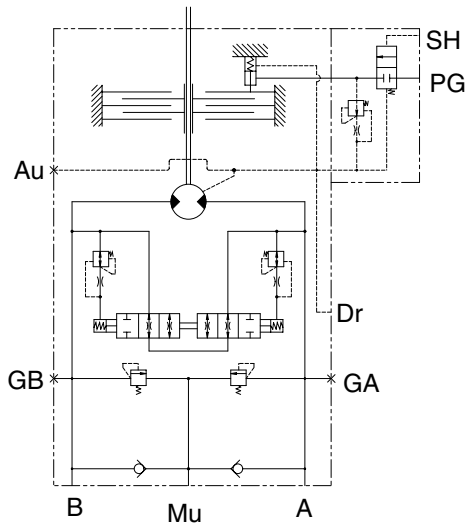
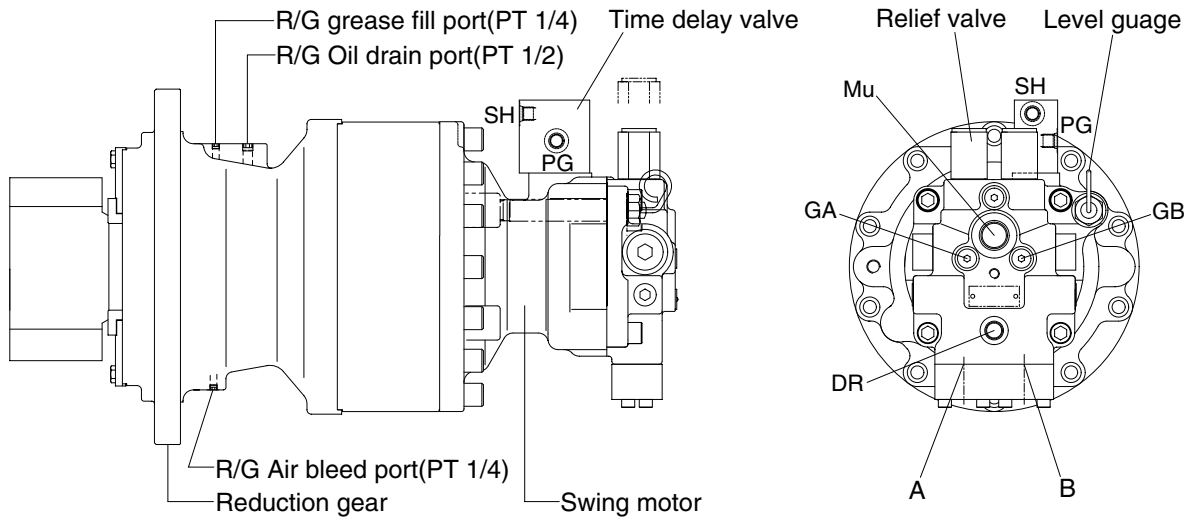


GROUP 3 SWING DEVICE

1. STRUCTURE

Swing device consists swing motor, swing reduction gear.

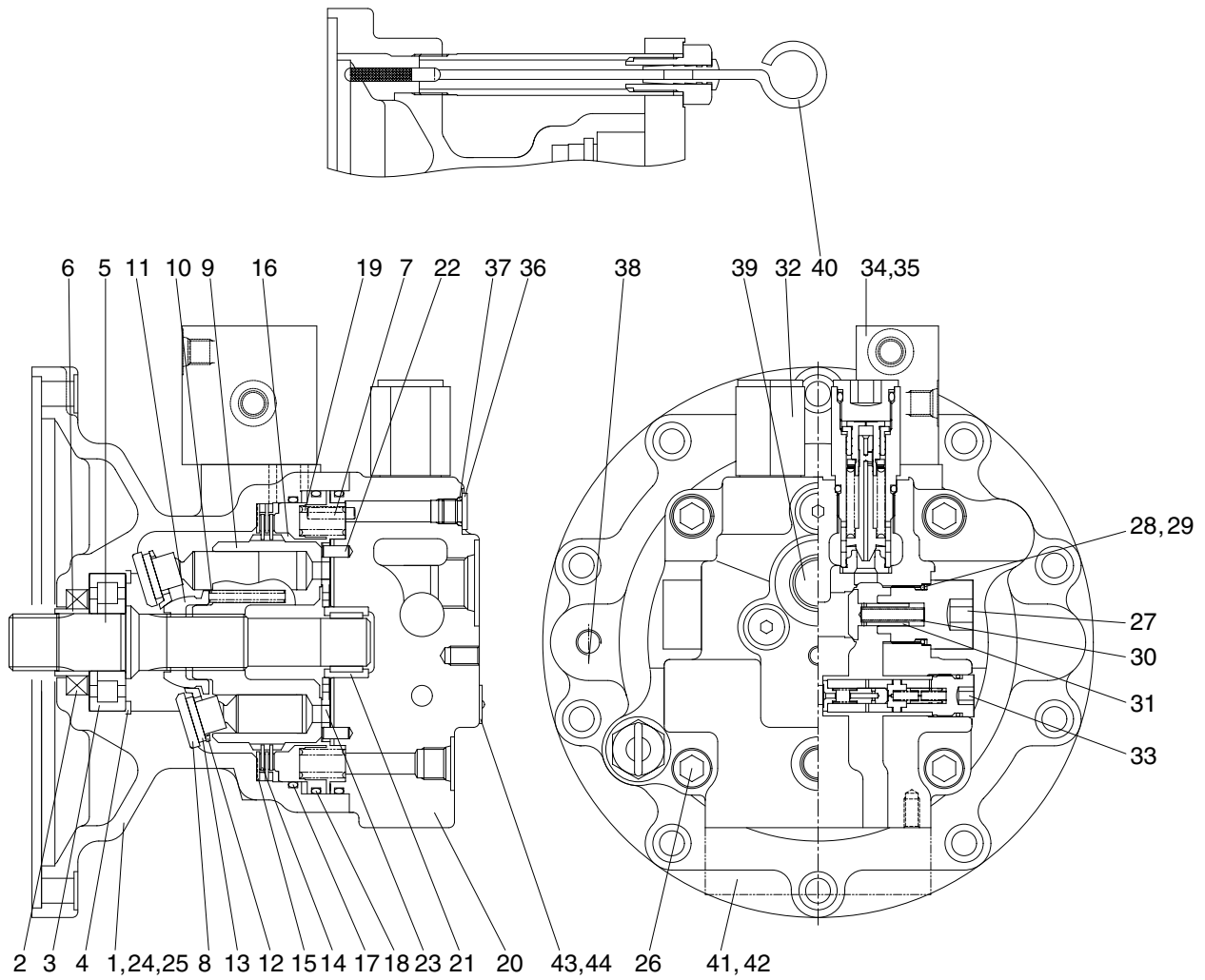
Swing motor include mechanical parking valve, relief valve, make up valve and time delay valve.



Port	Port name	Port size
A	Main port	PF 3/4
B	Main port	PF 3/4
Dr	Drain port	PF 1/2
Mu	Make up port	PF 3/4
SH	Brake release port	PF 1/4
PG	Stand by port	PF 1/4
GA, GB	Gage port	PF 1/4
Au	Air vent port	PF 1/4

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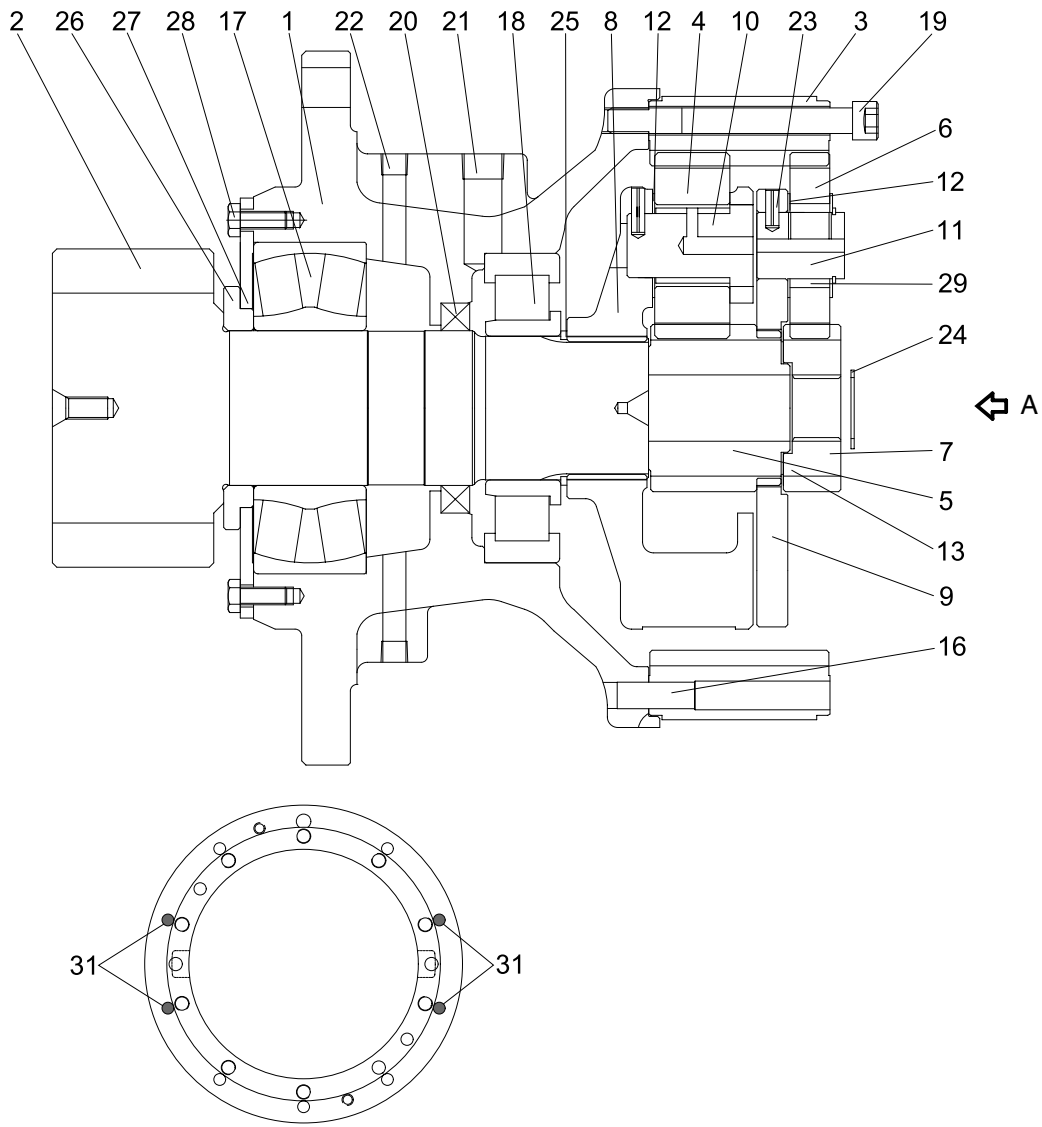
1) SWING MOTOR



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- | | | | | | |
|----|-----------------|----|----------------|----|---------------------|
| 1 | Body | 17 | O-ring | 33 | Anti-rotating valve |
| 2 | Oil seal | 18 | O-ring | 34 | Time delay valve |
| 3 | Roller bearing | 19 | Spring | 35 | Wrench bolt |
| 4 | Snap ring | 20 | Rear cover | 36 | Plug |
| 5 | Shaft | 21 | Needle bearing | 37 | O-ring |
| 6 | Bushing | 22 | Pin | 38 | Plug |
| 7 | Pin | 23 | Valve plate | 39 | Plug |
| 8 | Shoe plate | 24 | O-ring | 40 | Level gauge |
| 9 | Cylinder block | 25 | O-ring | 41 | Flange |
| 10 | Spring | 26 | Wrench bolt | 42 | O-ring |
| 11 | Ball guide | 27 | Plug | 43 | Name plate |
| 12 | Set plate | 28 | Back up ring | 44 | Rivet |
| 13 | Piston assembly | 29 | O-ring | 45 | Plug |
| 14 | Friction plate | 30 | Spring | 46 | O-ring |
| 15 | Plate | 31 | Check | 47 | O-ring |
| 16 | Brake piston | 32 | Relief valve | 48 | Back up ring |

2) REDUCTION GEAR



VIEW A

1407A2SM03

1	Casing	11	Pin No.1	22	Plug(A)
2	Drive shaft	12	Thrust washer(B)	23	Spring pin
3	Ring gear	13	Side plate No. 1	24	Stop ring
4	Planet gear No.2	16	Knock pin	25	Stop ring
5	Sun gear No.2	17	Sph roller bearing	26	Spacer
6	Planet gear No.1	18	Cyl roller bearing	27	Cover plate
7	Sun gear No.1	19	Socket head bolt	28	Bolt
8	Carrier No.2	20	Oil seal	29	Needle cage
9	Carrier No.1	21	Plug(B)	31	Rubber cap
10	Pin No.2 assembly				

2. PRINCIPLE OF DRIVING

2.1 Generating the turning force

The high hydraulic supplied from a hydraulic pump flows into a cylinder(9) through valve casing of motor(20), and valve plate(23).

The high hydraulic is built as flowing on one side of Y-Y line connected by the upper and lower sides of piston(13).

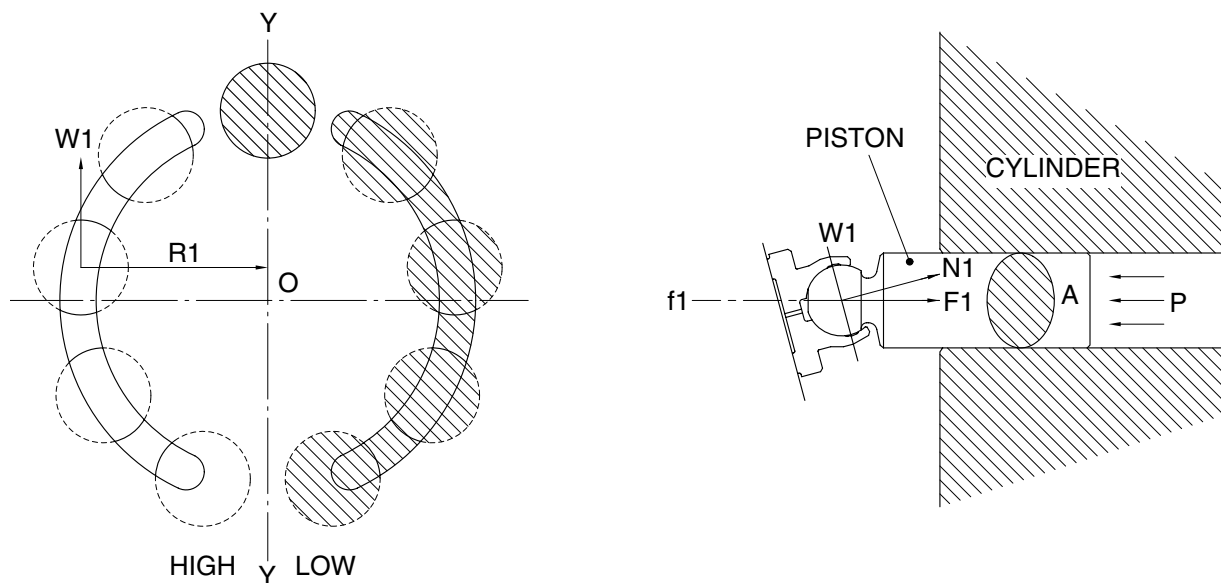
The high hydraulic can generate the force, $F1=P \times A$ (P : supplied pressure, A : water pressure area), like following pictures, working on a piston.

This force, $F1$, is divided as $N1$ thrust partial pressure and $W1$ radial partial pressure, in case of the plate of a tilt angle, α .

$W1$ generates torque, $T=W1 \times R1$, for Y-Y line connected by the upper and lower sides of the piston as following pictures.

The sum of torque ($\Sigma W1 \times R1$), generated from each piston(4~5 pieces) on the side of a high hydraulic, generates the turning force.

This torque transfers the turning force to a cylinder(9) through a piston; because a cylinder is combined with a turning axis and spline, a turning axis rotates and a turning force is sent.



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2.2 Working of relief valve

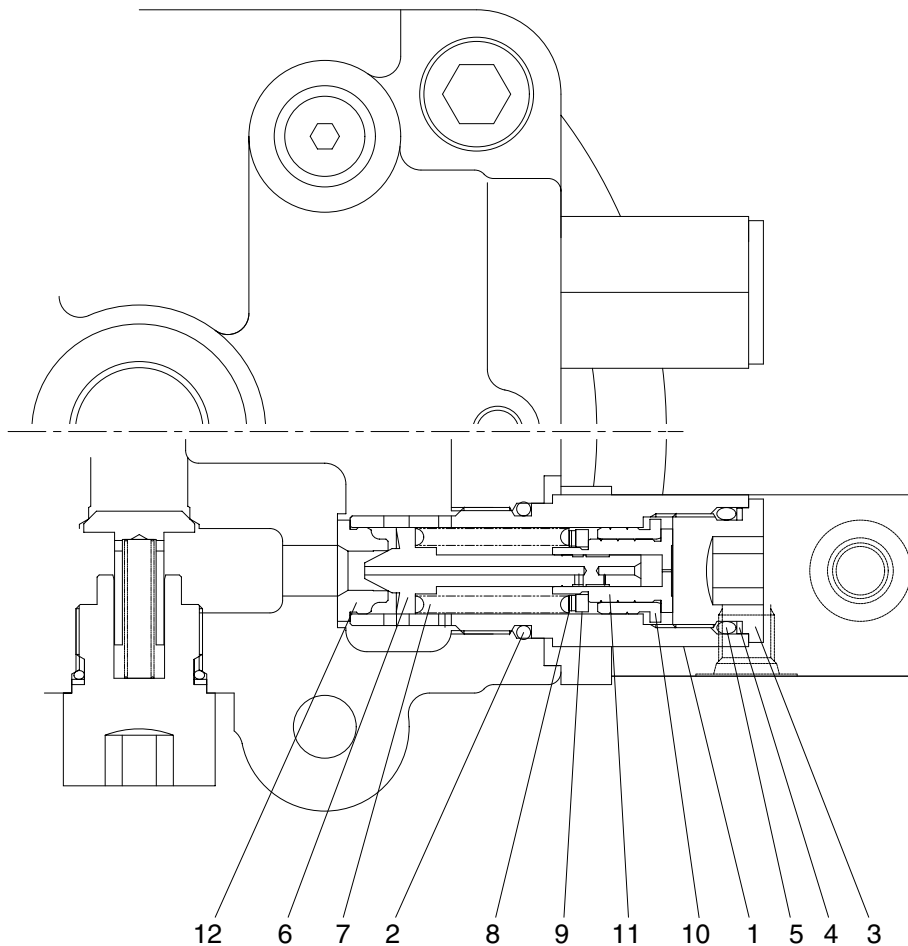
Relief valve carries on two functions of followings

- 1) It standardizes a pressure in case of driving a hydraulic motor; bypasses an extra oil in a motor inlet related to acceleration of an inertia to an outlet.
- 2) In case of an inertia stopped, it forces an equipment stopped, according to generating the pressure of a brake on the projected side.

Once high pressure oil supplied to P port, the inside pressure of shock less spool increases.

If the pressure is stronger than the power of the spring, it will be standardized.

In case of driving a hydraulic motor, it standardizes a pressure. And in the event of stopping an inertia, it forces an equipment stopped, according to generating the pressure of break on the projected side.



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2.3 Working of parking brake

1) Parking brake OFF

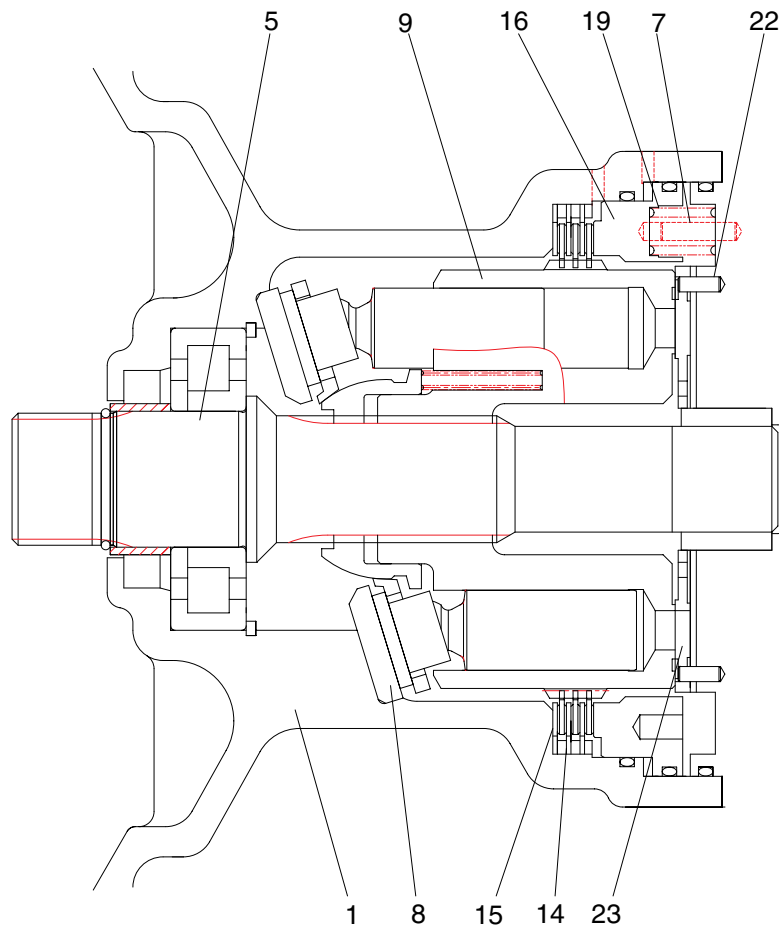
If swing control level sets the swing position, pilot oil will moves swing spool and also it will be supplied to SH port of time delay valve of swing motor through shuttle valve against the power of the spring. The pressure of the spring switches spool to left and moves awaiting PG port oil of delay valve to parking position. After then it moves up parking piston pressing frictional plate to release parking brake.

2) Parking brake ON

If swing control level sets neutrality, swing pilot supplied to SH port of time delay valve through shuttle valve will be stopped.

According to this process, spool is returned by the power of the spring and the pressure of PG port of time delay valve which is always standing by release valve is stopped to parking piston.

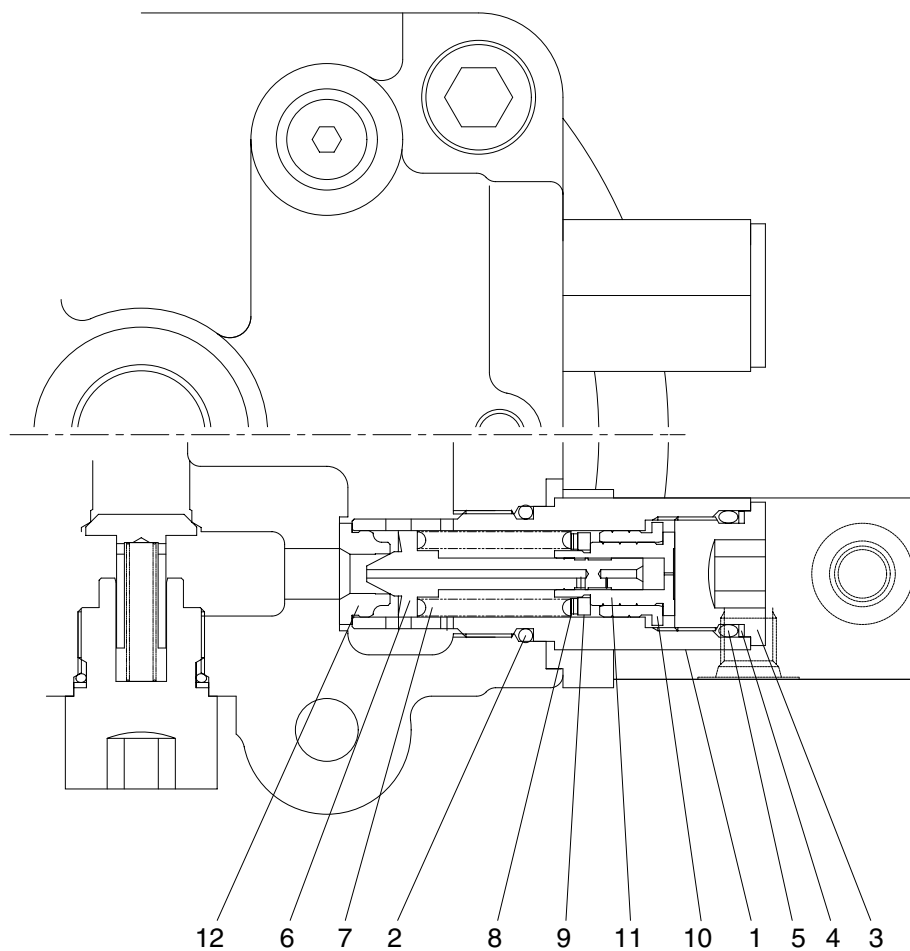
In that time, orifice in spool stops leaking out working oil to create 6 second time delay in order to prevent the impact which may be happened at the moment of sudden stop of swing brake.



2.4 Make up check valve

In case of rapid rotation which is faster than the amount of supplied oil to swing motor entrance, mounted make up check valve supplies working oil to prevent cavitation according to the shortage of supplying oil.

In the event of sudden stop of the operating excavator, supplying working oil to entrance of swing motor is stopped. However, by means of inertia of rotation, swing motor will be stopped after more rotation. In that time, make up check valve is opened and supplies working oil according to the pressure of hydraulic oil line to the entrance of the motor, which is lower than working oil awaiting in a make up check valve port.



220072SM10

2.5 Working description of plowing switch

The capacity of driving motor is changeable depending on the change of plowing angle of the plate. That is operated by a plowing valve.

1) The pressure of external pilot : when $P_i = 0$ (large plowing)

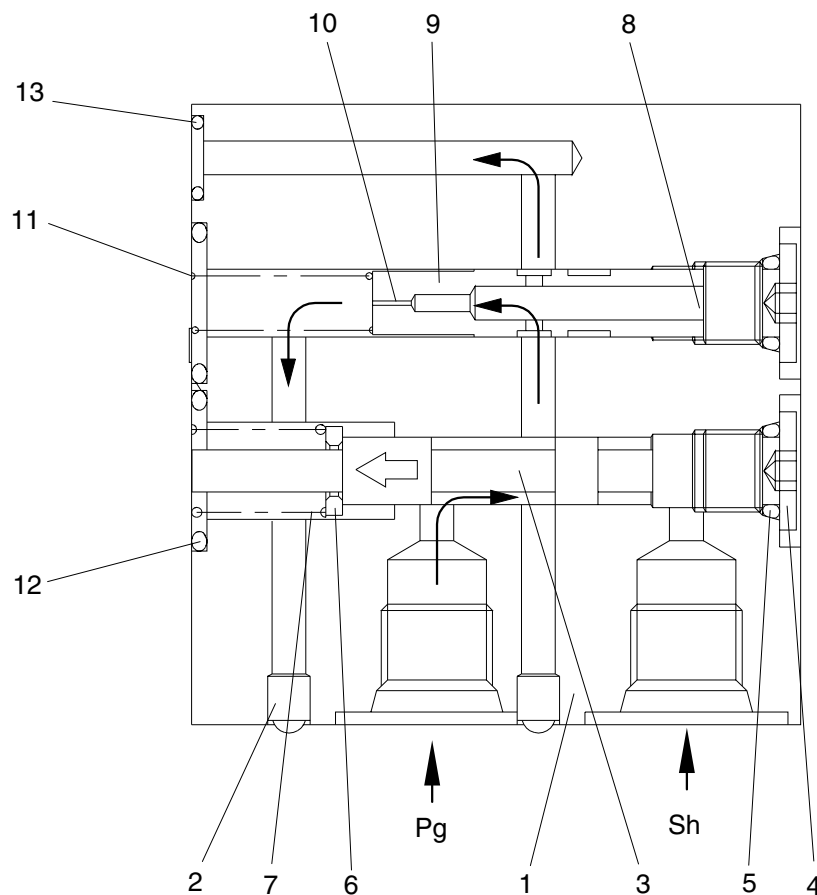
A high pressure oil operated at a motor works on port P of a switching valve, by the high pressure selecting function installed in valve casing.

Spool assembled at the switching part of plowing is adhered to plug by spring.

So the high pressure oil of port P flows to port Sb.

The pressure of this oil can be operated from port Sb to room A, through valve casing and the path A' of shaft casing. An oil in room B flows into a drain line through the path of $B \rightarrow S_a$.

Plowing piston moves to the right side because of the high pressure oil; the plate moves to the place adhered to stopper, based on the shaft "0" ; it is fixed.



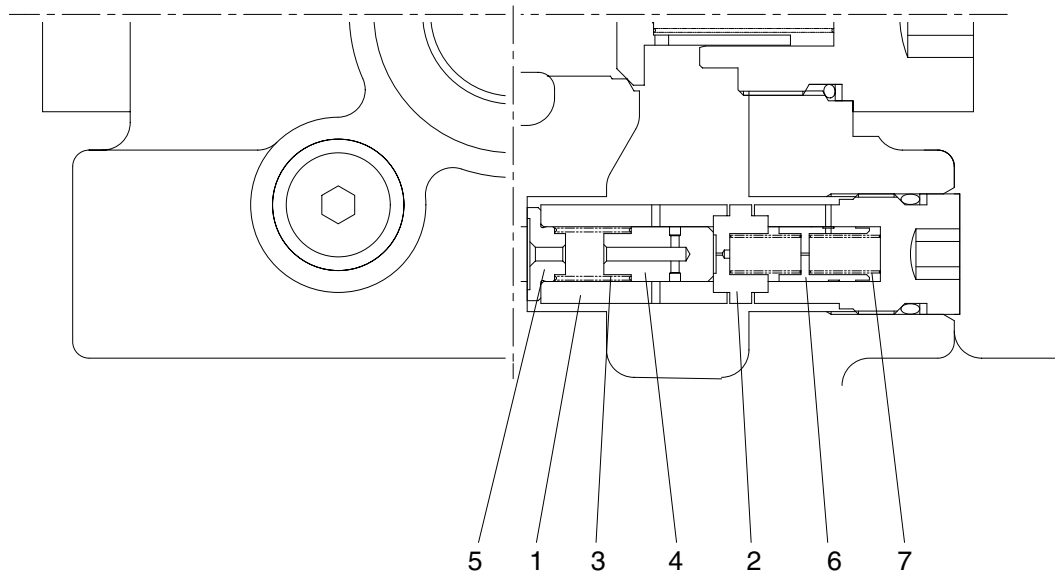
220072SM12

2.6 Working of anti-inversion valve

In the event of swing motor operates switch part to drive and stop the swing part. By the action of pump on motor, there is break on both-side of port because of the block on both sides.

Swing part is stopped by pressure of brake (in order words, 4-5 times of inversion)

Under the operating condition, the side of anti-inversion blocks off both ports but bypassing compressed oil which is blocked in processing of anti-inversion fixed time and amount to inverse port, prevent increasing pressure of motor and decrease inversing action.



220072SM13