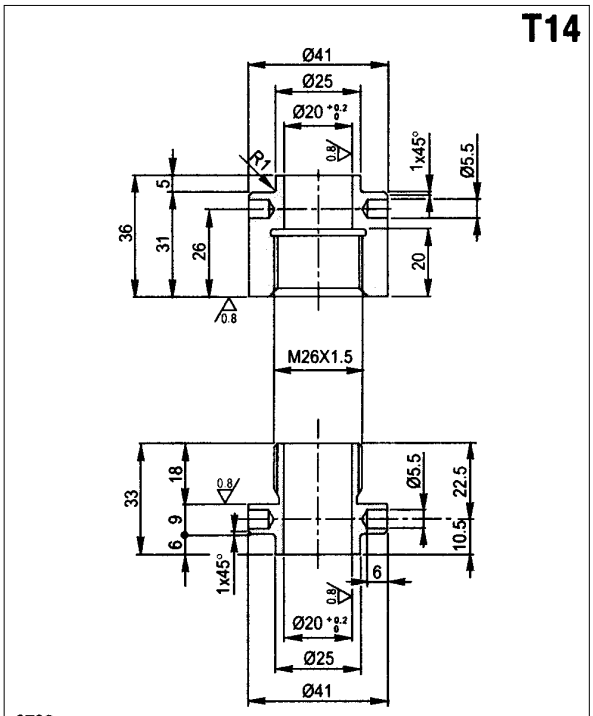

T12
100
50
R110
R15
5x45°
27.5±0.2
55
500
555
17±0.1
Ø23
125
125
1867
14W7FA263

T13



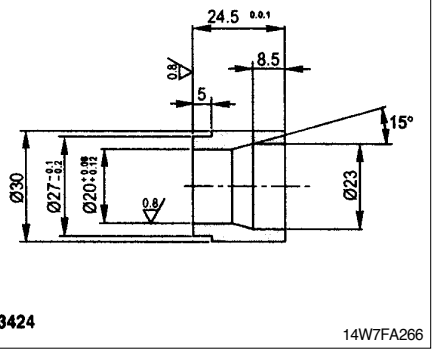
3333 14W7FA264

T14



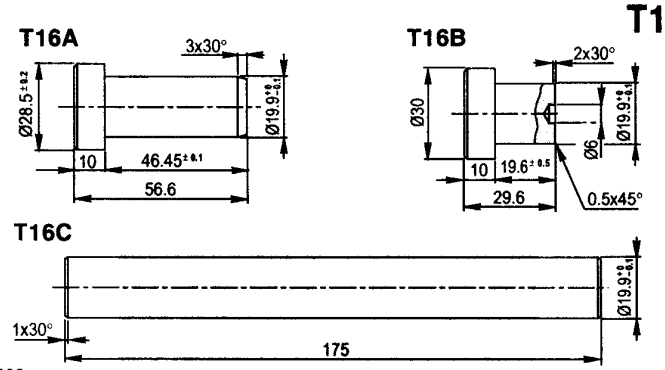
3708 14W7FA265

T15



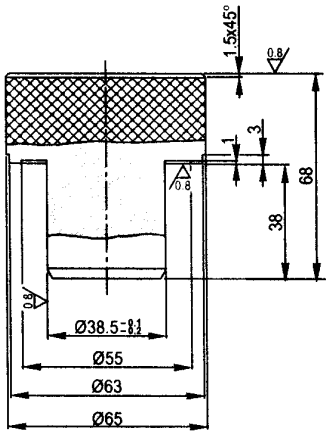
3424 14W7FA266

T16



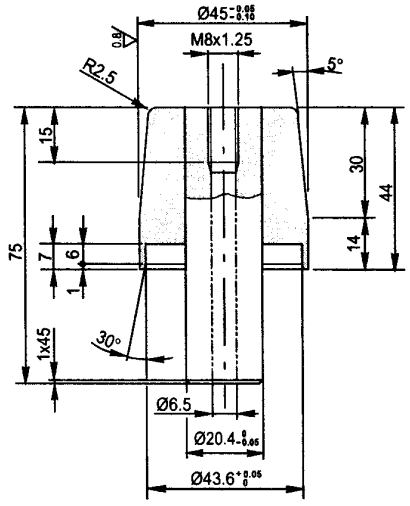
2306 14W7FA267

T17

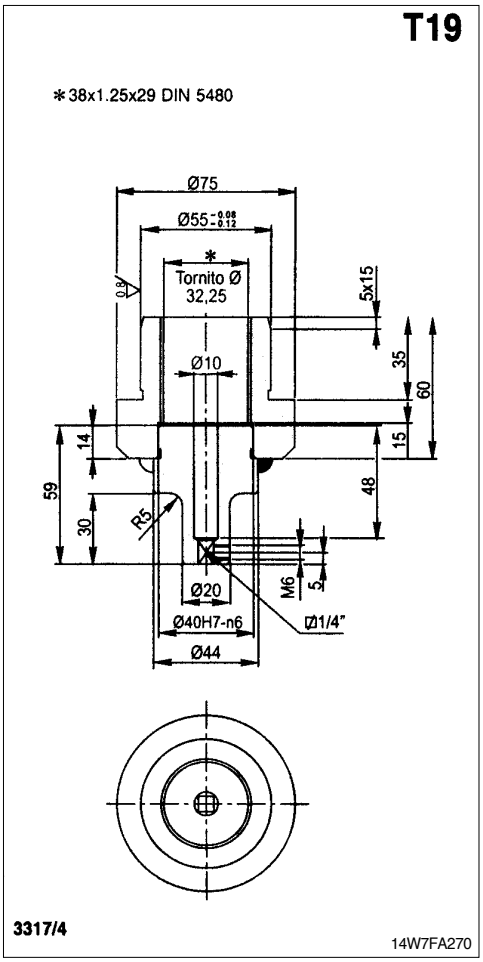


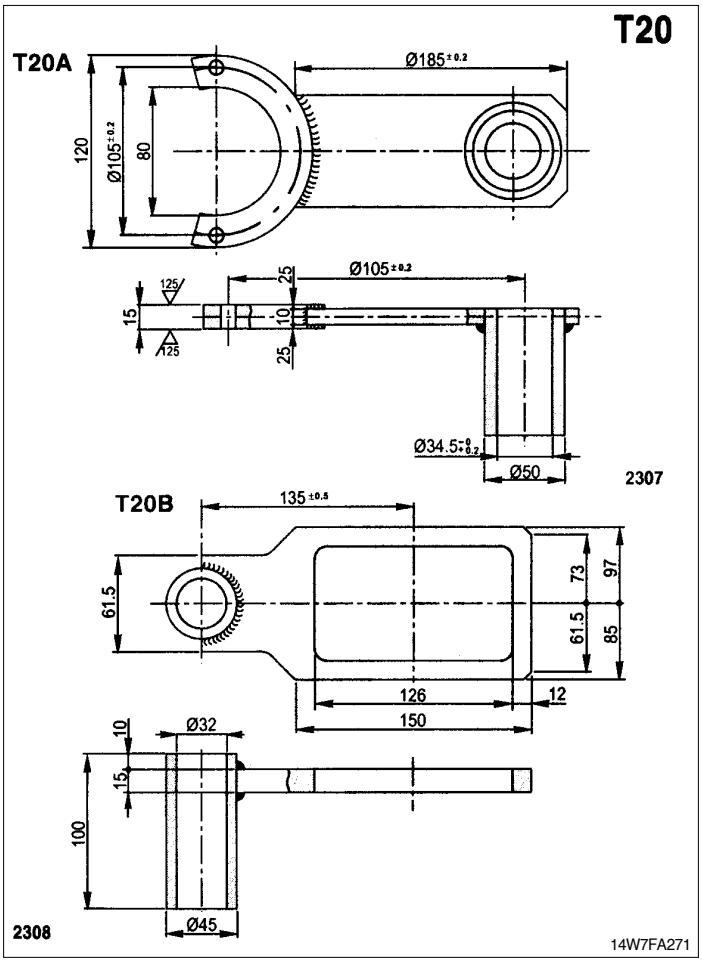
3332 14W7FA268

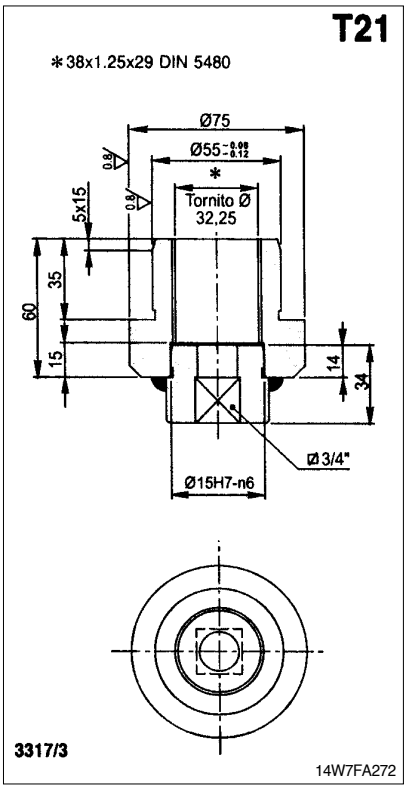
T18

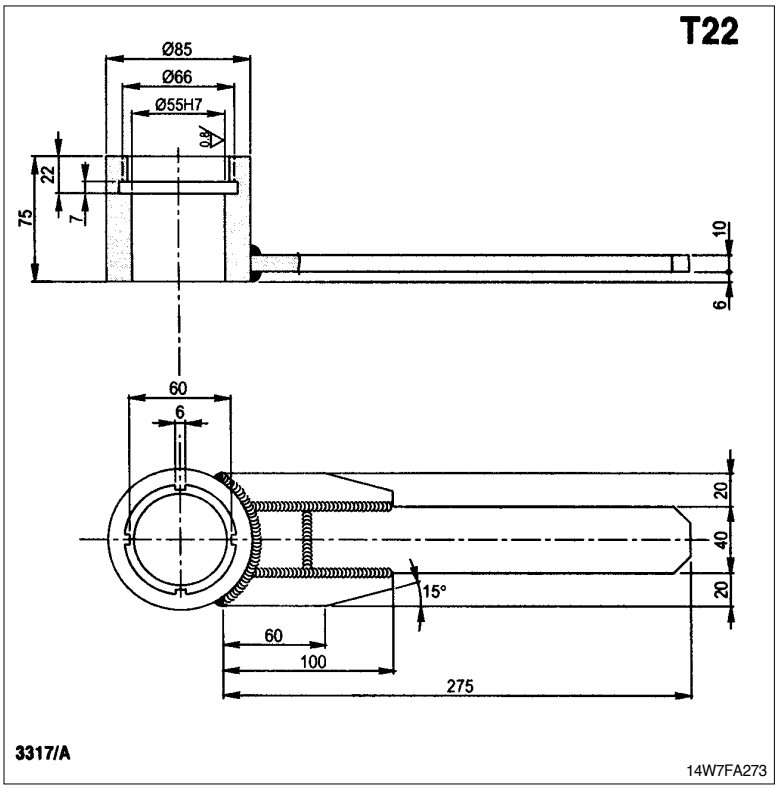


2724 14W7FA269

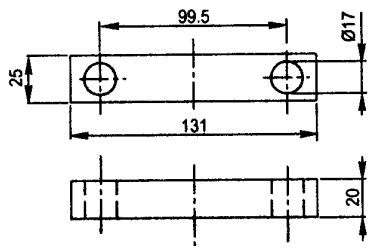

T19
*38x1.25x29 DIN 5480
Ø75
Ø55
Tornito Ø 32,25
5x15
Ø10
35
60
14
15
59
48
30
R5
Ø20
M6
5
Ø40H7-n6
Ø1/4"
Ø44
3317/4
14W7FA270


T20
T20A
Ø185
120
Ø105
80
Ø105
125
25
15
10
25
Ø34.5
Ø50
2307
T20B
135
61.5
73
97
61.5
85
126
12
150
Ø32
10
15
100
Ø45
2308
14W7FA271


T21
*38x1.25x29 DIN 5480
Ø75
Ø55
Tornito Ø 32,25
5x15
60
35
15
14
34
Ø3/4"
Ø15H7-n6
3317/3
14W7FA272


T22
Ø85
Ø66
Ø55H7
22
7
75
10
6
60
6
20
40
20
15°
60
100
275
3317/A
14W7FA273

T23



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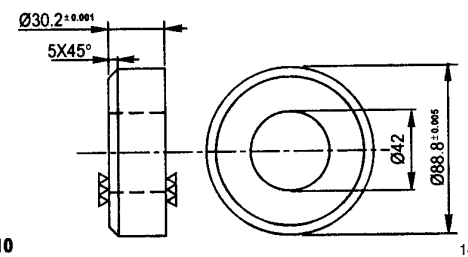
T24



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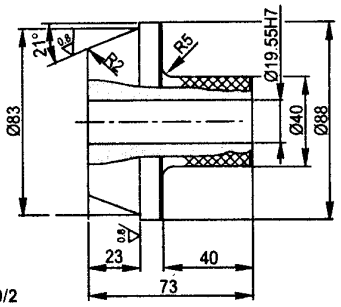
14W7FA275

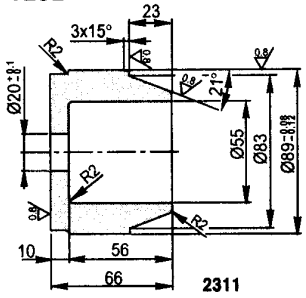
T25

T25A



3329/2

T25B



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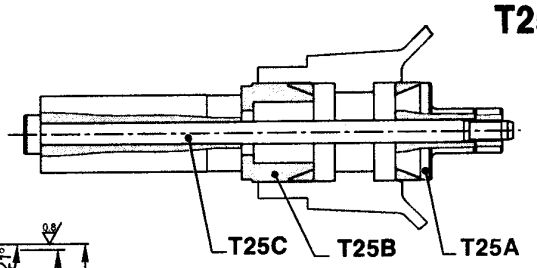
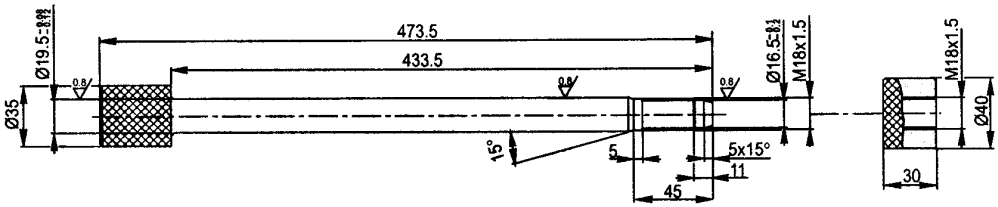


T25C

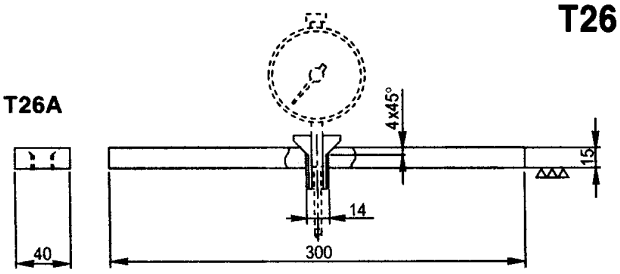


3329/3

14W7FA276

T26

T26A



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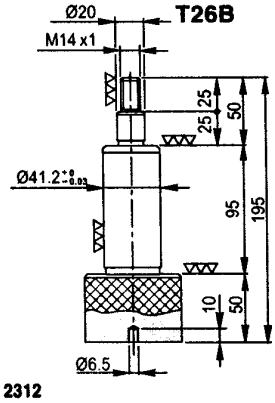

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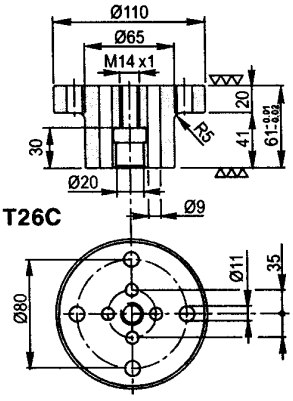

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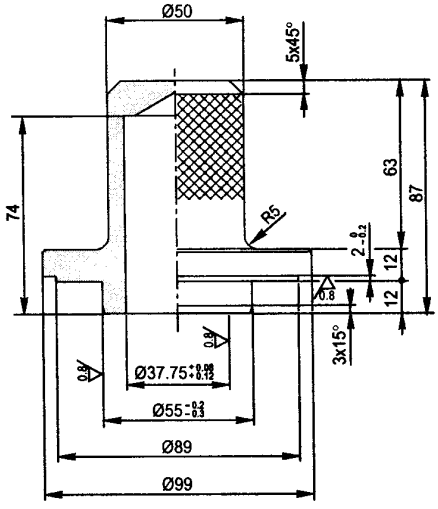

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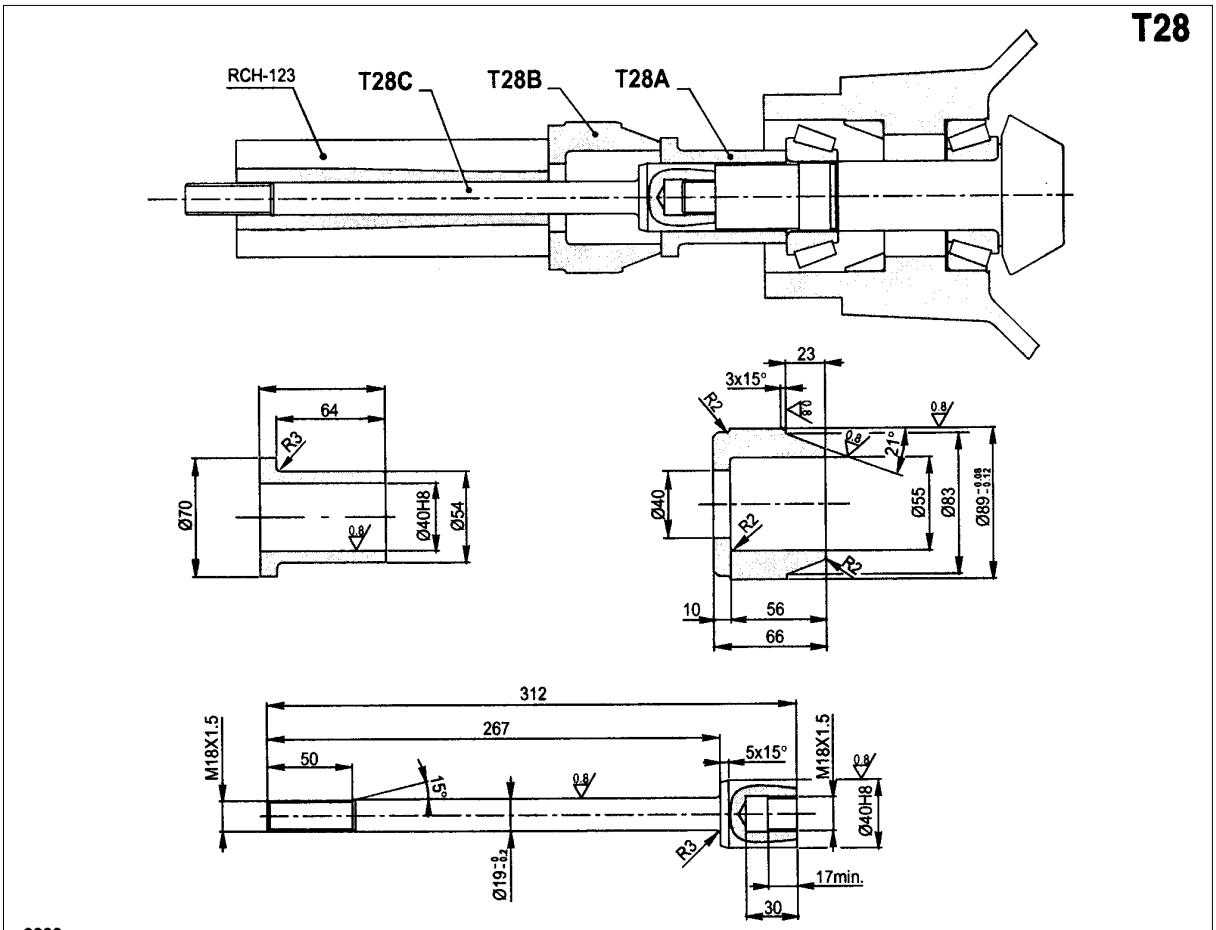

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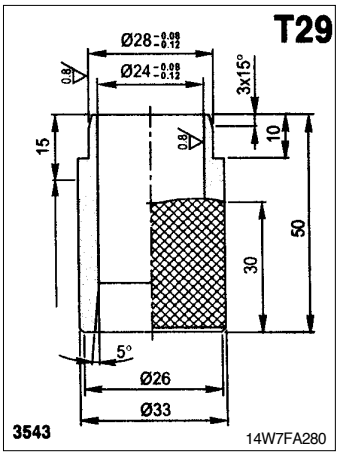

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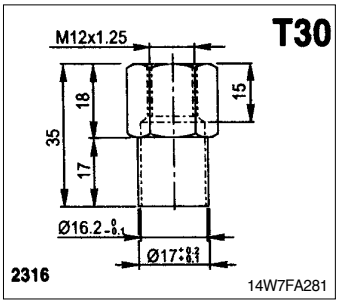

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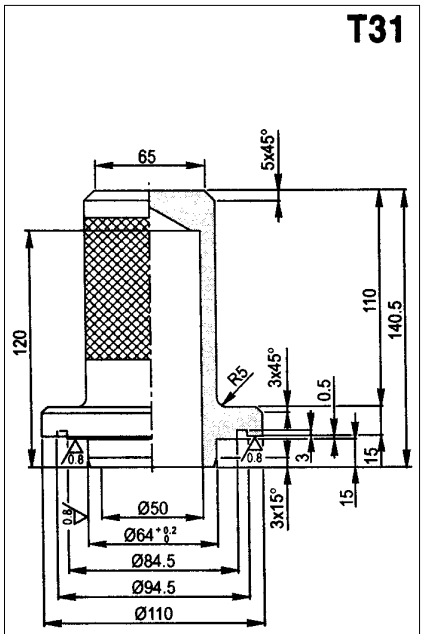

3739

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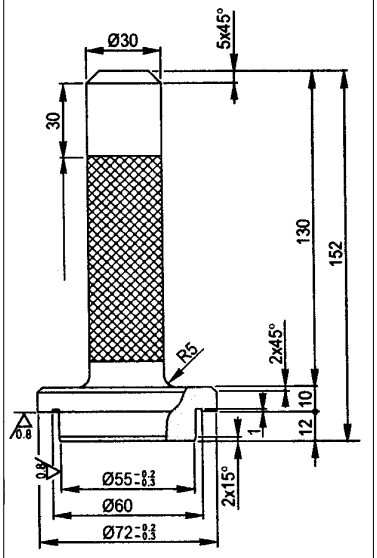


2317

14W7FA283

GROUP 10 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.

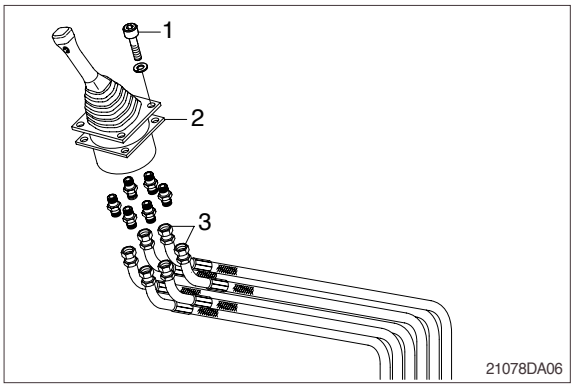
(4) Loosen the socket bolt(1).

(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.



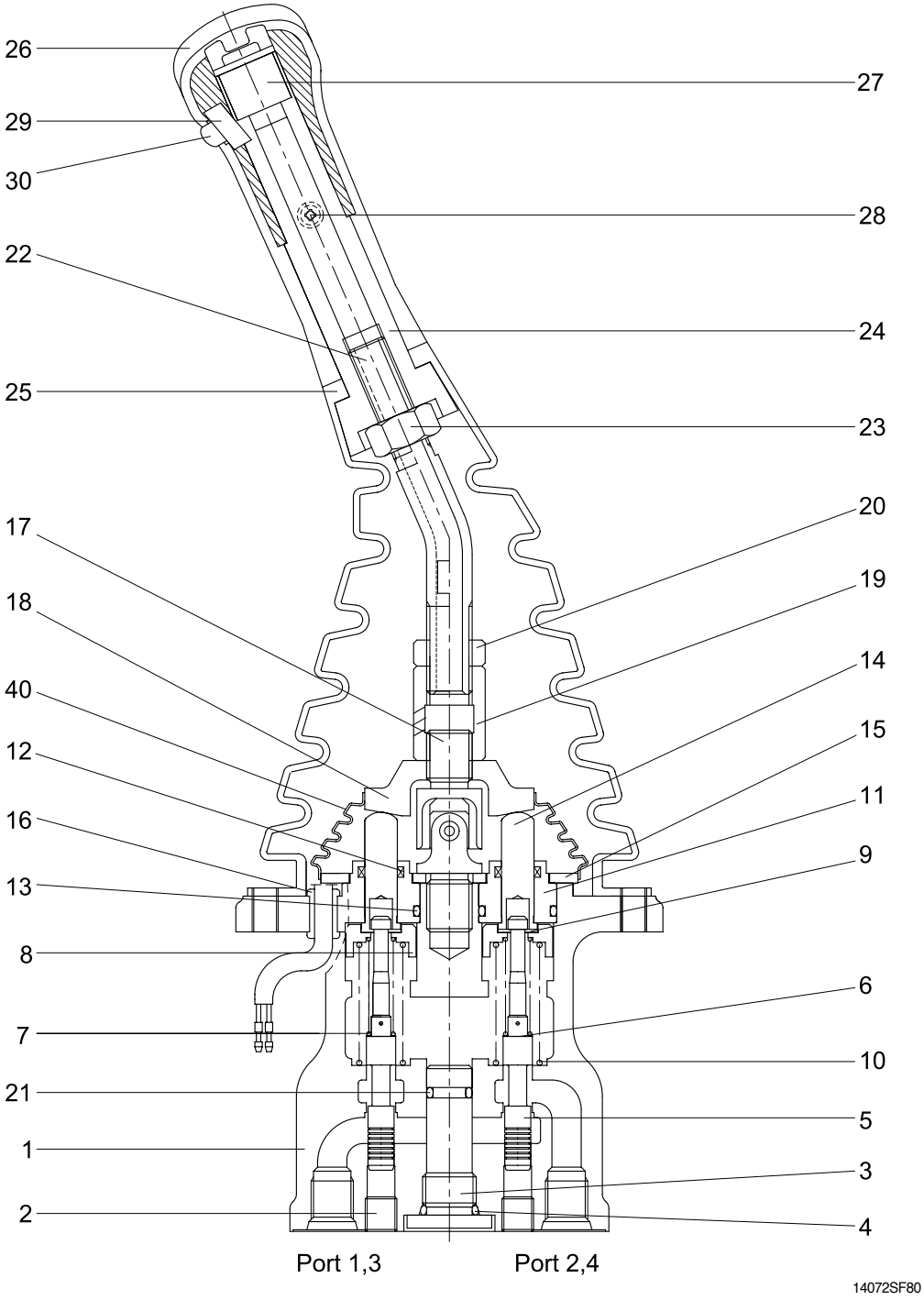
2) INSTALL

(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

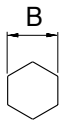
1) STRUCTURE



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

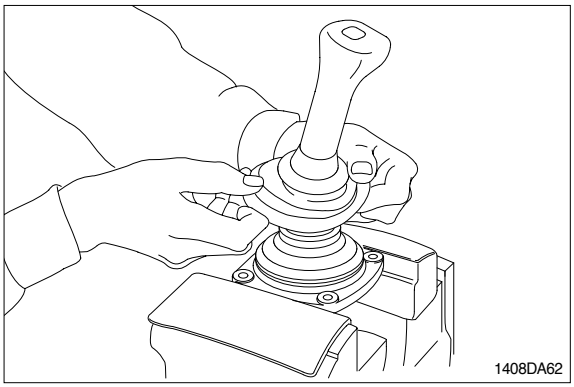
3) DISASSEMBLY

(1) Clean pilot valve with kerosene.

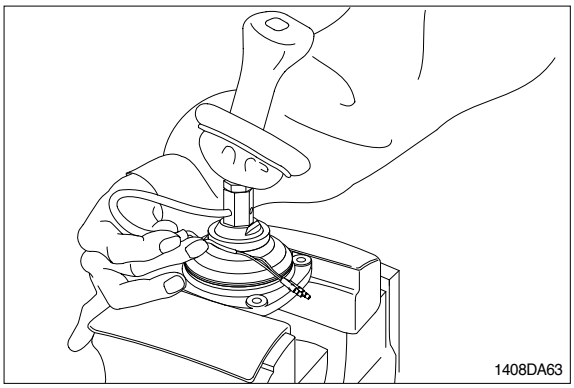
※ Put blind plugs into all ports

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

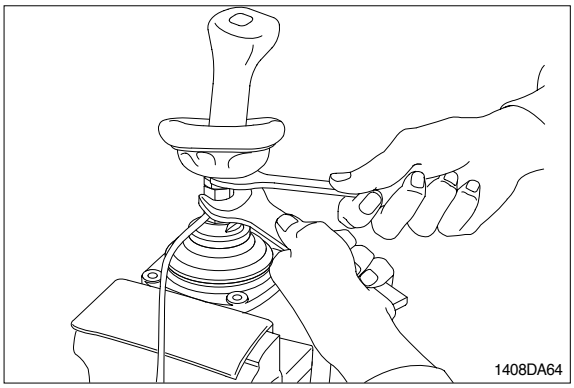
(3) Remove end of boot(25) from case(1) and take it out upwards.



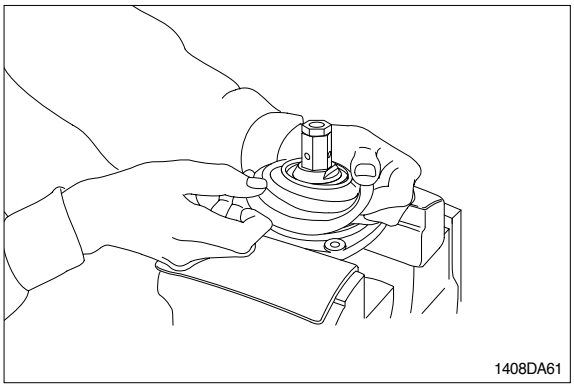
※ For valve with switch, remove cord also through hole of casing.



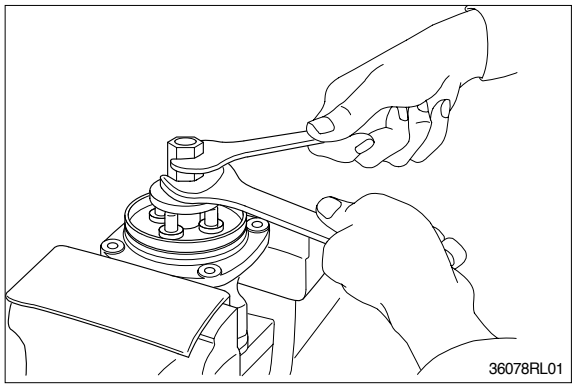
(4) Loosen lock nut(20) and adjusting nut(19) with spanners on them respectively, and take out handle section as one body.

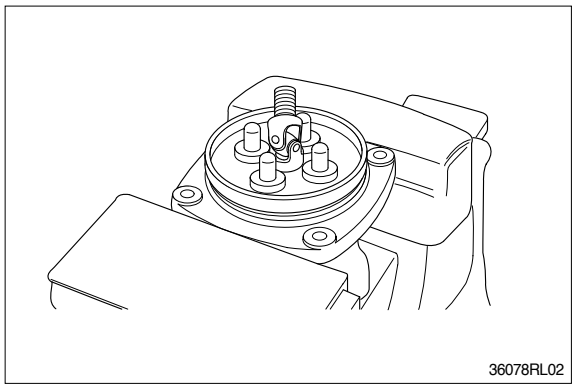


(5) Remove the boot(40)



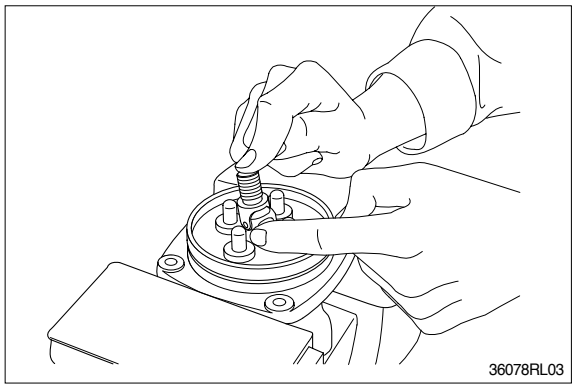
(6) Loosen adjusting nut(19) and plate(18) with spanners on them respectively, and remove them.

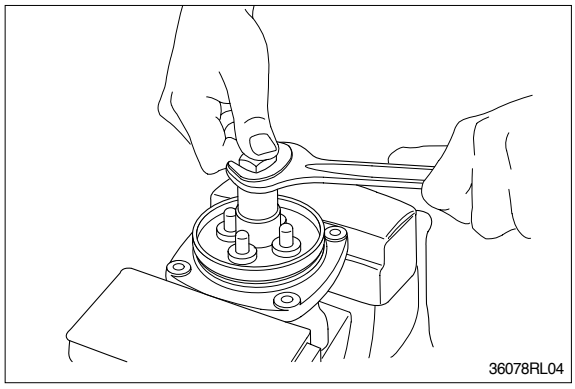




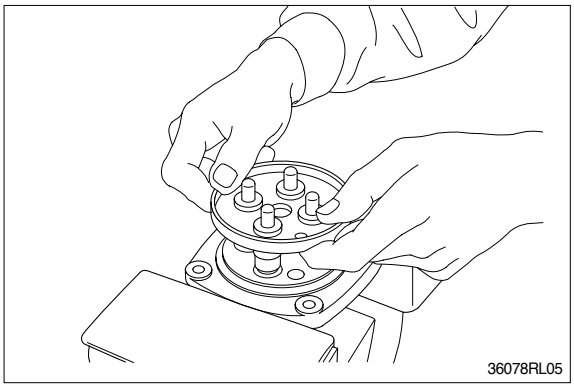
(7) Turn joint anticlockwise to loosen it, utilizing jig(Special tool).

※ 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.





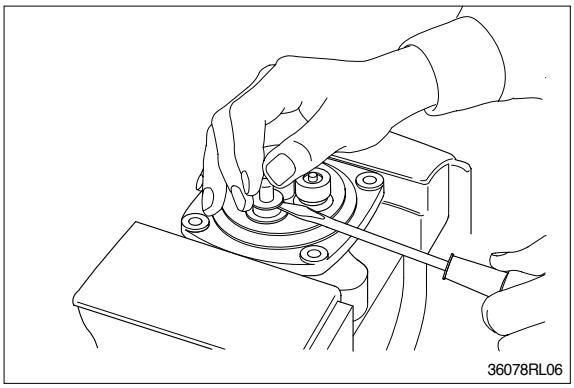
(8) Remove plate(15).



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

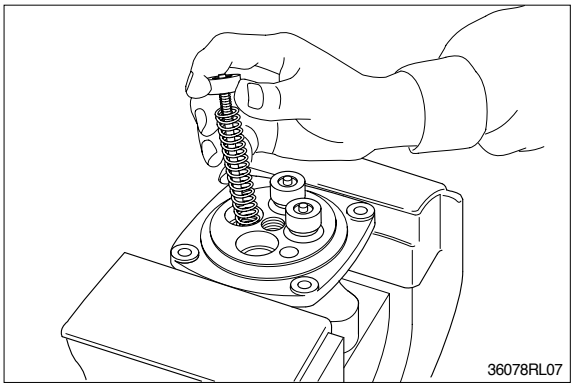
※ Take it out with minus screwdriver.
Take it out, utilizing external periphery groove of plug and paying attention not to damage it by partial loading.

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

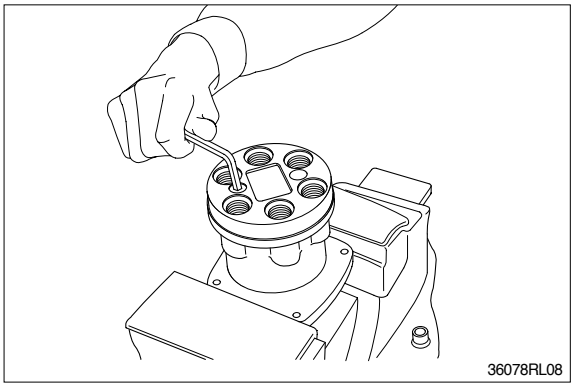


(10) Remove reducing valve subassembly and return spring(10) out of casing.

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



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

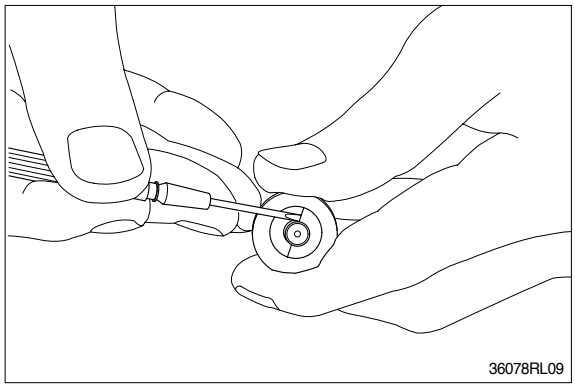


(12) For disassembling reducing valve section, stand it vertically with spool(5) bottom placed on flat workbench. Push down spring seat(8) and remove two pieces of semicircular stopper(9) with tip of small minus screwdriver.

※ Pay attention not to damage spool surface.

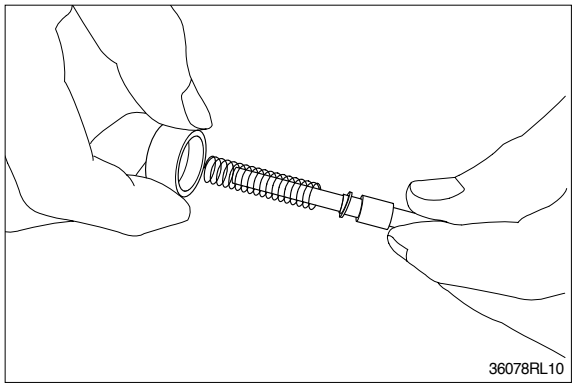
※ Record original position of spring seat(8, 31).

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

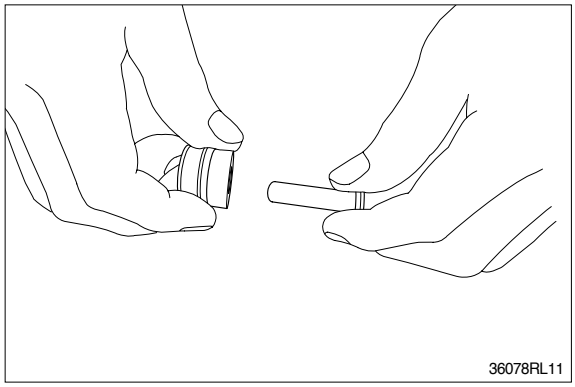


(13) Separate spool(5), spring seat(8), spring(7) and shim(6) individually.

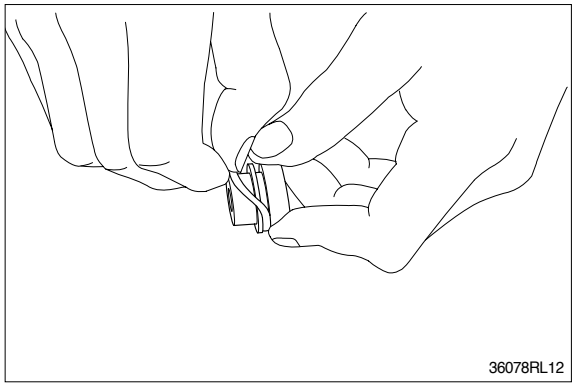
※ Until being assembled, they should be handled as one subassembly group.

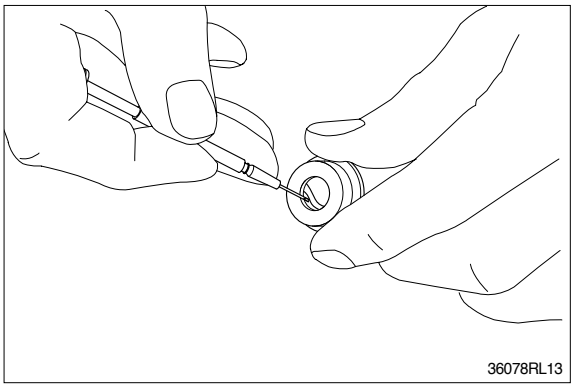


(14) Take push rod(14) out of plug(11).

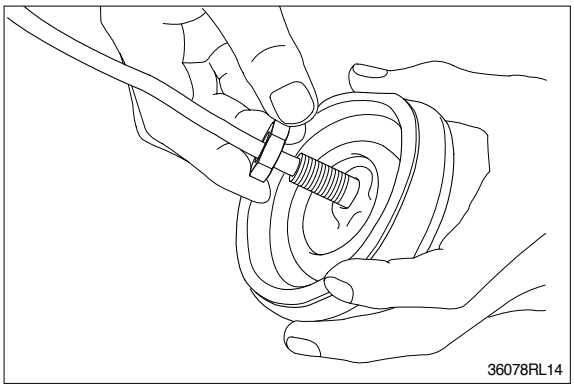


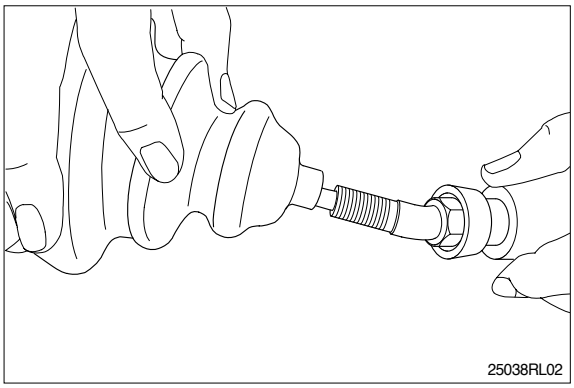
(15) Remove O-ring(13) and seal(12) from plug(11).
Use small minus screwdriver or so on to remove this seal.





(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.

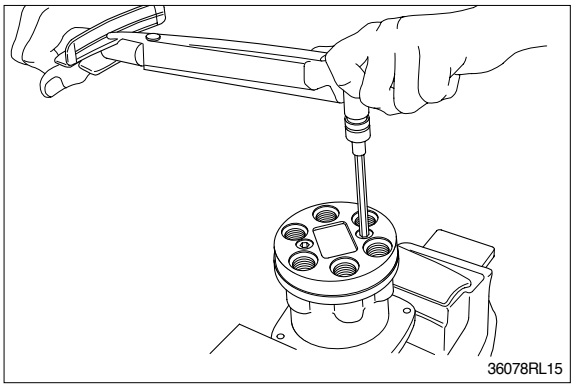
Apply rust-preventives to all parts.

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

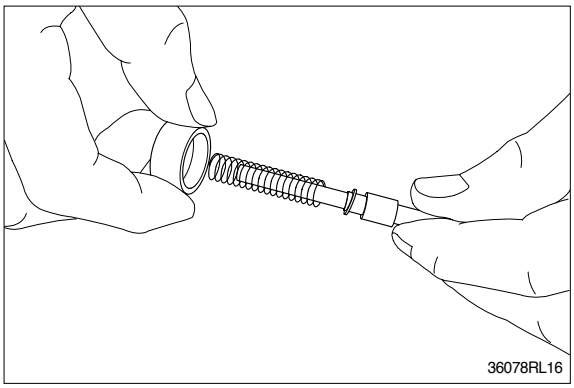
4) ASSEMBLY

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

※ Tighten two bolts alternately and slowly.

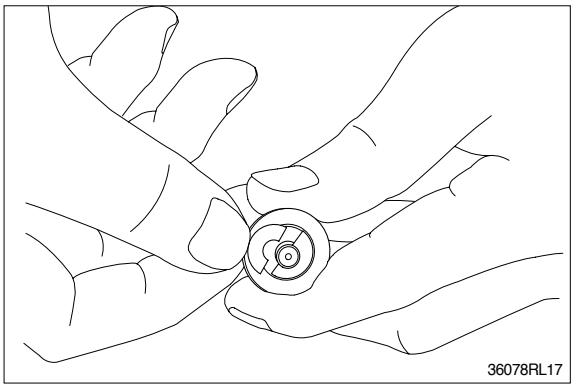


(2) Put shim(6), springs(7) and spring seat(8) onto spool(5) in this order.



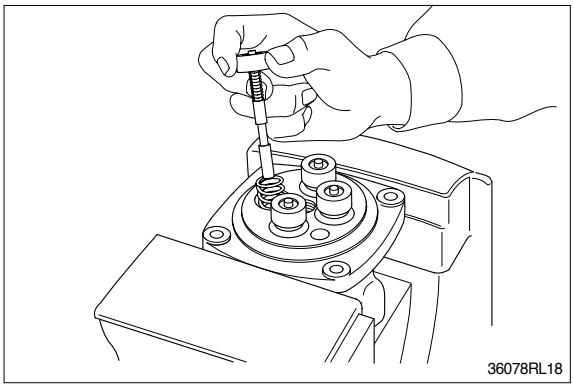
(3) Stand spool vertically with its bottom placed on flat workbench, and with spring seat pushed down, put two pieces of semicircular stopper(9) on spring seat without piling them on.

※ 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.

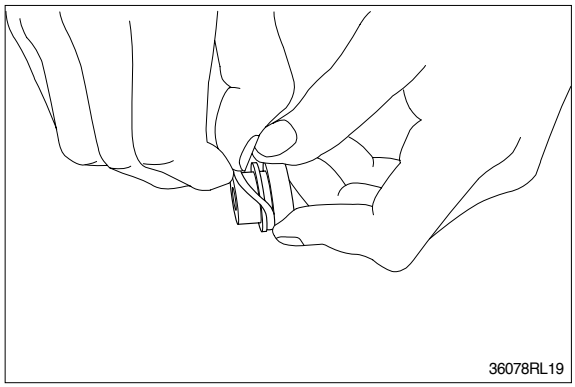


(4) Assemble spring(10) into casing(1). Assemble reducing valve subassembly into casing.

※ Assemble them to their original positions.

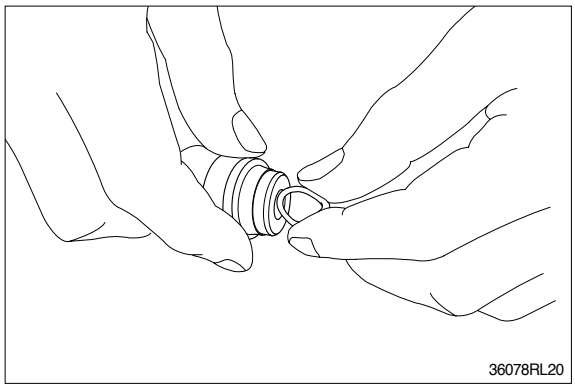


(5) Assemble O-ring(13) onto plug(11).



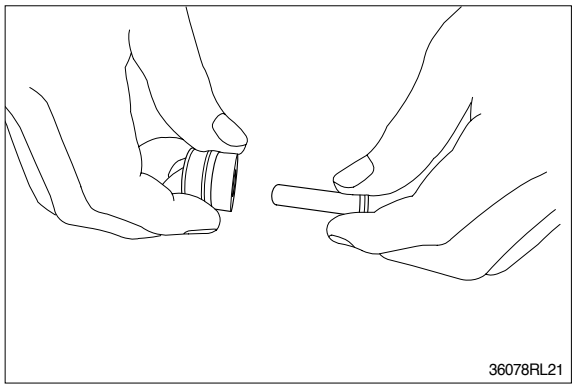
(6) Assemble seal(12) to plug(11).

※ Assemble seal in such lip direction as shown below.



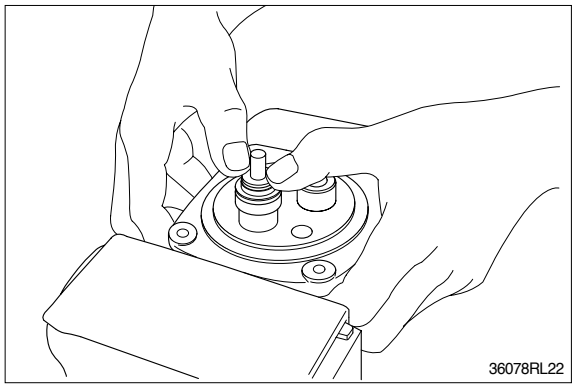
(7) Assemble push rod(14) to plug(11).

※ Apply working oil on push-rod surface.

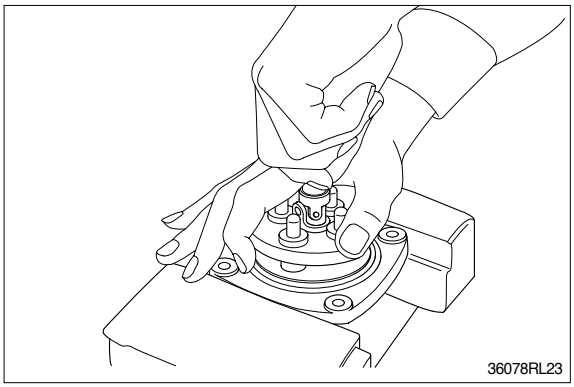


(8) Assemble plug subassembly to casing.

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

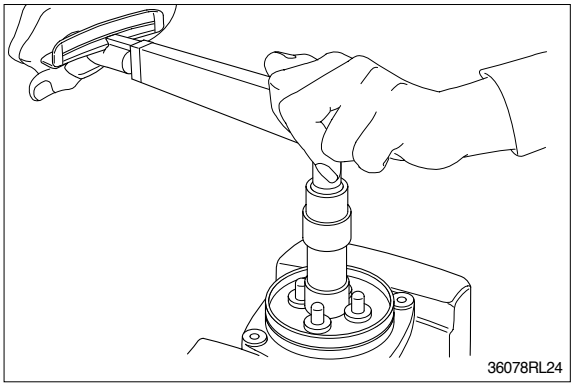


(9) When return spring is strong in force, assemble 4 sets at the same time, utilizing plate(15), and tighten joint(17) temporarily.



(10) Fit plate(15).

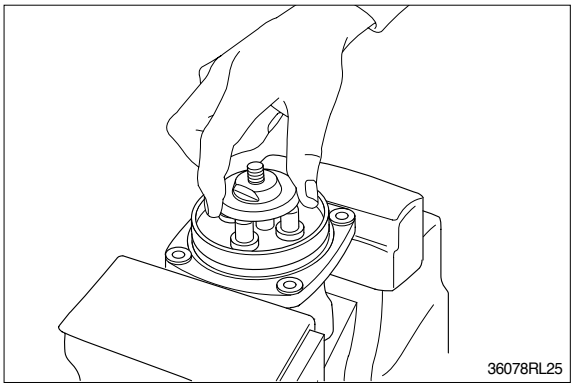
(11) Tighten joint(17) with the specified torque to casing, utilizing jig.



(12) Assemble swash plate(18) to joint(17).

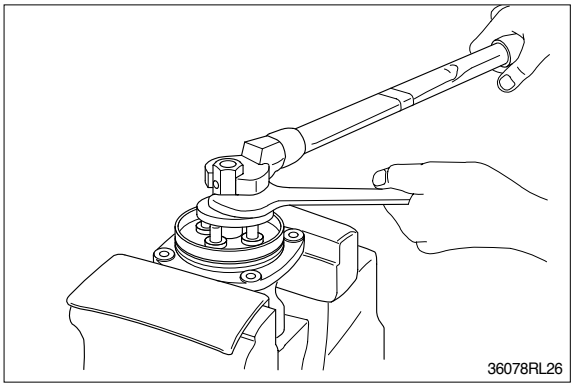
※ Screw it to position that it contacts with 4 push rods evenly.

※ Do not screw it over.

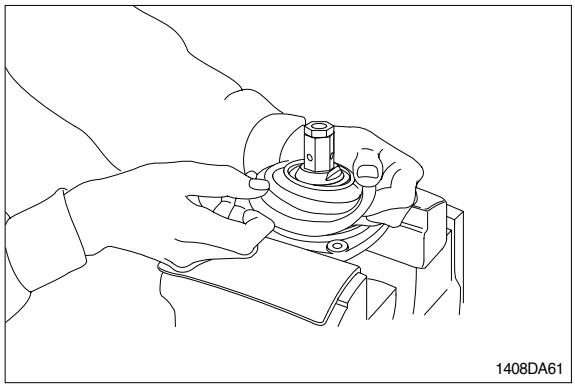


(13) Assemble adjusting nut(19), apply spanner to width across flat of plate(18) to fix it, and tighten adjusting nut to the specified torque.

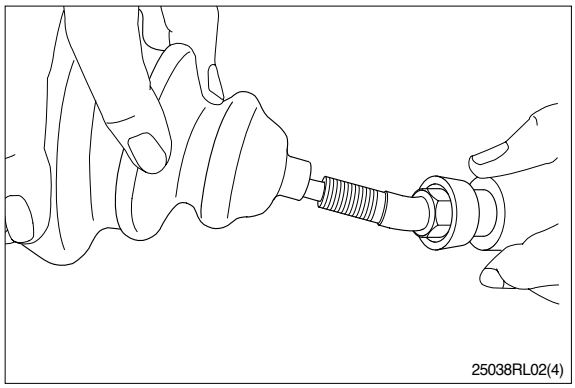
※ During tightening, do not change position of disk.

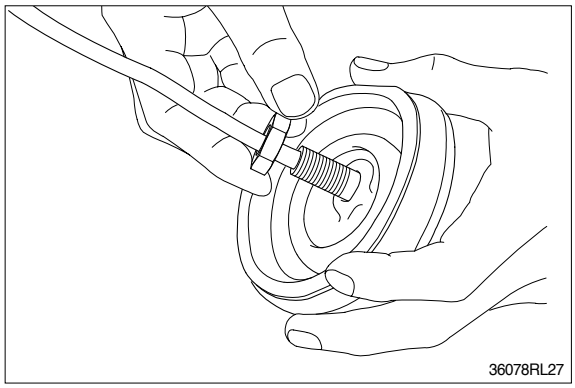


(14) Fit boot(40) to plate.

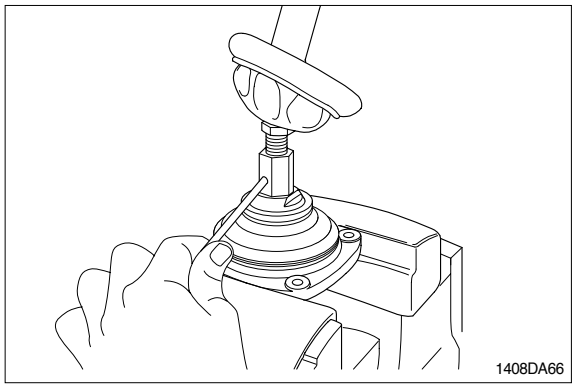


(15) Fit boot(25) and lock nut(20), and handle subassembly is assembled completely.



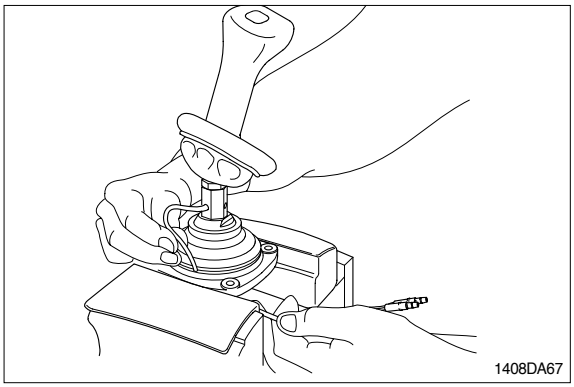


(16) Pull out cord and tube through adjusting nut hole provided in direction 60。 to 120。 from casing hole.

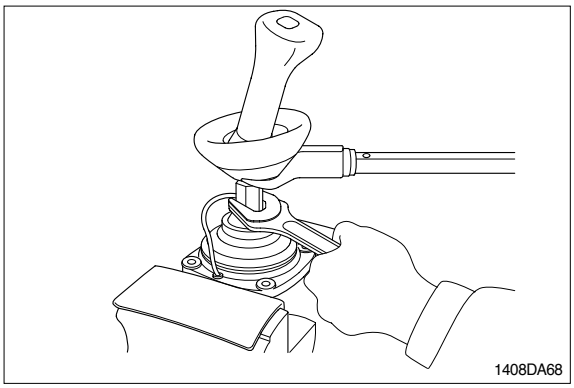


(17) Assemble bushing(16) to plate and pass cord and tube through it.

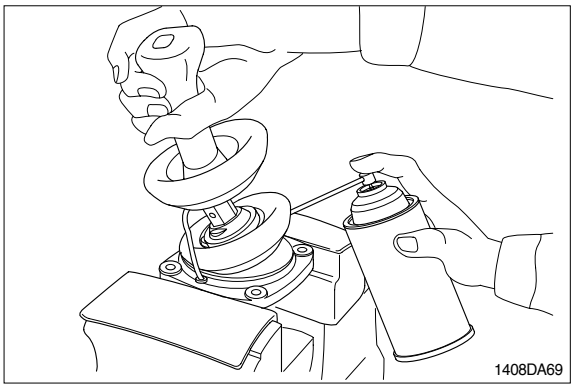
※ Provide margin necessary to operation.



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

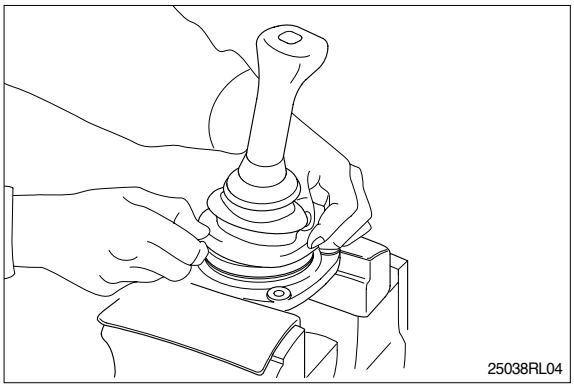


(19) Apply grease to rotating section of joint and contacting faces of disk and push rod.



(20) Assemble lower end of bellows to casing.

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



GROUP 11 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.

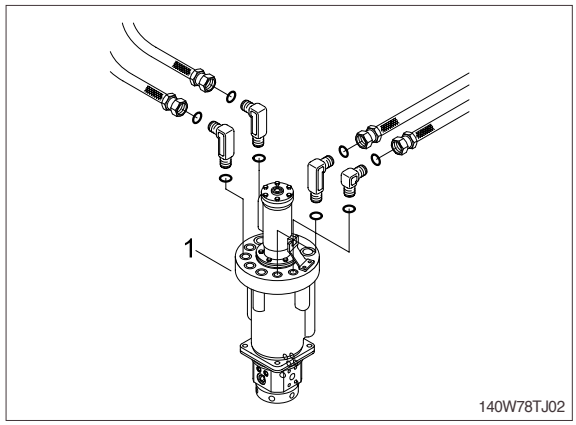
(5) Sling the turning joint assembly (1) and remove the mounting bolt.

· Weight : 100kg(220lb)

· Tightening torque : 12.2± 1.3kgf · m (88.2± 9.4lbf · ft)

(6) Remove the turning joint assembly.

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



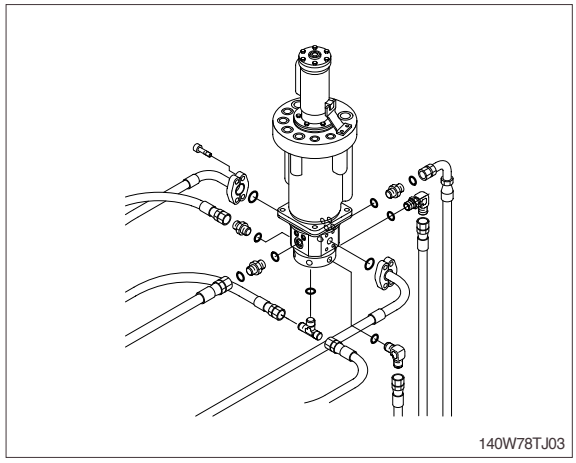
2) INSTALL

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

※ Take care of turning joint direction.

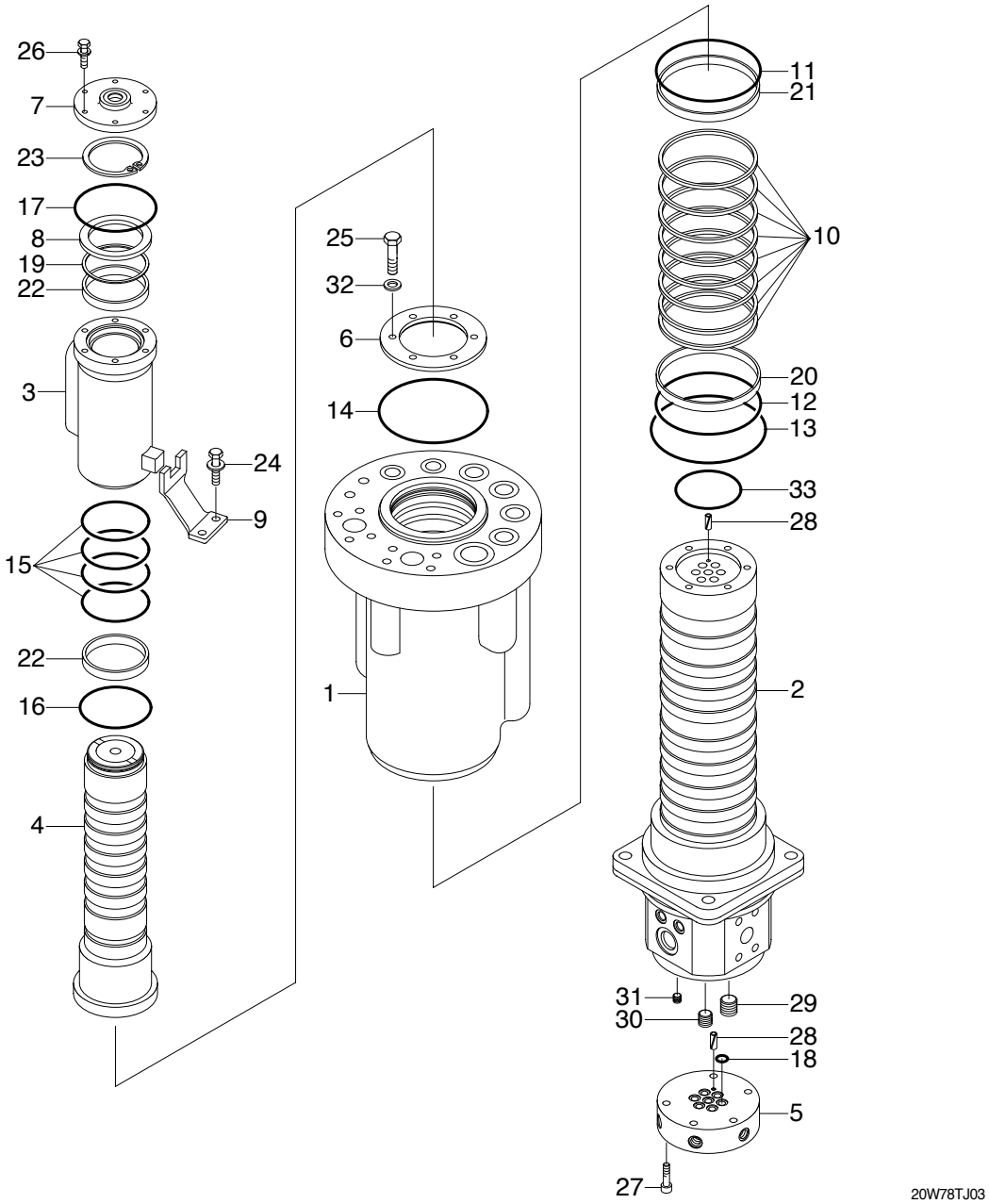
※ Assemble hoses to their original positions.

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



2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

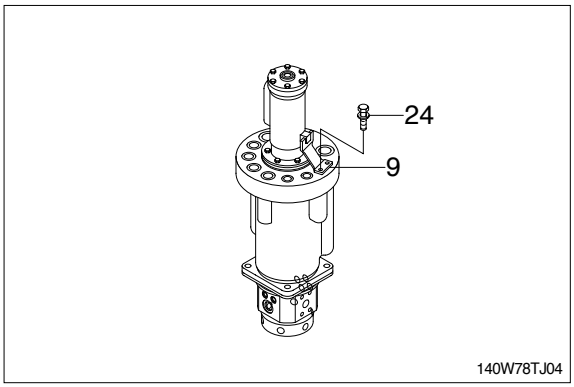


1	Main hub	12	O-ring	23	Retainer ring
2	Main shaft	13	O-ring	24	Bolt-w/washer
3	Top hub	14	O-ring	25	Hex bolt
4	Top shaft	15	O-ring	26	Bolt-w/washer
5	Adaptor	16	O-ring	27	Socket bolt
6	Main cover	17	O-ring	28	Spring pin
7	Top cover	18	O-ring	29	Plug
8	Spacer	19	Back up ring	30	Plug
9	Bracket	20	Wear ring	31	Plug
10	Slipper seal	21	Wear ring	32	Plain washer
11	O-ring	22	Wear ring	33	O-ring

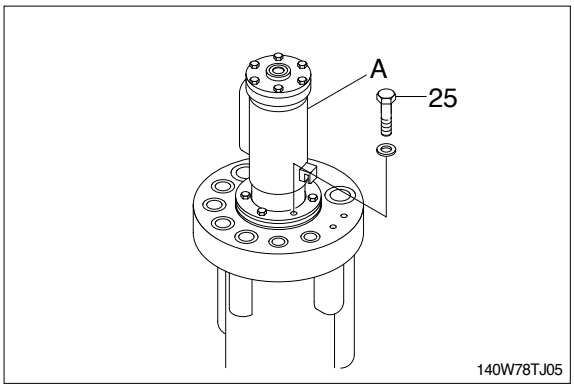
2) DISASSEMBLY

※ Before the disassembly, clean the turning joint.

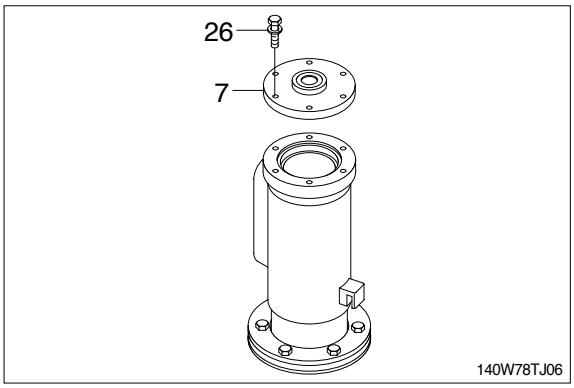
(1) Loosen the bolt(24) and remove the bracket(9).



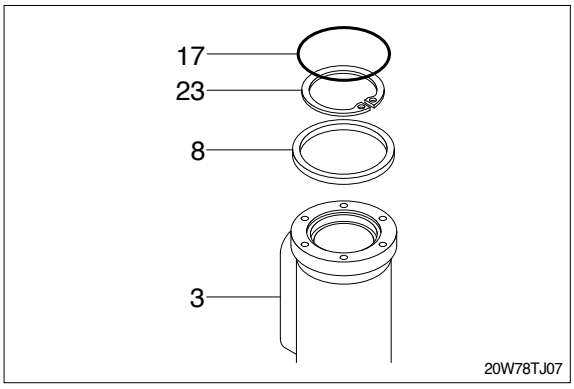
(2) Loosen the bolt(25) and remove the upside(A) of turning joint.
Remove O-ring(14)



(3) Loosen the bolt(26) and remove top cover (7).



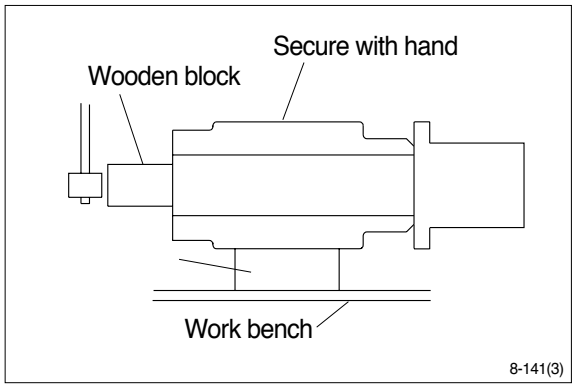
(4) Remove O-ring(17), retainer ring(23) and spacer(8).



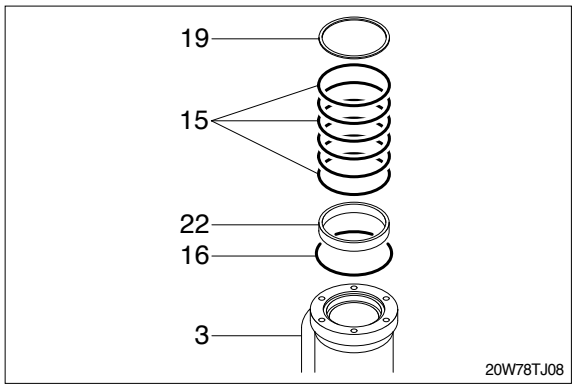
(5) Place hub(3) on a V-block and by using a wood buffer at the shaft end, hit out shaft(4) to about 1/2 from the hub with a hammer.

※ Take care not to damage the shaft(4) when remove hub(3) or rest it sideway.

※ Put a fitting mark on hub(3) and shaft(4).



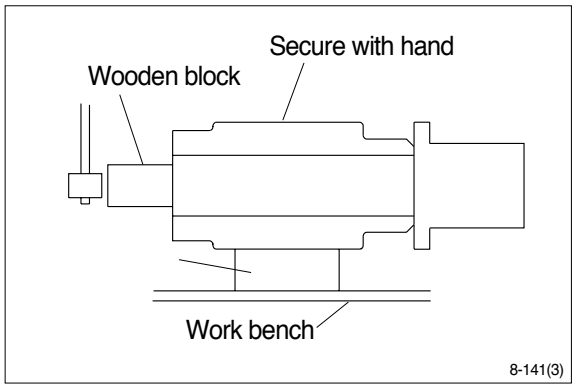
(6) Remove eight O-rings(15), back up ring (19), O-ring(16) and wear ring(22) from hub(3).



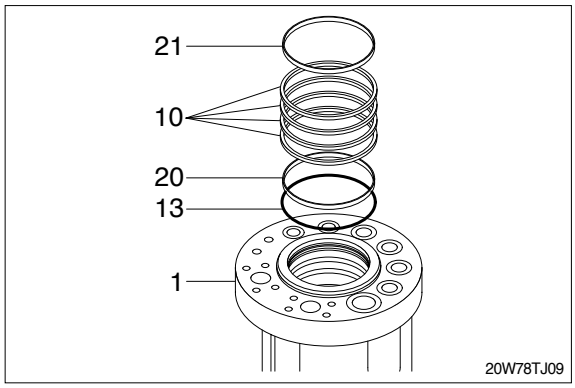
(7) Place main hub(1) on a V-block and by using a wood buffer at the shaft end, hit out main shaft(2) to about 1/2 from the main hub with a hammer.

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

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



(8) Remove wear ring(21), eight slipper seal(10), O-ring(13) and wear ring(20) from main hub(1).

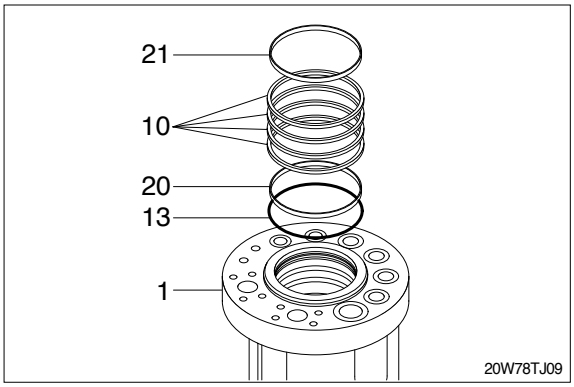


3) ASSEMBLY

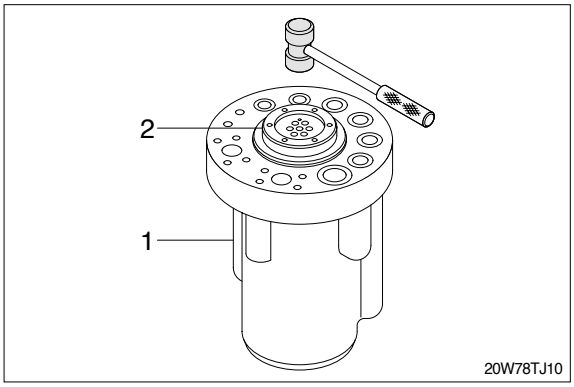
※ Clean all parts.
※ As a general rule, replace oil seals and O-ring.
※ Coat the sliding surfaces of all parts with engine oil or grease before installing.

(1) Fit wear ring(21), eight slipper seal(10), O-ring(13) and wear ring(20).

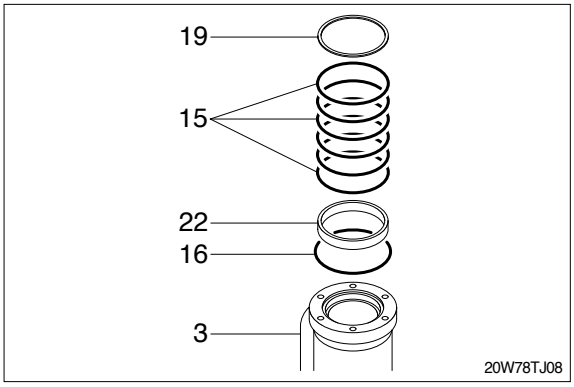
(2) Fit O-ring(13) to main shaft(2)



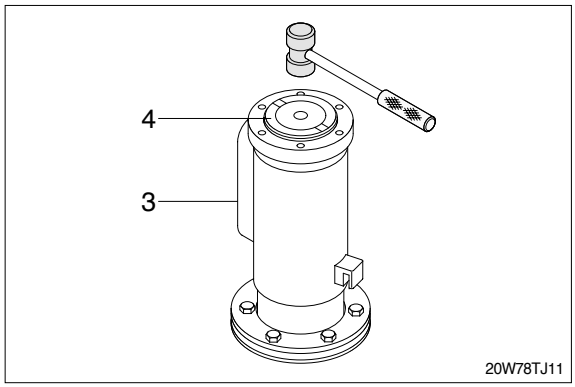
(3) Set main shaft(2) on block, tap main hub(1) with a plastic hammer to install.



(4) Fit eight O-ring(15), back up ring(19), O-ring(16) and wear ring(22) to hub(3) of turning joint upside.

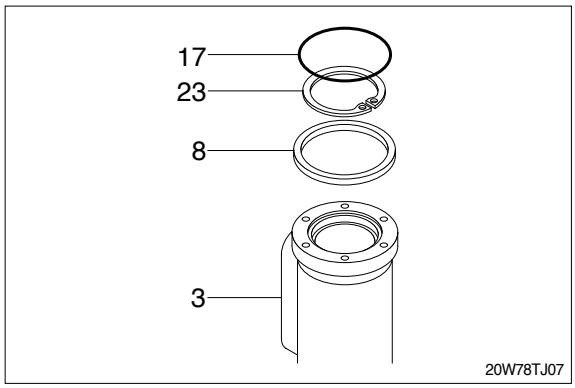


(5) Set shaft(4) of turning joint upside on block, tap hub(3) with a plastic hammer to install.

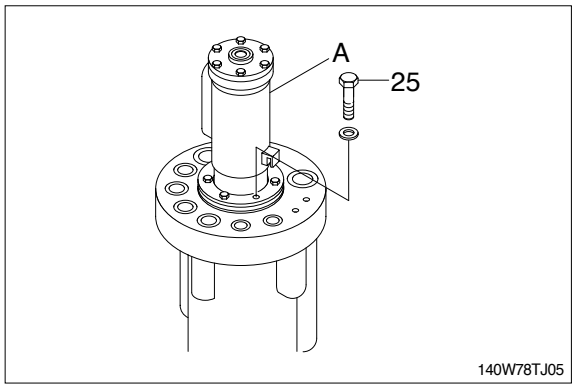


(6) Fit spacer(8) and retainer ring(23) to shaft(4).

(7) Fit O-ring(17) to hub(3).

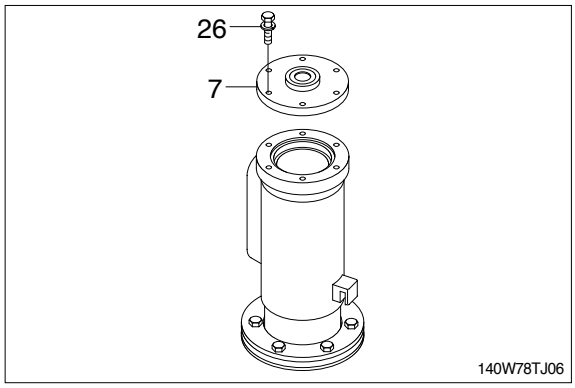


(8) Set turning joint upside(A) on downside, tighten bolts(25).
· Torque : 3.5±0.4kgf · m



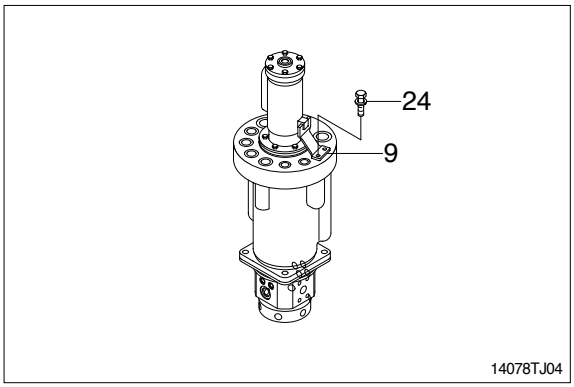
(9) Fit O-ring(17) to hub(3).

(10) Install cover(7) to hub and tighten bolts(26).
· Torque : 2.35±0.35kgf · m



(11) Install bracket(9) to hub and tighten bolts (24).
· Torque : 5.5±0.6kgf · m

This completes assembling



1. REMOVAL AND INSTALL

1) BUCKET CYLINDER

(1) Removal

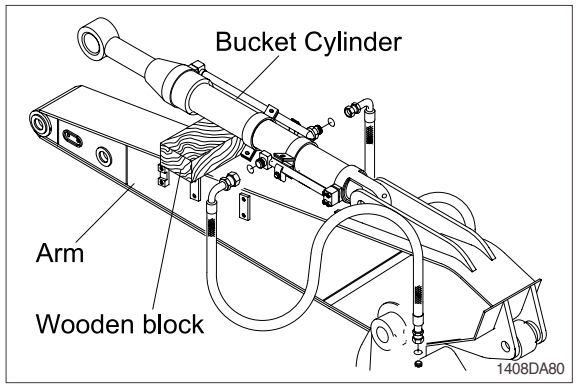
※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.

※ 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.

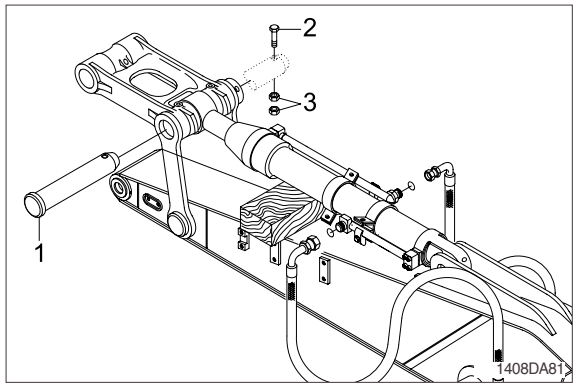
※ Escaping fluid under pressure can penetrate the skin causing serious injury. Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Set block between bucket cylinder and arm.

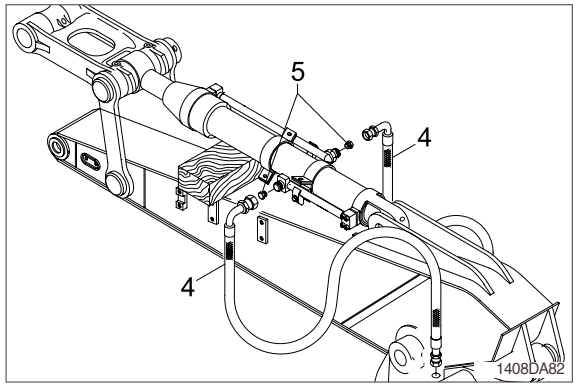


② Remove bolt(2), nut(3) and pull out pin (1).

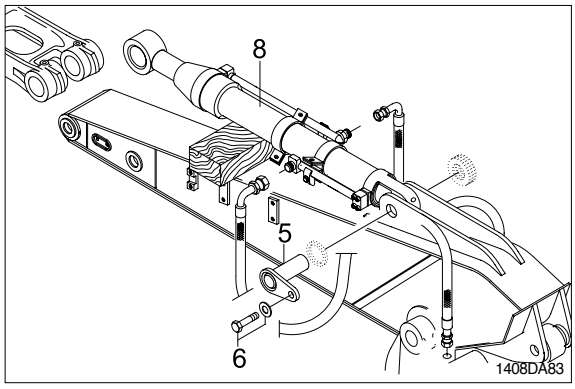
※ Tie the rod with wire to prevent it from coming out.



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 : 105kg(230lb)



(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

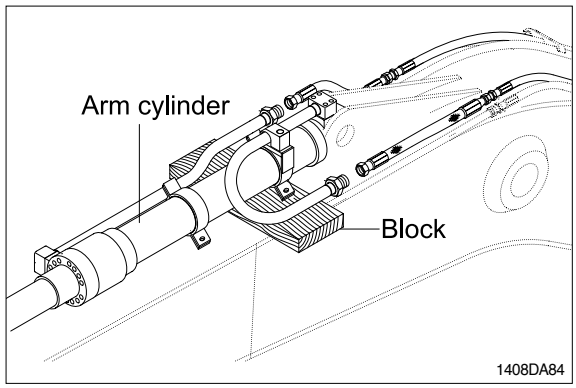
※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.

※ 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.

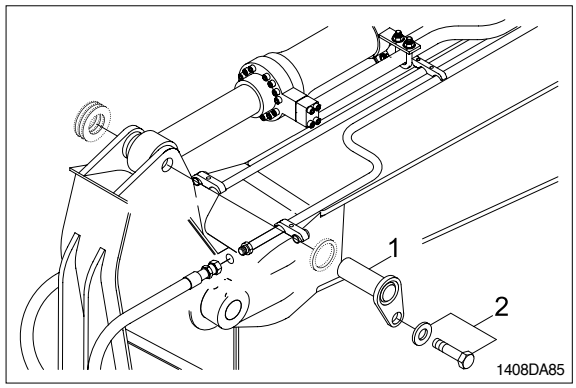
※ Escaping fluid under pressure can penetrate the skin causing serious injury.
Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Set block between arm cylinder and boom.



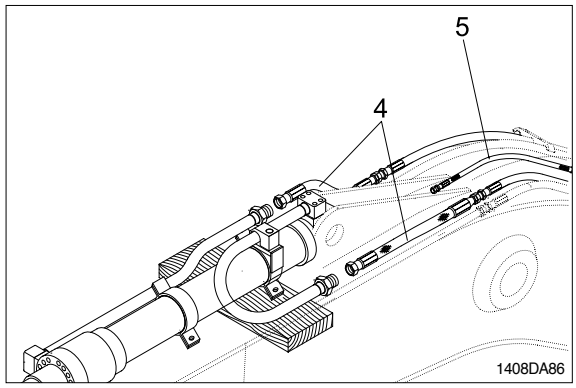
② Remove bolt(2) and pull out pin(1).

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



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

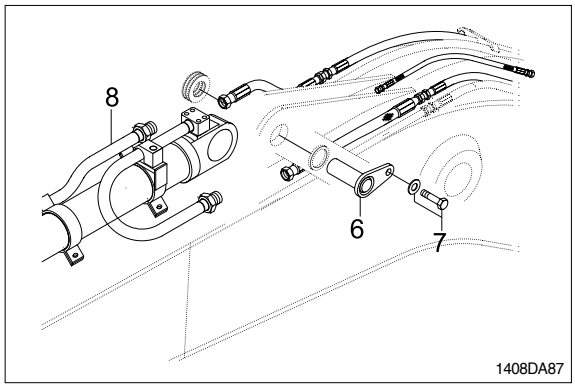
④ Disconnect greasing pipings(5).



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

⑥ Remove arm cylinder assembly(8).

· Weight : 160kg(355lb)



(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.

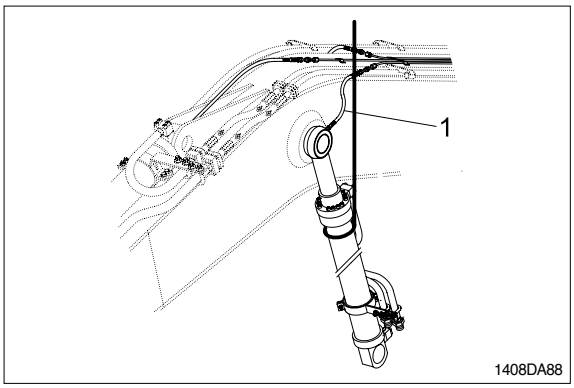
※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

⚠ 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.

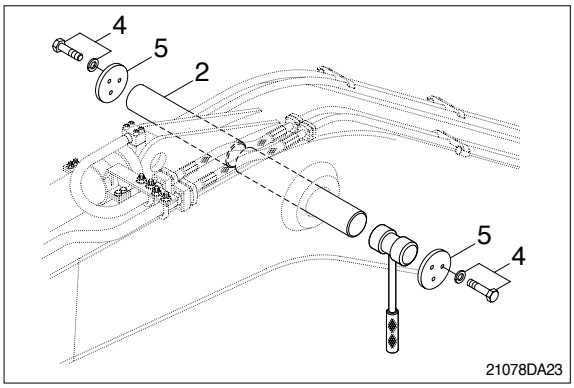
① Disconnect greasing hoses(1).

② Sling boom cylinder assembly.

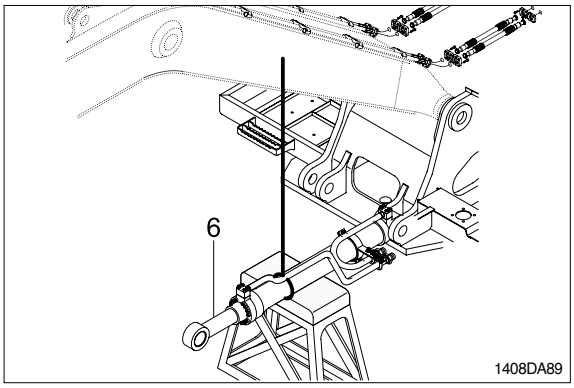


③ Remove bolt(4), stop plate(5) and pull out pin(2).

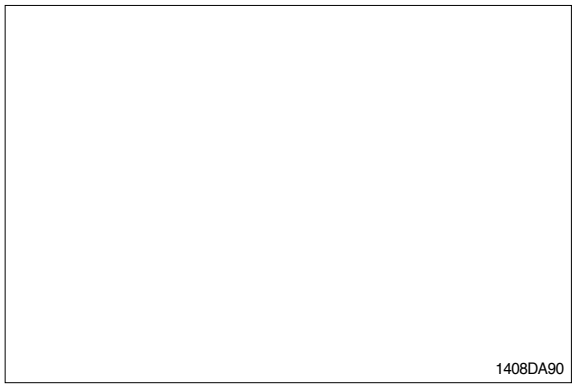
※ Tie the rod with wire to prevent it from coming out.



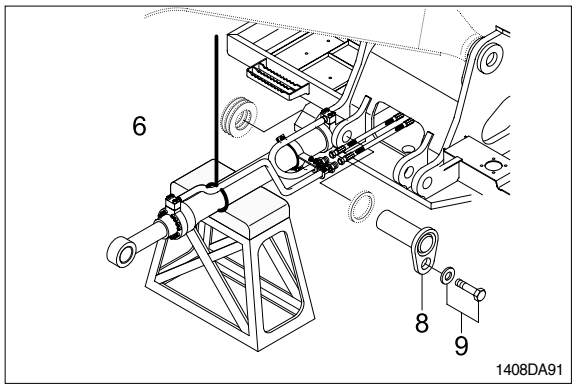
④ Lower the boom cylinder assembly(6) on a stand.



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 : 128kg(282lb)



(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.

4) DOZER CYLINDER

(1) Removal

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

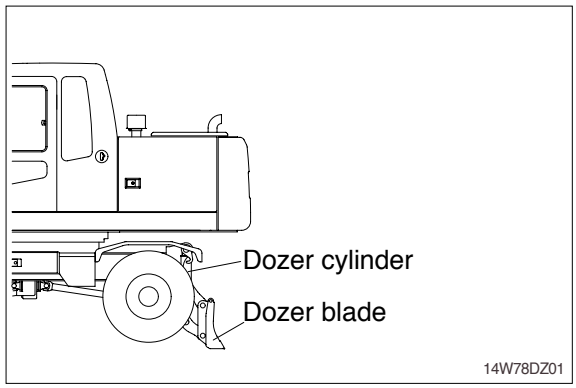
※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

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

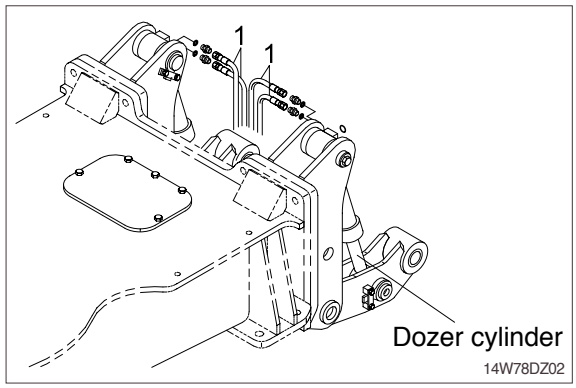
⚠ Escaping fluid under pressure can penetrate the skin causing serious injury.

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

① Lower the dozer blade to the ground.



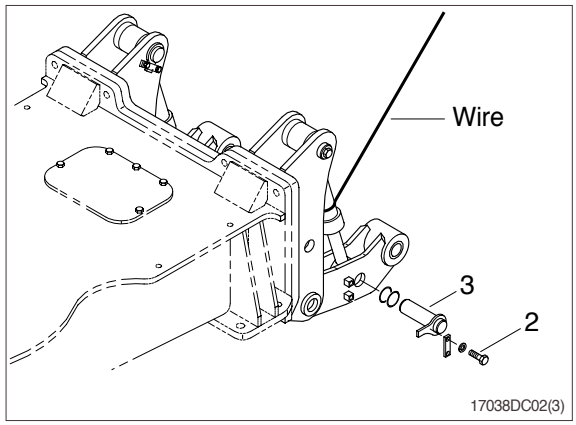
② Disconnect dozer cylinder hoses(1), and put plugs on cylinder pipe.



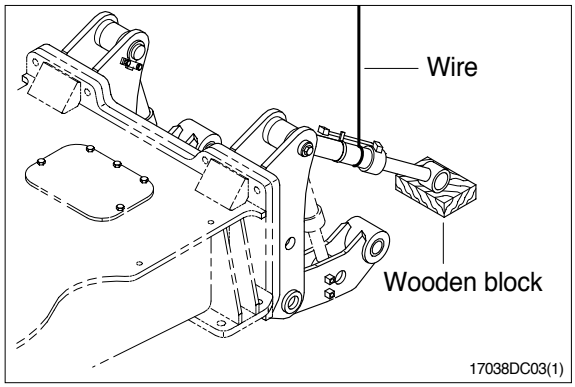
③ Sling dozer cylinder assembly.

④ Remove bolt(2) and pull out pin(3).

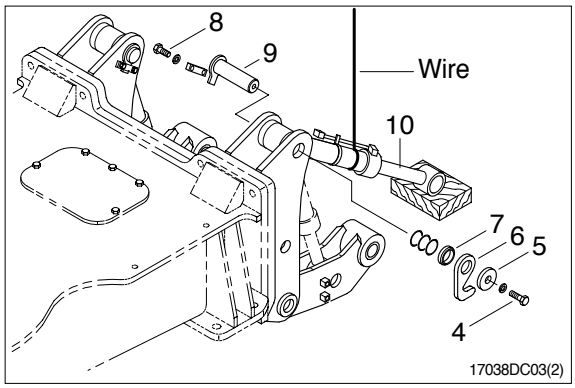
※ Tie the rod with wire to prevent it from coming out.



⑤ Lower the dozer cylinder rod side on a wooden block.



⑥ Loosen the bolt(4) and remove lock washer(5), hook plate(6), and spacer(7).
⑦ Remove bolt(8) and pull out pin(9).
⑧ Remove the dozer cylinder assy(10).
· Weight : 55kg(120lb)



(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.

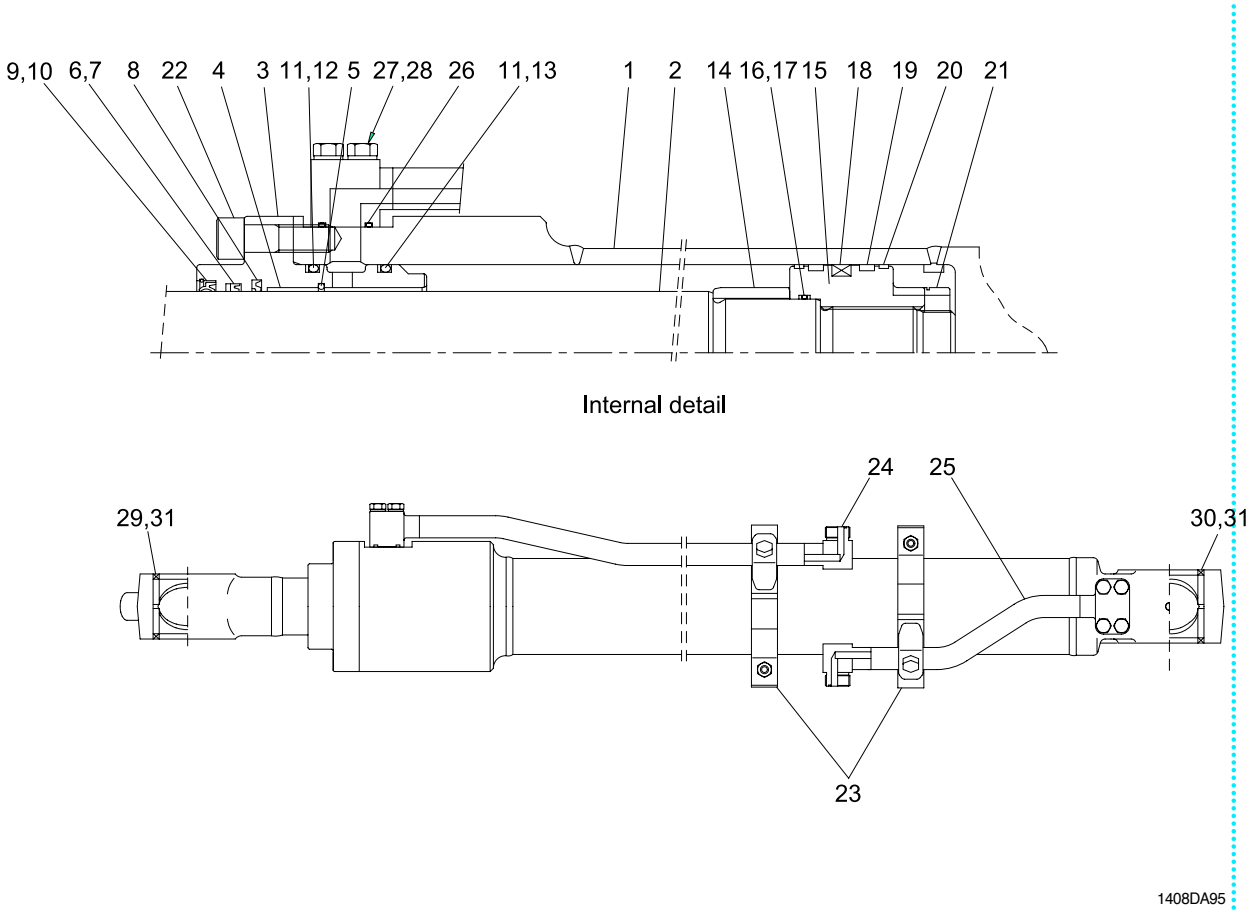
※ Bleed the air from the dozer cylinder.

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

2. DISASSEMBLY AND ASSEMBLY

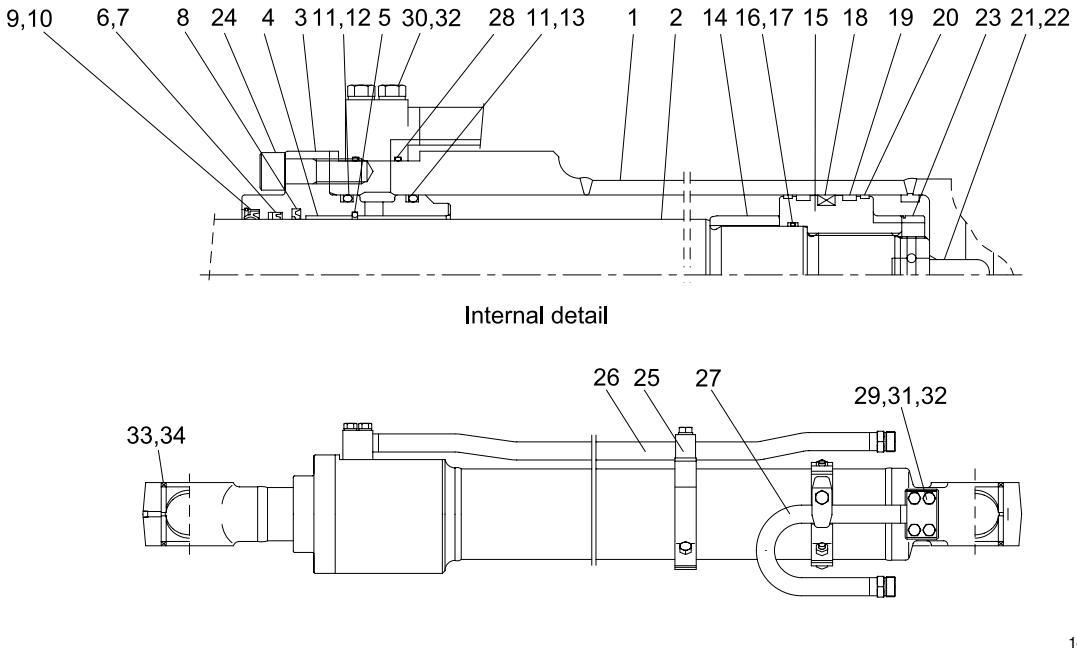
1) STRUCTURE

(1) Bucket cylinder



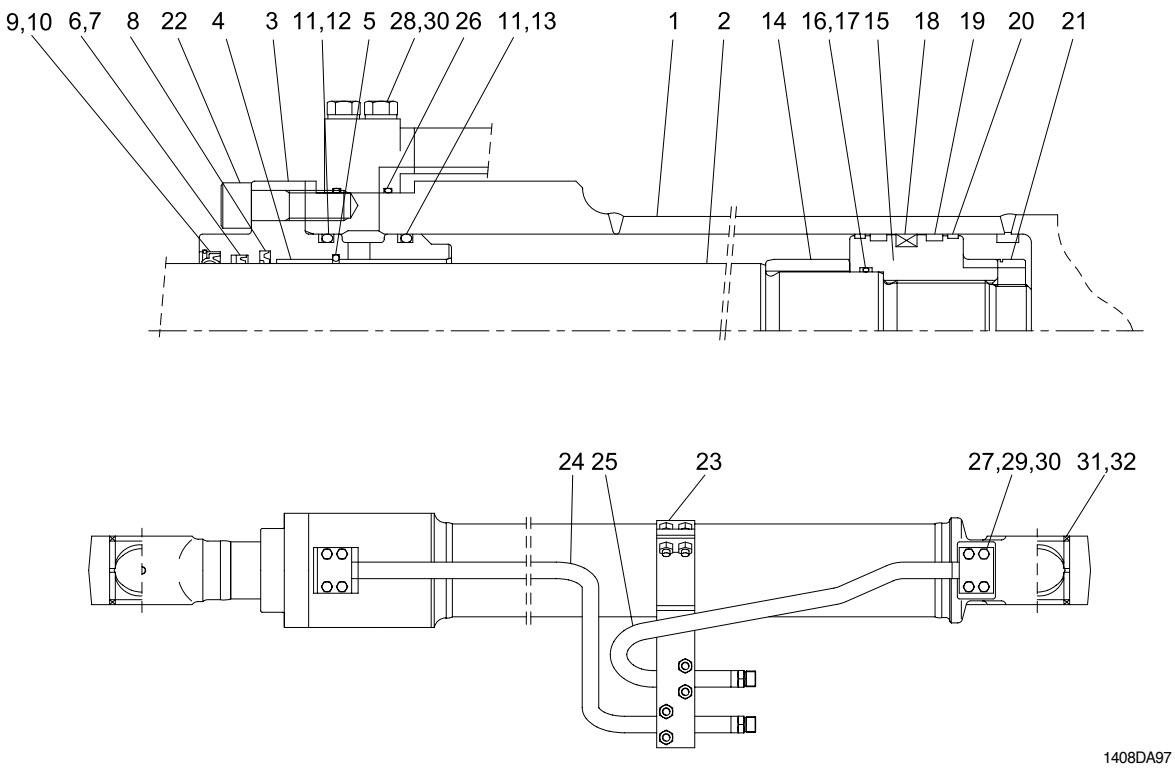
1	Tube assembly	11	O-ring	21	Nut-lock
2	Rod assembly	12	Ring-back up	22	Bolt-hexagon socket head
3	Gland	13	Ring-back up	23	Band assembly
4	DD2 bushing	14	Ring-cushion	24	Pipe assembly(R)
5	Ring-snap	15	Piston	25	Pipe assembly(B)
6	Seal-rod	16	O-ring	26	O-ring
7	Ring-back up	17	Ring-back up	27	Bolt-hexagon head
8	Ring-buffer	18	Seal-piston	28	Washer-spring
9	Wiper-dust	19	Ring-wear	29	Bush-pin
10	Ring-snap	20	Ring-dust	30	Bush-pin
				31	Seal-dust

(2) Arm cylinder



1	Tube assembly	13	Ring-back up	24	Bolt-hexagon socket head
2	Rod assembly	14	Ring-cushion	25	Band assembly
3	Gland	15	Piston	26	Pipe assembly(R)
4	DD2 bushing	16	O-ring	27	Pipe assembly(B)
5	Ring-snap	17	Ring-back up	28	O-ring
6	Seal-rod	18	Seal-piston	29	O-ring
7	Ring-back up	19	Ring-wear	30	Bolt-hexagon head
8	Ring-buffer	20	Ring-dust	31	Bolt-hexagon head
9	Wiper-dust	21	Spear-cushion	32	Washer-spring
10	Ring-snap	22	Ball-steel	33	Bush-pin
11	O-ring	23	Nut-lock	34	Seal-dust
12	Ring-back up				

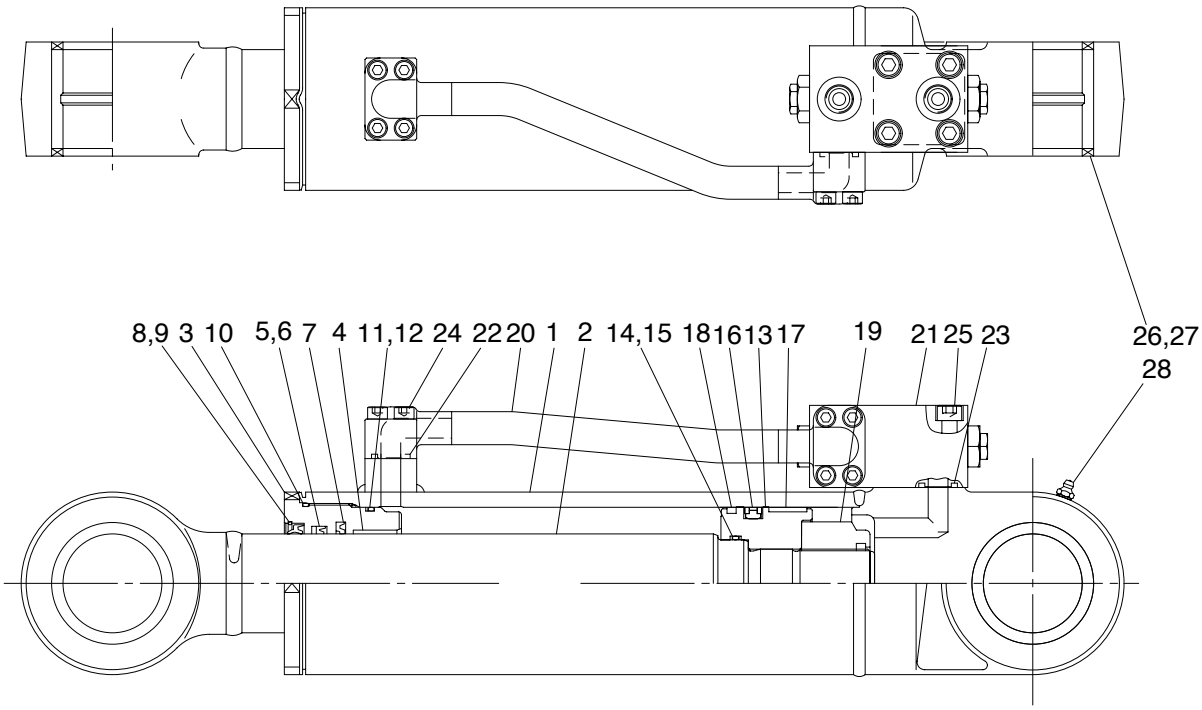
(3) Boom cylinder



1	Tube assembly	12	Ring-buck up	23	Band assembly
2	Rod assembly	13	Ring-buck up	24	Pipe assembly(R, LH/RH)
3	Gland	14	Ring-cushion	25	Pipe assembly(B, LH/RH)
4	DD2 bush	15	Piston	26	O-ring
5	Ring-snap	16	O-ring	27	O-ring
6	Seal-rod	17	Ring-buck up	28	Bolt-hexagon head
7	Ring-buck up	18	Seal-piston	29	Bolt-hexagon head
8	Ring-buffer	19	Ring-wear	30	Washer-spring
9	Wiper-dust	20	Ring-dust	31	Bush-pin
10	Ring-snap	21	Nut-lock	32	Seal-dust
11	O-ring	22	Bolt-hexagon socket head		

(4) Dozer cylinder

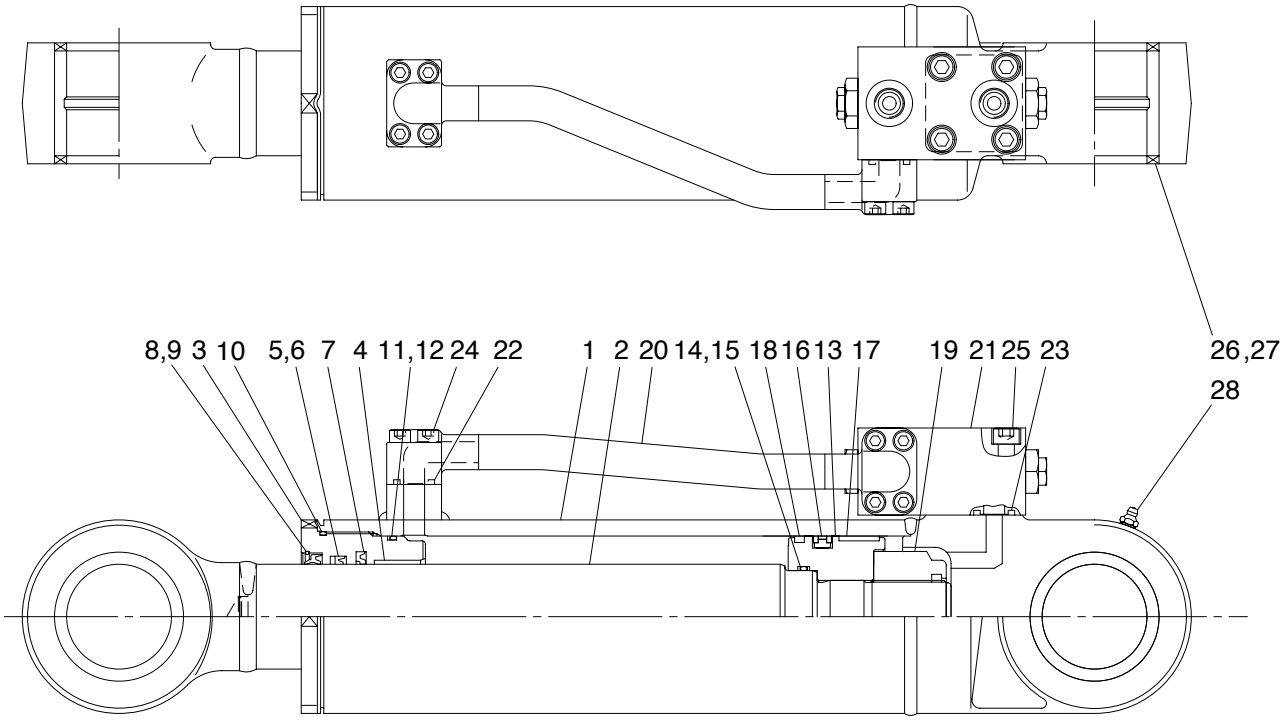
① Rear dozer cylinder



140W78DZ06

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

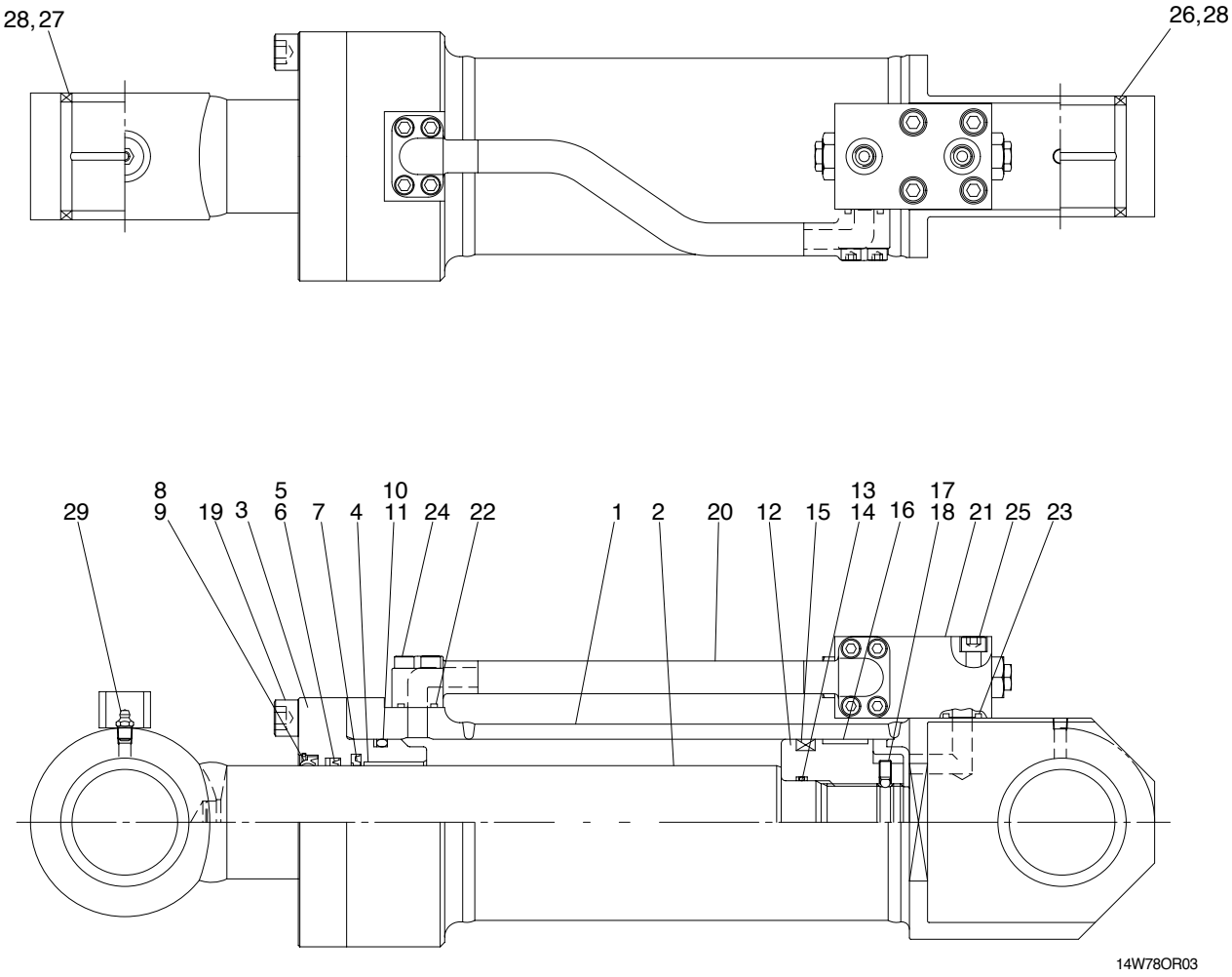
② Front dozer cylinder



14W78DZ03

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

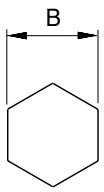
(5) Outrigger cylinder



1	Tube assembly	10	O-ring	20	Pipe assembly
2	Rod assembly	11	Back up ring	21	Double check valve
3	Gland	12	Piston	22	O-ring
4	Du bushing	13	O-ring	23	O-ring
5	Rod seal	14	Back up ring	24	Hexagon socket head bolt
6	Back up ring	15	Piston seal	25	Hexagon socket head bolt
7	Buffer ring	16	Wear ring	26	Pin bush
8	Dust wiper	17	Set screw	27	Pin bushing
9	Snap ring	18	Steel ball	28	Dust seal
		19	Hexagon socket head bolt	29	Grease nipple

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Allen wrench	6	
	8	
	14	
	17	
Spanner	7	
	8	
(-) 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	M16	23±2.0	166±14.5
	Boom cylinder		M16	23±2.0	166±14.5
	Arm cylinder	26	M18	32±3.0	232±21.7
	Dozer cylinder	18	M16	23±2.0	166±14.5
	Outrigger cylinder				
	Bucket cylinder	27	M10	5.4±0.5	39.1±3.6
	Boom cylinder	27			
	Arm cylinder	33			
	Dozer cylinder	23	M8	2.7±0.3	19.5±2.2
	Outrigger cylinder				
	Dozer cylinder	24	M10	5.4±0.5	39.1±3.6
	Outrigger cylinder				
Hexagon head bolt	Bucket	26	M10	3.2±0.3	23.1±2.2
	Boom	25			
	Arm	29			
Lock nut	Bucket cylinder	21	M60	100±10.0	723±72.3
	Boom cylinder	21	M60		
	Arm cylinder	25	M70		
	Dozer cylinder	17	M56	400±40	2893±289
	Outrigger cylinder		M52	300±30	2170±217
Piston	Bucket cylinder	14	-	150±15.0	1085±109
	Boom cylinder				
	Arm cylinder				
	Dozer cylinder	12		100±10	723.3±72.3
	Outrigger cylinder				

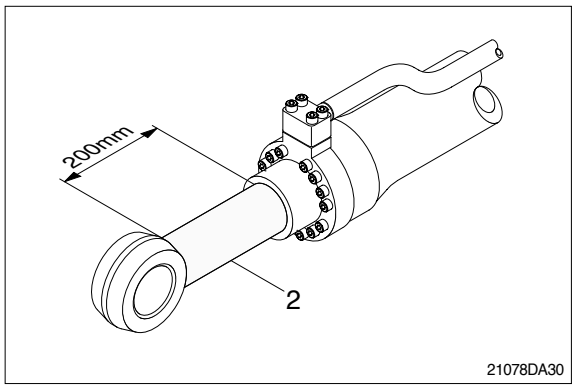
3) DISASSEMBLY

(1) Remove cylinder head and piston rod

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

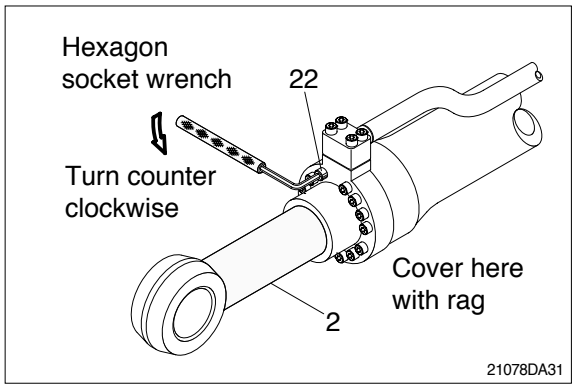
※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

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



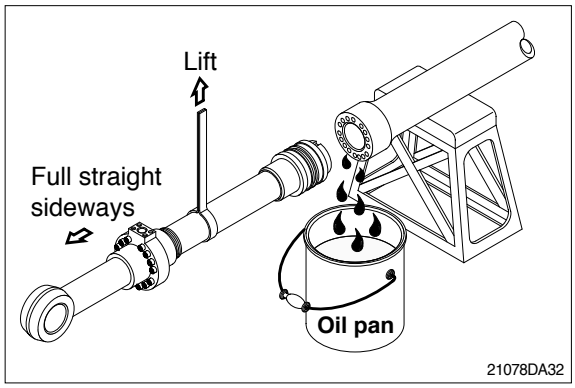
③ Loosen and remove socket bolts(22) of the gland in sequence.

※ 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).

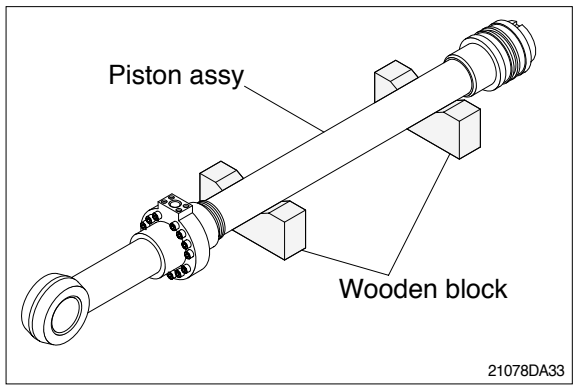
※ Since the rod assembly is heavy in this case, lift the tip of the rod assembly(2) with a crane or some means and draw it out. However, when rod assembly(2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.



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.

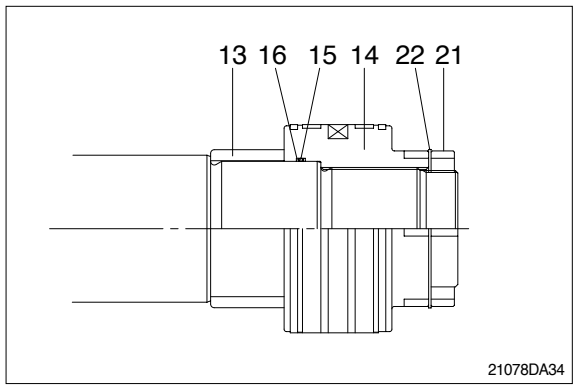


(2) Remove piston and cylinder head

① Remove lock nut(21).

※ Since lock nut(21) and lock washer(22) is tightened to a high torque, use a hydraulic and power wrench that utilizers a hydraulic cylinder, to remove the lock nut(21) and lock washer (22).

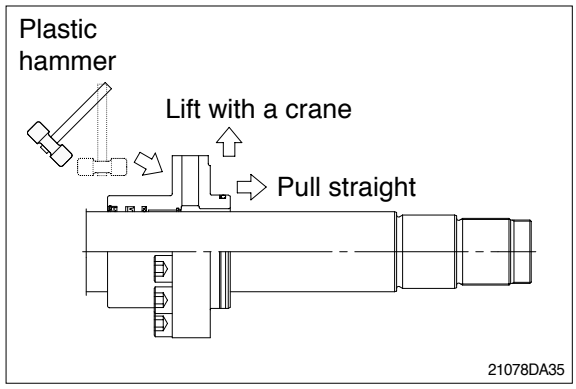
② Remove piston assembly(14), back up ring(16), and O-ring(15).



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 (5,6,7,8,9,10) by the threads of rod assembly(2).

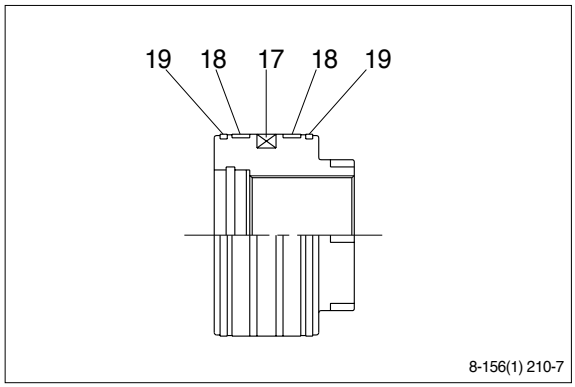


(3) Disassemble the piston assembly

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

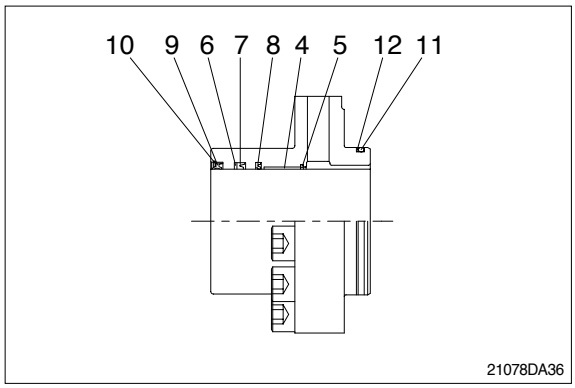
① Remove back up ring(12) and O-ring (11).

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.

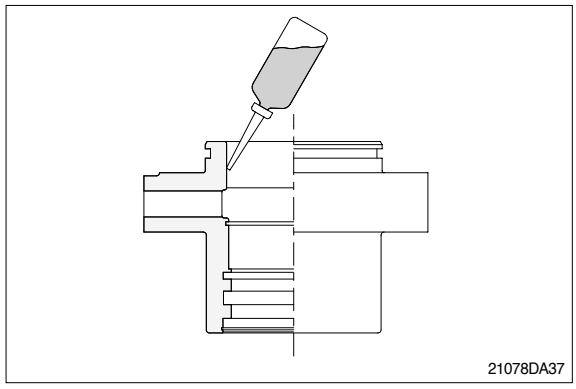


3) ASSEMBLY

(1) Assemble cylinder head assembly

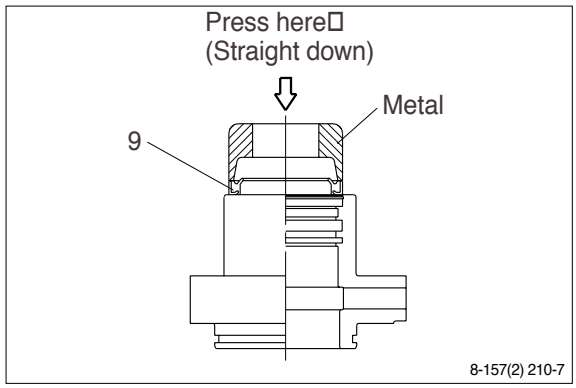
※ Check for scratches or rough surfaces if found smooth with an oil stone.

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.

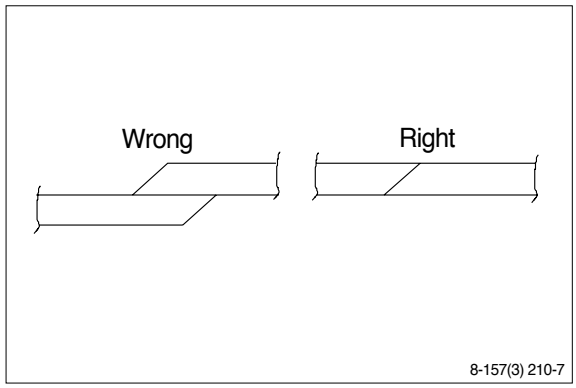
③ Fit snap ring(10) to the stop face.



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

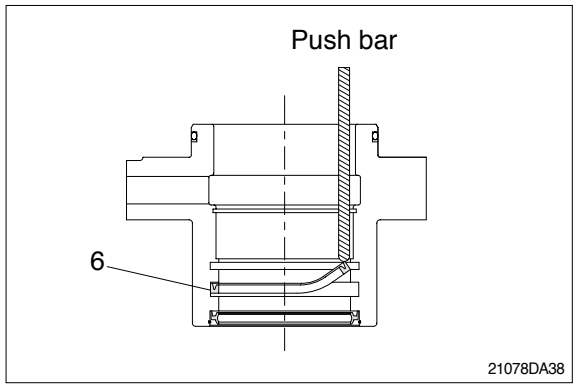
※ Coat each packing with hydraulic oil before fitting it.

※ 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.

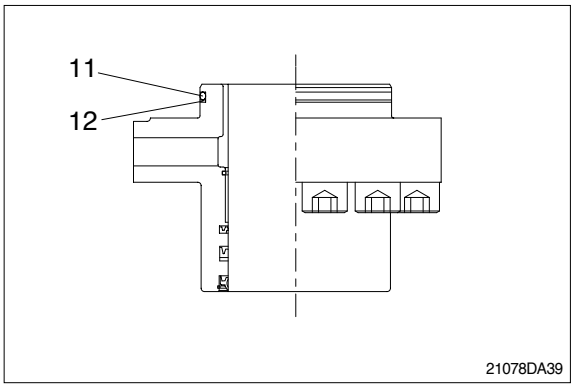
※ Fitting rod seal(6) upside down may damage its lip. Therefore check the correct direction that is shown in fig.



⑤ Fit back up ring(12) to gland(3).

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

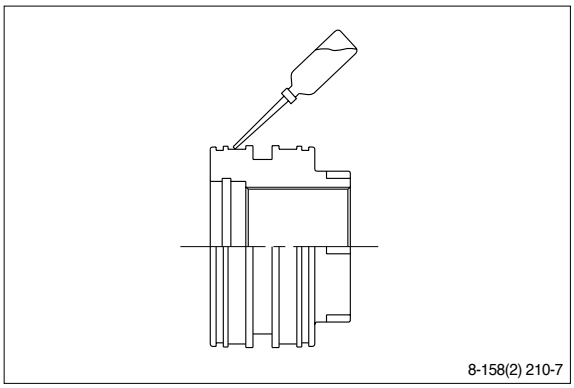
⑥ Fit O-ring(11) to gland(3).



(2) Assemble piston assembly

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

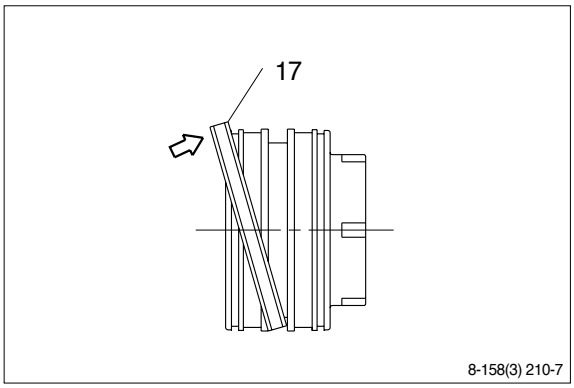
① Coat the outer face of piston(14) with hydraulic oil.



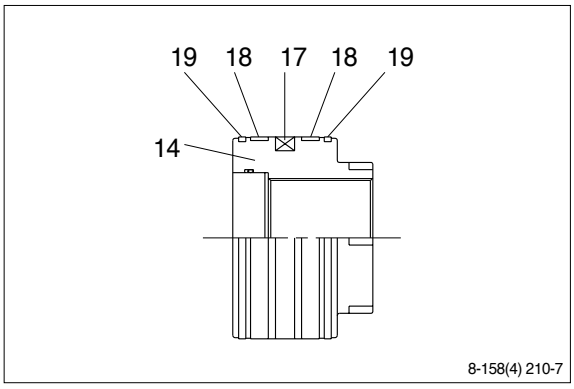
② Fit piston seal(17) to piston.

※ 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).

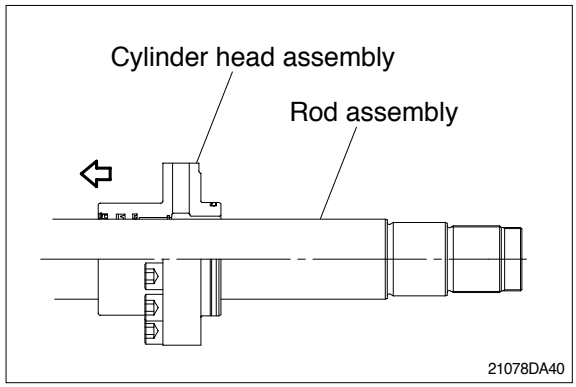


(3) Install piston and cylinder head

① Fix the rod assembly to the work bench.

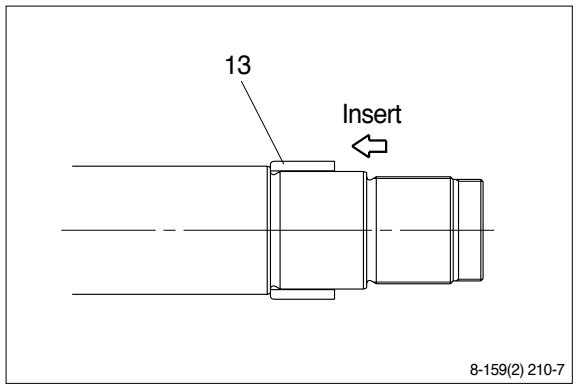
② Apply hydraulic oil to the outer surface of rod assembly(2), the inner surface of piston and cylinder head.

③ Insert cylinder head assembly to rod assembly.



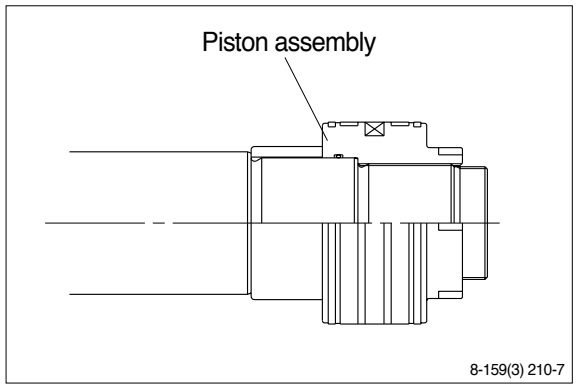
④ Insert cushion ring(13) to rod assembly.

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



⑤ Fit piston assembly to rod assembly.

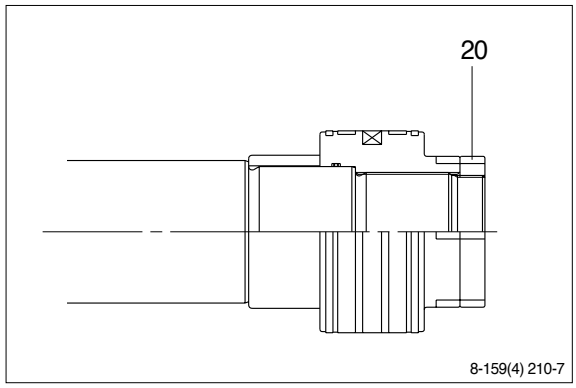
· Tightening torque : 150±15.0kgf · m
(1085±109lbf · ft)



⑥ Fit lock nut to piston.

· Tightening torque :

Item		kgf · m	lbf · ft
Bucket	21	100±10	723±72.3
Boom	21	100±10	723±72.3
Arm	25	100±10	723±72.3
Dozer-RR	19	292±29	2112±209
Dozer-FR	19	292±29	2112±209



(3) Overall assemble

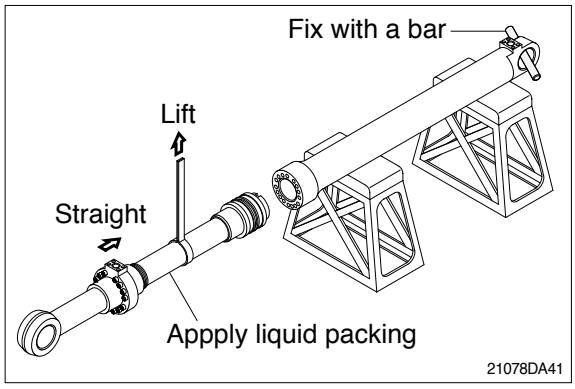
① Place a V-block on a rigid work bench. Mount the tube assembly(1) on it and fix the assembly by passing a bar through the clevis pin hole to lock the assembly.

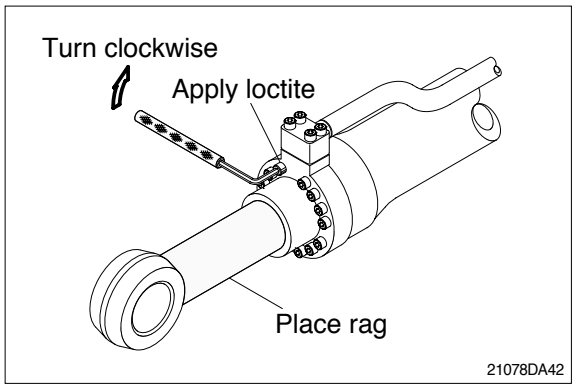
② Insert the rod assembly in to the tube assembly, while lifting and moving the rod assembly with a crane.

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

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

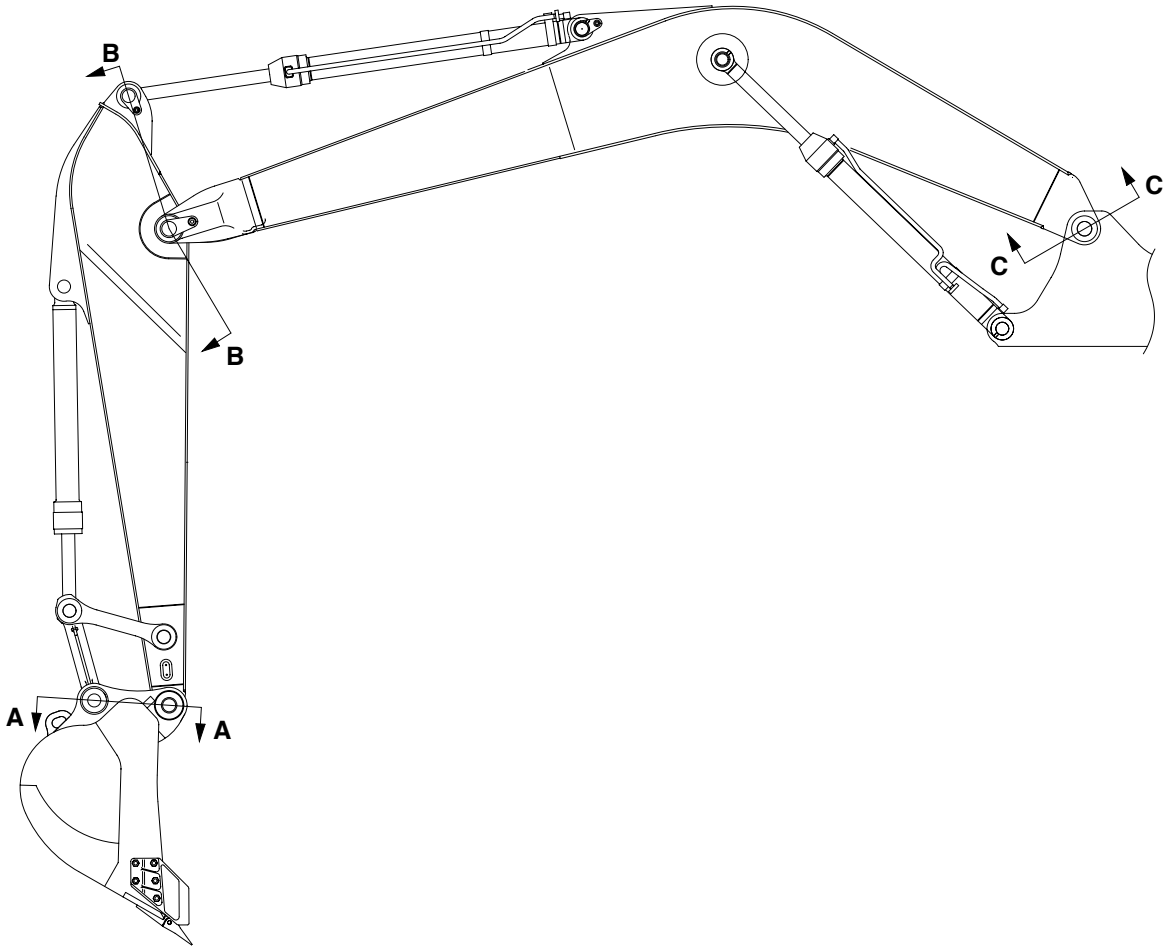
※ Refer to the table of tightening torque.

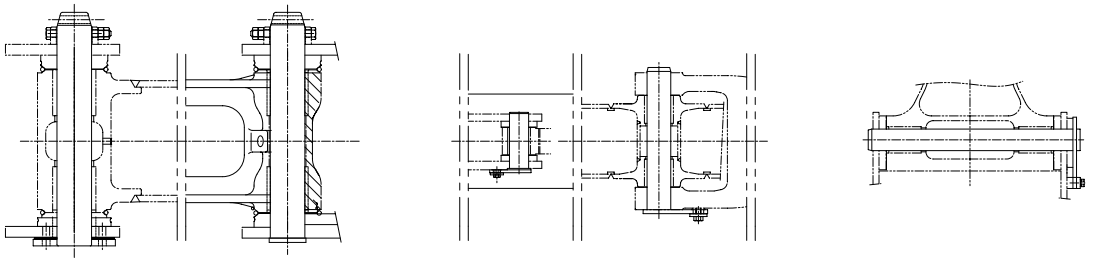




GROUP 13 WORK EQUIPMENT

1. STRUCTURE





SECTION A SECTION B SECTION C

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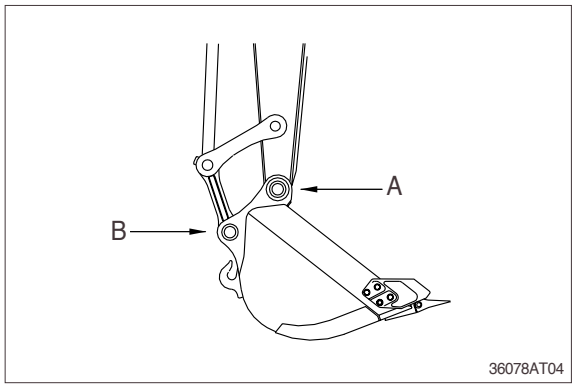
2. REMOVAL AND INSTALL

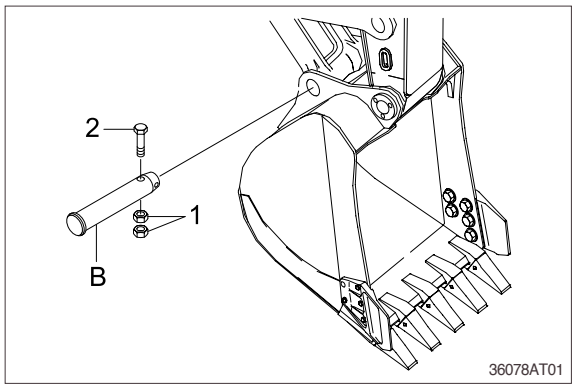
1) BUCKET ASSEMBLY

(1) Removal

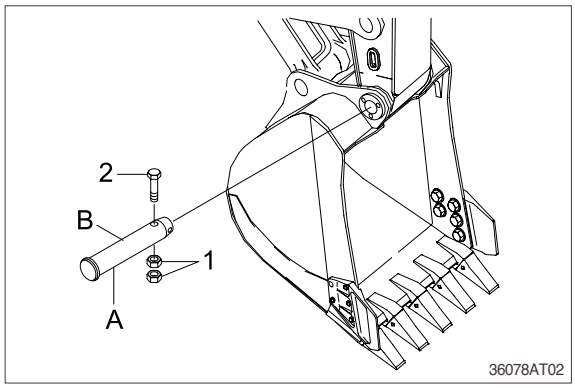
① Lower the work equipment completely to ground with back of bucket facing down.



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



③ Remove nut(3), bolt(4) and draw out the pin(B) then remove the bucket assembly.
· Weight : 690kg(1520lb)

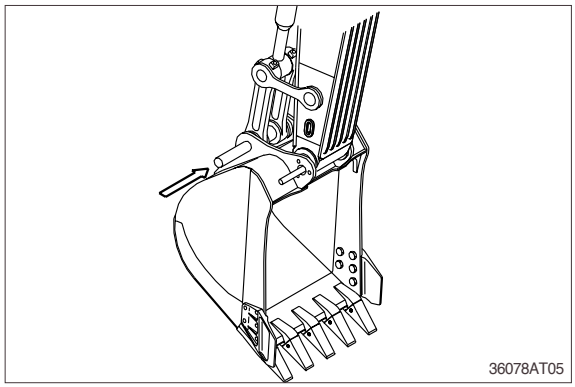


(2) Install

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

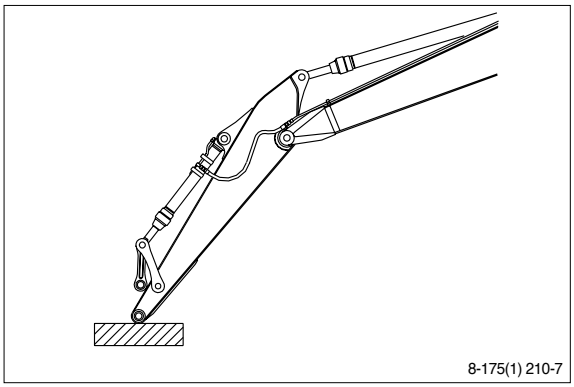
③ Sling arm cylinder assembly, remove spring, pin stopper and pull out pin.

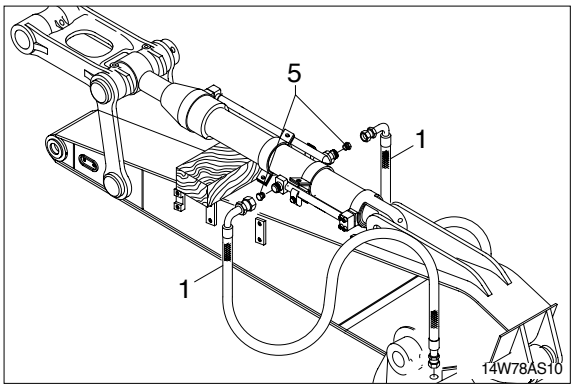
※ Tie the rod with wire to prevent it from coming out.

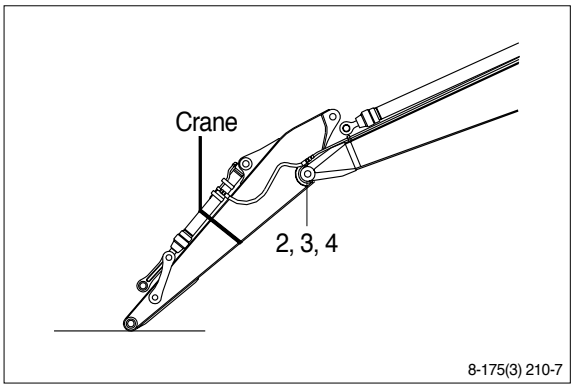
④ For details, see **removal of arm cylinder assembly.**
Place a wooden block under the cylinder and bring the cylinder down to it.

⑤ Remove bolt(2), plate(3) and pull out the pin(4) then remove the arm assembly.
· Weight : 570kg(1260lb)

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







(2) Install

① Carry out installation in the reverse order to removal.

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

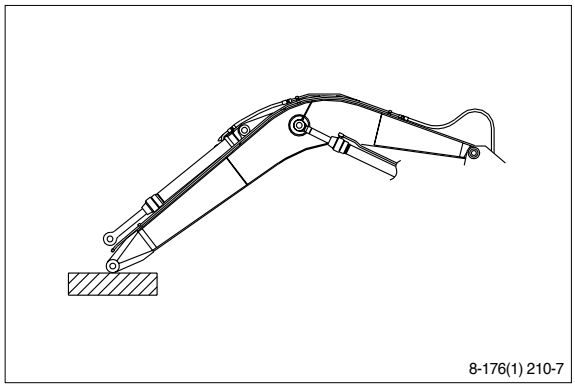
※ Bleed the air from the cylinder.

3) BOOM CYLINDER

(1) Removal

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

② Remove boom cylinder assembly from boom.
For details, see **removal of arm cylinder assembly.**

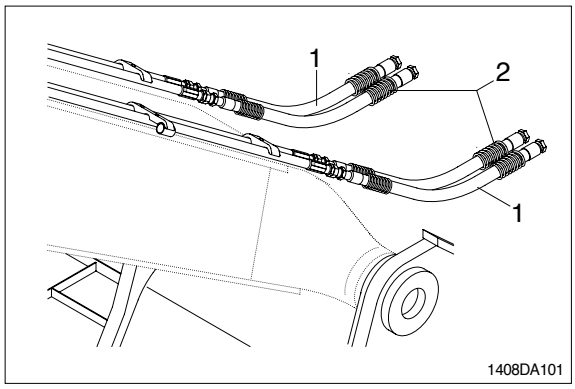


③ Disconnect head lamp wiring.

④ Disconnect bucket cylinder hose(2) and arm cylinder hose(1).

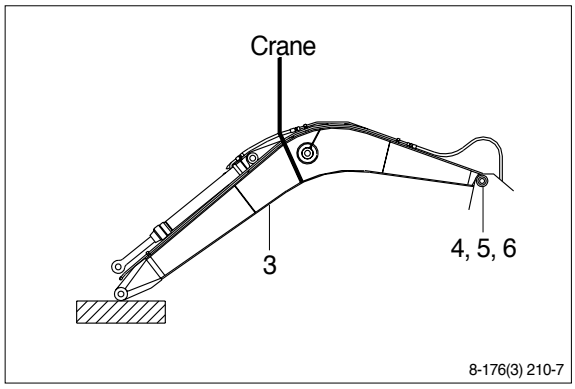
※ When the hose are disconnected, oil may spurt out.

⑤ Sling boom assembly(3).



⑥ Remove bolt(4), plate(5) and pull out the pin(6) then remove boom assembly.
· Weight : 1040kg(2290lb)

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



(2) Install

① Carry out installation in the reverse order to removal.

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

※ Bleed the air from the cylinder.