36. Mount the thrust washer, gear B2, needle and thrust washer on the carrier 2 and fix them with the snap ring.
   • Be careful not to expand the snap ring more than necessary.
   • Install the snap ring with its edge positioned upside (cover side).

37. Install the carrier 2 assembly in the housing.

38. Fit the O-ring to the housing.
   • Apply grease to the O-ring.

39. Install the ring on the cover.
   • Apply grease to secure.
40. Supply 330 mL of lubricant and mount the cover.
   • Be careful not to damage the O-ring.
   • Align the character “DRAIN” on the cover to the notch on the housing.

41. Fit the snap ring.
   • Put the blade of a screwdriver on the snap ring end and push it into position.

42. Wind the seal tape around the plugs and mount it on the cover.
   Plug: 46~51 N·m
1. X-ring
2. O-ring
3. O-ring
4. Shaft Face Seal
5. Inner Face Seal
6. Outer Face Seal
7. O-ring
8. O-ring
9. O-ring
10. O-ring
11. O-ring
12. Bearing Housing
13. Flange Mounting
14. Pinion Gear
15. Plug
16. Brake Piston
17. Ring
18. Snap Ring
19. Friction Disc
20. Center Disc
21. Spring
22. Front Bearing
23. Snap Ring
24. Snap Ring
25. Rear Bearing
26. Cap Screw
27. Geroller
28. Drive Gear
29. Valve Plate
30. Valve Drive Gear
31. Valve
32. Balancing Ring
33. Spring
34. Pin
35. Valve Housing
36. Ball
37. Plug
38. Spring
39. Plug
40. Bolt
41. Collar
Brake Valve

1. Plunger
2. Piston
3. Spring
4. Timer Orifice
5. Damper Orifice
OPERATION

Hydraulic Motor 1.

High pressure hydraulic oil flowing in the main port (1) enters the geroller (4) via the valve (2) and valve plate (3). The geroller (4) consists of a stator (5) and rotor (6), and the stator (5) contains 7 rollers inside it and is fixed to the housing. The inner rotor has 6 external gears. For this reason, 7 chambers are formed inside the geroller. The rotor (6) is constructed so that it orbits around inside the stator.

On the other hand, there are 12 holes in the valve (2) for hydraulic oil, with high pressure hydraulic oil or returning oil flowing through half of these holes at a time. In the same way, there are oil holes made in the valve plate (3) in 7 places. These oil holes connect with the 7 chambers in the geroller (4). Thus, since the 7 oil holes in the valve plate (3) connect with some of the 12 oil holes in the valve (2), a circuit is formed for oil to flow to the geroller (4).

In this way, orbiting of the rotor (6) of the geroller is started by hydraulic pressure, with only the rotations which take place in the orbiting action being picked up by the drive gear (7), causing the shaft (8) to rotate. Also, the rotations of the rotor (6) are transmitted via the valve drive gear (9) to the valve (2).

The rotations of the valve (2) cause the oil holes in the valve which connect with the oil holes in the valve plate (3) to shift in sequence. For this reason, high pressure oil flowing in the geroller (4) also flows into sequentially differing chambers. This causes the motor to rotate continuously.
Hydraulic Motor 2.

In Fig. 1, when high pressure oil is introduced into chambers B, C and D, the rotor (6) rotates in the arrow direction while making contact with the inside of the stator (5). The valve (2) rotates along with this, so the chambers in which high pressure oil is introduced also shift sequentially, but in the direction opposite the arrow direction. In Fig. 2, the rotor (6) has turned 1/14 revolution. This cause the chambers where high pressure oil is introduced to shift to A, G and F. At this time, the center of the rotor Y shifts in a circle about point X to point Y’. In Fig. 3, Y’ shifts to Y”.

That is, the center of the rotor (6) rotates in a circle around point X, 6/7 revolution, from Y to Y’ to Y”. In Fig. 4, point Y” has returned to point Y, making 1 cycle of shifting the chambers where high pressure oil is introduced.

At this time, the • mark on the rotor (6) rotates 1/6 revolution in the reverse direction.

From this, we can see that 1 revolution of the output shaft is achieved by introduction of high pressure oil into 42 chambers, that is, 7 chambers × 6 cycles = 42 chambers.
Brake Valve
As this valve has a shockless function, the operation takes place in two stages.

Stage 1
When the pressure in Av port exceeds the set pressure of the spring (1), the plunger (2) moves to the left and the pressure oil escapes from Av port.

Stage 2
The pressure from Av port passes through the orifice (4) to the piston chamber (B), and the piston (3) is moved to the stroke end. This increases the spring force, and a new spring force is set. In this way, 2-stage relief operation is executed and the shock at the time of braking is reduced.

Parking Brake
The friction discs (1) are connected to the pinion gear (2) via the splines and the center discs (3) are connected to the bearing housing (4). The friction discs (1) and the center discs (3) are pressed against the bearing housing (4) by the spring (5) via the brake piston (6). The friction force between these discs generates the brake torque to prevent the pinion gear (2) from rotating.

When the oil is introduced from the parking brake release port to the piston chamber (A), the oil pressure overpowers the spring force and moves the brake piston (6). This generates a clearance between the friction discs (1) and the center discs (3) to release the parking brake.
DISASSEMBLY AND ASSEMBLY

General Cautions
- Carry out disassembly and assembly operations in a clean place and provide clean containers to place the disassembled parts in.
- Before disassembly, clean around the ports and remove the paint from each joint using a wire brush.
- Clean all disassembled parts in cleaning solvent. Use a lint free cloth, or air dry the parts.
- Make match marks on each part so that they will be assembled in the same positions when assembled.
- Replace all seals with new ones each time the hydraulic units is disassembled.
- Check each part to make sure there is no abnormal wear or seizing and use sandpaper, etc. to remove any burrs, sharp edges, etc.
- Do not turn adjusting screws if not required.
- Apply hydraulic oil to sliding surfaces and apply a thin coating of grease to seals when assembling them.

Disassembly
1. Remove the cap screws and then the brake valve.
   - Do not disassemble the brake valve into parts unless necessary.

2. Remove the bolts of the valve housing.

3. Remove the valve housing and then the balancing ring (5) and valve (6).
   - Be careful not to lose the springs (7) and pins (8) for the balancing ring.
4. Remove the valve plate and valve drive gear.

5. Remove the geroller.

6. Remove the drive gear.

7. Remove the cap screws and then the flange mounting.
   • Do not remove the bearing from the flange mounting unless necessary.
8. Remove the springs from the flange mounting.

9. Remove the brake piston.

10. Remove the ring.

11. Remove the center discs (20) and friction discs (19).
12. Remove the snap ring.

13. Remove the pinion gear.
   - Use a supporting tool and push out the shaft assembly using a press.
   - Do not remove the bearing and collar from the pinion gear unless necessary.

14. Remove the X-ring from the bearing housing.

15. Remove the plugs, springs and balls from the valve housing.