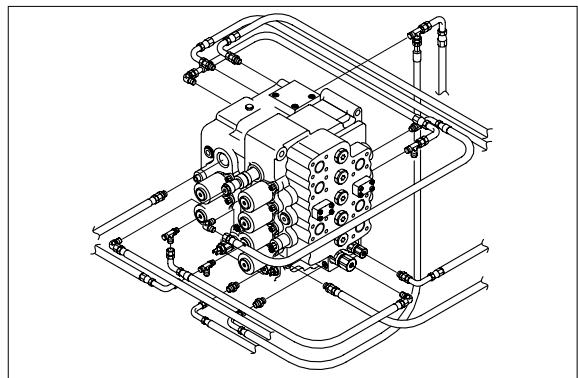
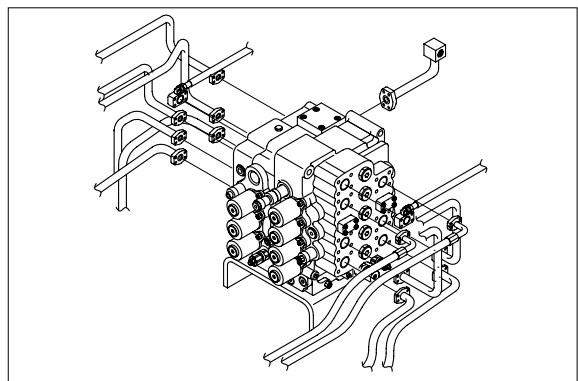


## GROUP 4 MAIN CONTROL VALVE

### 1. REMOVAL AND INSTALL

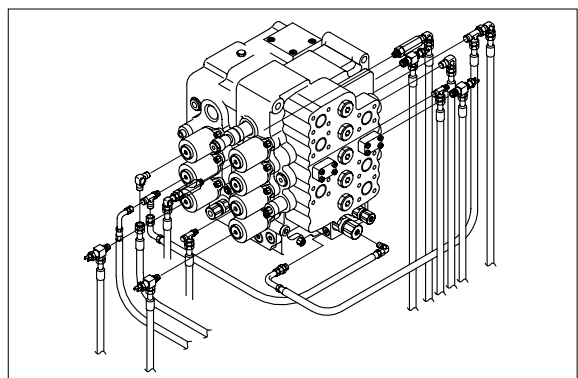
#### 1) REMOVAL

- (1) Lower the work equipment to the ground and stop the engine.
- (2) Loosen the breather slowly to release the pressure inside the hydraulic tank.
  - ▲ Escaping fluid under pressure can penetrate the skin causing serious injury.
  - ※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.
- (3) Remove bolts and disconnect pipe.
- (4) Disconnect pilot line hoses.
- (5) Disconnect pilot piping.
- (6) Sling the control valve assembly and remove the control valve mounting bolt.
  - weight : 130kg(287lb)
- (7) Remove the control valve assembly.
  - ※ When removing the control valve assembly, check that all the piping have been disconnected.

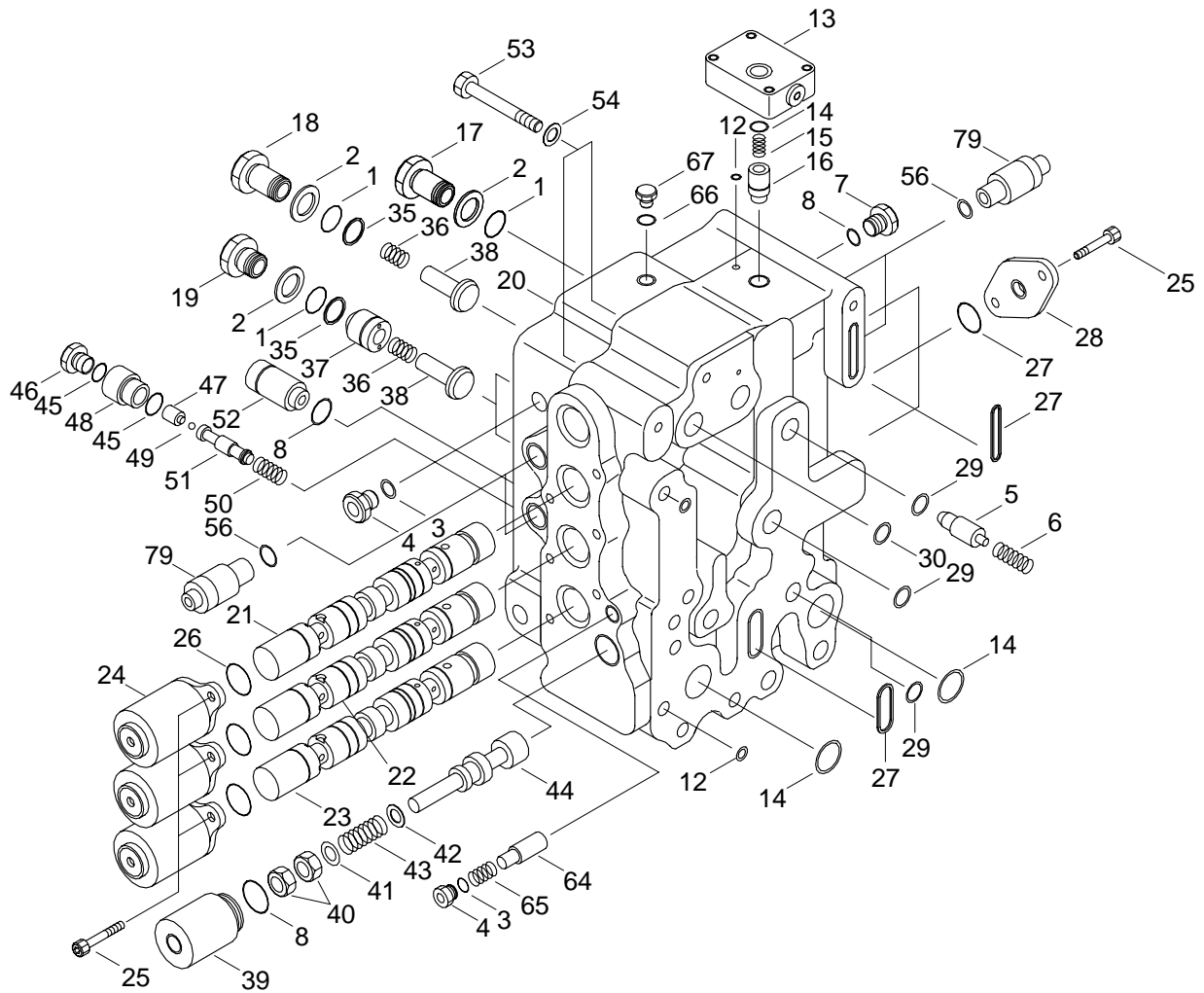


#### 2) INSTALL

- (1) Carry out installation in the reverse order to removal
- (2) Bleed the air from below items.
  - ① Cylinder (boom, arm, bucket)
  - ② Swing motor
  - ③ Travel motor
  - ※ See each item removal and install
- (3) Confirmed the hydraulic oil level and recheck the hydraulic oil leak or not.

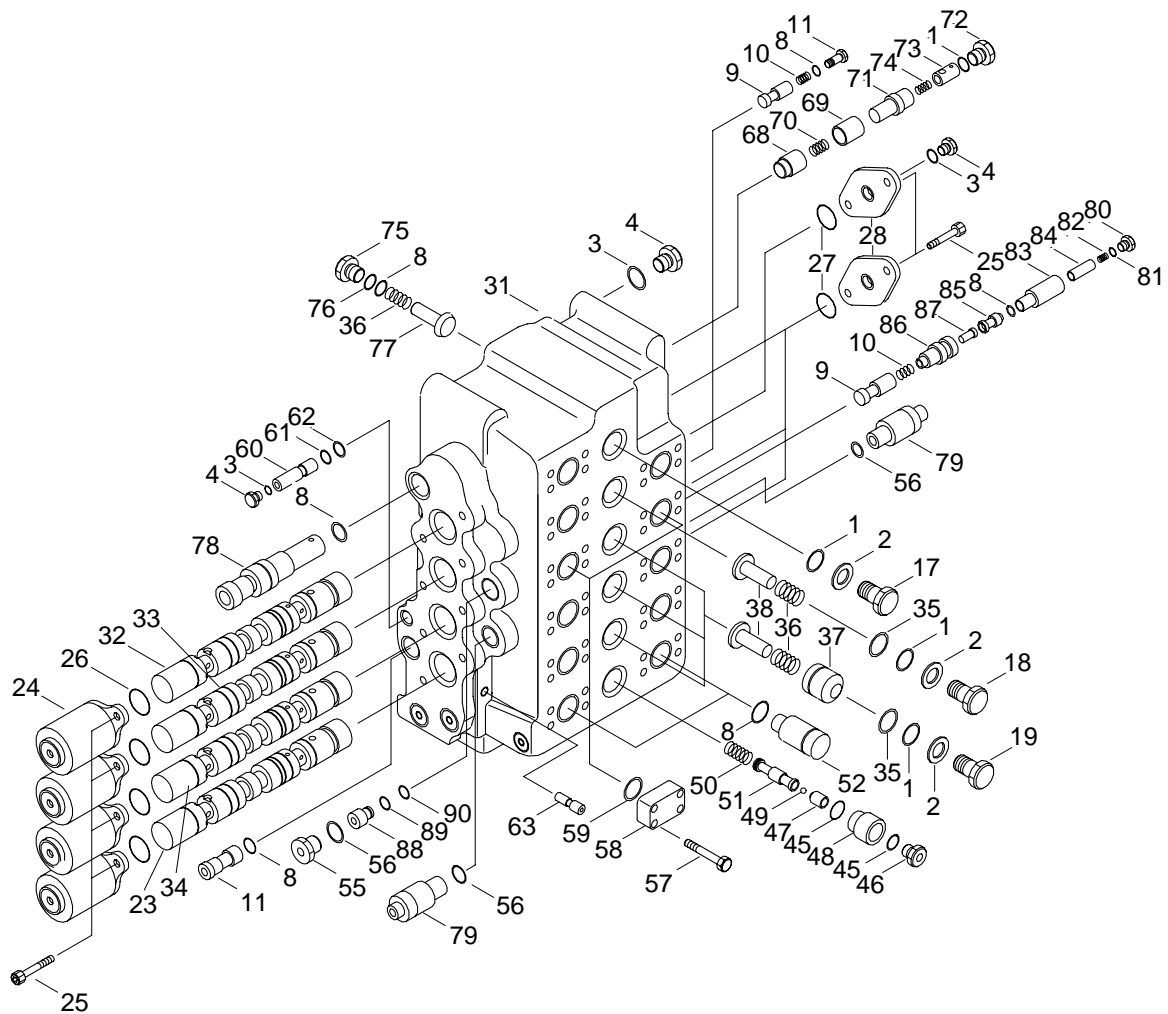


## 2. STRUCTURE(1/2)



1	O-ring	22	Plunger assy	44	Spool
2	Back up ring	23	Plunger assy	45	O-ring
3	O-ring	24	Cover	46	Cap
4	Cap	25	Socket bolt	47	Piston
5	Check	26	O-ring	48	Cap
6	Spring	27	O-ring	49	Steel ball
7	Cap	28	Retainer	50	Spring
8	O-ring	29	O-ring	51	Spool
12	O-ring	30	O-ring	52	Foot relief assy
13	Cover assy	35	Nylon chip	53	Socket bolt
14	O-ring	36	Spring	54	Spring washer
15	Spring	37	Check	56	O-ring
16	Poppet	38	Check	64	Check
17	Cap	39	Cap	65	Spring
18	Cap	40	Nut	66	O-ring
19	Cap	41	Spacer	67	Cap
20	Housing	42	Washer	79	Overload relief assy
21	Plunger assy	43	Spring		

## STRUCTURE(2/2)



1	O-ring	36	Spring	70	Spring
2	Back up ring	37	Check	71	Sleeve
3	O-ring	38	Check	72	Cap
4	Cap	45	O-ring	73	Piston
8	O-ring	46	Cap	74	Spring
9	Check	47	Piston	75	Cap
10	Spring	48	Cap	76	Back up ring
11	Cap	49	Steel ball	77	Check
17	Cap	50	Spring	78	Main relief assy
18	Cap	51	Spool	79	Overload relief assy
19	Cap	52	Foot relief assy	80	Cap
23	Plunger assy	55	Cap	81	O-ring
24	Cover	56	O-ring	82	Spring
25	Socket bolt	57	Socket bolt	83	Cap
26	O-ring	58	Flange	84	Spring guide
27	O-ring	59	O-ring	85	Spool
28	Retainer	60	Orifice	86	Sleeve
31	Housing	61	Back up ring	87	Piston
32	Plunger assy	62	O-ring	88	Plug
33	Plunger assy	63	Orifice	89	Back up ring
34	Plunger assy	68	Check	90	O-ring
35	Nylon chip	69	Piston		

### **3. DISASSEMBLY AND ASSEMBLY**

#### **1) PRECAUTION**

##### **(1) Disassembly**

- ① Handle the components carefully not to drop them or bump them with each other as they are made with precision.
- ② Do not force the work by hitting or twisting as burred or damaged component may not be assembled or result in oil leakage or low performance.
- ③ When disassembled, tag the components for identification so that they can be re-assembled correctly.
- ④ Once disassembled, O-rings and backup rings are usually not to be used again. (Remove them using a wire with its end made like a shoehorn. Be careful not to damage the slot.)
- ⑤ If the components are left disassembled or half-disassembled, they may get rust from moisture or dust. If the work has to be interrupted, take measures to prevent rust and dust.

##### **(2) Assembly**

- ① Take the same precautions as for disassembly.
- ② When assembling the components, remove any metal chips or foreign objects and check them for any burrs or dents. Remove burrs and dents with oil-stone, if any.
- ③ O-rings and backup rings are to be replaced with new ones, as a rule.
- ④ When installing O-rings and backup rings, be careful not to damage them. (Apply a little amount of grease for smoothness.)
- ⑤ Tighten the bolts and caps with specified torque.

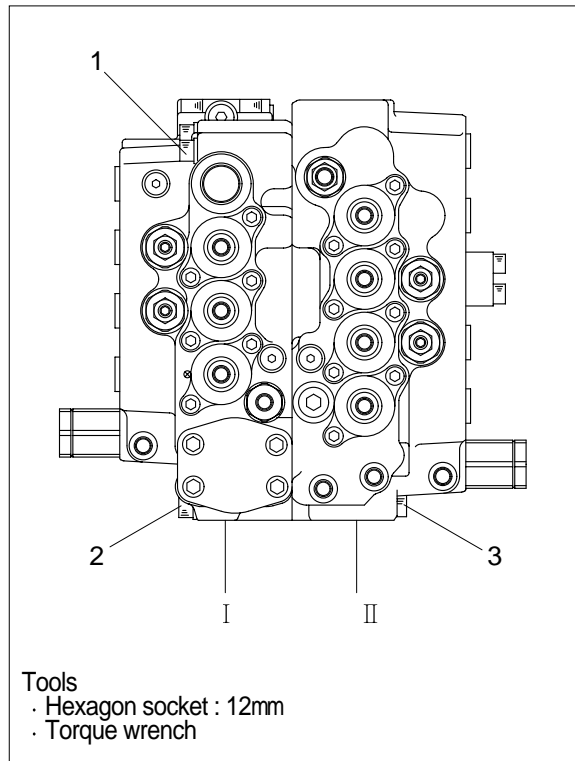
## 2) MOUNTING AND DISMOUNTING VALVES

### (1) Disassembly

- ① 3-spool valve( I ) can be removed by loosening socket bolts(1) and (2).
- ② 4-plunger valve( II ) can be removed by loosening socket bolt(3).

### (2) Assembly

- ① In the reverse manner of disassembly, reassemble 4-spool valve( II).
  - ② Reassemble 3-spool valve( I).
  - ③ Tighten the bolts to the torque of 15kgf · m (108lbf · ft)
- ※ Valves should be mounted after making sure that all O-rings and check assembly are placed on assembling faces of 4-plunger valve and that check valve and spring are placed on assembling faces of 3-plunger valve.



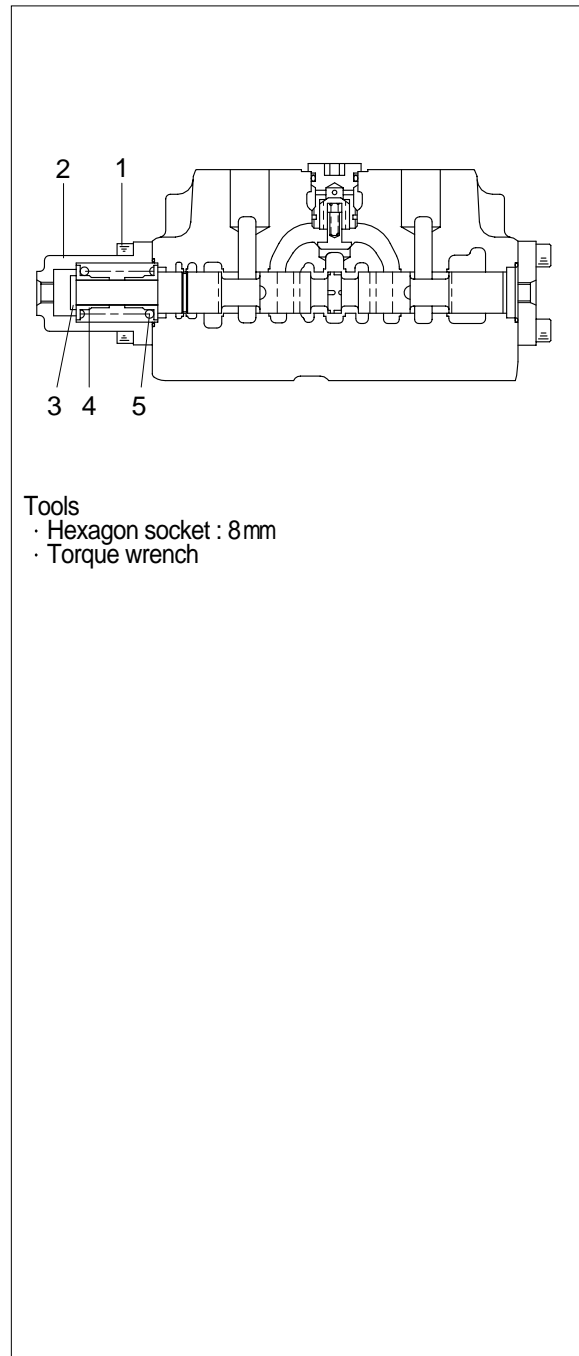
### 3) OPERATING SECTION OF HYDRAULIC PACK

#### (1) Disassembling

- ① Loosen socket bolt(1) to remove cover (2).
- ② Pull the plunger out while holding the spring.
  - ※ Do not pull it out violently, but draw it out gently while making sure of its contact with HG hole.
- ③ Place the plunger between holders and loosen plunger cap(3) by using a vise.
- ④ Remove plunger cap(3), guide(4) and spring(5) in this order.

#### (2) Assembling

- ① Place the plunger between holders and clamp the holders with the vise.
- ② Mount guide(4), spring(5) and plunger cap(3) to the plunger.
- ③ Tighten plunger cap(3) at the specified torque.  
Tightening torque : 6kgf · m (43.4lbf · ft)
- ④ Restore the plunger to the valve while holding the spring section.
  - ※ Insert the plunger into the valve hole while turning it slowly so that it is well aligned with the HG hole. In particular, be careful not to hit it against the first round corner.
- ⑤ Install cover(2) after making sure that O-ring is placed on the edge of the valve hole and tighten socket bolt(1) with the specified torque.  
Tightening torque : 5kgf · m (36.2lbf · ft)



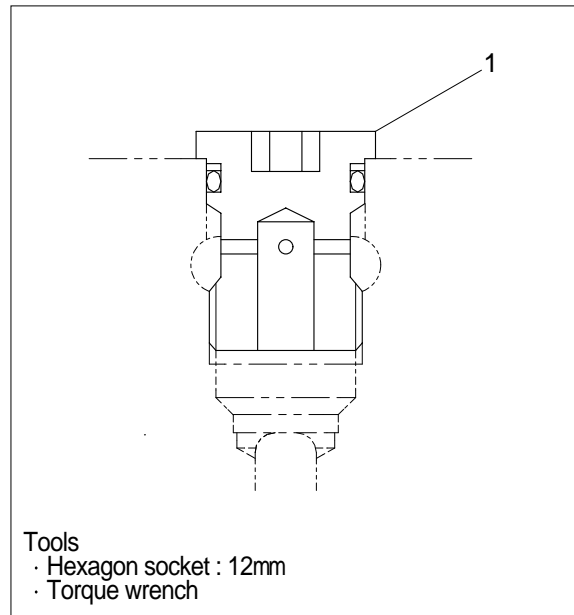
#### 4) ORIFICE ASSEMBLY

##### (1) Disassembling

- ① Remove cap(1).

##### (2) Assembling

- ① Tighten cap(1) with the specified torque.  
※ Be careful for the backup ring not to protrude.  
Tightening torque : 20kgf · m(144.7lbf · ft)



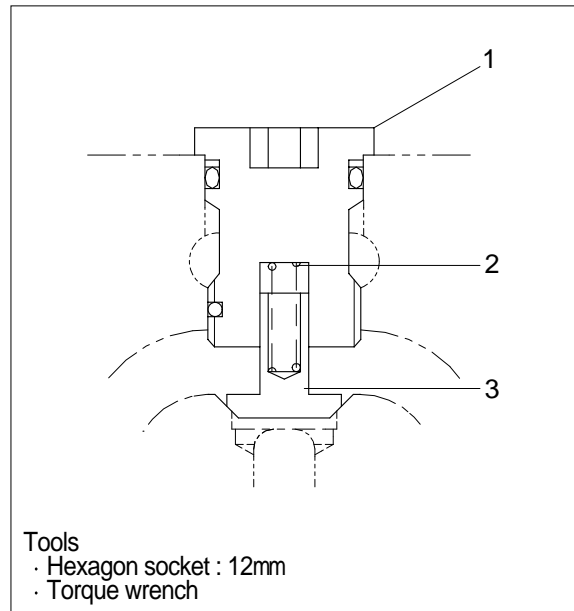
#### 5) CHECK ASSEMBLY

##### (1) Disassembling

- ① Remove cap(1).
- ② Remove spring(2) and check valve(3).

##### (2) Assembling

- ① Mount check valve(3) and spring(2) to the valve housing.
- ② Tighten cap(1) with the specified torque.  
※ Be careful for the backup ring not to protrude.  
Tightening torque : 20kgf · m(144.7lbf · ft)



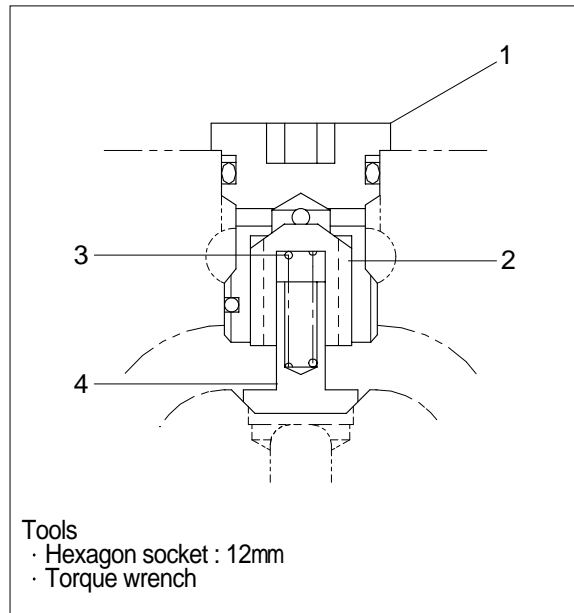
## 6) LOAD CHECK ASSEMBLY

### (1) Disassembling

- ① Remove the cap(1).
- ② Remove check valve(2), spring(3) and check valve(4).

### (2) Assembling

- ① Mount check valve(4), spring(3) and check valve(2) to the valve housing.
  - ② Tighten cap(1) at the specified torque.
- ※ Be careful for the backup ring not to protrude.
- Tightening torque : 20kgf · m(144.7lbf · ft)



## 7) MAIN RELIEF ASSEMBLY

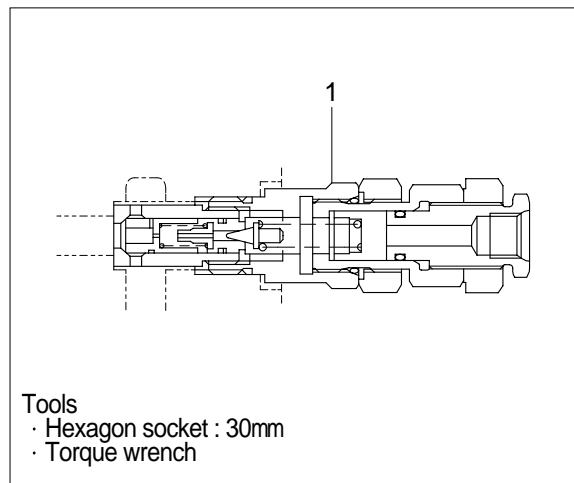
Relief assembly is assembled into a single block as a cartridge. Do not disassemble the relief assembly as a rule.

### (1) Disassembling

- ① Remove the cartridge as it is while holding cap(1).

### (2) Assembling

- ① Install the cartridge and tighten cap(1) at the specified torque.
- Tightening torque : 10kgf · m(72.3lbf · ft)





## 8) FOOT RELIEF ASSEMBLY

Impossible to adjust the foot relief assembly as it is installed to the machine.

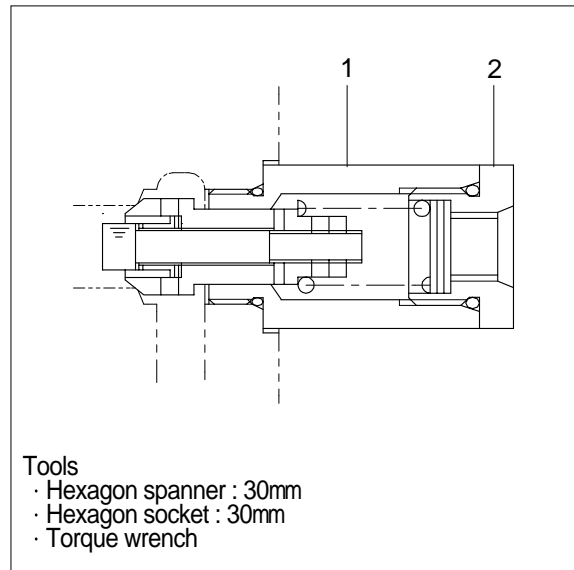
Remove the cartridge as it is from the valve housing. Do not disassemble the cartridge.

### (1) Disassembling

- ① Remove the cartridge as it is from the valve housing while holding cartridge sleeve(1).

### (2) Assembling

- ① Install the cartridge to the valve housing and tighten cap(2) at the specified torque.  
Tightening torque : 6kgf · m(43.4lbf · ft)



## 9) RELIEF ASSEMBLY

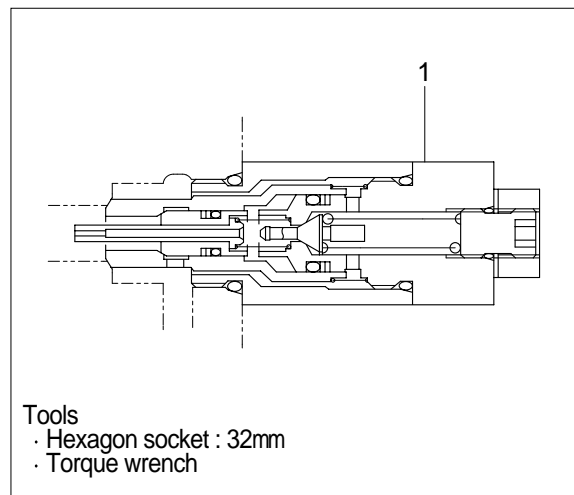
Relief assembly is assembled into a single block as a cartridge. Do not disassemble the relief assembly as a rule.

### (1) Disassembling

- ① Remove the cartridge as it is while holding cap(1).

### (2) Assembling

- ① Install the cartridge and tighten cap(1) at the specified torque.  
Tightening torque : 6kgf · m(43.4lbf · ft)



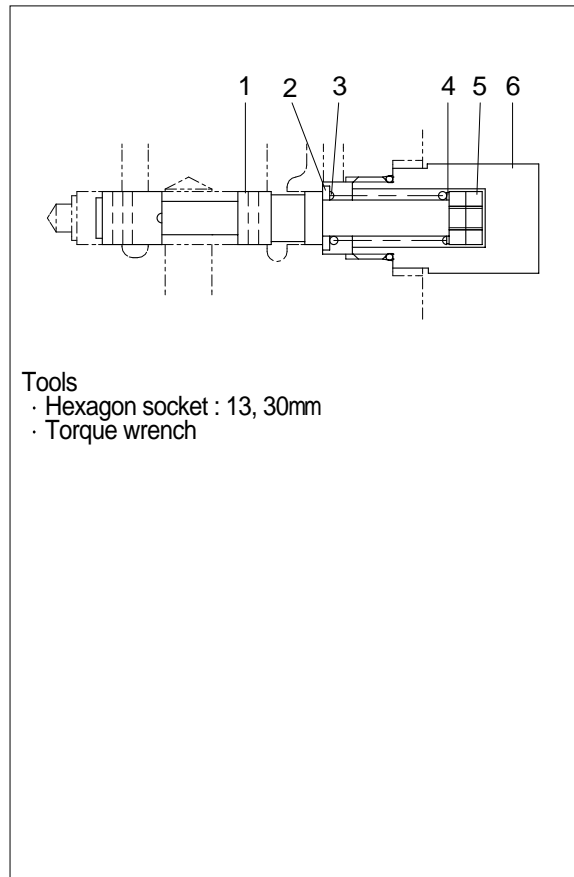
## 10) SELECTOR VALVE ASSEMBLY

### (1) Disassembling

- ① Remove cap(6).
- ② Pull the spool out while holding the spring.
- ③ Take the spool with a holder and clamp the latter with a vise.
- ④ Remove hexagonal nut(5), washer(4), spring(3) and washer(2).

### (2) Assembling

- ① Hold the spool with the holder and clamp the latter on the vise.
- ② Mount washer(2), spring(3) and washer(4) to spool(1).
- ③ Mount hexagonal nut(5) and tighten the outer hex. nut at the specified torque.  
Tightening torque : 1.5kgf · m(10.8lbf · ft)
- ④ Restore the spool while holding the spring.
- ⑤ Tighten cap(6) at the specified torque.  
Tightening torque : 6kgf · m(43.4lbf · ft)



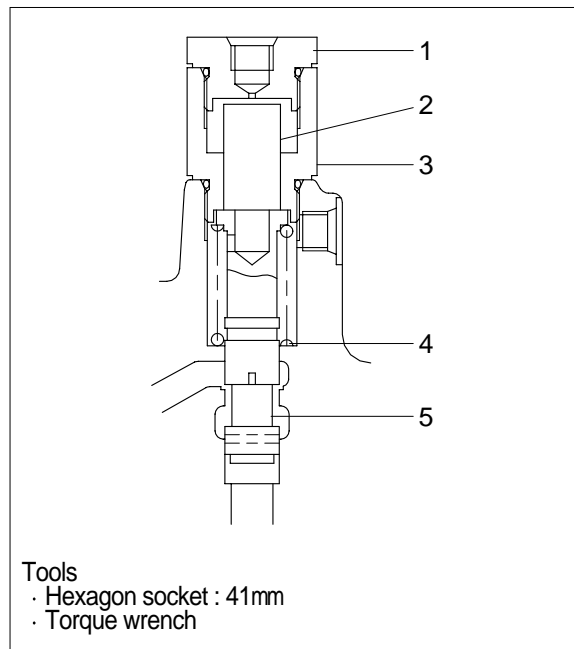
## 11) CENTER BYPASS SPOOL ASSEMBLY

### (1) Disassembling

- ① Remove cap(1) to take piston(2) off.
- ② Remove cap(3) to take spring(4) and spool(5) off.

### (2) Assembling

- ① Mount spring(4) and insert spool(5) into the valve housing.
- ② Tighten cap(3) at the specified torque.  
Tightening torque : 10kgf · m(72.3lbf · ft)
- ③ Insert piston(2) into cap(3).
- ④ Tighten cap(1) with the specified torque.  
Tightening torque : 10kgf · m(72.3lbf · ft)



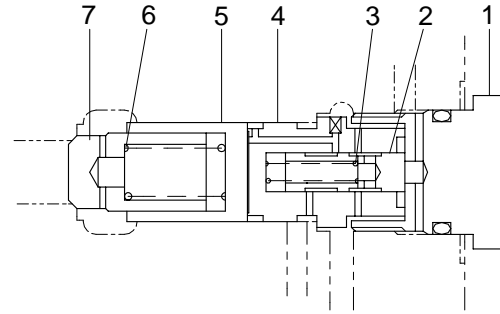
## 12) LOGIC CHECK ASSEMBLY

### (1) Disassembling

- ① Remove cap(1).
- ② Take off piston(2) and spring(3).
- ③ Extract sleeve(4) with a magnet or the like.
- ④ Take off piston(5), spring(6) and check valve(7).

### (2) Assembling

- ① Mount check valve(7), spring(6) and piston(5) into the valve housing.
- ② Insert spring(3) and piston(2) into sleeve(4).
- ③ Mount sleeve(4) with spring(3) and piston(2) to the valve housing.
- ④ Tighten cap(1) at the specified torque.  
Tightening torque : 10kgf · m(72.3lbf · ft)



#### Tools

- Hexagon socket : 36mm
- Torque wrench

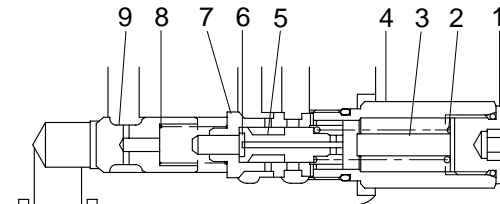
## 13) ARM REGENERATION

### (1) Disassembling

- ① Remove cap(1).
- ② Take off spring retainer(3) and spring(2).
- ③ Remove cap(4).
- ④ Take off spool(5), piston(6) and sleeve(7).
- ⑤ Take off spring(8) and check valve(9).

### (2) Assembling

- ① Mount check valve(9) and spring(8) into the valve housing.
- ② Insert piston(6) and spool(5) into sleeve(7).
- ③ Mount sleeve(7) with piston(6) and spool(5) to the valve housing.
- ④ Tighten cap(4) at the specified torque.  
Tightening torque : 10kgf · m(72.3lbf · ft)
- ⑤ Mount spring(2) and spring retainer(3) to the assembly.
- ⑥ Tighten cap(1) at the specified torque.  
Tightening torque : 6kgf · m(43.4lbf · ft)



#### Tools

- Hexagon socket : 10mm
- Socket : 27mm
- Torque wrench

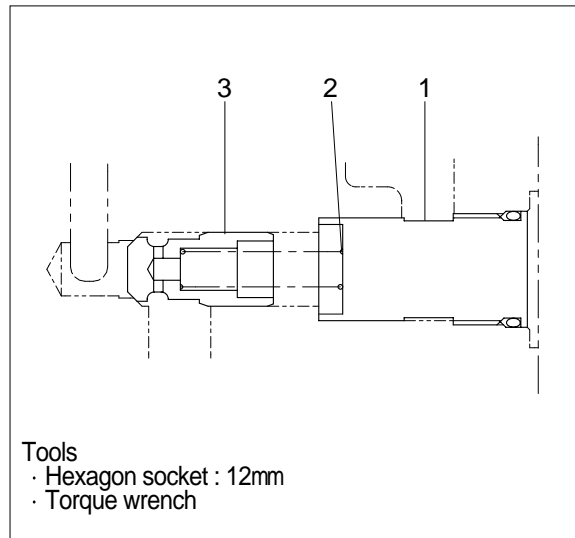
#### 14) BUCKET FLOW SUMMATION CHECK

##### (1) Disassembling

- ① Remove cap(1).
- ② Take off spring(2) and check valve(3).

##### (2) Assembling

- ① Mount check valve(3) and spring(2) to the valve housing.
- ② Tighten cap(1) at the specified torque.  
Tightening torque : 10kgf · m(72.3lbf · ft)



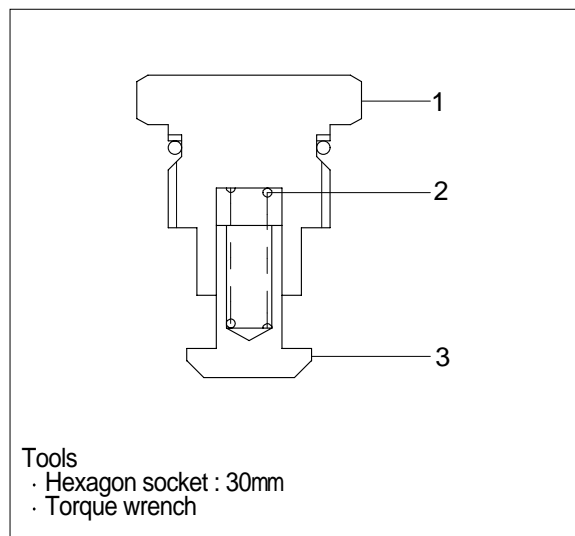
#### 15) CHECK ASSEMBLY

##### (1) Disassembling

- ① Remove cap(1).
- ② Take off spring(2) and check valve(3).

##### (2) Assembling

- ① Mount check valve(3) and spring(2) to the valve housing.
- ② Tighten cap(1) at the specified torque.  
Tightening torque : 6kgf · m(43.4lbf · ft)



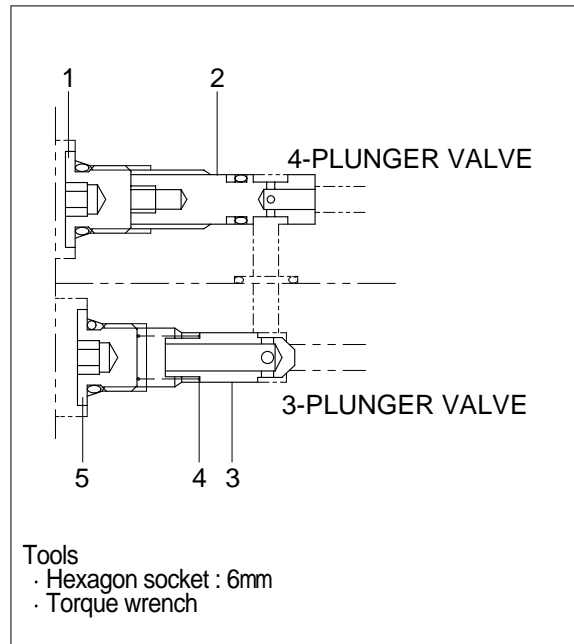
## 16) INTERNAL PARALLEL CIRCUIT

### (1) Disassembling

- ① Remove cap(1) for 4-plunger valve.
- ② Screw M5 thread in the end extracting tap of orifice(2) and extract orifice(2).
- ③ Remove cap(5) for 3-plunger valve.
- ④ Take off spring(4) and check valve(3).

### (2) Assembling

- ① Mount check valve(3) for 3-plunger valve and spring(4).
- ② Tighten cap(5) at the specified torque.  
Tightening torque : 3kgf · m(21.7lbf · ft)
- ③ Mount orifice(2) to 4-plunger valve.
- ④ Tighten cap(1) at the specified torque.  
Tightening torque : 3kgf · m(21.7lbf · ft)



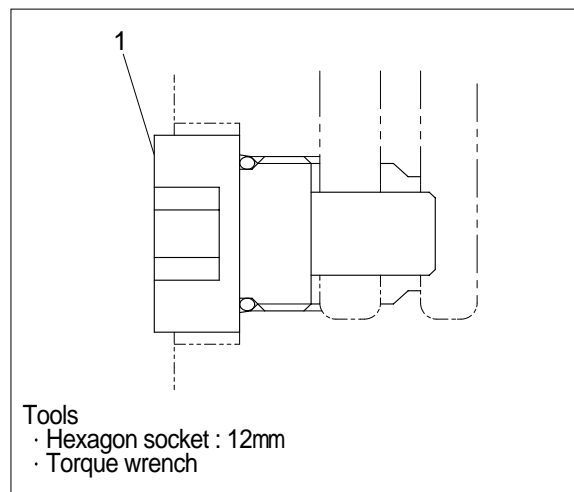
## 17) BOOM THROTTLING CAP

### (1) Disassembling

- ① Remove cap(1).

### (2) Assembling

- ① Tighten cap(1) at the specified torque.  
Tightening torque : 10kgf · m(72.3lbf · ft)



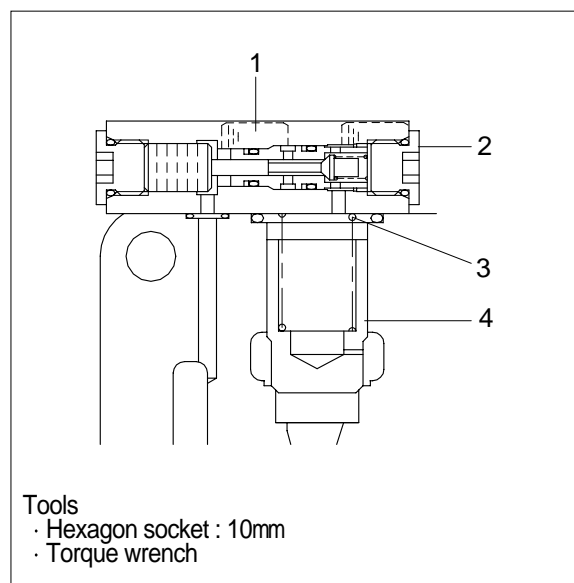
## 18) LOAD HOLDING VALVE(Basic unit)

### (1) Disassembling

- ① Loosen socket bolt(1) to remove cover assembly(2).
- ② Take off spring(3) and check valve(4)

### (2) Assembling

- ① Mount check valve(4) and spring(3) to the valve housing.
- ② Mount cover assembly(2) to the valve housing and tighten socket bolt(1) at the specified torque.  
Tightening torque : 10kgf · m(72.3lbf · ft)



## 19) LOAD HOLDING VALVE(Cover assembly)

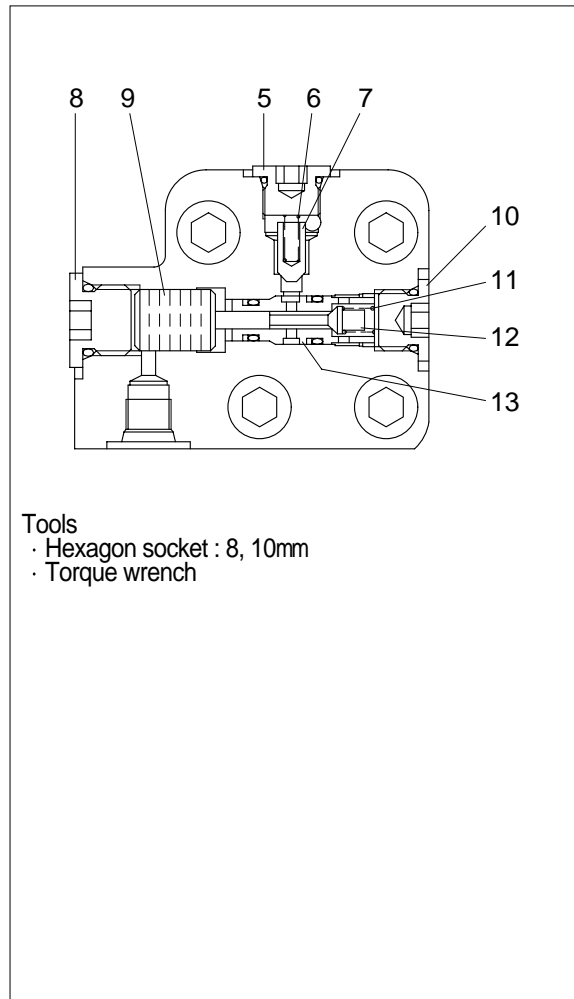
### (1) Disassembling

- ① Remove cap(5).
- ② Take off spring(6) and check valve(7).
- ③ Remove cap(8).
- ④ Take off piston(9).
- ⑤ Remove cap(10).
- ⑥ Extract spring(11) and check valve(12).
- ⑦ Push sleeve(13) out with a rod or the like through the hole of cap(8).

※ Be careful not to damage the guideway of the sleeve.

### (2) Assembling

- ① Mount sleeve(13) to the cover.
- ② Mount spring(11) with check valve(12) to the cover.
- ③ Tighten cap(10) at the specified torque.  
Tightening torque : 5kgf · m(36.2lbf · ft)
- ④ Insert piston(9) into the cover.
- ⑤ Tightening cap(8) at the specified torque.  
Tightening torque : 6kgf · m(43.4lbf · ft)
- ⑥ Mount check valve(7) and spring(6).
- ⑦ Tighten cap(5) at the specified torque.  
Tightening torque : 5kgf · m(36.2lbf · ft)



## 20) HOLDERS

Put the plunger between holders and clamp them by a vise after decreasing the plunger and holders as a special tool.