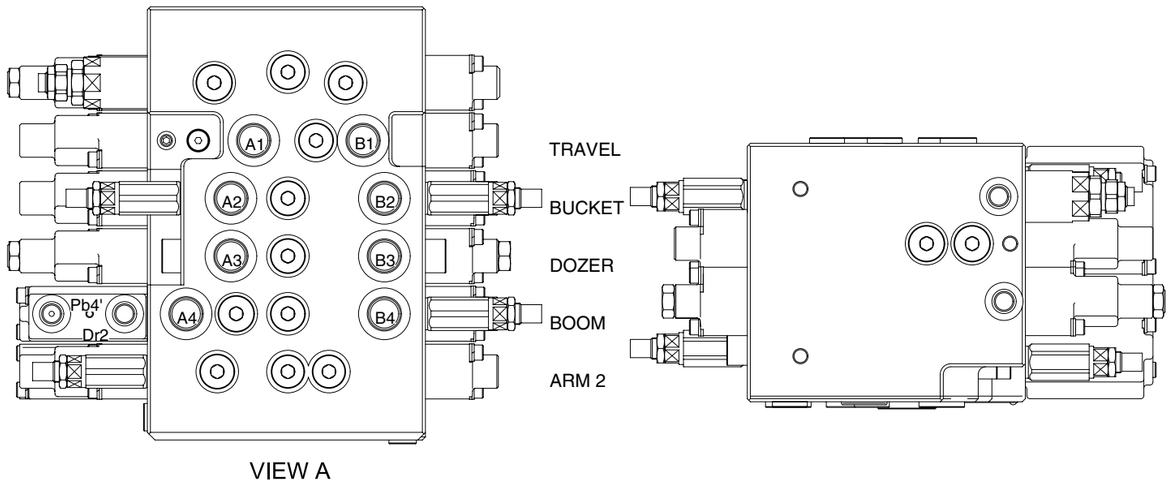
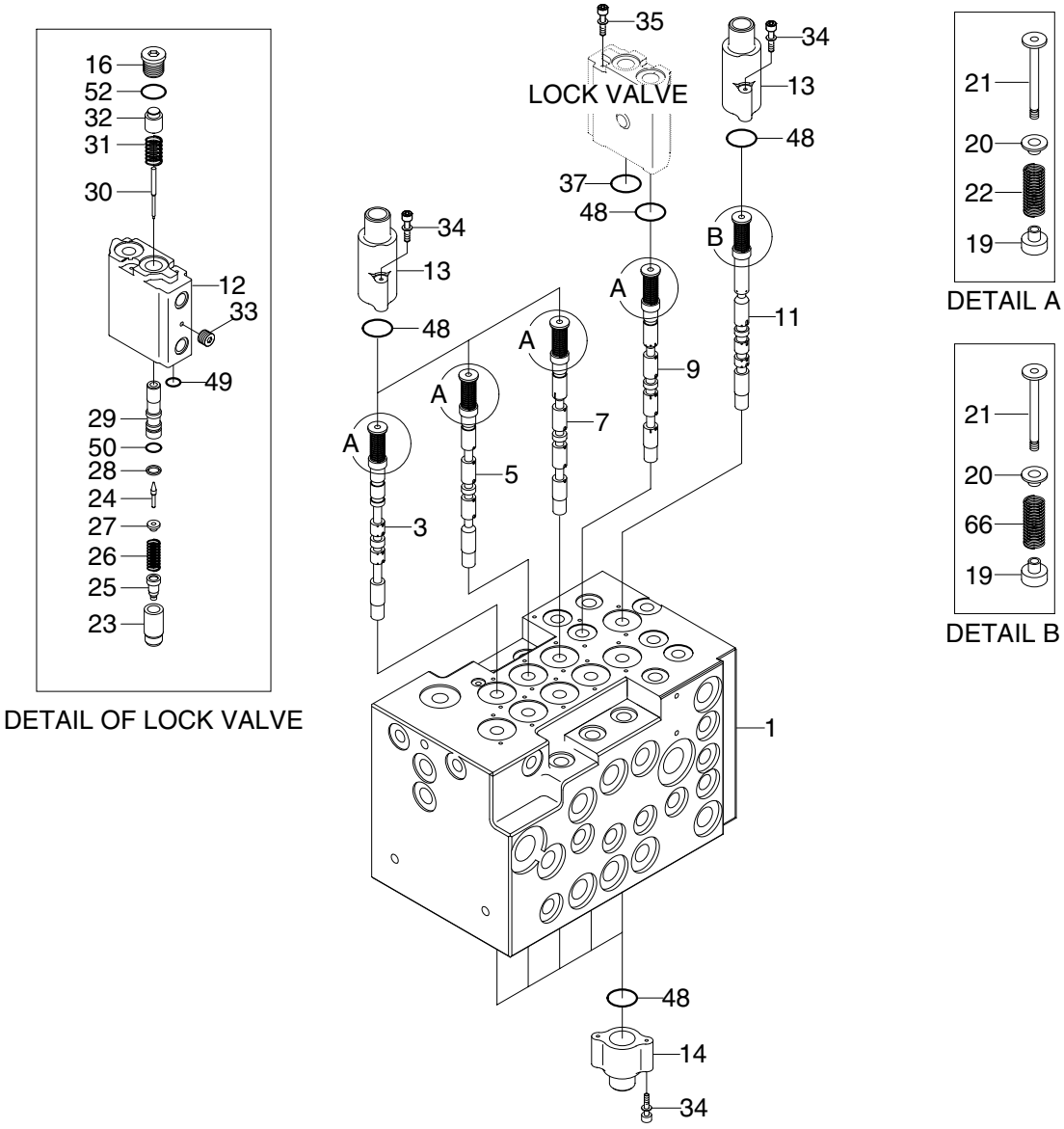
1. STRUCTURE



Mark	Port name	Port size	Tightening torque
Rs	Make up for swing motor	G1/4	2.5~3kgf · m (18.1~21.7lbf · ft)
Pa1	Travel left pilot port(FW)		
Pb1	Travel left pilot port(BW)		
Pc1	Travel right pilot port(BW)		
Pd1	Travel right pilot port(FW)		
Pa2	Bucket in pilot port		
Pb2	Bucket out pilot port		
Pc2	Swing pilot port(RH)		
Pd2	Swing pilot port(LH)		
Pc3	Option pilot port		
Pd3	Option pilot port		
Pa40	Boom up pilot port		
Pa41	Boom up confluence pilot port		
Pb4	Boom down pilot port		
Pb4'	Lock valve pilot port(Boom)		
Pc50	Arm in pilot port		
Pc51	Arm in confluence pilot port		
Pc5'	Lock valve pilot port(Arm)		
Pd50	Arm out pilot port		
Pd51	Arm out confluence pilot port		
PO	Pilot pressure port		
Dr1	Drain port		
Dr2	Drain port		
Dr3	Drain port		
A1	Travel motor right side port(FW)	G1/2	6~7kgf · m (43.4~50.6lbf · ft)
B1	Travel motor right side port(BW)		
C1	Travel motor left side port(BW)		
D1	Travel motor left side port(FW)		
A2	Bucket head side port		
B2	Option port		
C2	Swing motor port(LH)		
D2	Swing motor port(RH)		
A3	Dozer up port		
B3	Dozer down port		
C3	Bucket rod side port		
D3	Option port		
A4	Boom head side port		
B4	Boom rod side port		
C5	Arm head side port		
D5	Arm rod side port		
P1	Pump port(P1 side)	G3/4	8~9kgf · m (57.9~65.1lbf · ft)
P2	Pump port(P2 side)		
T1	Return port	SAE3000, 1 1/4 (M10)	5.5~8.3kgf · m (39.8~60.0lbf · ft)

7072MCV30

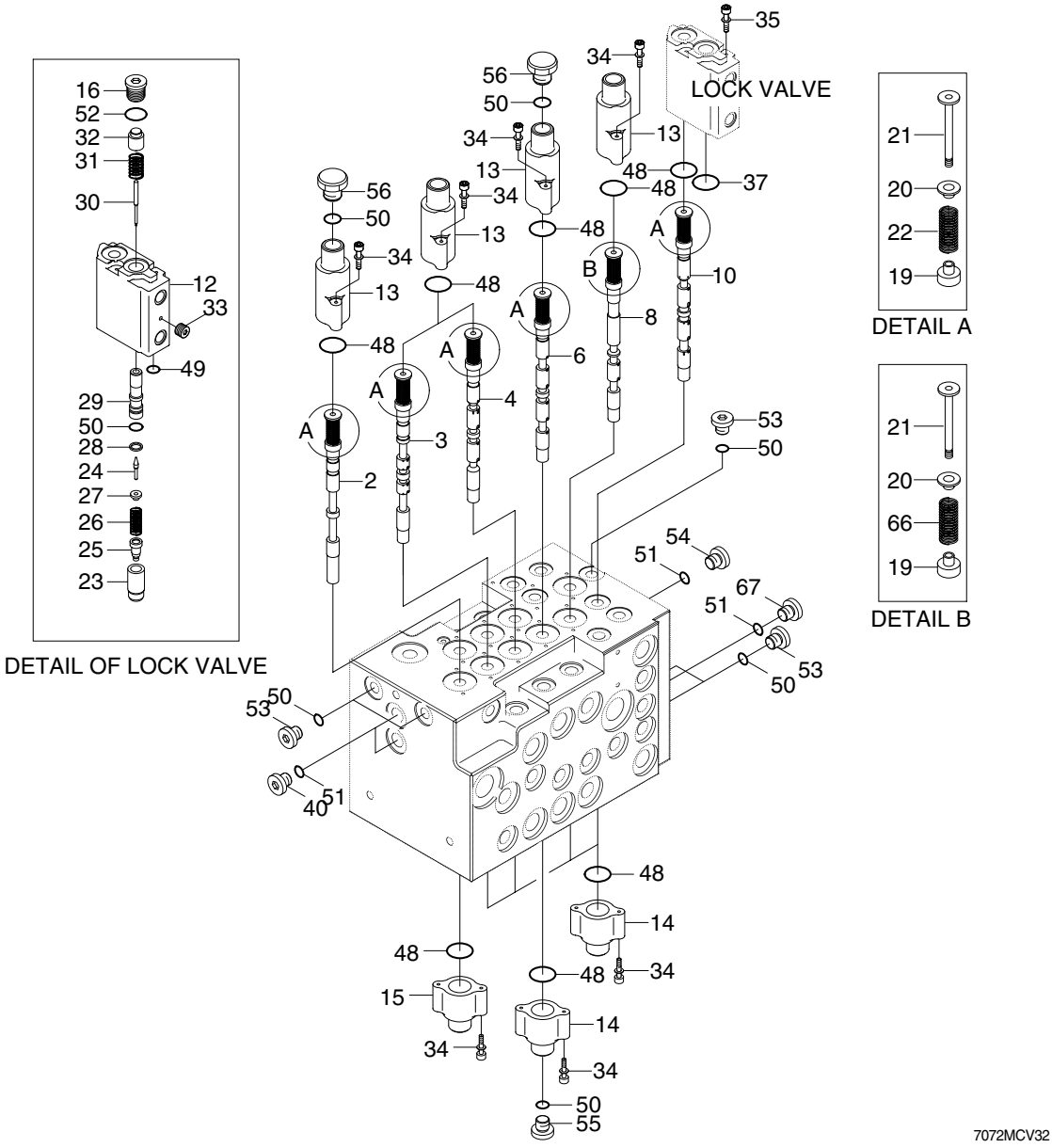
1) Structure(1/4)



7072MCV31

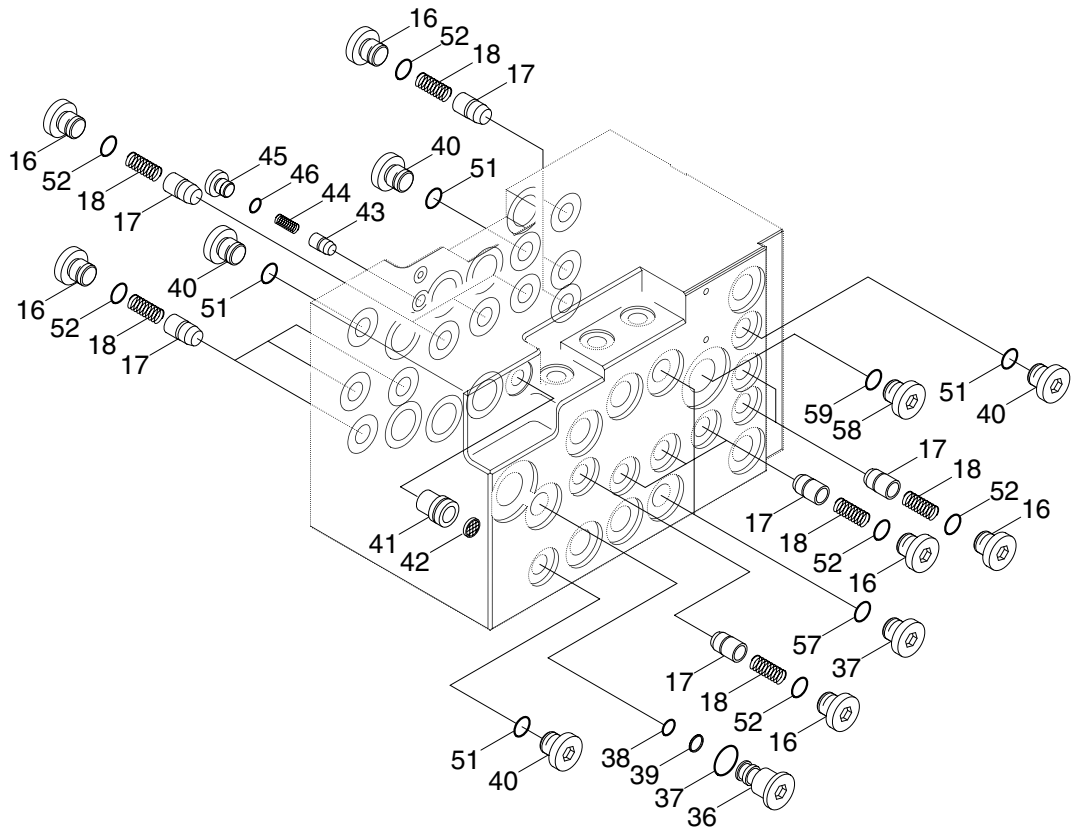
1	Body	20	Spring holder	31	Lock valve spring
3	Spool-Travel(LH)	21	Spool end	32	Piston
5	Spool-Swing	22	Spring	33	Plug
7	Spool-Option	23	Lock valve	34	Socket head bolt
9	Spool-Boom 2	24	Poppet	35	Socket head bolt
11	Spool-Arm	25	Lock valve restrictor	37	O-ring
12	Pilot-Cover	26	Lock valve spring	48	O-ring
13	Pilot-Cover	27	Spring holder	49	O-ring
14	Pilot-Cover	28	Retaining ring	50	O-ring
16	Plug	29	Piston guide	52	O-ring
19	Spring holder	30	Piston	66	Spring

2) Structure(2/4)



2	Spool-Travel straight	23	Lock valve	40	Plug
4	Spool-Travel(RH)	24	Poppet	48	O-ring
6	Spool-Dozer	25	Lock valve restrictor	49	O-ring
8	Spool-Boom	26	Lock valve spring	50	O-ring
10	Spool-Arm 2	27	Spring holder	51	O-ring
12	Pilot-Cover	28	Retaining ring	52	O-ring
13	Pilot-Cover	29	Piston guide	53	Plug
14	Pilot-Cover	30	Piston	54	Restrictor plug
15	Pilot-Cover	31	Lock valve spring	55	Plug
16	Plug	32	Piston	56	Plug
19	Spring holder	33	Plug	66	Spring
20	Spring holder	34	Socket head bolt	67	Restrictor plug
21	Spool end	35	Socket head bolt		
22	Spring	37	O-ring		

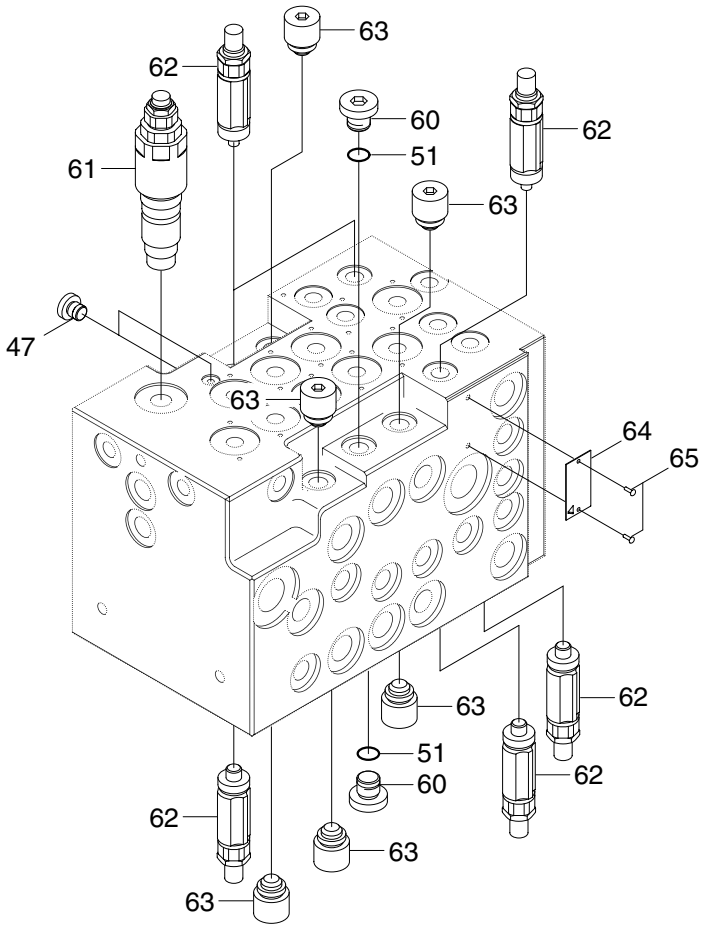
3) Structure(3/4)



7072MCV33

16	Plug	40	Plug	51	O-ring
17	Check valve	41	Restrictor plug	52	O-ring
18	Check valve spring	42	Coin type filter	57	Plug
36	Plug	43	Check valve	58	Plug
37	O-ring	44	Check valve spring	59	O-ring
38	O-ring	45	Plug		
39	Back up ring	46	O-ring		

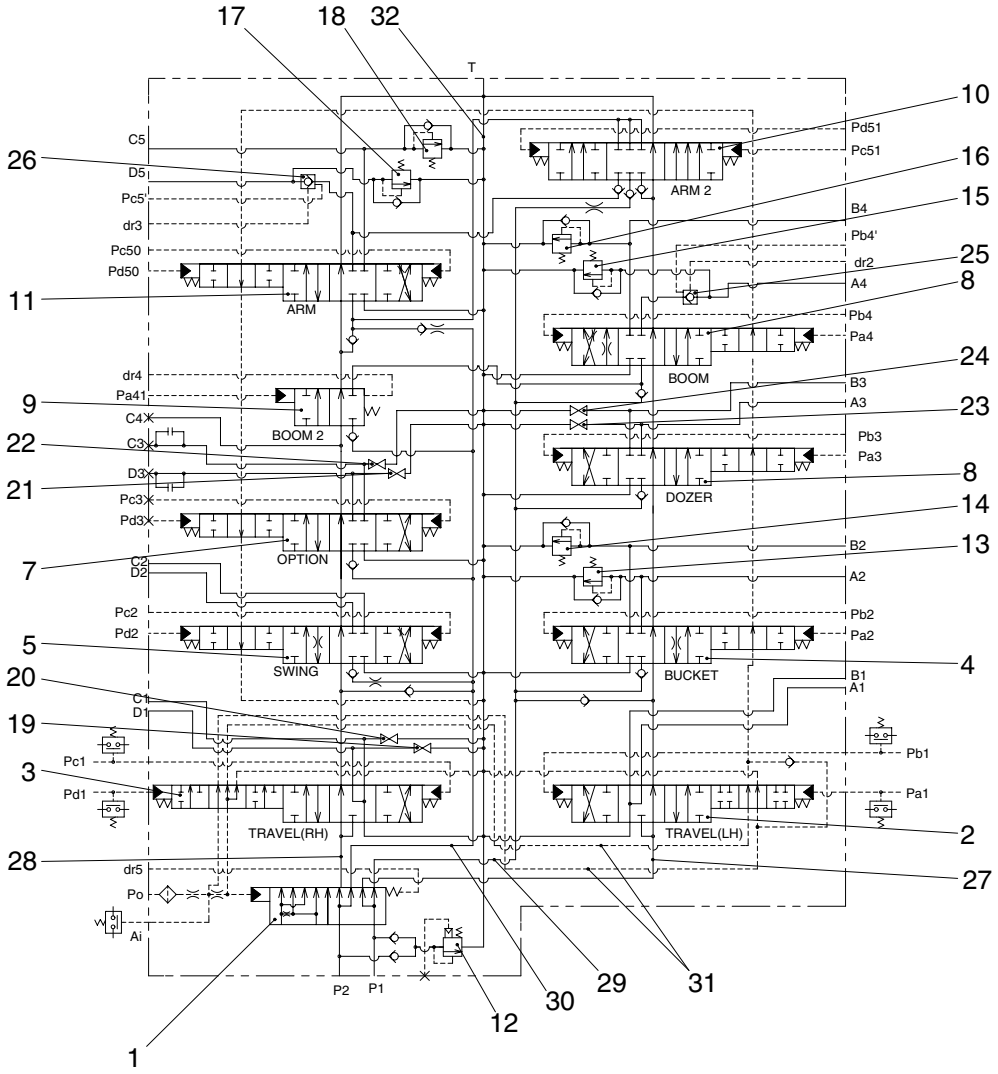
4) Structure(4/4)



7072MCV34

47 Plug
48 O-ring
51 O-ring
60 Plug
61 Main relief valve
62 Overload relief valve
63 Relief valve plug
64 Name plate
65 Pin

2. HYDRAULIC CIRCUIT DIAGRAM



7072MCV01

Ref. No.	Description	Ref. No.	Description
1	Spool - Straight travel	17	Overload relief valve
2	Spool - Travel left	18	Overload relief valve
3	Spool - Travel right	19	Relief plug
4	Spool - Bucket	20	Relief plug
5	Spool - Swing	21	Relief plug
6	Spool - Dozer	22	Relief plug
7	Spool - Option	23	Relief plug
8	Spool - Boom	24	Relief plug
9	Spool - Boom2	25	Boom lock valve
10	Spool - Arm2	26	Arm lock valve
11	Spool - Arm	27	By - Pass(P1)
12	Main relief valve	28	By - Pass(P2)
13	Overload relief valve	29	Parallel passage(P1)
14	Overload relief valve	30	Parallel passage(P2)
15	Overload relief valve	31	Pilot signal passage
16	Overload relief valve	32	Tank passage

3. FUNCTION

1) CONTROL VALVE

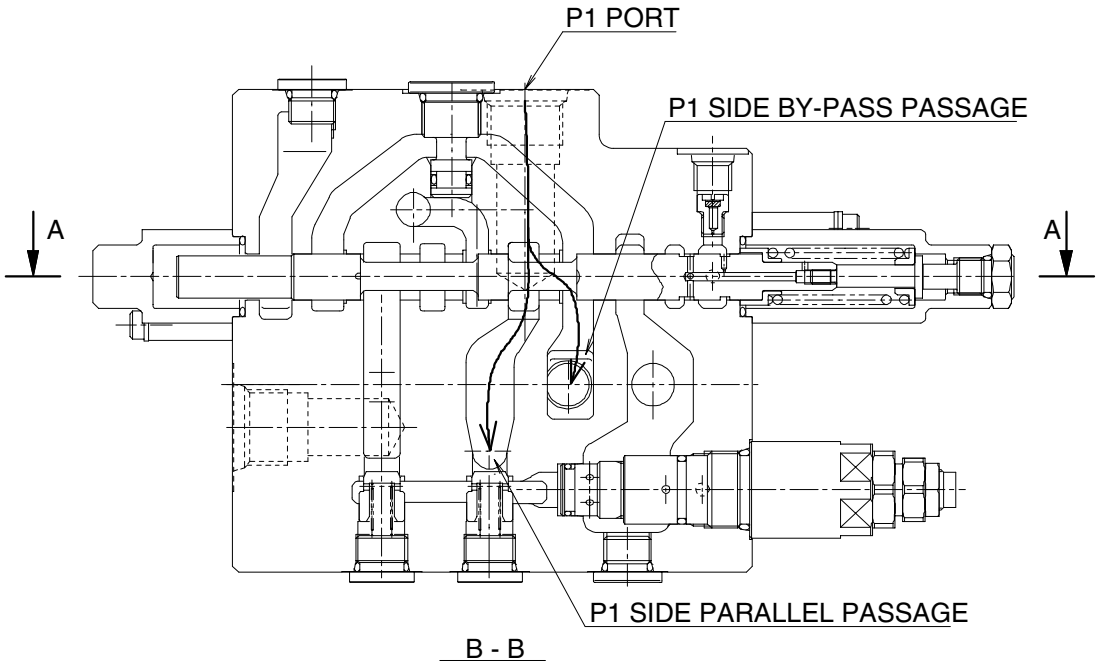
(1) Neutral

P1 : The oil from the pump flows into the control valve through the port P1, P1 and also into the left travel spool portion via the travel straight spool land.
As by-pass(P1) is not closed by the spool at the spool in neutral, the oil go through the by-pass of each spool of left travel → bucket → dozer → boom → arm2, and flows out the tank passage through the passage of the discharge portion body.

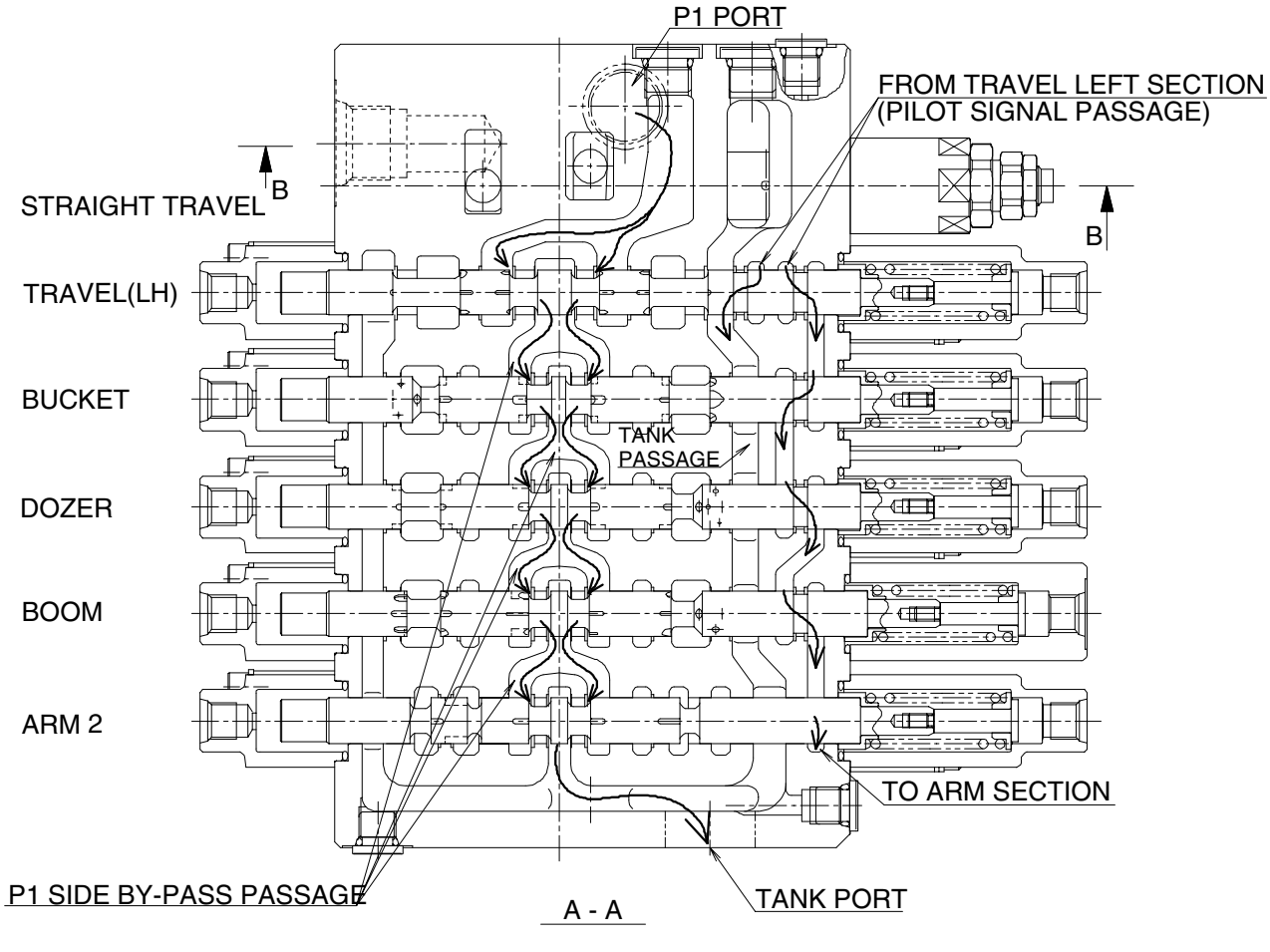
P2 : The oil from the pump flows into the control valve through the port P2, P2 and also into the right travel spool portion via the travel straight spool land.
As by-pass(P2) is not closed by the spool at the spool in neutral, the oil go through the by-pass of each spool of right travel → swing → option → boom2 → arm, and flows out the tank passage through the passage of the discharge portion body.

P0 : The oil from the pump flows into the control valve through the port P0, and further into the pilot signal passage via the filter and orifice in the supply portion.
At the spool neutral, it flows from travel spool(LH/RH) portion to the tank passage through the passage in the travel spool(LH/RH).
Accordingly, the pilot signal passage pressure comes to be equal to the tank pressure, and the also the receiving pressure on the travel straight spool stays to be unswitched.

At neutral(P1)

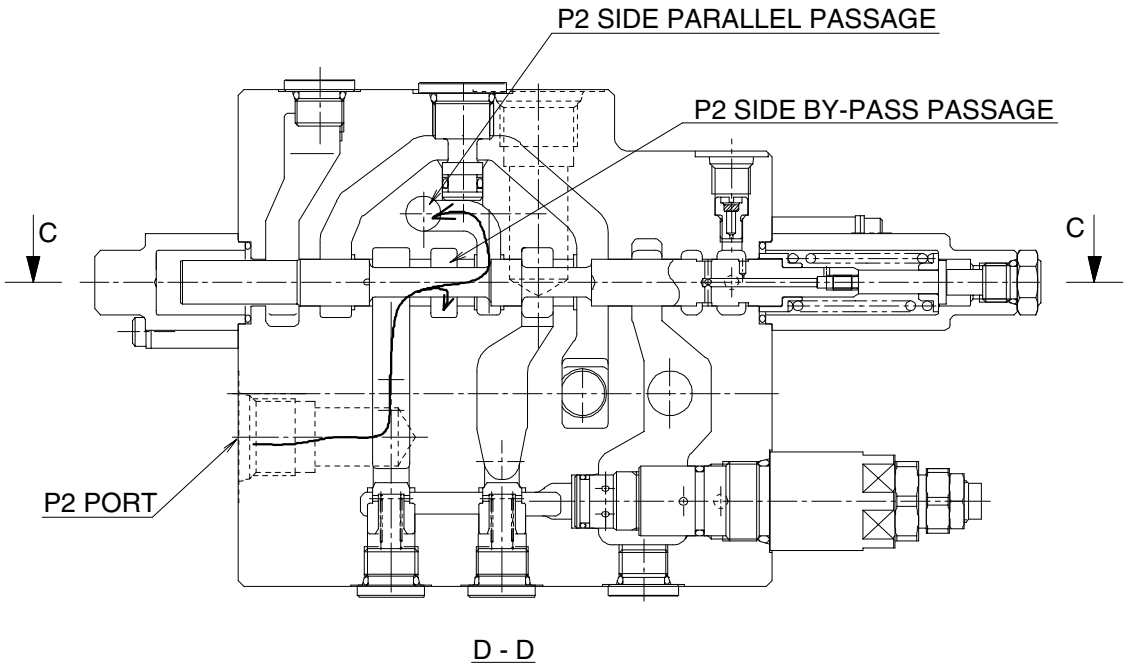


7072MCV02

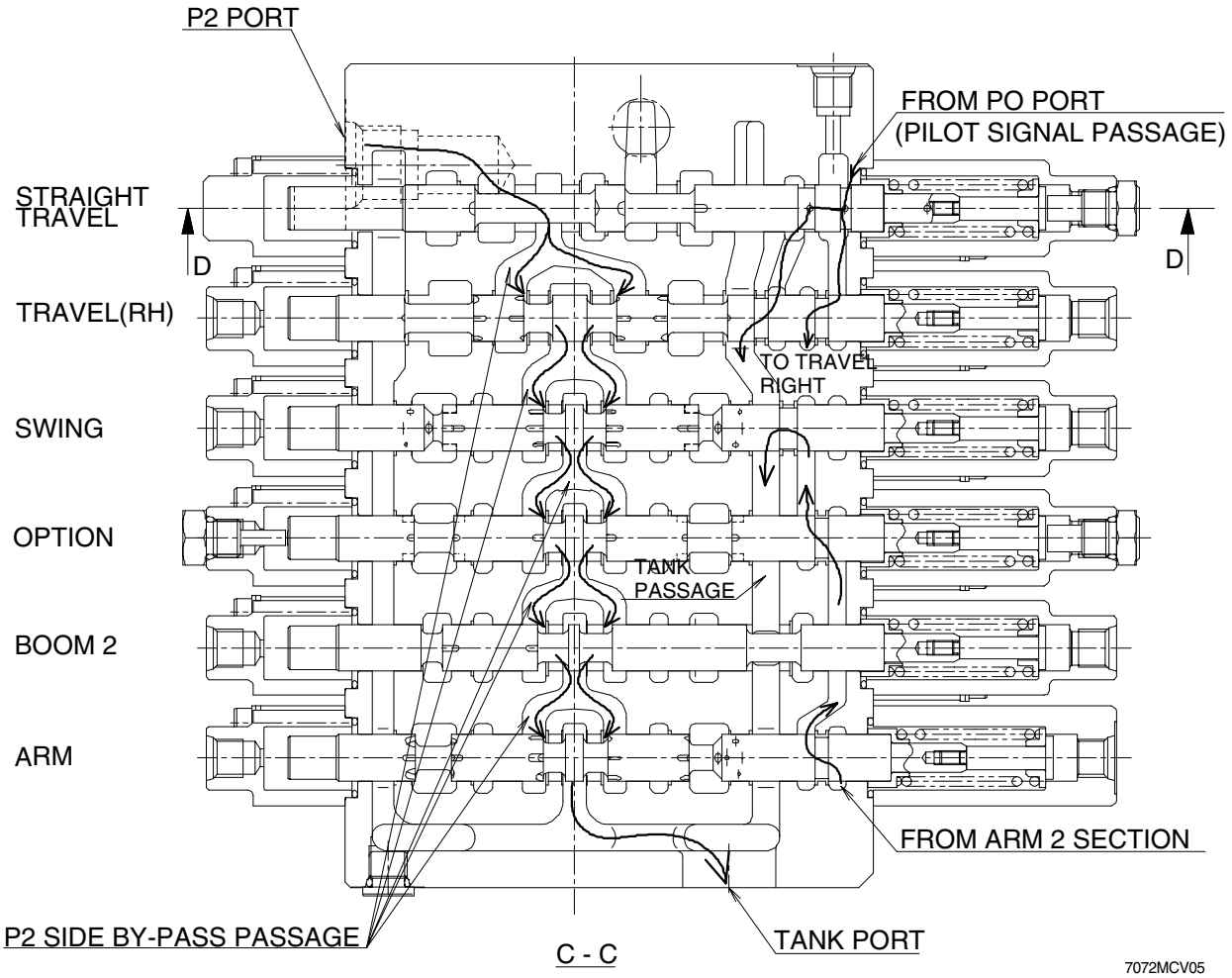


7072MCV03

At neutral(P2)



7072MCV04



7072MCV05

(2) Operating of each section

Here, it represents and the operation of the boom(raise) and arm(dump & crowd) section is explained.

① Boom raise operation

With the boom raise operation, the pilot secondary pressure enters into the Pa40 port, and moves the spool for the boom operation. And with the movement of the spool, as the by-pass circuit is cut at the boom switching section, the oil is received through the P1 port flows into the parallel circuit on the boom switching section.

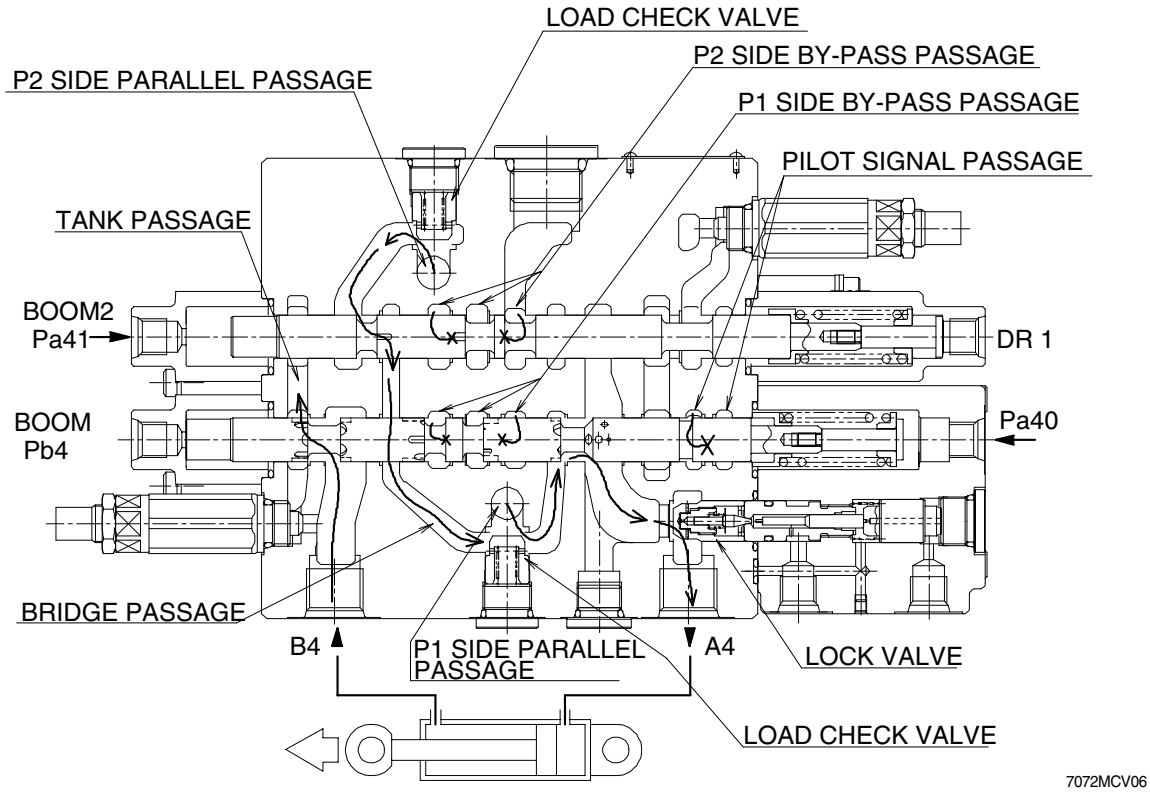
With the movement of the spool, as the circuit from the passage leading to the boom lock valve section to the bridge passage is opened, the oil entered in the parallel circuit passes through the load check valve on the boom switching section and flows into the A4 port through the bridge passage and open the boom lock valve(free flow) and is fed into the boom cylinder head side.

Moreover, secondary pilot pressure enters into Pa41 port of boom2 spool simultaneously, and moves boom2 spool. And with the movement of the boom2 spool, as the by-pass(P2) circuit is cut at the boom2 switching section, the oil received through the P2 port flows into the P2 parallel circuit on the boom2 switching section. The oil which flowed into P2 parallel passage in the boom2 parallel circuit on the boom2 switching section. The oil which flowed into P2 parallel passage in the boom2 section flows into the bridge passage of the boom section from the land of boom2 spool released by shift of boom2 spool. And P2 oil is fed into the boom cylinder head side.

On the other hand, the return oil from the boom cylinder rod side flows into the B4 port, and with the movement of the spool the oil flows out into the tank passage.

The oil from the port P0 flows to the pilot signal passage through the orifice.

So the oil in the pilot signal passage flows from the travel section to the tank passage, the pilot signal pressure becomes to equal to the tank pressure, therefore the travel straight spool is not switched.



② Arm crowd operation

With the arm crowd operation, the pilot secondary pressure enters into the Pc50 port, and moves the spool for the arm operation. And with the movement of the spool, as the by-pass circuit is cut at the arm switching section, the oil received through the P2 port flows into the parallel circuit on the arm switching section.

With the movement of the spool, as the circuit from the passage leading to the bridge passage is opened, the oil entered in the parallel circuit passes through the load check valve on the arm switching section and flows into the D5 port through the bridge passage and is fed into the arm cylinder rod side.

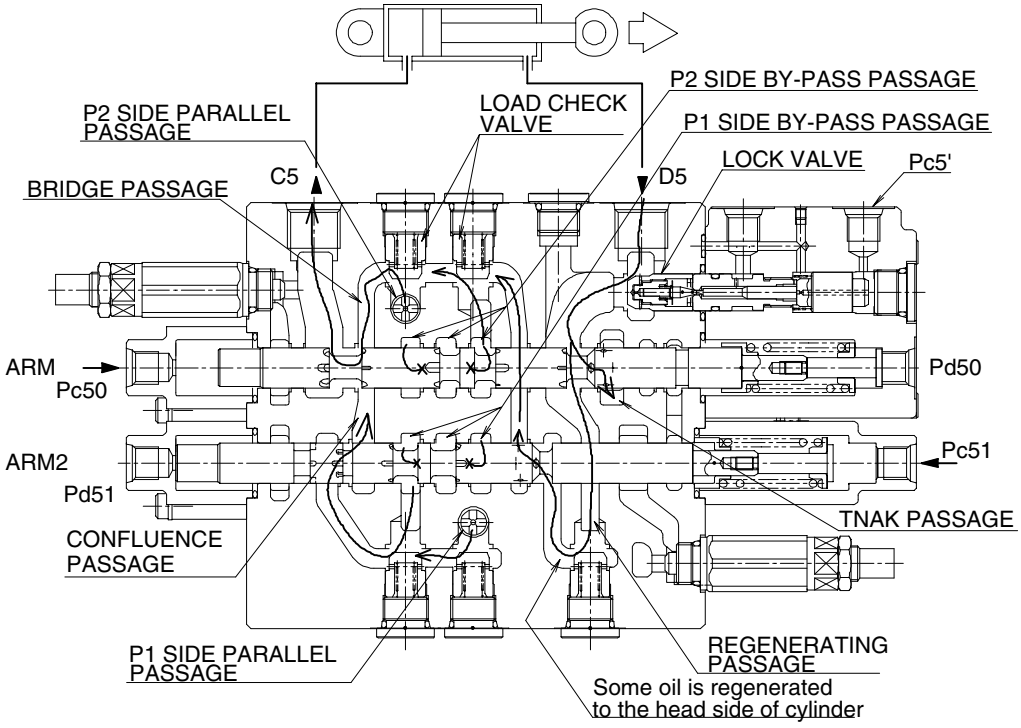
Moreover, secondary pilot pressure enters into Pc51 port of arm2 spool simultaneously, and moves arm2 spool. And with the movement of the arm2 spool, as the by-pass(P1) circuit is cut at the arm2 switching section, the oil received through the P1 port flows into the arm confluence passage through the check valve in the arm2 switching section. The oil which flowed into arm confluence passage in the arm2 section flows into the bridge passage of the arm section from the land of arm2 spool released by shift of arm2 spool. And P1 oil is fed into the arm cylinder head side.

On the other hand, secondary pilot pressure enters into Pc5', port of arm lock valve simultaneously, so arm lock valve is released.(Refer to "ACTUATION OF LOCK VALVE, RELEASING" page(2-23). And the return oil from the arm cylinder rod side flows into the D5 port, and with the movement of the spool some of the oil flows out into the tank passage through the meter-out orifice of the arm spool.

The rest of the oil flows to the bridge passage through the regenerating check valve, regenerating land of the arm2 spool and into the port C5. Accordingly, in this case, the arm cylinder extends the rod to start crowding, and further, the supply flow to the arm cylinder increased by the regeneration by which the cylinder moves faster.

The oil from the port P0 flows to the pilot signal passage through the orifice.

So the oil in the pilot signal passage flows from the travel section to the tank passage, the pilot signal pressure becomes to equal to the tank pressure, therefore the travel straight spool is not switched.



③ Arm dump operation

With the arm dump operation, the pilot secondary pressure enters into the Pd50 port, and moves the spool for the arm operation. And with the movement of the spool, as the by-pass circuit is cut at the arm switching section, the oil received through the P2 port flows into the parallel circuit on the arm switching section.

With the movement of the spool, as the circuit from the passage leading to the arm lock valve section to the bridge passage is opened, the oil entered in the parallel circuit passes through the load check valve on the arm switching section and flows into the C5 port through the bridge passage and open the arm lock valve(free flow) and is fed into the arm cylinder rod side.

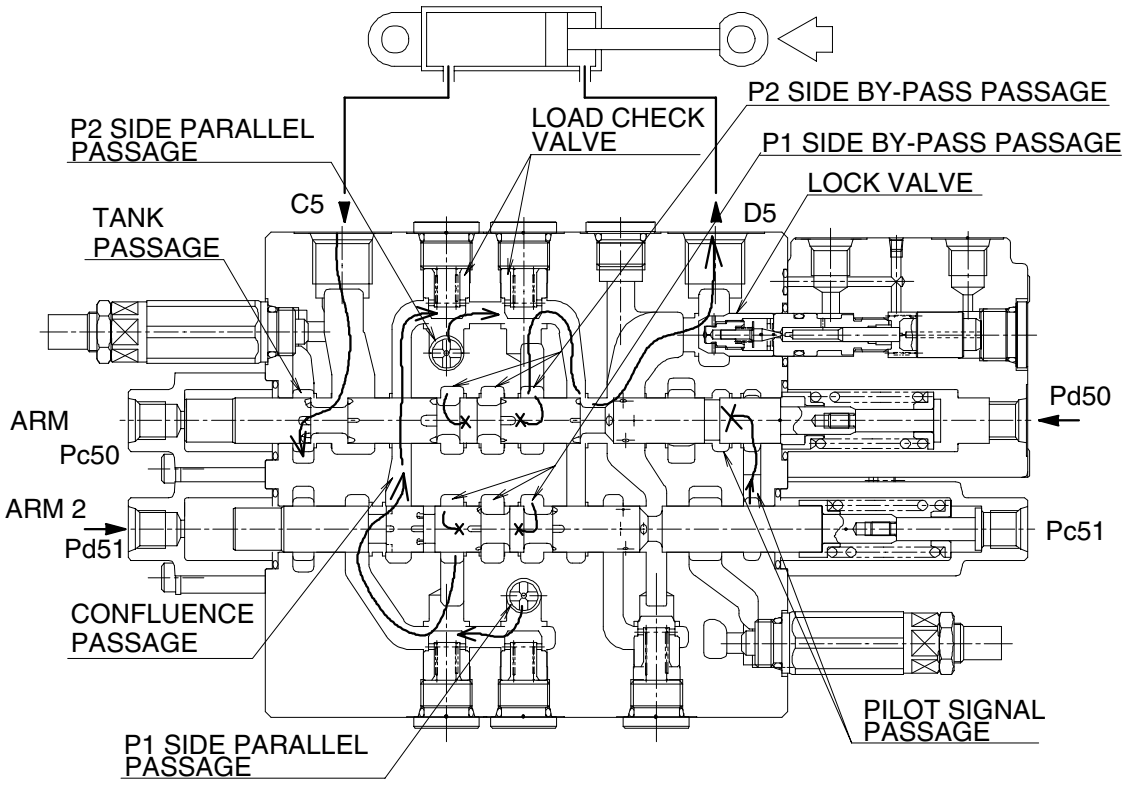
Moreover, secondary pilot pressure enters into Pd51 port of arm2 spool simultaneously, and moves arm2 spool. And with the movement of the arm2 spool, as the by-pass(P1) circuit is cut at the arm2 switching section, the oil received through the P1 port flows into the arm confluence passage through the check valve in the arm2 switching section. The oil which flowed into arm confluence passage in the arm2 section flows into the bridge passage of the arm section from the land of arm2 spool released by shift of arm2 spool. And P1 oil is fed into the arm cylinder rod side.

On the other hand, the return oil from the arm cylinder head side flows into the C5 port, and with the movement of the spool the oil flows out into the tank passage.

The oil from the port P0 flows to the pilot signal passage through the orifice.

So the oil in the pilot signal passage flows from the travel section to the tank passage, the pilot signal pressure becomes to equal to the tank pressure, therefore the travel straight spool is not switched.

Also about other switching sections(travel, swing, bucket, etc.), there is only no spool like a boom2 or an arm2, and an operation is the same.



7072MCV08

(3) Travel straight function

Straight-travel valve is the valve for keeping traveling straight, when boom, arm, bucket, swing, dozer, or option is operated at the time of traveling.

When any of the both travels and arm, boom, bucket, swing, dozer, or option is switched at the state of the pilot pressure supplied in the port P0, the pilot signal passage is closed from the tank passage, and the pilot pressure comes to act in the pilot passage.

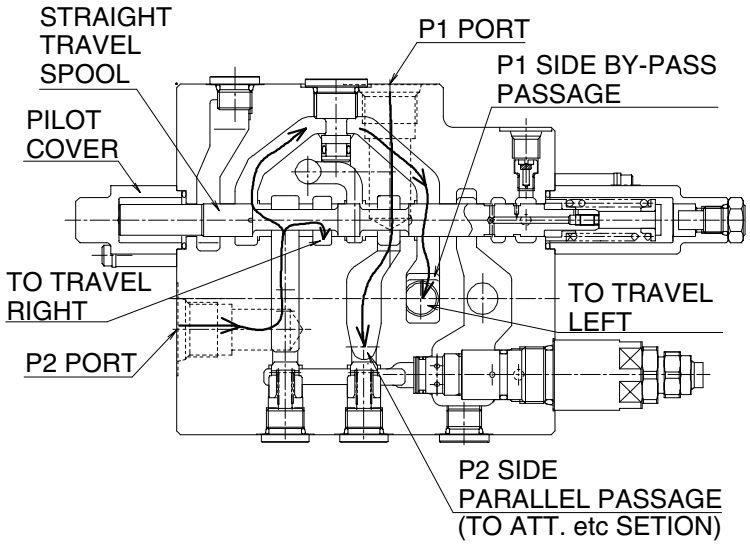
Therefore, the pilot pressure acts in the spring room of the straight travel spool, and the spool against the spring moves until to contact to the pilot cover of the opposite side.

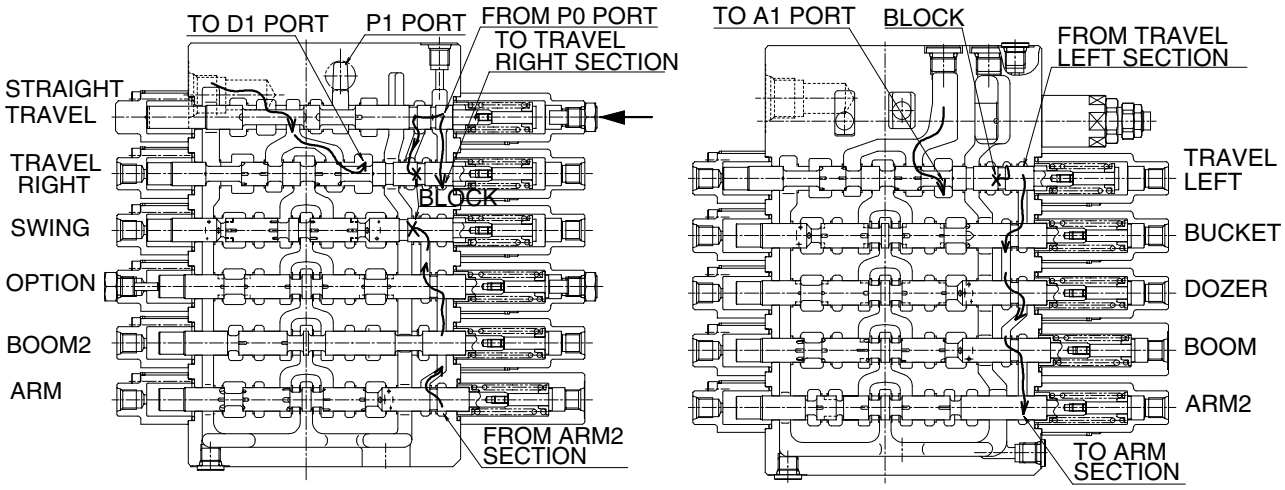
When the straight travel spool is switched, the oil pressure from P1 is led to the each attachment switching section through the P1 and P2 parallel passage.

On the other hand, the oil from P2 is supplied to the both travel section through P1 and P2 bypass passage.

Therefore, when attachments(boom or arm...etc.) is switched at the time of both travels, since the oil of P2 mainly flows to both travels, and the oil of P1 mainly flows to attachments, it can keep traveling straight.

The following figure expresses the state when operating the both travels and the swing section as reference.





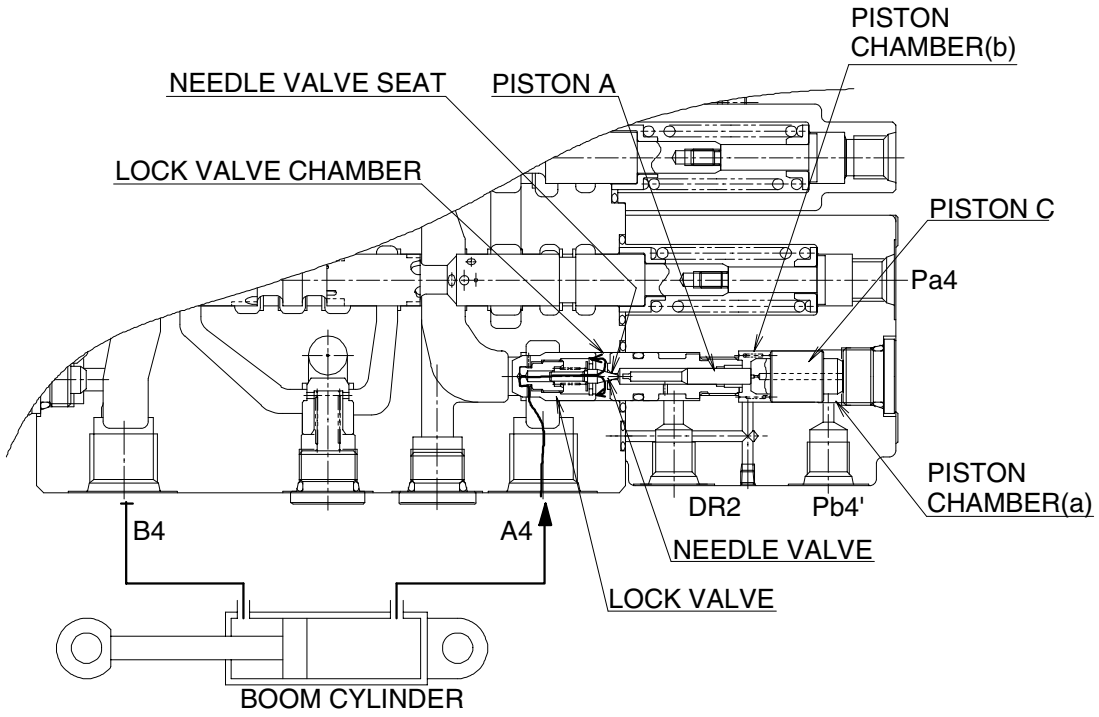
7072MCV09A~C

2) ACTUATION OF LOCK VALVE(BOOM AND ARM)

(1) Holding

In the condition where the spool for booms on the neutral position, pilot piston chamber(A) is connected to the drain passage through pilot port(Pb4') used to release the lock valve, and piston chamber(b) is also connected to the drain passage through drain port(DR2).

Therefore, piston(C) must be held in the condition shown in the figure. Then the retaining pressure of the boom cylinder acts on the lock valve chamber as shown in the figure, and pushes the needle valve against the seat section, preventing the leakage on the boom cylinder head side. Consequently the movement of the boom cylinder due to the leakage is also prevented.



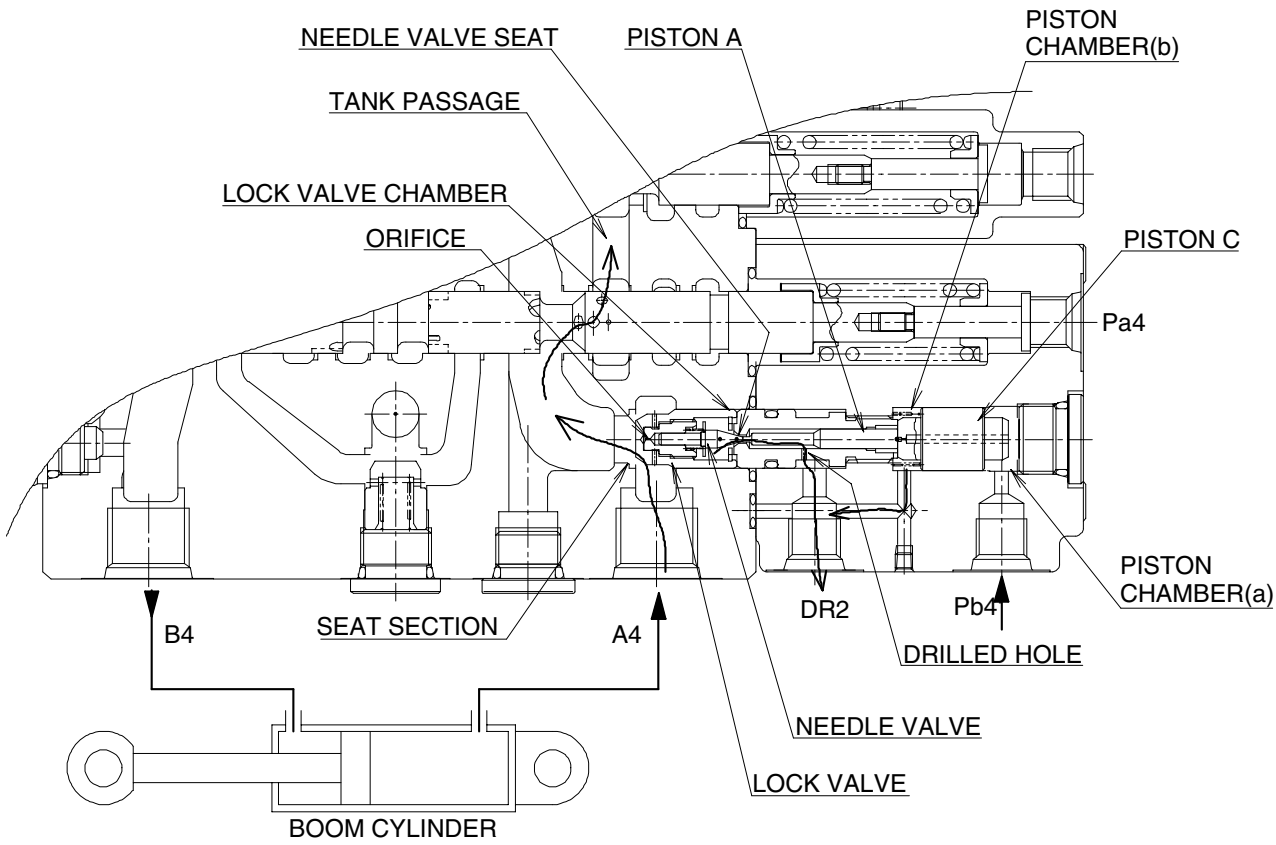
7072MCV10

(2) Releasing

When the pilot pressure acts on pilot port(Pb4') for releasing of lock valve, piston(C) moves leftward, and pushes and opens the needle valve through piston(A).

Then the return oil from the boom cylinder flows through the orifice of the lock valve, lock valve chamber and drilled hole, and flows into the tank passage through the notch of the spool for boom.

The pressure of the lock valve chamber lowers because the needle valve opens and the return oil from the boom cylinder opens the lock valve. Consequently the return oil from the boom cylinder flows into the tank passage through the notch of the spool for boom.



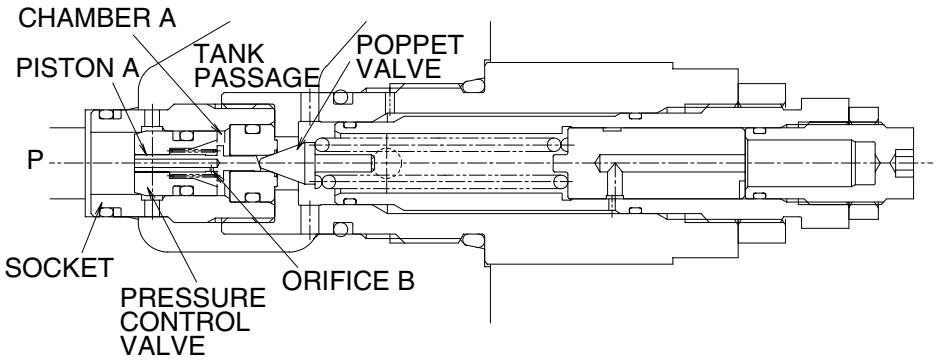
7072MCV11

2) ACTUATION OF RELIEF VALVE

(1) Main relief valve

① Relief function

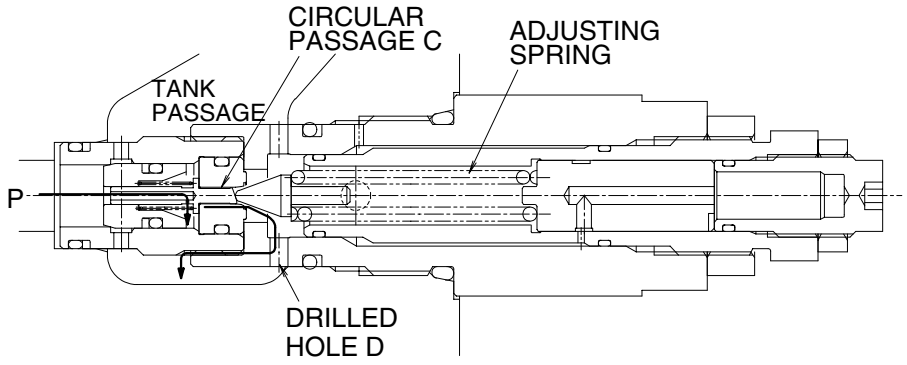
The pressure passes through the inside of piston placed in the pressure control valve(parent valve) and orifice B and is led to chamber A, while the pressure control valve is seated on the socket also on the body securely.



7072MCV12

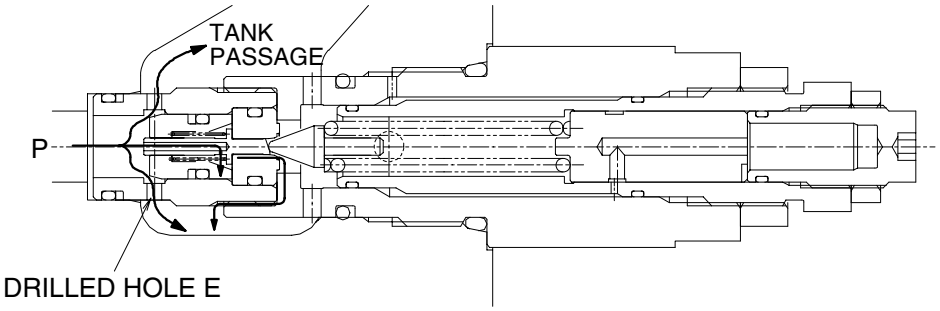
When the pressure of port P reaches to the set pressure by spring, poppet valve leaves from the seat.

The oil flows through inside of piston A → orifice B → chamber A → circular passage C → drilled hole D and outer side socket, and flows out to the tank passage.



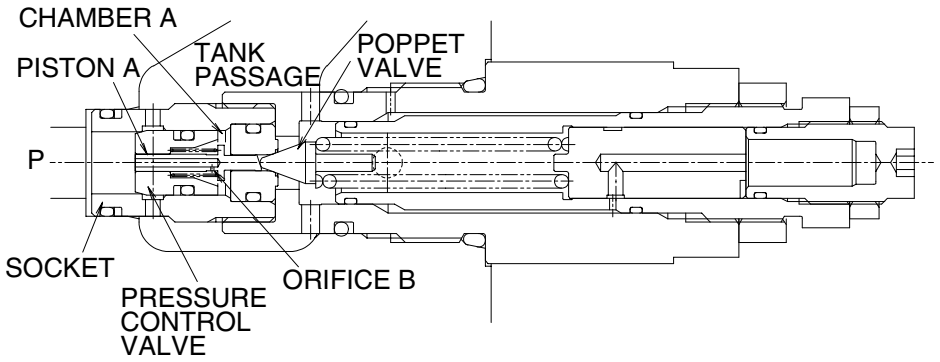
7072MCV13

As the pressure in chamber A drops by unseating of poppet valve, pressure control valve leaves from the seat, by which the oil in port P flows out to the tank passage through drilled hole E.



7072MCV14

When the pressure in port P falls to the set pressure by spring, poppet valve is re-seated by the spring, and the pressure in chamber A comes to equal to the port P, by which pressure control valve is re-seated on socket returning to the initial situation.

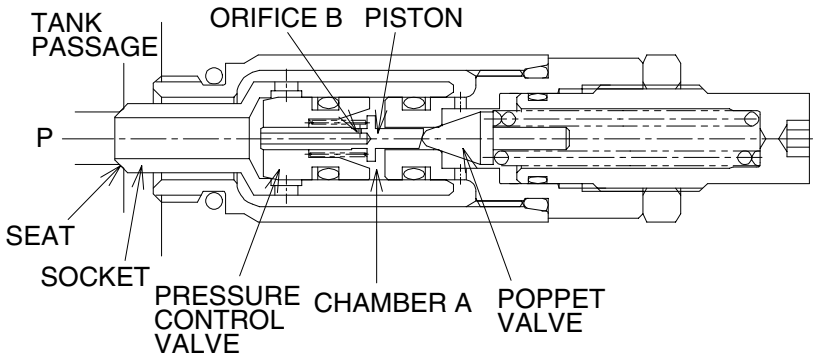


7072MCV12

(2) Overload relief valve

① Relief function

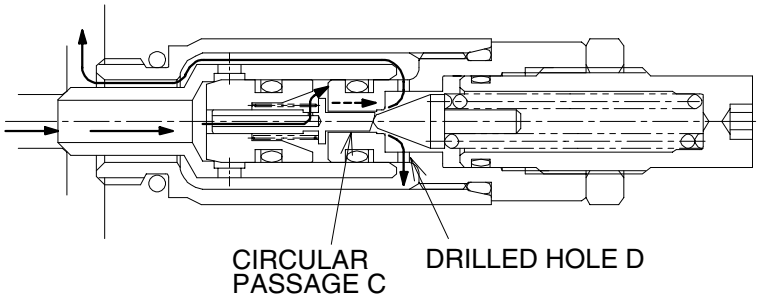
The pressure passes through the inside of piston in the pressure control valve(main valve) and orifice B and is led to chamber A, while the poppet valve is seated on the socket also on the body securely.



7072MCV16

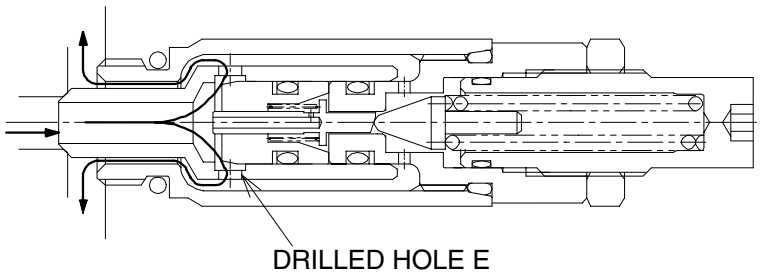
Then the pressure of port P reaches to the set pressure by spring, poppet valve leaves from the seat.

The oil flows through inside of piston → orifice B → chamber A → circular passage C → drilled hole D and outer side socket, and flows out to the tank passage.



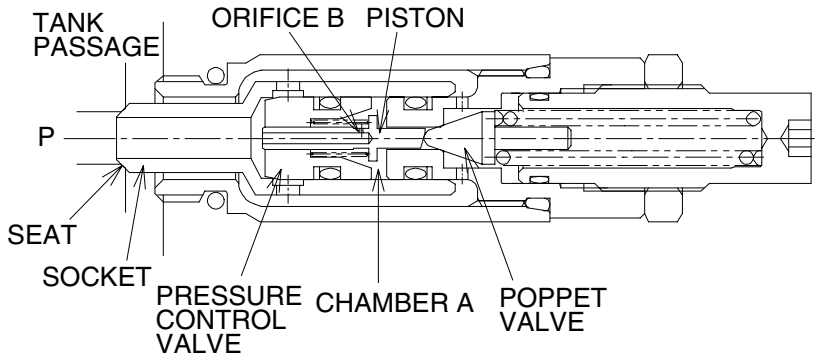
7072MCV17

As the pressure in chamber A drops by unseating of poppet valve, pressure control valve leaves from the seat, by which the oil in port P flows out to the tank passage through drilled hole E.



7072MCV18

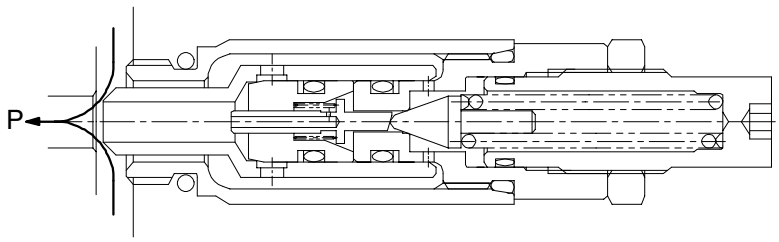
When the pressure in port P falls to the set pressure by spring, poppet valve is re-seated by the spring, and the pressure in chamber A comes to equal to the port P, by which pressure control valve is re-seated on socket returning to the initial situation.



7072MCV16

② Suction function

When the negative pressure is generated in port P, this valve supplies the oil from the tank passage. When the pressure in port P is less than the tank passage pressure, the push-up force acts on socket, by which socket is left from the seat, and the oil flows from the tank passage to port P.



7072MCV19