

## MODEL U-25ALS MOTOR DRIVEN GREASE PUMP INSTRUCTION MANUAL

The motor driven grease pump U-25ALS is used as a grease supply source of a centralized lubricating system, which serves automatic and concentrating supply of appropriate amount of grease and is a high pressure grease pump capable of feeding lubrication grease at a constant feed rate by means of pressure.

### 1. Main Particulars:

- Reduction ratio : 1/15
- Pump revolution : 100min<sup>-1</sup> (50Hz), 120min<sup>-1</sup> (60Hz)
- Discharge capacity : 60cm<sup>3</sup>/min(50Hz), 72cm<sup>3</sup>/min(60Hz)
- Discharge pressure : Max. 21MPa
- Motor : 0.4kW 4P 3 $\phi$  totally enclosed fan cooled type
- Reservoir capacity : 25 $\phi$

### 2. The pump consists of:

- Model P-25A motor driven grease pump (with built-in reduction gear)
- Model T-25A-25 grease reservoir
- Model HV03 Reversing valve
- Model SV02 Solenoid valve
- Model SP-R-250 pressure switch
- Motor

This pump is provided with relief valves and pressure gauges and the motor is directly connected to the pump, thus being compact construction in general.

### 3. Explanation of Construction and Operation:

#### 3-1 Model P-25A Motor driven pump (Refer to Figs. I and II):

The rotating torque obtained by motor is reduced by the Worm ① and Worm Wheel ② in the pump with a built-in reduction gear and is then transferred to the Cam ④ through the Eccentric Shaft ③.

Further, this torque is converted by the eccentric movement of the cam to the reciprocating movement of the Pilot Piston ⑥ and the Main Piston ⑦ connected to the ends of the Connecting Rod ⑤. The pilot piston and main piston move while keeping certain phase difference from each other by means of cam, so that the main piston acts to suction and discharge grease and the piston rod acts as valve, harmonized with the suction-discharge cycle. Grease is sucked up from the suction port ④ and ③ of the Pump Cylinder ⑧ simultaneously, and during compression cycle of the Piston it goes through the passage ② to reach the discharge port ① where it may be discharged. Pressurized grease is put into HV03 Hydraulic change-over valve ⑩, then fed to the discharging ports of Line I and Line II simultaneously, the grease is fed to the Pressure Gauge ⑨ and the Relief valve ⑪, for enabling to check the specific discharge pressure and to relieve excess grease into the tank when the discharge pressure is abnormally high. This pump can discharge grease by left turn of its shaft.

### 3-2 Model T-25A-25 Grease reservoir (Refer to Fig. I):

The grease storage reservoir is equipped with the Follower Plate ⑬ to keep properly the high and low oil levels, and the plate comes up and down inside the tank according to increase and decrease of the grease. The oil level can be confirmed by the scale of the Piston Rod ⑭, but, when it comes down to the bottom, the Low Level Switch ⑰ turns on according to the Cam ⑯ fitted on the upper part of the piston rod, and when the oil level comes up to the top, the High Level Switch ⑱ turns on according to the cam fitted to the Cam Holder ⑮. If a relevant electric wiring is connected to this level switch circuit, automatic grease replenishment becomes available in addition to lamp indication, alarm signals, etc.

U-25A

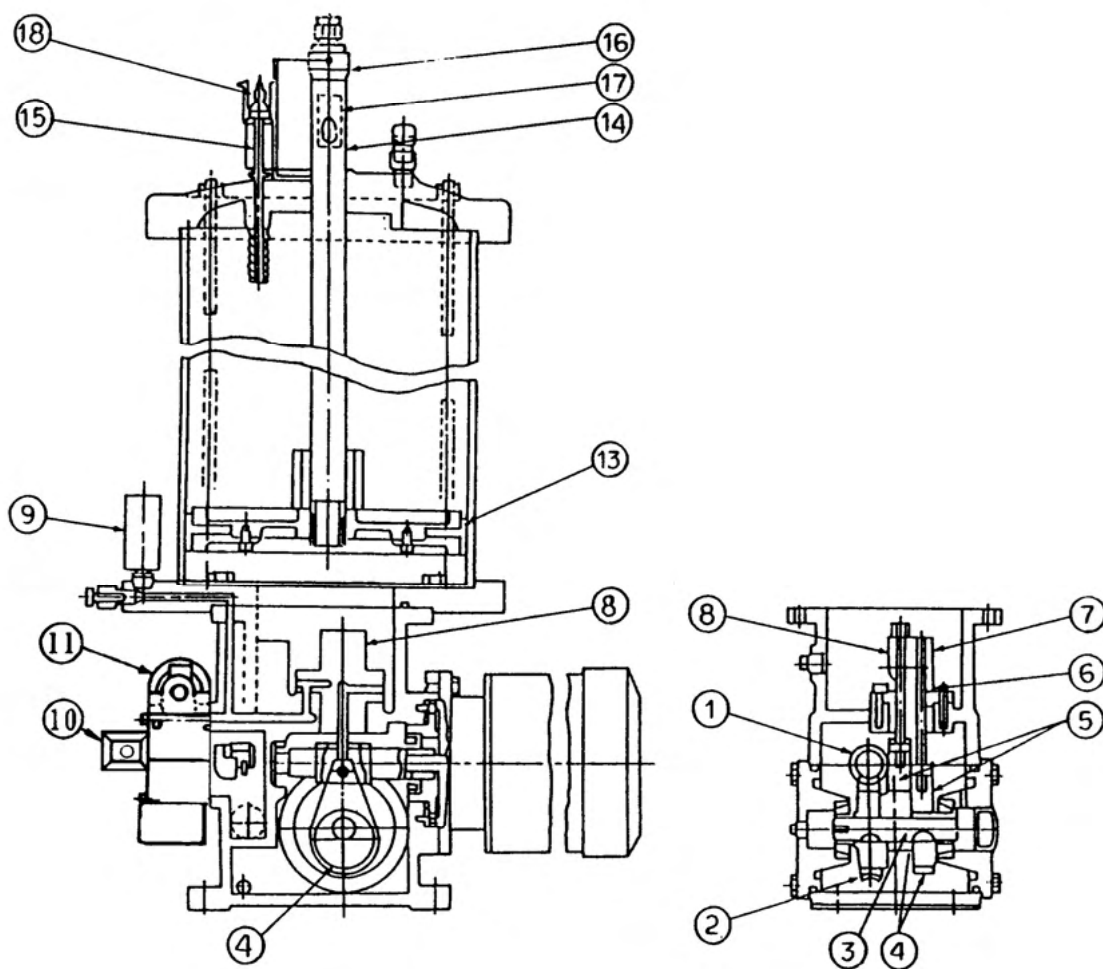


Fig. I

# ■ Structure and operation of double piston type pumps

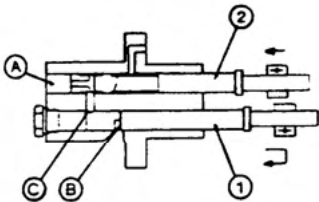
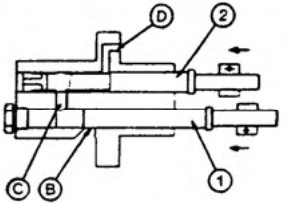
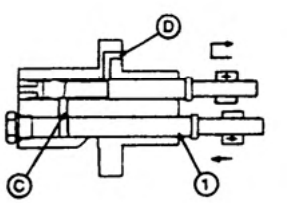
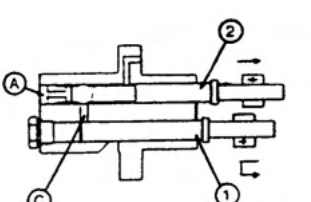
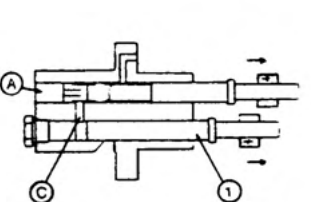
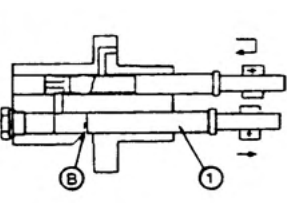
	<ul style="list-style-type: none"> <li>● Pilot piston ② operates in a way that connecting port ③ is open to suction port ④, so lubricating oil can be drawn in from suction ports ④ and ⑤ by the operation of main piston ①.</li> </ul>
	<ul style="list-style-type: none"> <li>● When main piston ① moves forward, suction port ⑤ is closed and pilot piston ② moves in a way that connecting hole ③ starts opening to discharge port ⑥.</li> </ul>
	<ul style="list-style-type: none"> <li>● When connecting hole ③ is open to discharge port ⑥, main piston ① continues to move forward and the lubricating oil in the cylinder is forcedly discharged from discharge port ⑥.</li> </ul>
	<ul style="list-style-type: none"> <li>● When main piston ① stops forwarding and before retreating, pilot piston ② works in a way connecting port ③ starts opening to suction port ④.</li> </ul>
	<ul style="list-style-type: none"> <li>● When connecting port ③ is open to suction port ④, main piston ① continues to retreat, and the lubricating oil is drawn into the cylinder from the reservoir.</li> </ul>
	<ul style="list-style-type: none"> <li>● When suction port ⑤ is open, main piston ① draws in the lubricating oil from suction port ⑤.</li> </ul>

Fig. II



### 3-3 Model HV03 reversing valve, model SV02 solenoid controlled valve

This reversing valve is attached to the dual line lubrication system pump and can be used with the following piping systems:

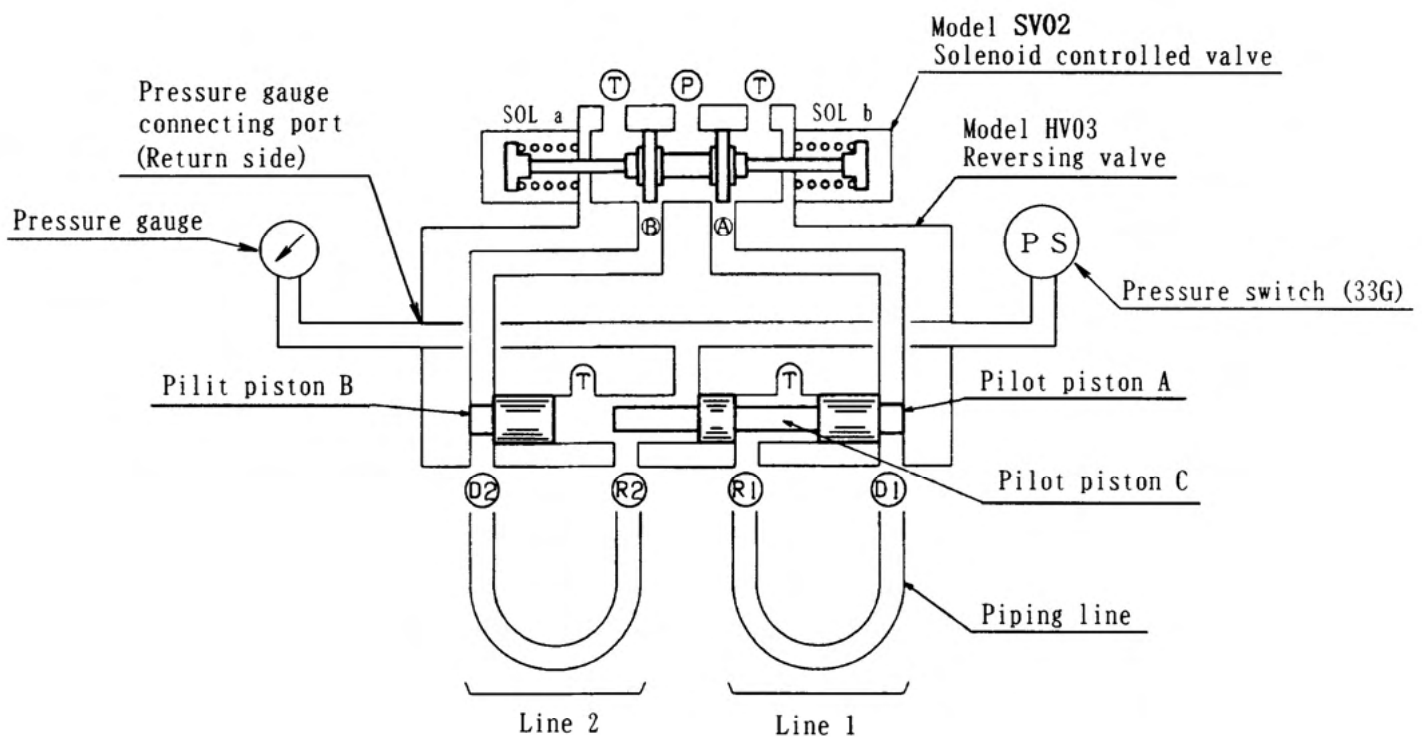
- 1) Loop system....Connects the pressure switch to the rerurn line.
- 2) End system.....Connects the pressure switch or the pressure control valve to the end of piping.
- 3) Lance system...Connects the pressure switch to the pump line

#### • Loop system

The pressure grease pressurized at the pump goes through the reversing valve and activates every distribution valve. When the pressure rises to the preset reversing pressure (preset value of the pressure switch), the signal causes switching by the solenoid controlled valve. After this switching operation has been completed, the rest of the pressure of the main pipe and the branch pipes will be entirely released to the tank.

#### Position 1(before operation)

Before the peration, ①, ② and ③ ports are released to the tank. Therefore, all ports are released to the tank, piping line (line 1,2) ① and ②.



Position 1

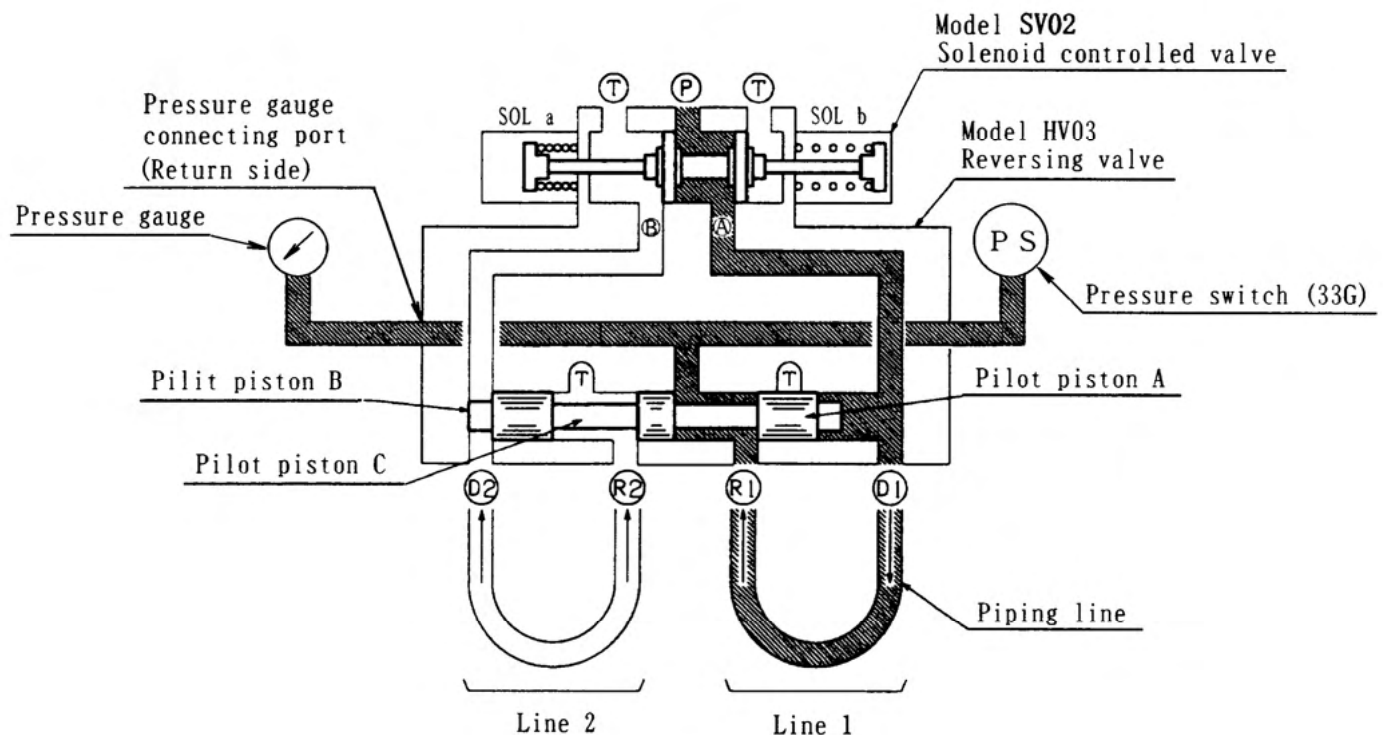
### Position 2 (lubricating line 1)

After starting the pump and exciting the solenoid controlled valve SOLa, the pressure grease goes through outlet port ① of the solenoid controlled valve and moves the reversing valve pilot piston A,B and C to the left and then will be delivered to ② port. (Note 1)

After every distribution valve has been activated by the pressure grease delivered from line 1, the pressure of line 1 return port ③ rises rapidly.

Then the pressure will be transferred to the pressure switch(33G). When the value reaches the preset value, the contact point will be ON. SOLa will be demagnetized by the signal and the pump will be stopped at the same time.

(Note 1) Line 2 is released to ④ port (delivery port) and the tank.



Position 2

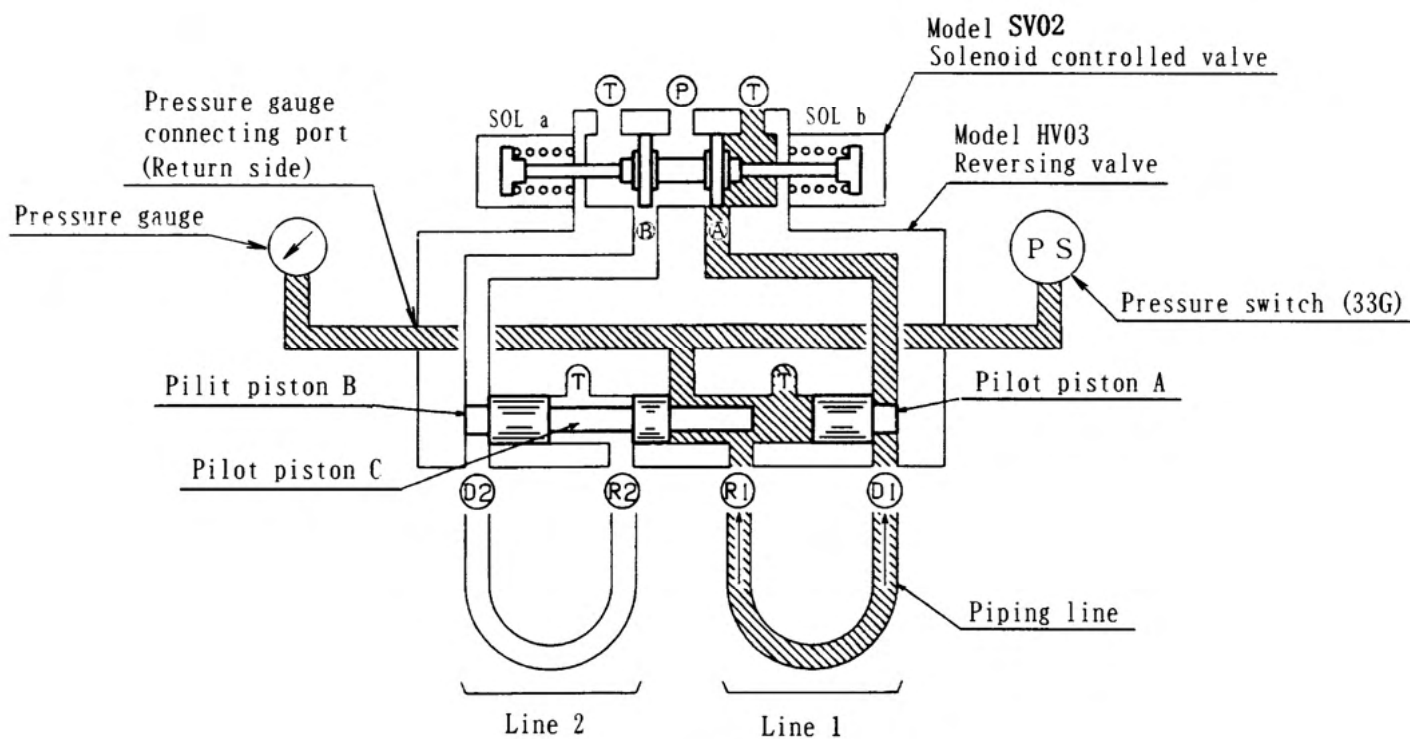
Note : Pilot pistons A,B and C are divided. When using in Lance system, these 3 pistons do not have any functions.

Position 3 (lubrication of line 1 is completed)

As a result of the demagnetization of SOLa, ① port will be connected to the tank through ① port. The pressure of port ① will be released to the tank via ① port (solenoid) and then will drop quickly.

At this time, the pressure which works on the left side (the ① side) of the pilot piston A rises higher than the pressure of the right side (the ② side). The pilot piston A moves to the right side and ② port is connected to ① port.

The release of all port's pressure results in the state of position 4.

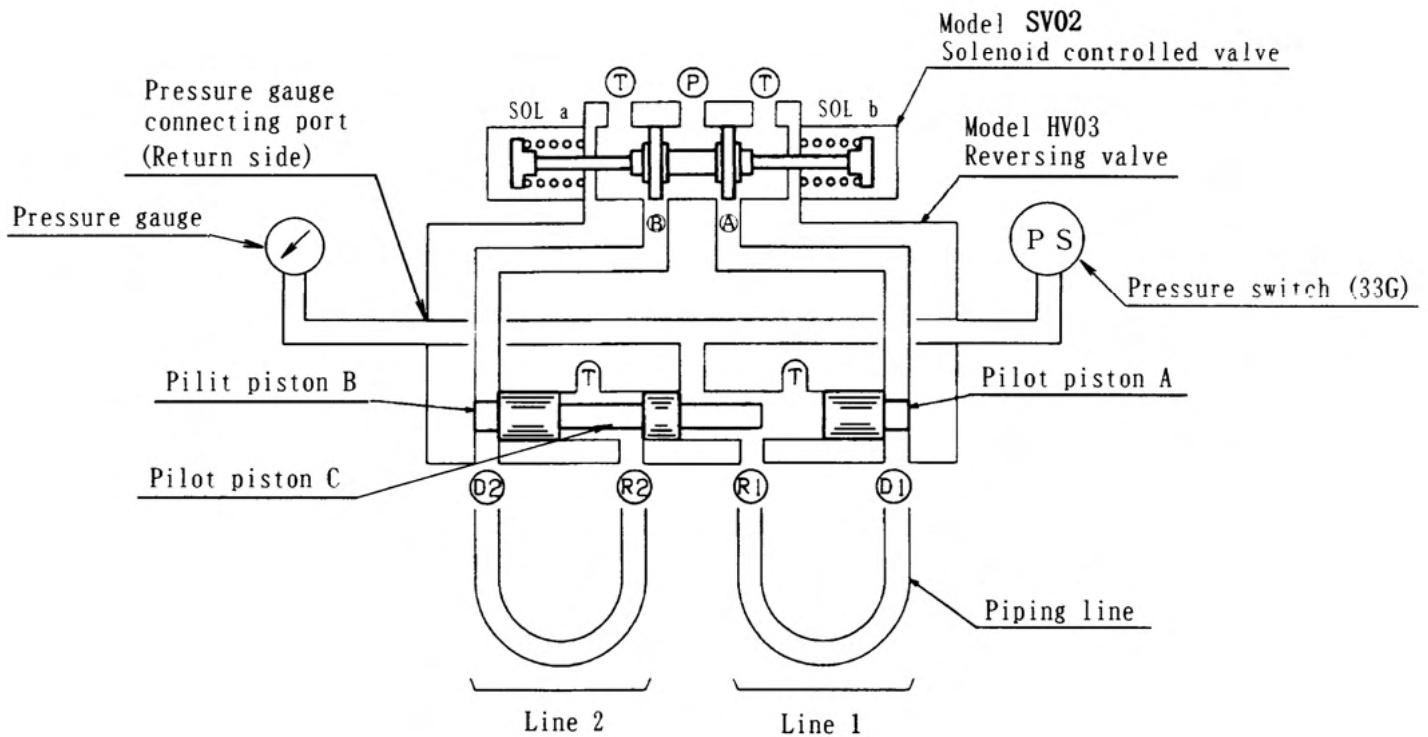


Position 3

## Position 4 (stop)

The operation of line 1 (SOLa) stops. Line 2 operation will be awaited. Once it runs, the lubrication by line 2 excites solenoid controlled valve SOLb.

The pump starts working and executes the operation opposite of line 1 (SOLa).



Position 4

#### 4. Precautions for Handling:

- 1) Care should be taken to prevent inclusion of dust, bubbles, etc. into the grease to be used.
- 2) Grease shall be charged after the air vent valve at the upper end of the piston is opened up, to purge out the air from the pump housing and tank, and the valve shall be closed after checking that grease is fully charged down to the bottom of the pump housing and tank follower plate and that the grease comes from the air vent valve.
- 3) Before starting the Pump, ensure that Crankcase is properly filled with oil. The oil (Gear oil class 2 ISO VG 220 JIS K2219 or the equivalent) should be replaced every 2000 hours operation except the first time replacement which must be conducted in 200 hours operation.
- 4) The reversing pressure of SP-R-250 pressure switch shall be usually set at 5MPa.  
The adjustment range is 3MPa to 20MPa.
- 5) The cracking pressure of the relief valve shall be usually set at 23MPa.

#### 5. Maintenance and Adjustment:

When the pump fails to function normally due to wear in its cylinder, i.e. fails to raise the pressure and to reduce the discharge rate, etc. after long term operation, adjustment shall be taken as follows:

- 1) First remove the drain plug from the crank chamber of the pump housing and discharge oil.
- 2) Release the pistons plug of the upper side of the cylinder from the upper side of the pump housing, remove five bolts of the pump cylinder and take up the cylinder.

- 3) Next, remove the cover attached to the oil gauge, take the eccentric shaft out of the cover hole.  
Then, the eccentric piston, connecting rod assembly and worm wheel are all in sight. Following this, remove the cover of the opposite side.
- 4) Provide a new pump cylinder from the upper side and slightly tighten it with bolts with a shim inserted beneath.
- 5) Replace the main piston and pilot piston with new ones to set to the connecting rod, re-assemble them to the eccentric shaft in the same condition as it was before disassembly, and incorporate two pistons to the pump cylinder inserting them from the cover hole.
- 6) Next, apply small quantity of oil from over the pump housing and turn it clockwise manually.  
It is good that the worm turns smoothly with a slight feeling of resistance at certain point of revolution  
(When the main piston clogs the suction hole.)

INSTRUCTION MANUAL  
OF  
MOTOR DRIVEN GREASE PUMP

**U-25ALM-10**

Model U-25ALM motor driven grease pump is used as a grease supply source of a centralized lubricating system, which serves automatic and concentrating supply of appropriate amount of grease and is a high pressure grease pump capable of feeding lubrication grease at a constant feed rate by means of pressure.

### 1. Main Specifications

- Reduction ratio : 1/15
- Pump revolution : 100 min<sup>-1</sup> (50Hz), 120 min<sup>-1</sup> (60Hz)
- Discharge volume : 60 cm<sup>3</sup>/min (50Hz), 72 cm<sup>3</sup>/min (60Hz)
- Rated pressure : Max. 21MPa
- Motor : 0.4kW 4P 3φ totally enclosed fan cooled type
- Reservoir capacity : 25ℓ

### 2. The pump construction

- Model P-25A Motor driven grease pump (built-in pump reduction gear.)
- Model T-25A-25 Grease tank
- Model HV03 Reversing valve
- Model SV02 Solenoid valve
- Model SP-R-250 Pressure switch
- Electric motor

This pump is provided with relief valve and pressure gauge, the motor is directly connected to the pump, thus being compact construction in general.

### 3. Explanation of Construction and Operation

#### 3-1 Model P-25A Grease pump (Refer to Figs. I and II)

The rotating torque obtained by motor is reduced by the ① Worm and ② Worm wheel in the pump with a built-in reduction gear and is then transferred to the ④ Cam through the ③ Electric shaft. Further, this torque is converted by the eccentric movement of the ④ Cam to the reciprocating movement of the ⑥ Pilot piston and the ⑦ Main piston connected to the ends of the ⑤ Connecting rod.

The ⑥ Pilot piston and ⑦ Main piston move while keeping certain phase difference from each other by means of ④ Cam, so that the ⑦ Main piston acts to suction and discharge grease and the ⑥ Pilot piston acts as valve, harmonized with the suction-discharge cycle. Grease is sucked up from the suction port ① and ② of the ⑧ Pump cylinder simultaneously, and during compression cycle of the Piston it goes through the passage ③ to reach the discharge port ④ where it may be discharged.



Pressurized grease put into ⑩ HV03 Reversing valve, then sent to discharge port of Line I and Line II, at the same time, also sent to ⑨ Pressure gauge and ⑪ Relief valve, it is used confirming the discharge pressure and opening the drain to tank in case of abnormally high pressure.

This pump can discharge grease by right turn of its shaft.

### 3-2 Model T-25A-25 Grease tank (Refer to Fig. 1)

The grease storage reservoir is equipped with the ⑬ Follower plate to keep properly the high and low oil levels, and the plate comes up and down inside the tank according to increase and decrease of the grease. The oil level can be confirmed by the scale of the ⑭ Piston rod, but, when it comes down to the bottom, the ⑰ Low level switch turns on according to the ⑯ Cam fitted on the upper part of the piston rod, and when the oil level comes up to the top, the ⑮ High level switch turns on. If a relevant electric wiring is connected to this level switch circuit, automatic grease replenishment becomes available in addition to lamp indication, alarm signals, etc.

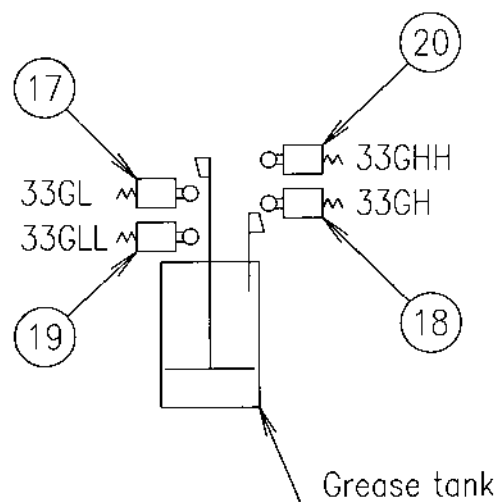
### 3-3 Two-step Low level switch, Two-step High level switch

Automatic grease replenishment is possible.

When ⑰ Low level switch (33GL) turns on, grease replenishment is started. And when ⑱ High level switch (33GH) turns on, grease replenishment is completed.

⑲ Low-low level switch (33GLL) is used for warning of "tank empty" in case of malfunction of Low level switch.

⑳ High-high level switch (33GHH) is used for warning of "tank full" in case of malfunction of High level switch.



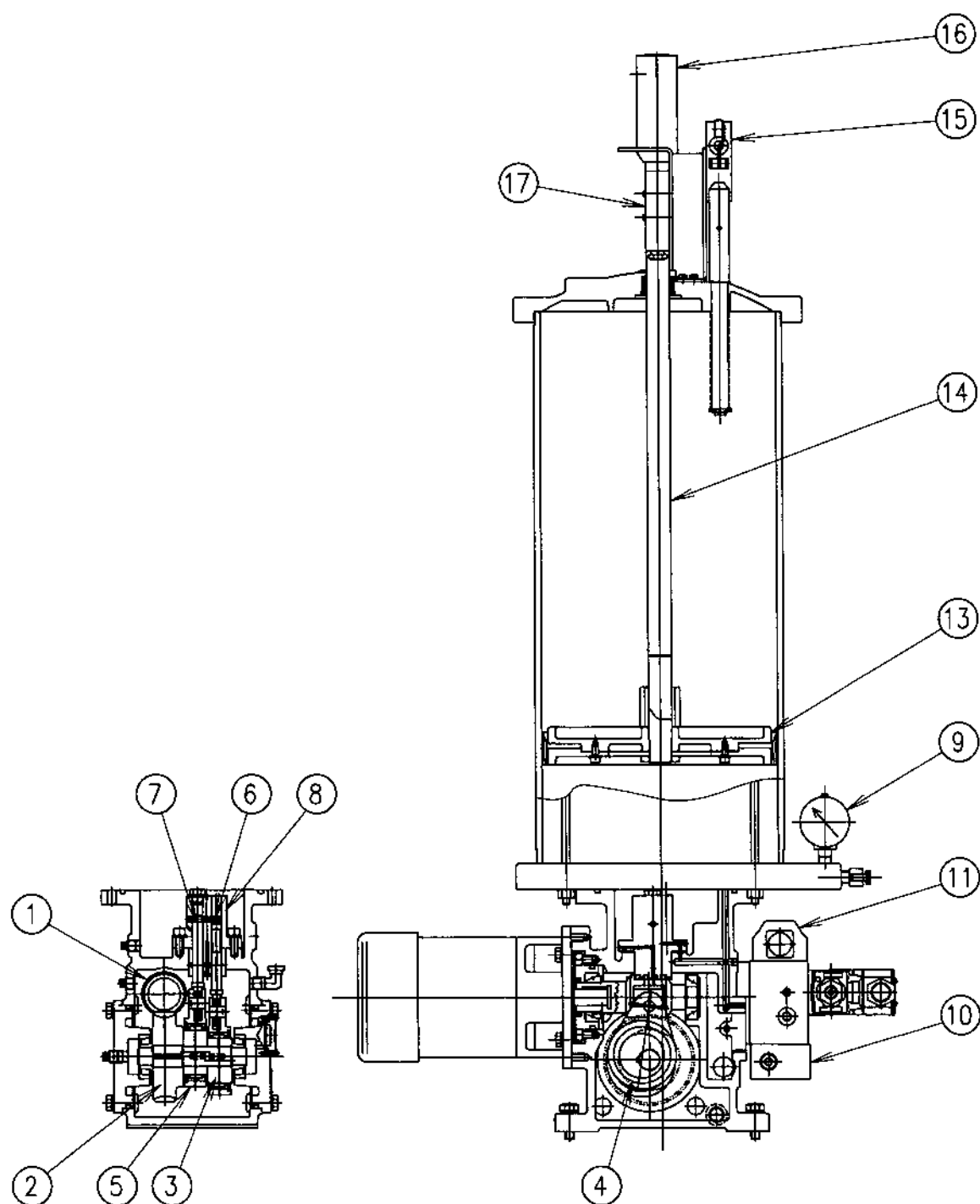


Fig. 1

### ■ Structure and operation of double piston type pump

	<ul style="list-style-type: none"> <li>● ② Pilot piston operates in a way that passage ③ is open to suction port ①, so lubrication oil can be drawn in from suction ports ① and ② by the operation of ① Main piston.</li> </ul>
	<ul style="list-style-type: none"> <li>● When ① Main piston moves forward, suction port ② is closed and ② Pilot piston moves in a way that passage ③ starts opening to discharge port ④.</li> </ul>
	<ul style="list-style-type: none"> <li>● When passage ③ is open to discharge port ④, ① Main piston continues to move forward and lubricating oil in the cylinder is forcibly discharged from discharge port ④.</li> </ul>
	<ul style="list-style-type: none"> <li>● When ① Main piston stops forwarding and before retreating, ② Pilot piston works in a way that passage ③ starts opening to suction port ①.</li> </ul>
	<ul style="list-style-type: none"> <li>● When passage ③ is open to suction port ①, ① Main piston continues to retreat, and lubricating oil is drawn into the cylinder from the reservoir.</li> </ul>
	<ul style="list-style-type: none"> <li>● When suction port ② is open, ① Main piston draws in lubricating oil from suction port ②.</li> </ul>

Fig. II

### 3-3 Model HV03 Reversing valve, model SV02 Solenoid valve

This reversing valve is attached to the dual line lubrication system pump and can be used with the following piping systems:

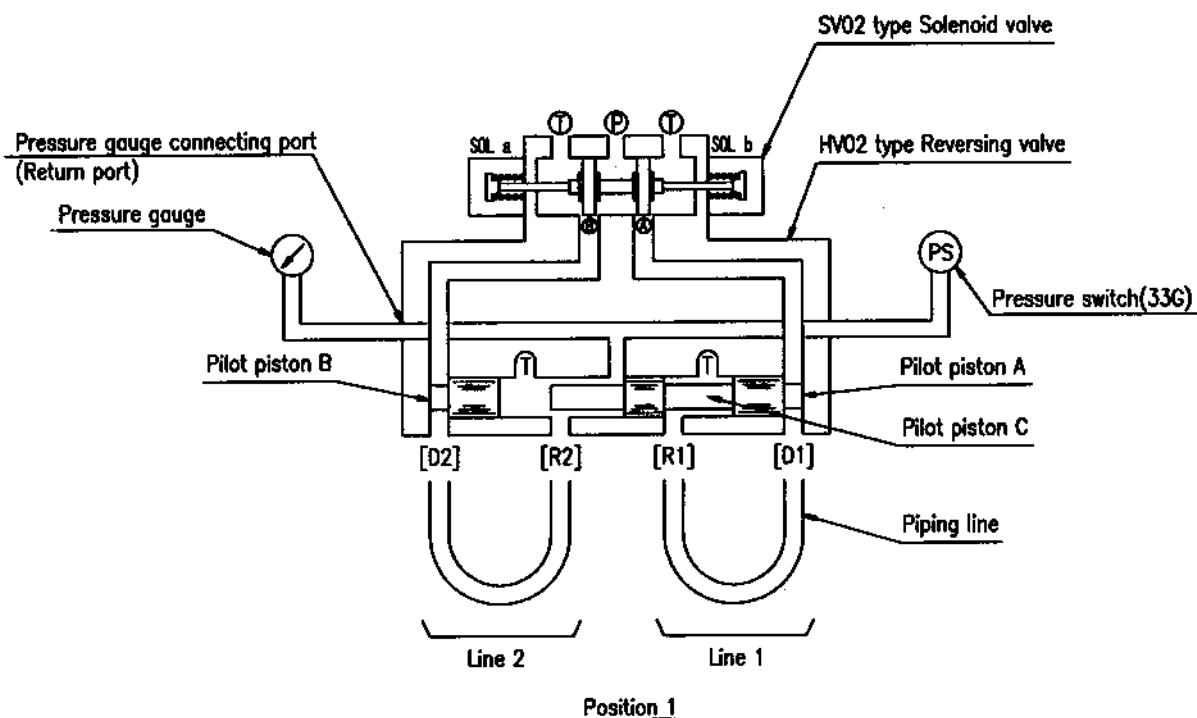
- 1) Lance system ... Connects the pressure switch to the pump line.
- 2) Loop system ... Connects the pressure switch to the return port.
- 3) End system ... Connects the pressure switch or pressure control valve to the end of piping.

#### • Loop system

Grease pressurized by the pump flows through the reversing valve and activates all the distributing valves. When the pressure increases to switching pressure (preset with the pressure switch), a signal is sent and the solenoid valve is operated. Upon completion of this switching operation, the residual pressure in the main pipes and branch pipes are released into the tank.

#### Position 1 (stopped state)

Before operating the pump, ports (P), (A) and (B) are open to the tank, and therefore all ports of piping line (Line 1 and Line 2), (D1) and (D2) are also released to the tank.



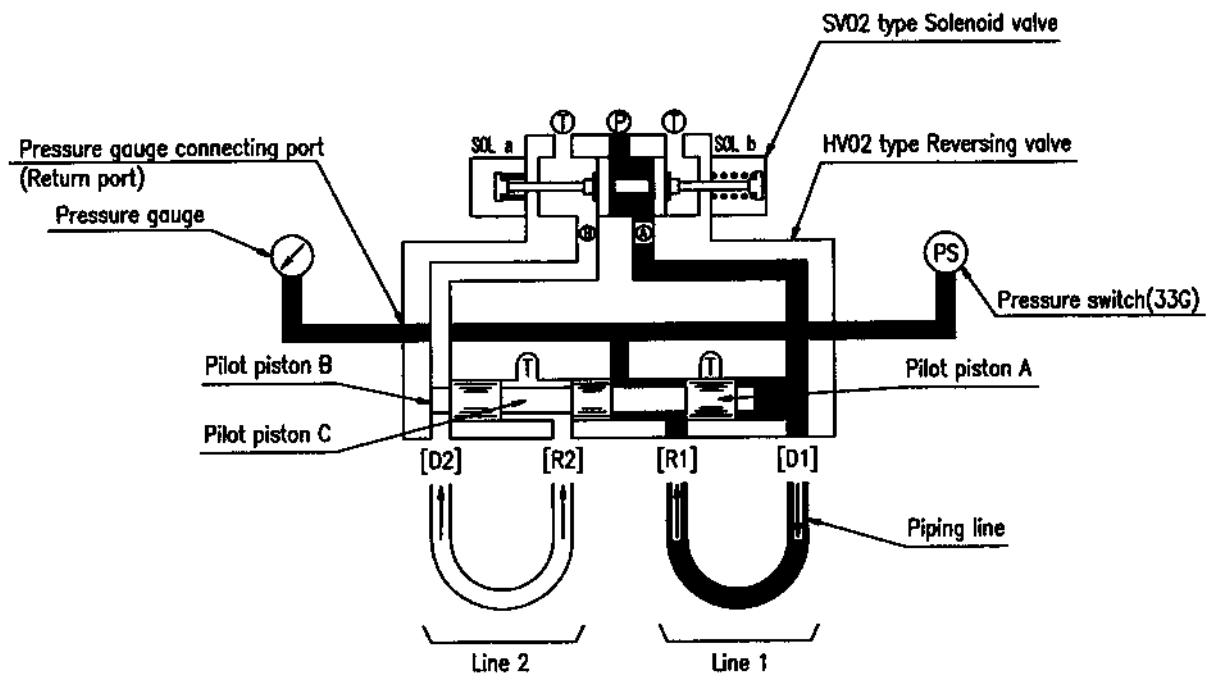
**Position 2 (grease being delivered to Line 1)**

Activate the pump to energize the solenoid valve SOLa. Pressurized grease flows through outlet port ① of the solenoid valve and makes move the reversing valve pilot piston A, B and C to left direction, discharges to port [D1] . (Note 1)

Pressurized grease discharged from Line 1 activates all the distributing valves. Pressure in Line 1 return port [R1] rapidly increases and is transmitted to the pressure switch (33G) .

When the pressure reaches the preset value, the switch turns ON and sends a signal to demagnetize SOLa and stop the pump.

(Note 1) Line 2 is released to discharge port [D2] and the tank.



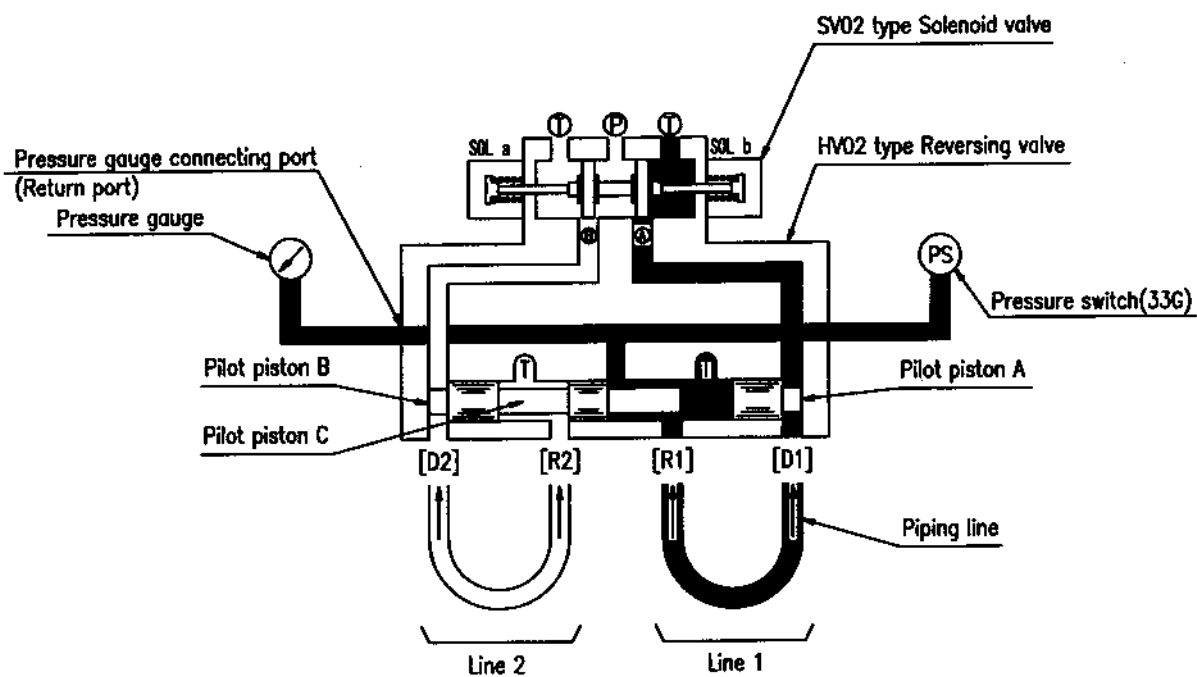
Position 2

Note : Pilot piston A, B and C are divided.

### Position 3 (completion of grease delivery to Line 1)

After SOLa is demagnetized, port ① is connected to the tank through port ④. Pressure in port ① decreases rapidly since it is released to the tank through port ④ (solenoid). At this time, the pressure to work on left side ([R1] side) of pilot piston A becomes higher than right side ([D1] side), pilot piston A moves to right side and port [R1] is connected to port ④.

Pressure in all the ports is released and the state shifts to Position 4.

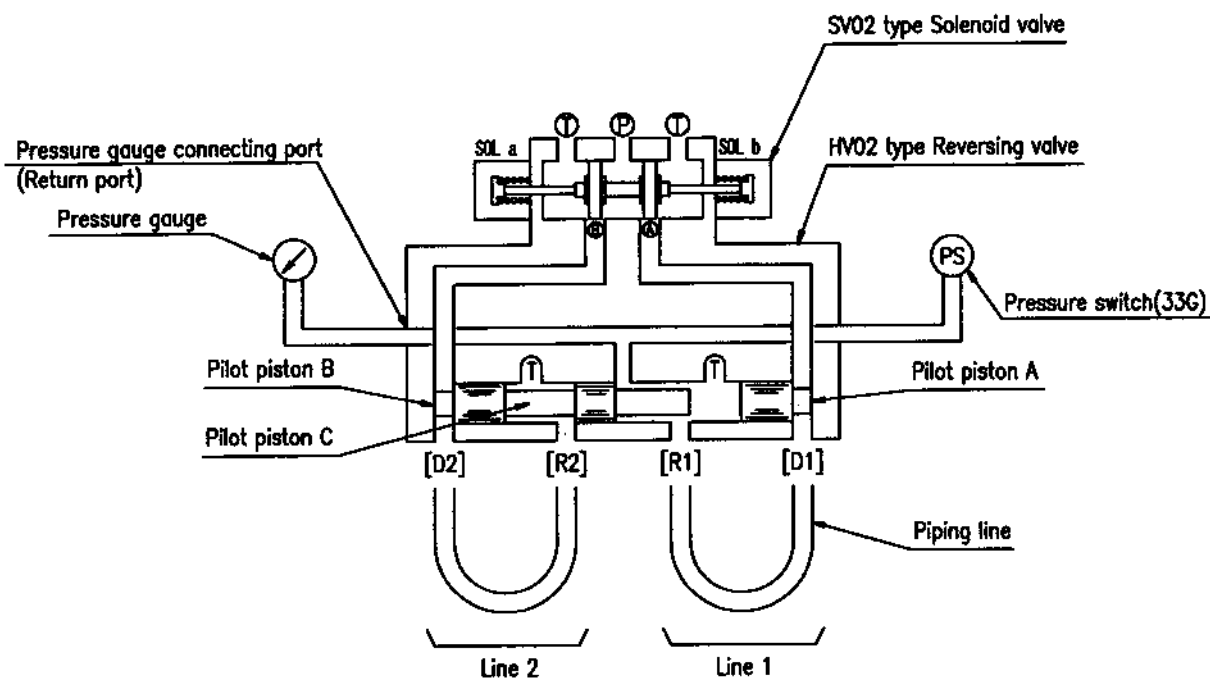


Position 3

**Position 4 (stopped state)**

After operation on Line 1 (SOLa) , wait for Line 2 operation.

When it starts, the solenoid valve SOLb is energized and the pump is activated and the operation on Line 1 (SOLa) is reversed.



**Position 4**

**4. Handling precautions**

- 1) Take care so that dust or air bubbles are not mixed in grease used.
- 2) Before filling with grease initially, open the air vent plug the top of the piston to remove air from the pump housing and the tank completely. Then, completely fill the pump housing and the tank with grease up to their lower part of tank follower plate to such an extent that grease flows out from the air vent plug.
- 3) Make sure that the crank chamber is filled with lubricating oil before starting the pump. Lubricating oil should gear oil, Class 2 ISO VG220 JISK2219, or the equivalent. Fill oil up to the specified oil level. Change it after 200 hours of operation, and then every 2,000 hours or so.
- 4) Reversing pressure of model SP-R-250 pressure switch is usually set at 5MPa.

- 5) The cracking pressure of relief valve shall be usually set at 23MPa.
- 6) When supplying grease without air venting in grease filler hose or filling circuit, air may be mixed into the tank and the pump pressure may not certain increase.

<When air has been mixed into the tank>

When air may be mixed into the tank, remove air with grease together, because removing the bubbles is difficult.

Release the air vent valve on pump outlet.

As air pressurizing the tank from upper of tank, operate the pump, push the grease including air out and make the tank empty.

After the tank becomes empty, fulfill new grease.

#### 5. Maintenance and Adjustment

If the pressure does not rise in long time operation, or discharge amount decreases, possibly resulting from wear of the pump cylinder set, adjust in the following procedure.

- 1) First, remove the drain plug from the crank chamber of pump housing and discharge oil.
- 2) Release the piston plug of the upper part of cylinder from the upper side of pump housing, remove five bolts of pump cylinder and take up the cylinder.
- 3) Next, Remove the cover with oil level gauge, take the eccentric shaft out of the cover hole. Then, eccentric, piston, connecting rod assembly and worm wheel are taken out together. Following this, remove the cover of opposite side.
- 4) Insert new pump cylinder from top and slightly tighten it with bolt.
- 5) Replace the main piston and pilot piston with new ones, set to the connecting rod, assemble them to the eccentric shaft in the same condition as it was before disassembly, and fit two pistons into the pump cylinder by inserting them from cover hole.
- 6) Next, apply small quantity of oil from top of the pump housing, turn it clockwise manually.  
It is good that the worm turns smoothly with a slight feeling of resistance at certain point of revolution (When the main piston blocks the suction hole).



INSTRUCTION MANUAL  
OF  
MOTOR DRIVEN GREASE PUMP

U-25ANS\*\*\*-10

The motor driven grease pump U-25ANS is used as a grease supply source of a centralized lubricating system, which serves automatic and concentrating supply of appropriate amount of grease and is a high pressure grease pump capable of feeding lubrication grease at a constant feed rate by means of pressure.

### 1. Main Specifications

- Reduction ratio : 1/15
- Pump revolution : 100 min<sup>-1</sup> (50Hz), 120 min<sup>-1</sup> (60Hz)
- Discharge volume : 60 cm<sup>3</sup>/min(50Hz), 72 cm<sup>3</sup>/min(60Hz)
- Rated pressure : Max. 21MPa
- Motor : 0.4kW 4P 3φ totally enclosed fan cooled type
- Reservoir capacity : 25ℓ

### 2. The pump construction

- Model P-25A Motor driven grease pump (built-in pump reduction gear.)
- Model T-25A Grease tank
- Model HV03 Reversing valve
- Model SV02 Solenoid valve
- Model SP-R-250 Pressure switch
- Electric motor

This pump is provided with relief valve and pressure gauge, the motor is directly connected to the pump, thus being compact construction in general.

### 3. Explanation of Construction and Operation

#### 3-1 Model P-25A Grease pump (Refer to Figs. I and II)

The rotating torque obtained by motor is reduced by the ① Worm and ② Worm Wheel in the pump with a built-in reduction gear and is then transferred to the ④ Cam through the ③ Electric Shaft. Further, this torque is converted by the eccentric movement of the cam to the reciprocating movement of the ⑥ Pilot Piston and the ⑦ Main Piston connected to the ends of the ⑤ Connecting Rod.

The ⑥ Pilot piston and ⑦ Main piston move while keeping certain phase difference from each other by means of ④ Cam, so that the ⑦ Main piston acts to suction and discharge grease and the ⑥ Pilot piston acts as valve, harmonized with the suction-discharge cycle.

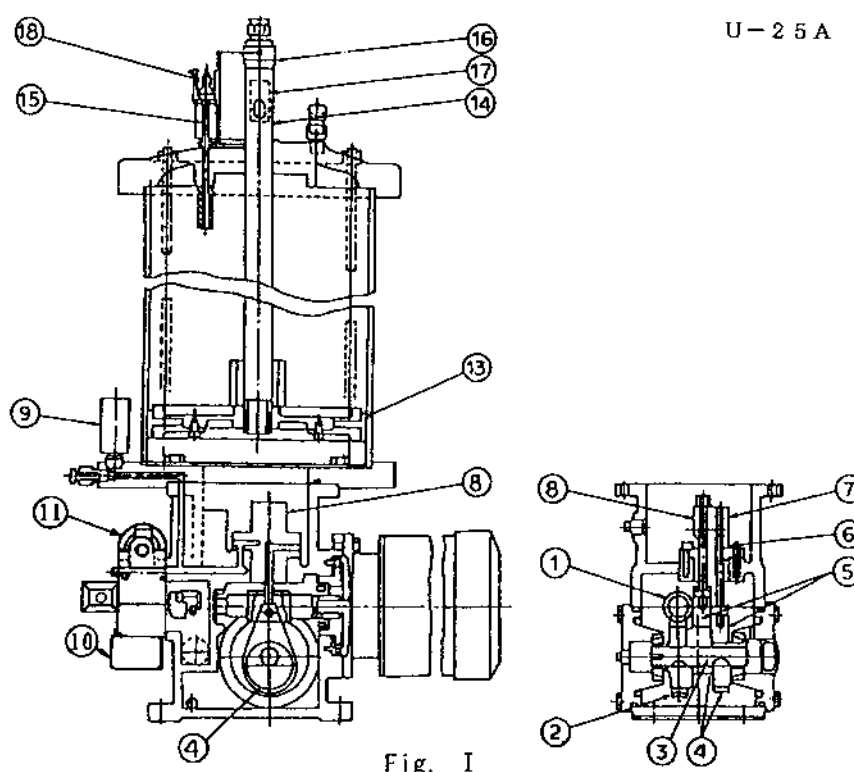
Grease is sucked up from the suction port ① and ② of the ⑧ Pump Cylinder simultaneously, and during compression cycle of the Piston it goes through the passage ③ to reach the discharge port ④ where it may be discharged.

Pressurized grease put into ⑩ HV03 Reversing valve, then sent to discharge port of Line I and Line II, at the same time, also sent to ⑨ Pressure gauge and ⑪ Relief valve, it is used confirming the discharge pressure and opening the drain to Tank in case of abnormally high pressure.

This pump can discharge grease by right turn of its shaft.

### 3-2 Model T-25A Grease tank (Refer to Fig. I)

The grease storage reservoir is equipped with the ⑬ Follower Plate to keep properly the high and low oil levels, and the plate comes up and down inside the tank according to increase and decrease of the grease. The oil level can be confirmed by the scale of the ⑭ Piston Rod, but, when it comes down to the bottom, the ⑰ Low Level Switch turns on according to the ⑯ Cam fitted on the upper part of the piston rod, and when the oil level comes up to the top, the ⑮ High Level Switch turns on. If a relevant electric wiring is connected to this level switch circuit, automatic grease replenishment becomes available in addition to lamp indication, alarm signals, etc.



# ■ Structure and operation of double piston type pumps

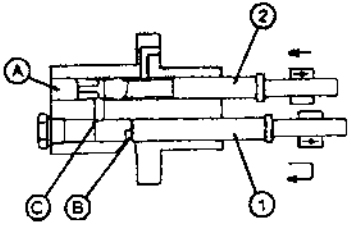
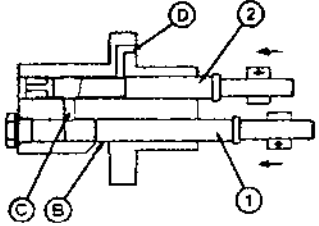
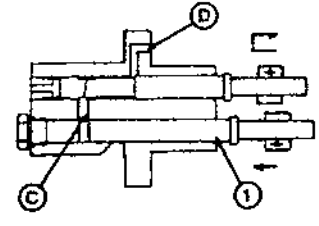
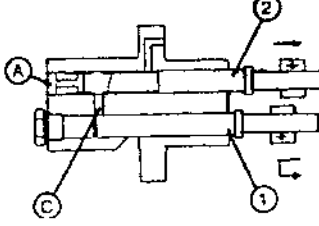
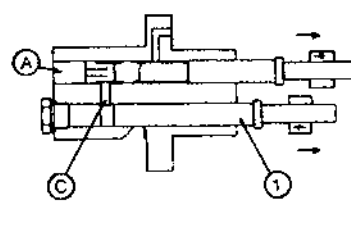
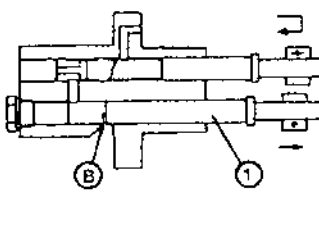
	<ul style="list-style-type: none"> <li>• ② Pilot piston operates in a way that connecting port ③ is open to suction port ①, so lubrication oil can be drawn in from suction ports ① and ② by the operation of main piston ①.</li> </ul>
	<ul style="list-style-type: none"> <li>• When ① Main piston moves forward, suction port ② is closed and ② Pilot piston moves in a way that connecting port ③ starts opening to discharge port ④.</li> </ul>
	<ul style="list-style-type: none"> <li>• When connecting port ③ is open to discharge port ④, ① Main piston continues to move forward and the lubricating oil in the cylinder is forcibly discharged from discharge port ④.</li> </ul>
	<ul style="list-style-type: none"> <li>• When ① Main piston stops forwarding and before retreating, ② Pilot piston works in a way connecting port ③ starts opening to suction port ①.</li> </ul>
	<ul style="list-style-type: none"> <li>• When connecting port ③ is open to suction port ①, ① Main piston continues to retreat, and the lubricating oil is drawn into the cylinder from the reservoir.</li> </ul>
	<ul style="list-style-type: none"> <li>• When suction port ② is open, ① Main piston draws in the lubricating oil from suction port ②.</li> </ul>

Fig. II

### 3-3 Model HV03 Reversing valve, model SV02 Solenoid valve

This reversing valve is attached to the dual line lubrication system pump and can be used with the following piping systems:

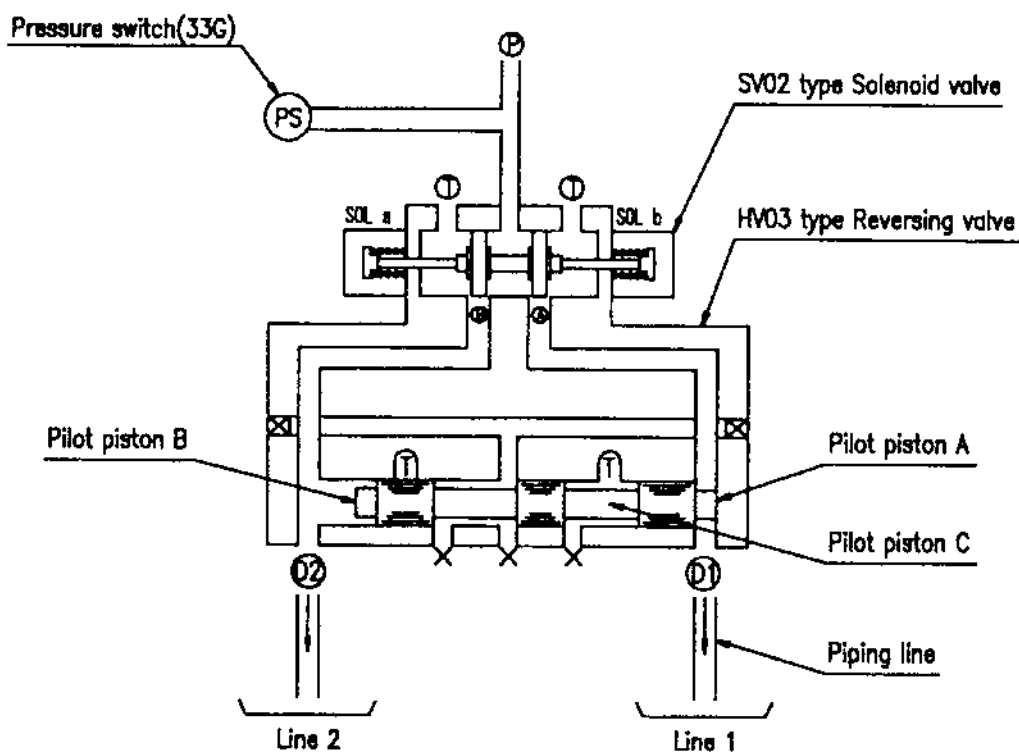
- 1) Lance system ... Connects the pressure switch to the pump line.
- 2) Loop system ... Connects the pressure switch to the return line.
- 3) End system ... Connects the pressure switch or pressure control valve to the end of piping.

#### • Lance system

Grease pressurized by the pump flows through the solenoid valve and activates all the distributing valves. When the pressure increases to switching pressure (preset with the pressure switch), a signal is sent and the solenoid valve is operated. Upon completion of this switching operation, the residual pressure in the main pipes and branch pipes are released into the tank.

#### Position 1 (stopped state)

Before operating the pump, ports **(P)**, **(A)** and **(B)** are open to the tank, and therefore all ports of piping line (Line 1 and Line 2) **(D1)**, **(D2)** are also released to the tank.



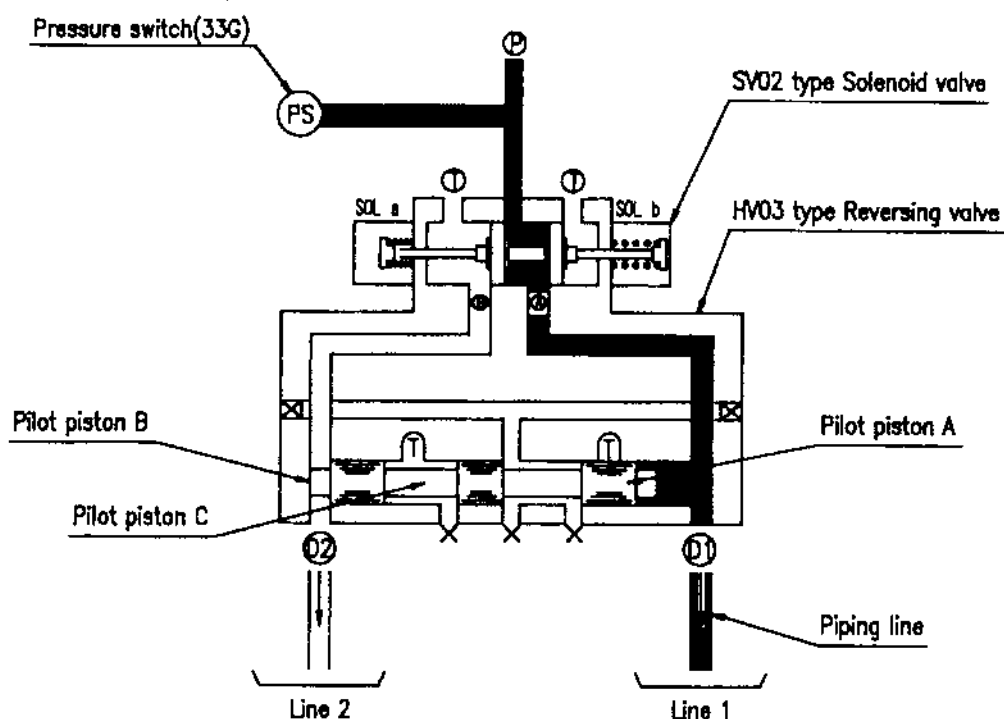
Position 1

### Position 2 (grease being delivered to Line 1)

Activate the pump to energize the solenoid valve SOLa. Pressurized grease flows through port **(A)** (outlet of the solenoid valve) and makes move the reversing valve pilot piston A to left direction, discharges to port **(D1)**. (Note 1)

Pressurized grease discharged from Line 1 activates all the distributing valves. Pressure in Line 1 rapidly increases and is transmitted to the pressure switch(33G). When the pressure reaches the preset value, the switch turns ON and sends a signal to demagnetize SOLa and stop the pump.

Note 1) Line 2 is released to port **(D2)** (discharge port) and the tank.

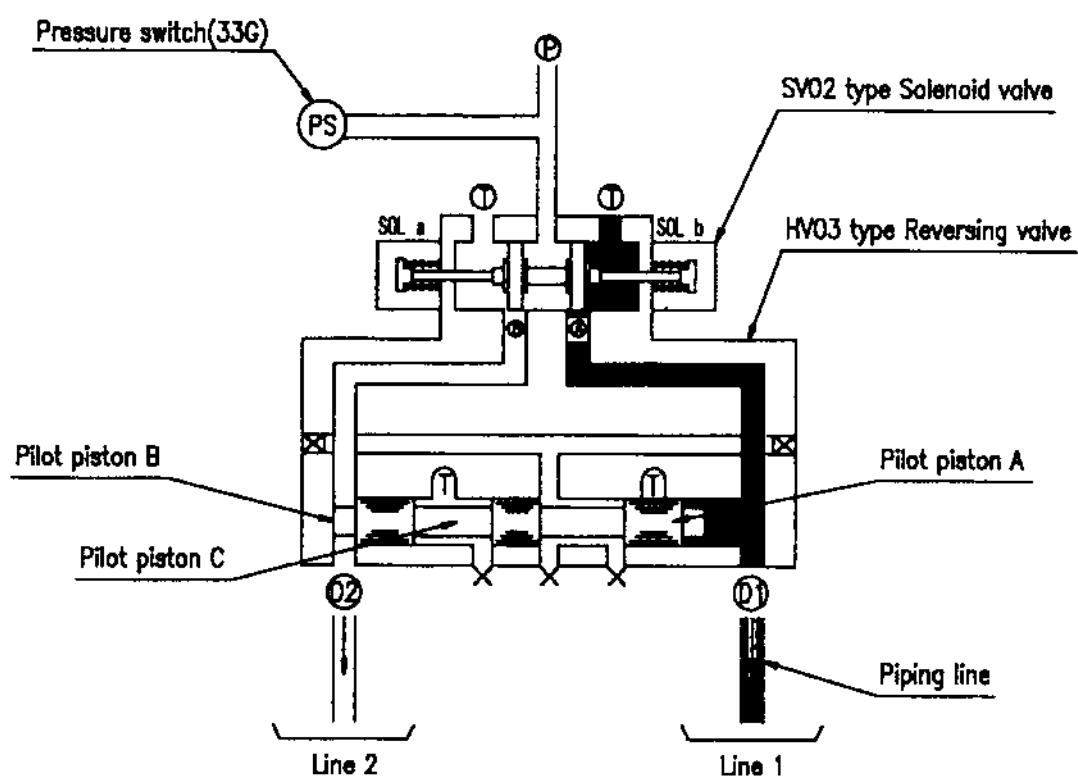


Position 2

Note : Pilot piston A, B and C are divided. When using in Lance system, there three pistons do not have any functions.

### Position 3 (completion of grease delivery to Line 1)

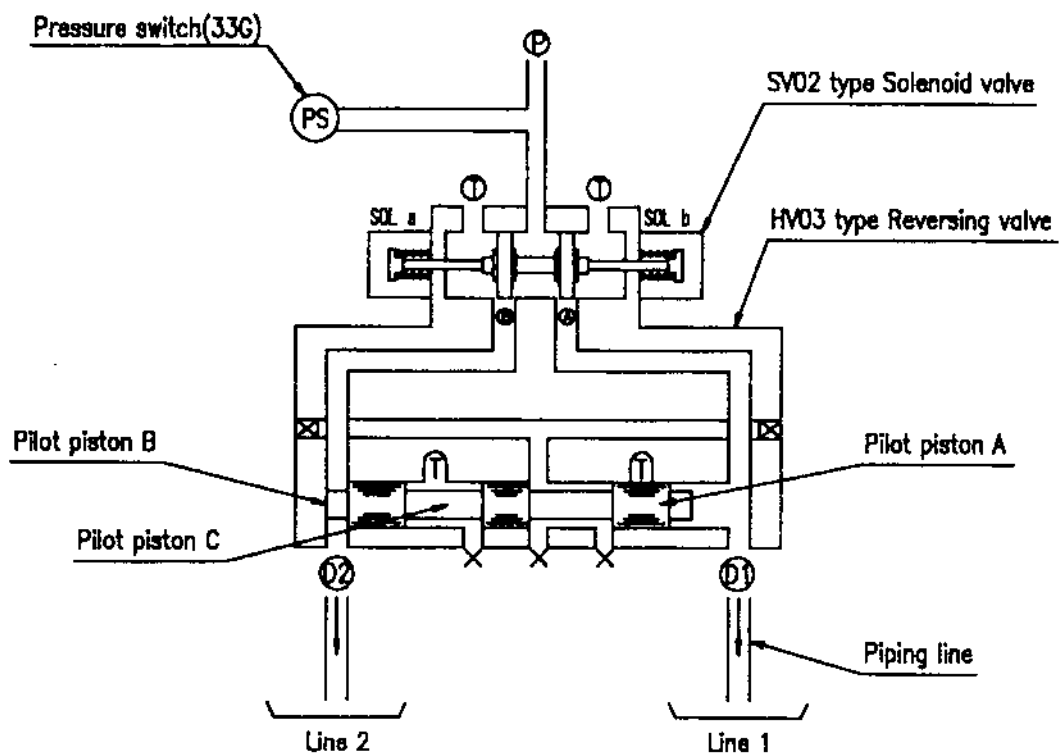
After SOLa is demagnetized, port (A) is connected to the tank through port (T) and pressure in port (A) decreases rapidly since it is released to the tank through port (T) (solenoid). Pressure in all the ports is released and the state shifts to Position 4.



Position 3

**Position 4 (stopped state)**

After operation on Line 1 (SOLa), wait for Line 2 operation. When it starts, the solenoid valve SOLb is energized and the pump is activated and the operation on Line 1 (SOLa) is reversed.



Position 4



#### 4. Handling precautions

- 1) Take care so that dust or air bubbles are not mixed in grease used.
- 2) Before filling with grease initially, open the air vent plug the top of the piston to remove air from the pump housing and the tank completely. Then, completely fill the pump housing and the tank with grease up to their lower part of tank follower plate to such an extent that grease flows out from the air vent plug.
- 3) Make sure that the crank chamber is filled with lubricating oil before starting the pump. Lubricating oil should gear oil, Class 2 ISO VG220 JISK2219, or the equivalent. Fill oil up to the specified oil level. Change it after 200 hours of operation, and then every 2,000 hours or so.
- 4) The reversing pressure of SP-R-250 pressure switch shall be usually set at 21MPa. Adjusting range is from 3MPa to 21MPa.
- 5) The cracking pressure of relief valve shall be usually set at 23MPa.

#### 5. Maintenance and Adjustment

If the pressure does not rise in long time operation, or discharge amount decreases, possibly resulting from wear of the pump cylinder set, adjust in the following procedure.

- 1) First, remove the drain plug from the crank chamber of pump housing and discharge oil.
- 2) Release the piston plug of the upper part of cylinder from the upper side of pump housing, remove five bolts of pump cylinder and take up the cylinder.
- 3) Next, Remove the cover with oil level gauge, take the eccentric shaft out of the cover hole. Then, eccentric, piston, connecting rod assembly and worm wheel are taken out together. Following this, remove the cover of opposite side.
- 4) Insert new pump cylinder from top and slightly tighten it with bolt.
- 5) Replace the main piston and pilot piston with new ones, set to the connecting rod, assemble them to the eccentric shaft in the same condition as it was before disassembly, and fit two pistons into the pump cylinder by inserting them from cover hole.
- 6) Next, apply small quantity of oil from top of the pump housing, turn it clockwise manually.

It is good that the worm turns smoothly with a slight feeling of resistance at certain point of revolution (When the main piston blocks the suction hole).

INSTRUCTION MANUAL  
OF  
MOTOR DRIVEN GREASE PUMP

U-25ANV-10

The motor driven grease pump U-25ANV is used as a grease supply source of a centralized lubricating system, which serves automatic and concentrating supply of appropriate amount of grease and is a high pressure grease pump capable of feeding lubrication grease at a constant feed rate by means of pressure.

#### 1. Main Specifications

- Reduction ratio : 1/15
- Pump revolution : 100 min<sup>-1</sup> (50Hz), 120 min<sup>-1</sup> (60Hz)
- Discharge volume : 60 cm<sup>3</sup>/min(50Hz), 72 cm<sup>3</sup>/min(60Hz)
- Rated pressure : Max. 21MPa
- Motor : 0.4kW 4P 3 $\phi$  totally enclosed fan cooled type
- Reservoir capacity : 25 $\phi$

#### 2. The pump construction

- Model P-25A Motor driven grease pump (built-in pump reduction gear.)
- Model T-25A-25 Grease tank
- Model HV03 Reversing valve
- Model SV02 Solenoid valve
- Model SP-R-250 Pressure switch
- Electric motor

This pump is provided with relief valve and pressure gauge, the motor is directly connected to the pump, thus being compact construction in general.

#### 3. Explanation of Construction and Operation

##### 3-1 Model P-25A Grease pump (Refer to Figs. I and II)

The rotating torque obtained by motor is reduced by the ① Worm and ② Worm Wheel in the pump with a built-in reduction gear and is then transferred to the ④ Cam through the ③ Electric Shaft. Further, this torque is converted by the eccentric movement of the cam to the reciprocating movement of the ⑥ Pilot Piston and the ⑦ Main Piston connected to the ends of the ⑤ Connecting Rod.

The ⑥ Pilot piston and ⑦ Main piston move while keeping certain phase difference from each other by means of ④ Cam, so that the ⑦ Main piston acts to suction and discharge grease and the ⑥ Pilot piston acts as valve, harmonized with the suction-discharge cycle.

Grease is sucked up from the suction port ① and ② of the ⑧ Pump Cylinder simultaneously, and during compression cycle of the Piston it goes through the passage ③ to reach the discharge port ④ where it may be discharged.

Pressurized grease put into ⑩ HV03 Reversing valve, then sent to discharge port of Line I and Line II, at the same time, also sent to ⑨ Pressure gauge and ⑪ Relief valve, it is used confirming the discharge pressure and opening the drain to Tank in case of abnormally high pressure.

This pump can discharge grease by right turn of its shaft.

### 3-2 Model T-25A-25 Grease tank (Refer to Fig. I)

The grease storage reservoir is equipped with the ⑬ Follower Plate to keep properly the high and low oil levels, and the plate comes up and down inside the tank according to increase and decrease of the grease. The oil level can be confirmed by the scale of the ⑭ Piston Rod, but, when it comes down to the bottom, the ⑰ Low Level Switch turns on according to the ⑯ Cam fitted on the upper part of the piston rod, and when the oil level comes up to the top, the ⑮ High Level Switch turns on. If a relevant electric wiring is connected to this level switch circuit, automatic grease replenishment becomes available in addition to lamp indication, alarm signals, etc.

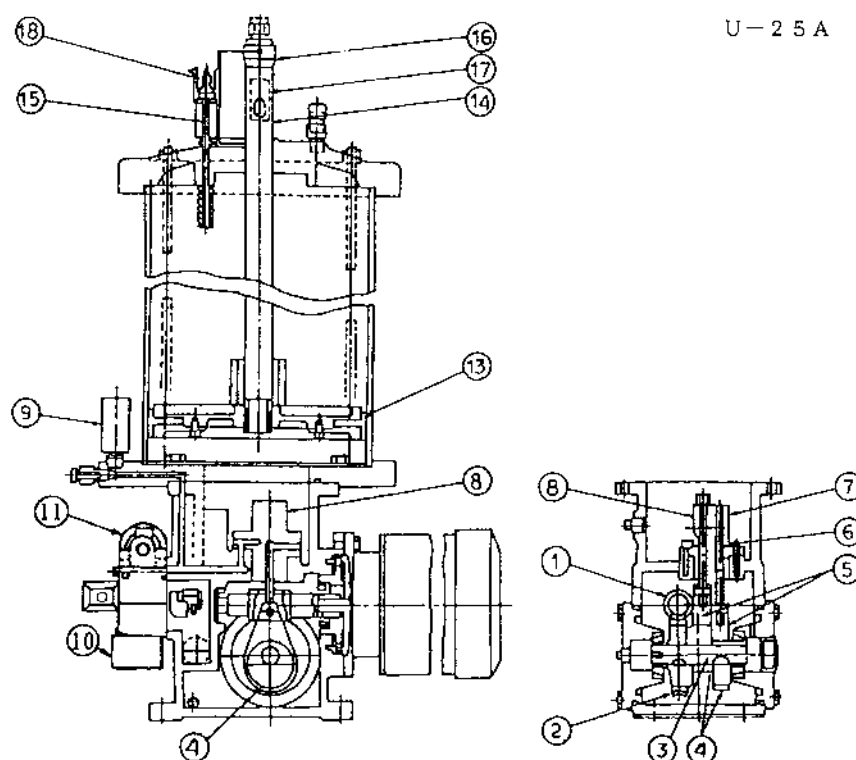


Fig. I

### 3-3 Two-step Low Level Limit Switch, Two-step High Level Limit Switch and Filling Valve.

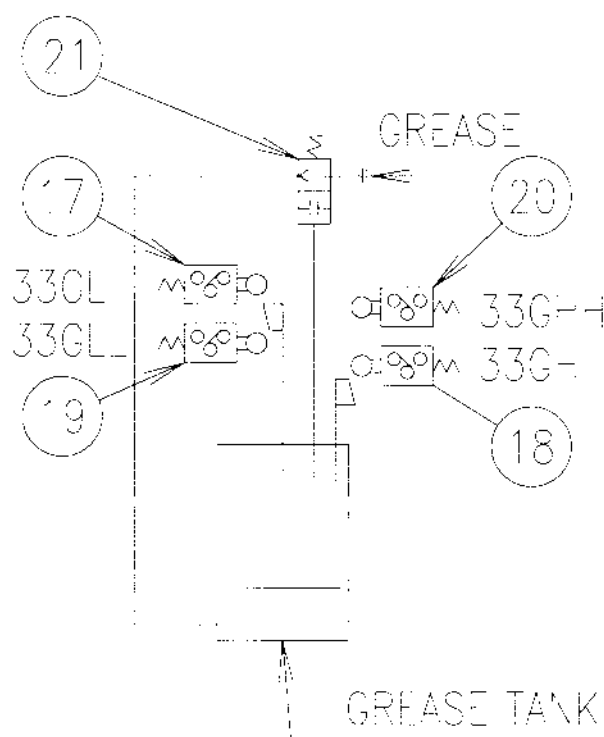
Grease can be automatically supplied.

Filling line is connected to inlet of ②① Filling valve, grease filling circuit is opened and shut by (Optional) Solenoid operated valve unit.

When the ①⑦ Low level limit switch (33GL) is turned on, grease supply is started, and when the ①⑧ High level limit switch (33GH) is turned on, grease supply is finished.

The ①⑨ Low low level limit switch (33GL) is used for warning of the empty tank in case of malfunction of Low level limit switch, and the ②⑦ High high level limit switch (33GHH) is used for warning of the filled tank in case of malfunction of High level limit switch.

②① Filling valve is designated to prevent mechanically overflow of grease in the tank. If the ①③ Follower plate rises abnormally, the spool is pushed up to close the supply line.



# ■ Structure and operation of double piston type pumps

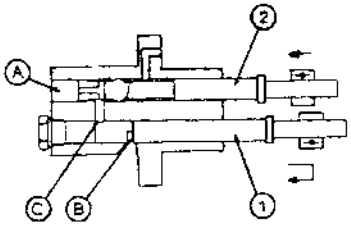
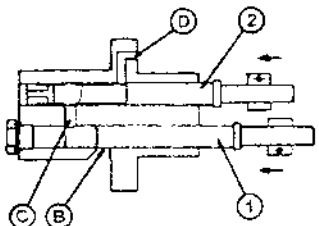
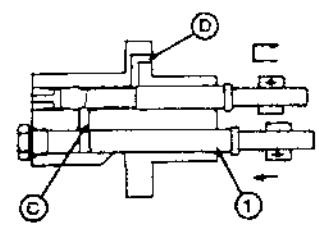
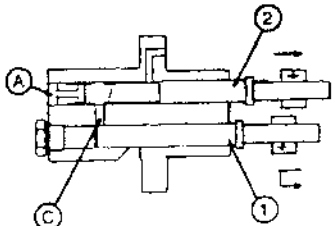
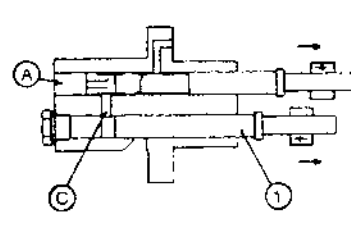
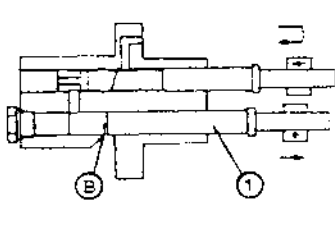
	<ul style="list-style-type: none"> <li>• ② Pilot piston operates in a way that connecting port ③ is open to suction port ①, so lubrication oil can be drawn in from suction ports ① and ② by the operation of main piston ①.</li> </ul>
	<ul style="list-style-type: none"> <li>• When ① Main piston moves forward, suction port ② is closed and ② Pilot piston moves in a way that connecting port ③ starts opening to discharge port ④.</li> </ul>
	<ul style="list-style-type: none"> <li>• When connecting port ③ is open to discharge port ④, ① Main piston continues to move forward and the lubricating oil in the cylinder is forcibly discharged from discharge port ④.</li> </ul>
	<ul style="list-style-type: none"> <li>• When ① Main piston stops forwarding and before retreating, ② Pilot piston works in a way connecting port ③ starts opening to suction port ①.</li> </ul>
	<ul style="list-style-type: none"> <li>• When connecting port ③ is open to suction port ①, ① Main piston continues to retreat, and the lubricating oil is drawn into the cylinder from the reservoir.</li> </ul>
	<ul style="list-style-type: none"> <li>• When suction port ② is open, ① Main piston draws in the lubricating oil from suction port ②.</li> </ul>

Fig. II

### 3-4 Model HV03 Reversing valve, model SV02 Solenoid valve

This reversing valve is attached to the dual line lubrication system pump and can be used with the following piping systems:

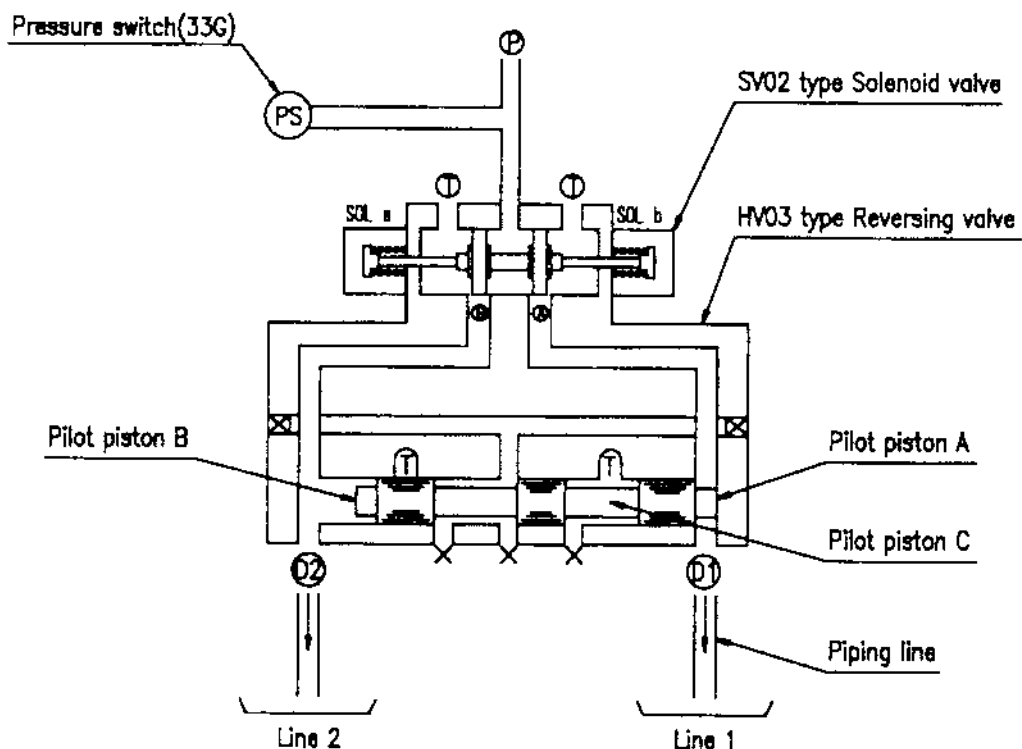
- 1) Lance system ... Connects the pressure switch to the pump line.
- 2) Loop system ... Connects the pressure switch to the return line.
- 3) End system ... Connects the pressure switch or pressure control valve to the end of piping.

#### • Lance system

Grease pressurized by the pump flows through the solenoid valve and activates all the distributing valves. When the pressure increases to switching pressure (preset with the pressure switch), a signal is sent and the solenoid valve is operated. Upon completion of this switching operation, the residual pressure in the main pipes and branch pipes are released into the tank.

#### Position 1 (stopped state)

Before operating the pump, ports **(P)**, **(A)** and **(B)** are open to the tank, and therefore all ports of piping line (Line 1 and Line 2) **(D1)**, **(D2)** are also released to the tank.



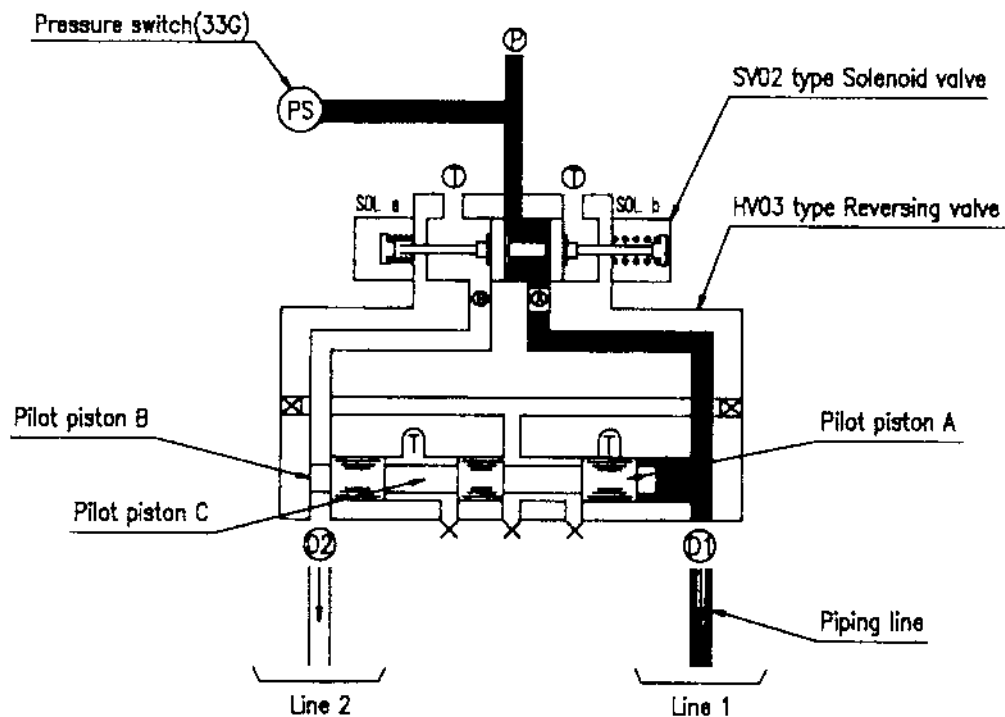
Position 1

**Position 2 (grease being delivered to Line 1)**

Activate the pump to energize the solenoid valve SOLa. Pressurized grease flows through port **(A)** (outlet of the solenoid valve) and makes move the reversing valve pilot piston A to left direction, discharges to port **(D1)**. (Note 1)

Pressurized grease discharged from Line 1 activates all the distributing valves. Pressure in Line 1 rapidly increases and is transmitted to the pressure switch (33G). When the pressure reaches the preset value, the switch turns ON and sends a signal to demagnetize SOLa and stop the pump.

Note 1) Line 2 is released to port **(D2)** (discharge port) and the tank.



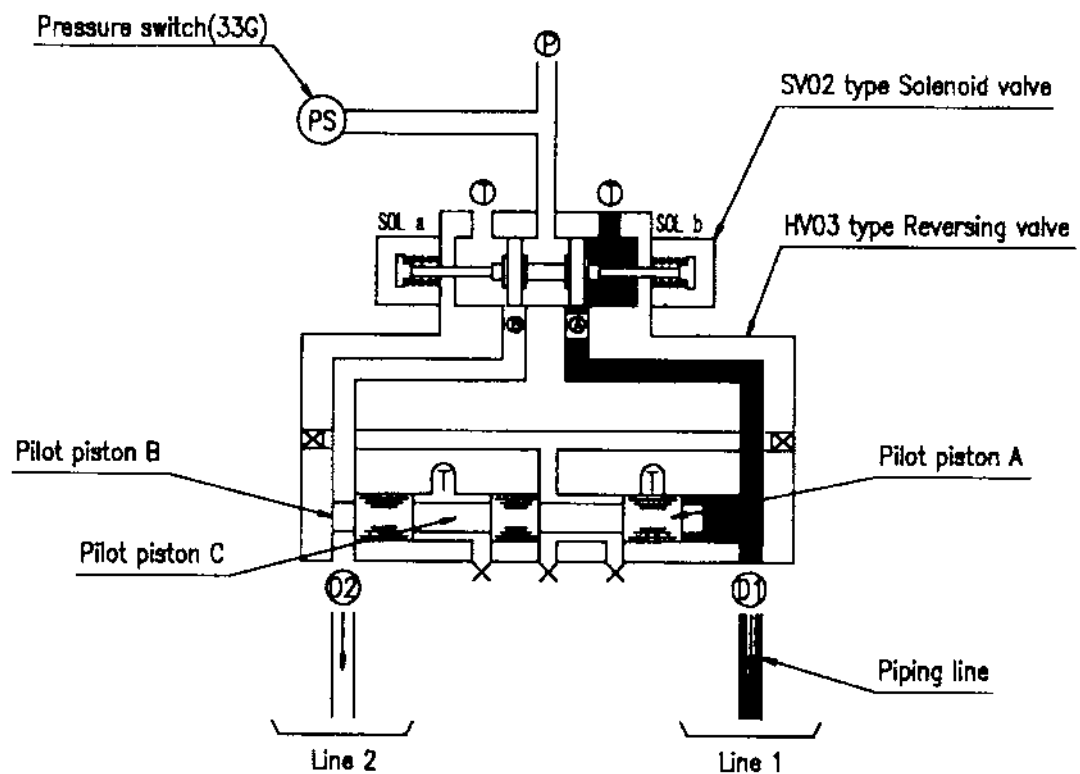
Position 2

Note : Pilot piston A, B and C are divided. When using in Lance system, there three pistons do not have any functions.



### Position 3 (completion of grease delivery to Line 1)

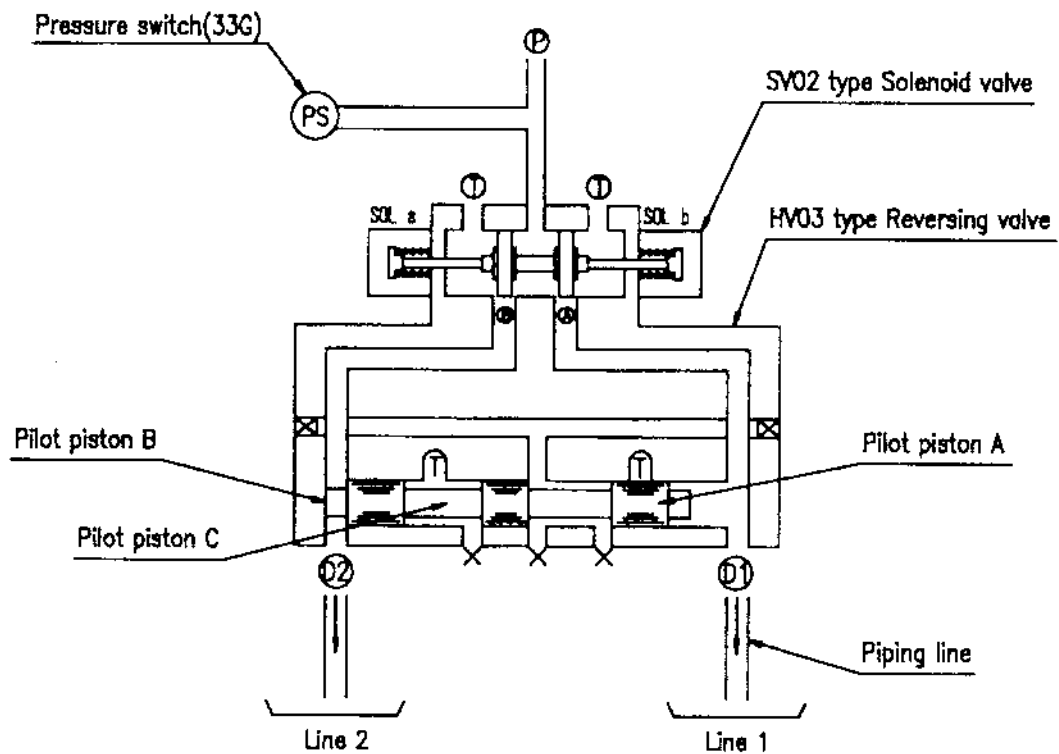
After SOLa is demagnetized, port ① is connected to the tank through port ① and pressure in port ① decreases rapidly since it is released to the tank through port ① (solenoid). Pressure in all the ports is released and the state shifts to Position 4.



Position 3

**Position 4 (stopped state)**

After operation on Line 1 (SOLa), wait for Line 2 operation. When it starts, the solenoid valve SOLb is energized and the pump is activated and the operation on Line 1 (SOLa) is reversed.

**Position 4**

#### 4. Handling precautions

- 1) Take care so that dust or air bubbles are not mixed in grease used.
- 2) Before filling with grease initially, open the air vent plug the top of the piston to remove air from the pump housing and the tank completely. Then, completely fill the pump housing and the tank with grease up to their lower part of tank follower plate to such an extent that grease flows out from the air vent plug.
- 3) Make sure that the crank chamber is filled with lubricating oil before starting the pump. Lubricating oil should gear oil, Class 2 ISO VG220 JISK2219, or the equivalent. Fill oil up to the specified oil level. Change it after 200 hours of operation, and then every 2,000 hours or so.
- 4) The reversing pressure of SP-R-250 pressure switch shall be usually set at 17MPa. Adjusting range is from 3MPa to 21MPa.
- 5) The cracking pressure of relief valve shall be usually set at 23MPa.

#### 5. Maintenance and Adjustment

If the pressure does not rise in long time operation, or discharge amount decreases, possibly resulting from wear of the pump cylinder set, adjust in the following procedure.

- 1) First, remove the drain plug from the crank chamber of pump housing and discharge oil.
- 2) Release the piston plug of the upper part of cylinder from the upper side of pump housing, remove five bolts of pump cylinder and take up the cylinder.
- 3) Next, Remove the cover with oil level gauge, take the eccentric shaft out of the cover hole. Then, eccentric, piston, connecting rod assembly and worm wheel are taken out together. Following this, remove the cover of opposite side.
- 4) Insert new pump cylinder from top and slightly tighten it with bolt.
- 5) Replace the main piston and pilot piston with new ones, set to the connecting rod, assemble them to the eccentric shaft in the same condition as it was before disassembly, and fit two pistons into the pump cylinder by inserting them from cover hole.
- 6) Next, apply small quantity of oil from top of the pump housing, turn it clockwise manually.

It is good that the worm turns smoothly with a slight feeling of resistance at certain point of revolution (When the main piston blocks the suction hole).

MODEL U-40ALS MOTOR DRIVEN GREASE PUMP  
INSTRUCTION MANUAL

The motor driven grease pump of U-40ALS type is intended for the use of supply source of a centralized lubricating system which serves automatic and concentrating supply of appropriate amount of grease and is a high pressure grease pump forcibly forwarding a fixed amount of grease by pressure.

## 1. Main Particulars :

- Reduction ratio : 1/20
- Pump revolution : 75 min<sup>-1</sup> (50Hz), 90 min<sup>-1</sup> (60Hz)
- Discharge capacity : 195 cm<sup>3</sup>/min(50Hz), 234 cm<sup>3</sup>/min(60Hz)
- Discharge pressure : Max. 21MPa
- Motor : 0.75kW 4P 3φ totally enclosed fan cooled type
- Reservoir capacity : 35L

## 2. The pump consisted of as follows :

- Model P-40A motor driven grease pump (reduction gear is built in.)
- Model T-35A grease reservoir
- Model HV03 Reversing valve
- Model SV02 Solenoid controlled valve
- Model SP-R-250 Pressure switch
- Motor

For others, relief valves and pressure gauges are equipped with, the motor is directly connected to the pump, being in compact construction in general.

## 3. Explanation of Construction and Operation :

## 3-1 Model P-40A Grease pump (Refer to Figs. I and II):

The turning effort obtained by motor starting is reduced by the Worm ① and Worm Wheel ② in the pump where a reduction gear is built in and is transferred to the Cam ④ through the Eccentric Shaft ③.

Further, this turning effort is converted by the eccentric movement of the cam into the reciprocating movement of the Pilot Piston ⑥ and the Main Piston ⑦ fitted at the end of the Connecting Rod ⑤.

The pilot piston and main piston is driven by the cam keeping certain phase difference with each other, therefore the main piston acts the suction pressurizing transfer of grease and the piston rod works complying with it as a valve.

Grease is sucked up from the suction port ① and ② of the Pump Cylinder ⑧ simultaneously, and during compression cycle of the Piston it goes through the passage ③ to reach the discharge port ④ where it may be discharged. Pressurized grease is put into HV03 Hydraulic change-over valve ⑩, transferred to the discharging ports of Line I and Line II simultaneously, with this, the grease is transferred to the Pressure Gauge ⑨ and the Relief valve ⑪, serving confirmation of discharge pressure and access to drainage into a tank in case of abnormal high pressure.

This pump can discharge grease by left turn of its shaft.

### 3-2 Model T-35A Grease reservoir (Refer to Fig. I):

The reservoir to store grease is equipped with the Follower Plate ⑬ for keeping proper fluctuation of the oil level, the plate coming up and down the tank inside according to increase and decrease in the grease.

The oil level can be confirmed by the scale of the Piston Rod ⑭, but, when it comes down to the bottom by its decreasing, the Low Level Switch ⑰ turns on according to the Cam ⑯ fitted on the upper part of the piston rod, and when the oil level comes up to the top by its increasing, the High Level Switch ⑱ turns on according to the cam fitted to the Cam Holder ⑮. With this electrically connected, it is possible to be automatically furnished with grease other than lamp indication, alarm signals, etc.

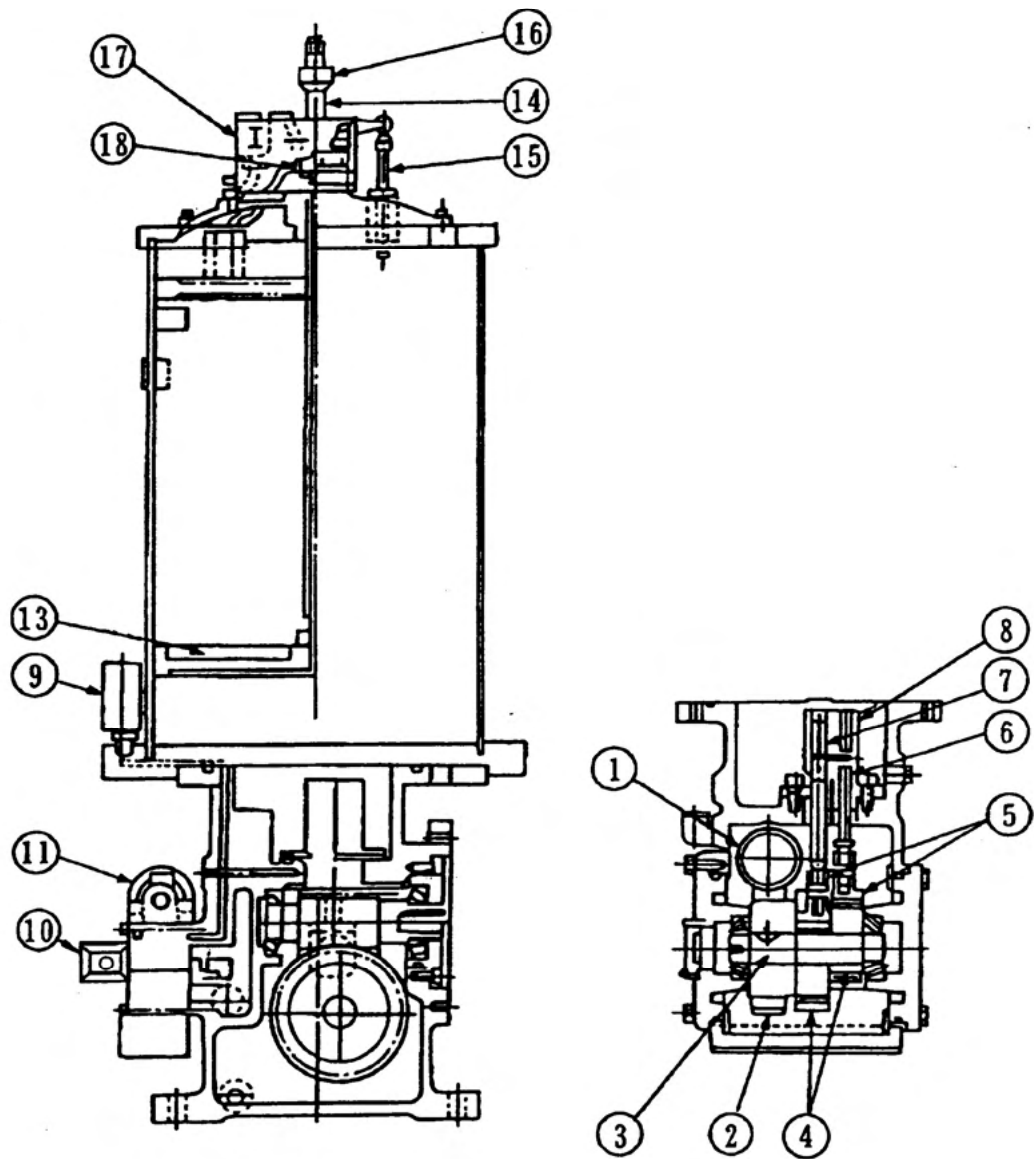


Fig. I

■ Structure and operation of double piston type pumps

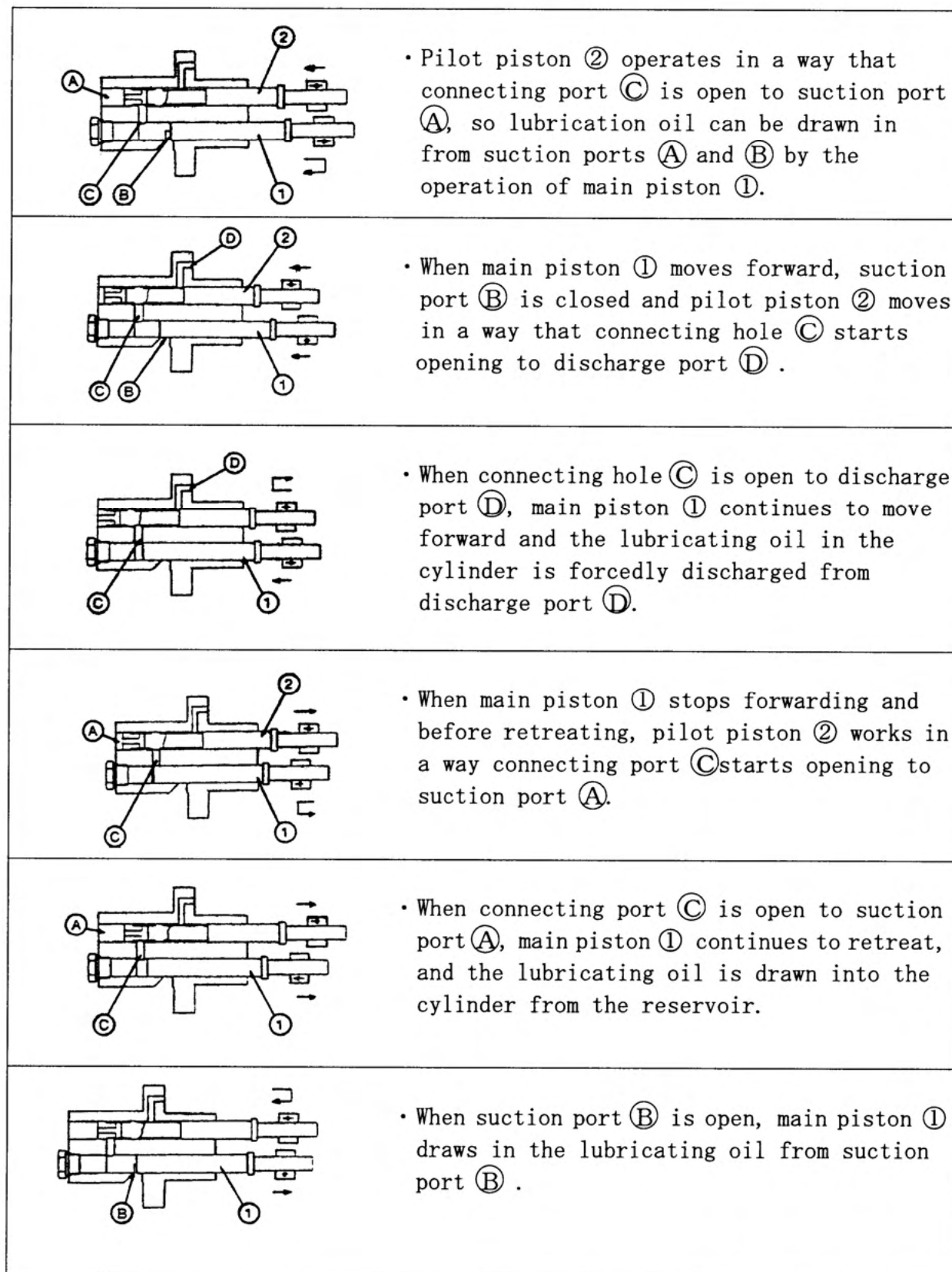


Fig. II

### 3-3 Model HV03 Reversing Valve , model SV02 Solenoid controlled valve

This reversing valve is attached to the dual line lubrication system pump and can be used with the following piping systems:

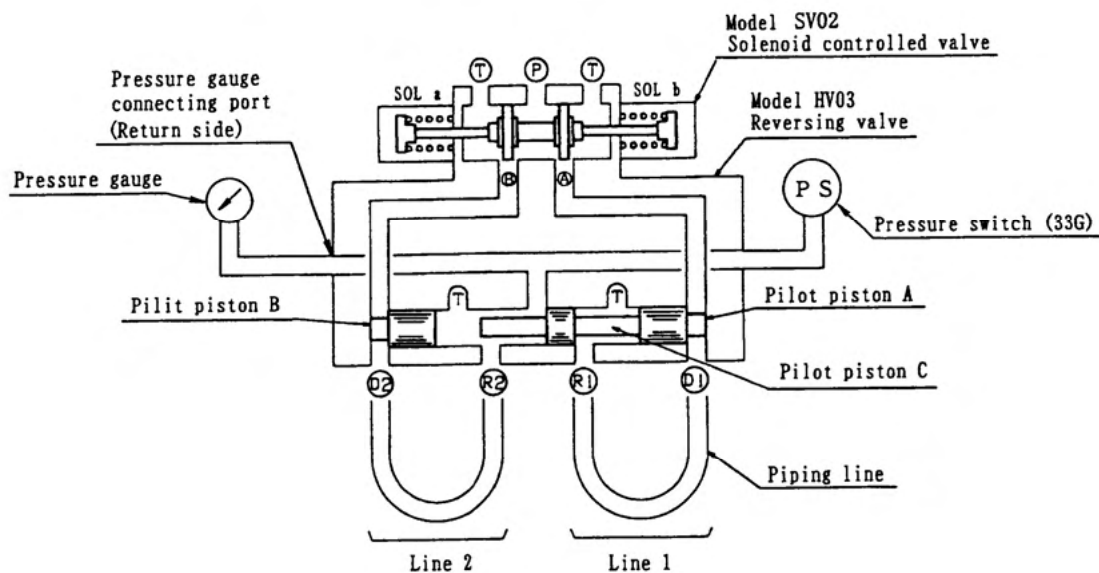
- 1) Lance system...Connects the pressure switch to the pump line.
- 2) Loop system....Connects the pressure switch to the return line.
- 3) End system.....Connects the pressure switch or the pressure control valve to the end of piping.

#### • Loop system

The pressure grease pressurized at the pump goes through the reversing valve and activates every distribution valve. When the pressure rises to the preset reversing pressure (preset value of the pressure switch), the signal causes switching by the solenoid controlled valve. After this switching operation has been completed, the rest of the pressure of the main pipe and the branch pipes will be entirely released to the tank.

#### Position 1 (before operation)

Before the operation, (P), (A) and (B) ports are released to the tank. Therefore, all ports are released to the tank, piping line (line 1, 2) (D1) and (D2).



Position 1



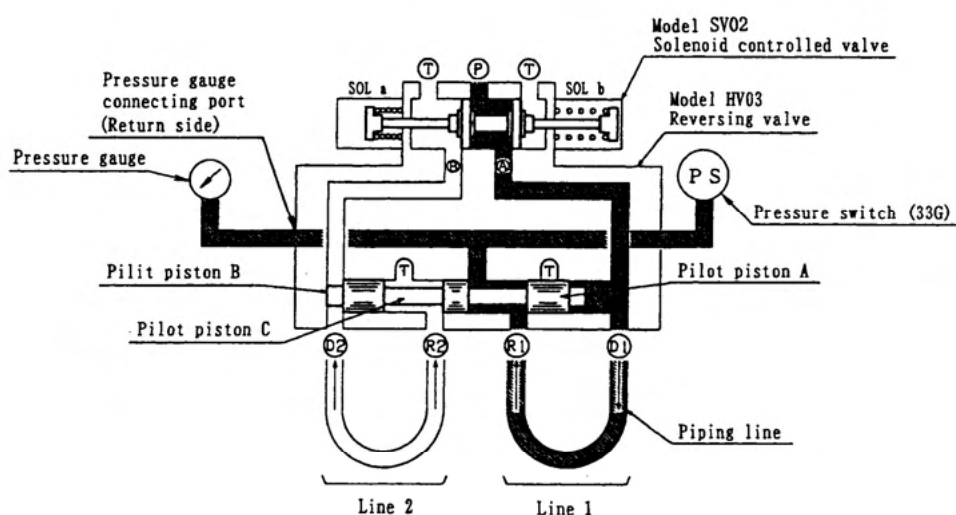
## Position 2 (lubricating line 1)

After starting the pump and exciting the solenoid controlled valve SOLa, the pressure grease goes through outlet port (A) of the solenoid controlled valve and moves the reversing valve pilot piston A, B and C to the left and then will be delivered to (D1) port. (Note 1)

After every distribution valve has been activated by the pressure grease delivered from line 1, the pressure of line 1 return port (R1) rises rapidly.

Then the pressure will be transferred to the pressure switch (33G). When the value reaches the preset value, the contact point will be ON. SOLa will be demagnetized by the signal and the pump will be stopped at the same time.

(Note 1) Line 2 is released to (D2) port (delivery port) and the tank.



## Position 2

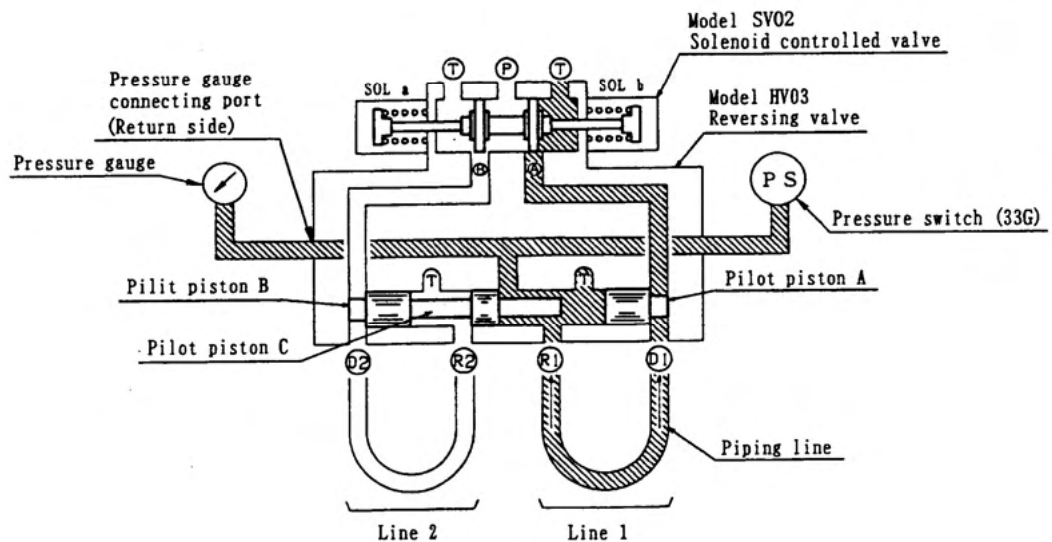
Note : Pilot pistons A, B and C are divided. When using in Lance system, these 3 pistons do not have any functions.

Position 3 (lubrication of line 1 is completed)

As a result of the demagnetization of SOLa, (A) port will be connected to the tank through (T) port. The pressure of port (A) will be released to the tank via (T) port (solenoid) and then will drop quickly.

At this time, the pressure which works on the left said (the (R1) side) of the pilot piston A rises higher than the pressure of the right side (the (D1) side). The pilot piston A moves to the right side and (R1) port is connected to (T) port.

The release of all port's pressure results in the state of position 4.

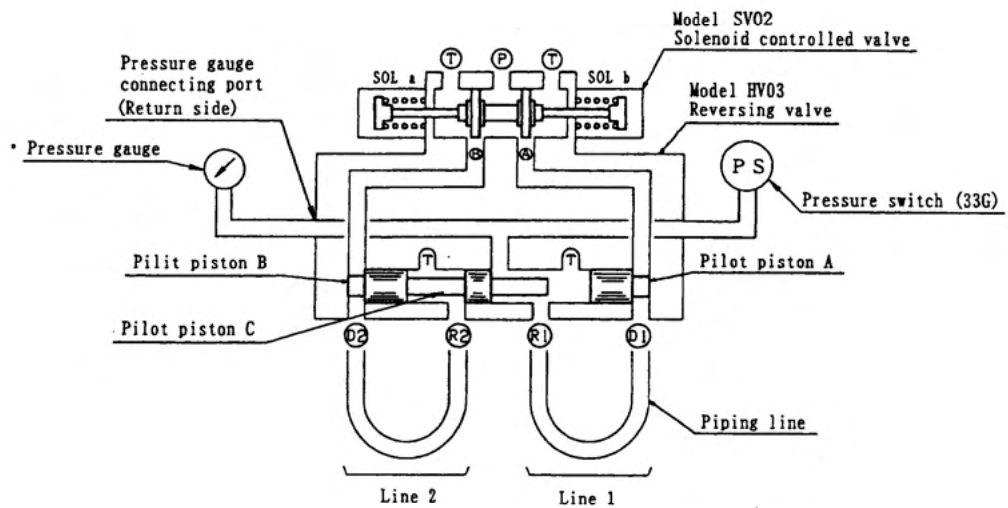


Position 3

#### Position 4 (stop)

The operation of line 1 (SOLa) stops. Line 2 operation will be awaited. Once it runs, the lubrication by line 2 excites solenoid controlled valve SOLb.

The pump starts working and executes the operation opposite of line 1 (SOLa).



Position 4

4. Precautions for Handling :

- 1) Care should be exercised not to mix dust, bubbles, etc. into the grease to be used.
- 2) First charging of grease is to be made after the air vent valve at the upper end of the piston is opened up for the purpose of completely removing the air inside the pump housing and tank, and the valve is to be closed upon confirmation that grease is fully charged down to the bottom of the pump housing and tank follower plate and the grease is coming out of the air vent valve.
- 3) Before starting the Pump, ensure that Crankcase is properly filled with oil. The oil (Gear oil class 2 ISO VG 220 JIS K2219 or the equivalent) should be replaced every 2000 hours operation except the first time replacement which must be conducted in 200 hours operation.
- 4) The reversing pressure of SP-R-250 Pressure switch is usually set at 5MPa.  
The adjustment range is 3MPa to 25 MPa.
- 5) The cracking pressure of the relief valve is usually set at 23MPa.

5. Maintenance and Adjustment :

When a cause is thought attributable to the wear in the pump cylinder, i.e. failure of increase in the pressure, decrease in the discharge amount, etc. due to long time operation, adjustment is to be taken as follows:

- 1) First remove the drain plug of the crank chamber of the pump housing and discharge oil.
- 2) Release the pistons plug of the upper side of the cylinder from the upper side of the pump housing, remove five bolts of the pump cylinder and take up the cylinder.

- 3) Next, remove the cover attached to the oil gauge, take the eccentric shaft out of the cover hole.

Then, the eccentric piston, connecting rod assembly and worm wheel are all seen coming out. Following with this, leave the cover of the opposite side removed.

- 4) Insert a new pump cylinder from the upper side and slightly tighten it with bolts.
- 5) Replace the main piston and pilot piston with new ones to set to the connecting rod, re-assemble them to the eccentric shaft in the same condition as the disassembly before, and incorporate two pistons to the pump cylinder inserting them from the cover hole.
- 6) Next, apply small quantity of oil from over the pump housing and turn it clockwise by hand in the same manner as before.

It is good that the worm turns smoothly with a slight feeling of resistance at certain point of revolution (When the main piston clogs the suction hole.)

## MODEL U-40ALM MOTOR DRIVEN GREASE PUMP INSTRUCTION MANUAL

The motor driven grease pump of U-40ALS type is intended for the use of supply source of a centralized lubricating system which serves automatic and concentrating supply of appropriate amount of grease and is a high pressure grease pump forcibly forwarding a fixed amount of grease by pressure.

### 1. Main Particulars:

- Reduction ratio : 1/20
- Pump revolution : 75 min<sup>-1</sup>(50Hz), 90 min<sup>-1</sup>(60Hz)
- Discharge capacity : 195 cm<sup>3</sup>/min(50Hz), 234 cm<sup>3</sup>/min(60Hz)
- Discharge pressure : Max. 21MPa
- Motor : 0.75kW 4P 3φ totally enclosed fan cooled type
- Reservoir capacity : 35ℓ

### 2. The pump consisted of as follows:

- Model P-40A motor driven grease pump (reduction gear is built in.)
- Model T-35A grease reservoir
- Model HV03 Reversing valve
- Model SV02 Solenoid controlled valve
- Model SP-R-250 Pressure switch
- Motor

For others, relief valves and pressure gauges are equipped with, the motor is directly connected to the pump, being in compact construction in general.

### 3. Explanation of Construction and Operation:

#### 3-1 Model P-40A Motor driven pump (Refer to Figs. I and II):

The turning effort obtained by motor starting is reduced by the Worm ① and Worm Wheel ② in the pump where a reduction gear is built in and is transferred to the Cam ④ through the Eccentric Shaft ③.

Further, this turning effort is converted by the eccentric movement of the cam into the reciprocating movement of the Pilot Piston ⑥ and the Main Piston ⑦ fitted at the end of the Connecting Rod ⑤.

The pilot piston and main piston is driven by the cam keeping certain phase difference with each other, therefore the main piston acts the suction pressurizing transfer of grease and the piston rod works complying with it as a valve.

Grease is sucked up from the suction port ① and ② of the Pump Cylinder ⑧ simultaneously, and during compression cycle of the Piston it goes through the passage ③ to reach the discharge port ④ where it may be discharged. Pressurized grease is put into HV03 Hydraulic change-over valve ⑩, transferred to the discharging ports of Line I and Line II simultaneously, with this, the grease is transferred to the Pressure Gauge ⑨ and the Relief valve ⑪, serving confirmation of discharge pressure and access to drainage into a tank in case of abnormal high pressure.

This pump can discharge grease by left turn of its shaft.

### 3-2 Model T-35A Grease reservoir (Refer to Fig. I):

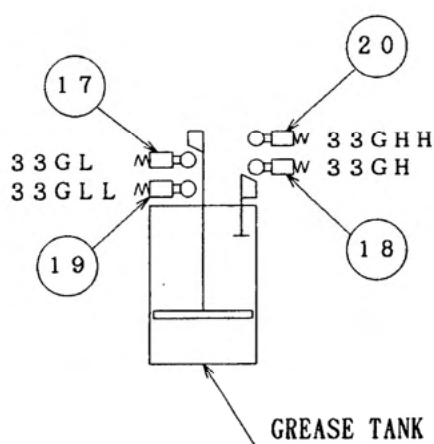
The reservoir to store grease is equipped with the Follower Plate ⑬ for keeping proper fluctuation of the oil level, the plate coming up and down the tank inside according to increase and decrease in the grease.

The oil level can be confirmed by the scale of the Piston Rod ⑭, but, when it comes down to the bottom by its decreasing, the Low Level Switch ⑰ turns on according to the Cam ⑯ fitted on the upper part of the piston rod, and when the oil level comes up to the top by its increasing, the High Level Switch ⑱ turns on according to the cam fitted to the Cam Holder ⑮. With this electrically connected, it is possible to be automatically furnished with grease other than lamp indication, alarm signals, etc.

3-3 Two-step Low Level Switch, Two-step High Level Switch Grease can be automatically supplied.

When the Tank Low Level Switch ⑰(33GL) is turned on, grease supply is started. It ends when the Tank High Level Switch ⑱(33GH) is turned on.

The Low-Low Level Switch ⑲(33GLL) is used for warning of the empty tank in case of malfunction of Low Level Switch, and the High-High Level Switch ⑳(33GHH) is used for warning of the filled tank in case of malfunction of High Level Switch.





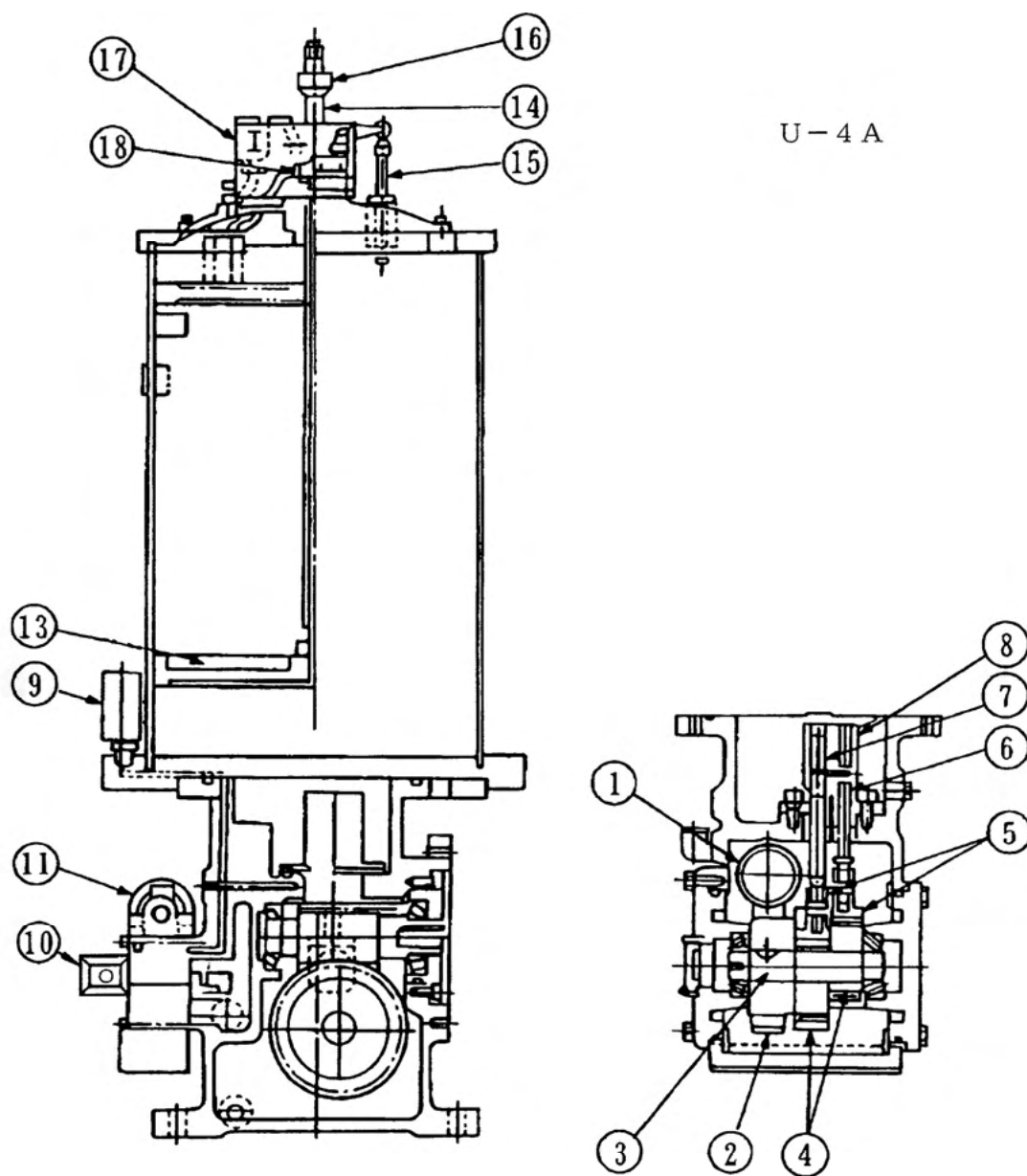


Fig. I

**■ Structure and operation of double piston type pumps**

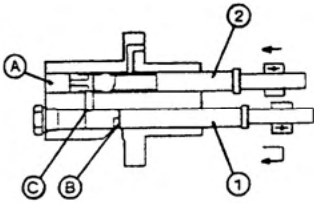
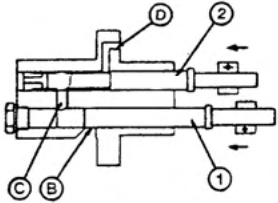
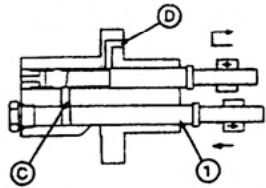
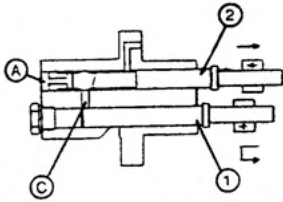
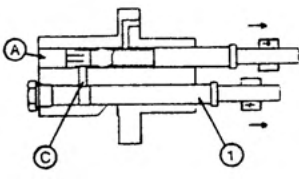
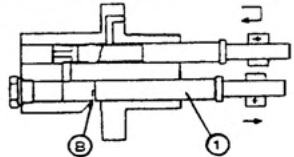
	<ul style="list-style-type: none"><li>● Pilot piston ② operates in a way that connecting port ③ is open to suction port ①, so lubricating oil can be drawn in from suction ports ① and ② by the operation of main piston ①.</li></ul>
	<ul style="list-style-type: none"><li>● When main piston ① moves forward, suction port ② is closed and pilot piston ② moves in a way that connecting hole ③ starts opening to discharge port ④.</li></ul>
	<ul style="list-style-type: none"><li>● When connecting hole ③ is open to discharge port ④, main piston ① continues to move forward and the lubricating oil in the cylinder is forcedly discharged from discharge port ④.</li></ul>
	<ul style="list-style-type: none"><li>● When main piston ① stops forwarding and before retreating, pilot piston ② works in a way connecting port ③ starts opening to suction port ①.</li></ul>
	<ul style="list-style-type: none"><li>● When connecting port ③ is open to suction port ①, main piston ① continues to retreat, and the lubricating oil is drawn into the cylinder from the reservoir.</li></ul>
	<ul style="list-style-type: none"><li>● When suction port ② is open, main piston ① draws in the lubricating oil from suction port ②.</li></ul>

Fig. II

### 3-3 Model HV03 Reversing valve, model SV02 Solenoid controlled valve

This reversing valve is attached to the dual line lubrication system pump and can be used with the following piping systems:

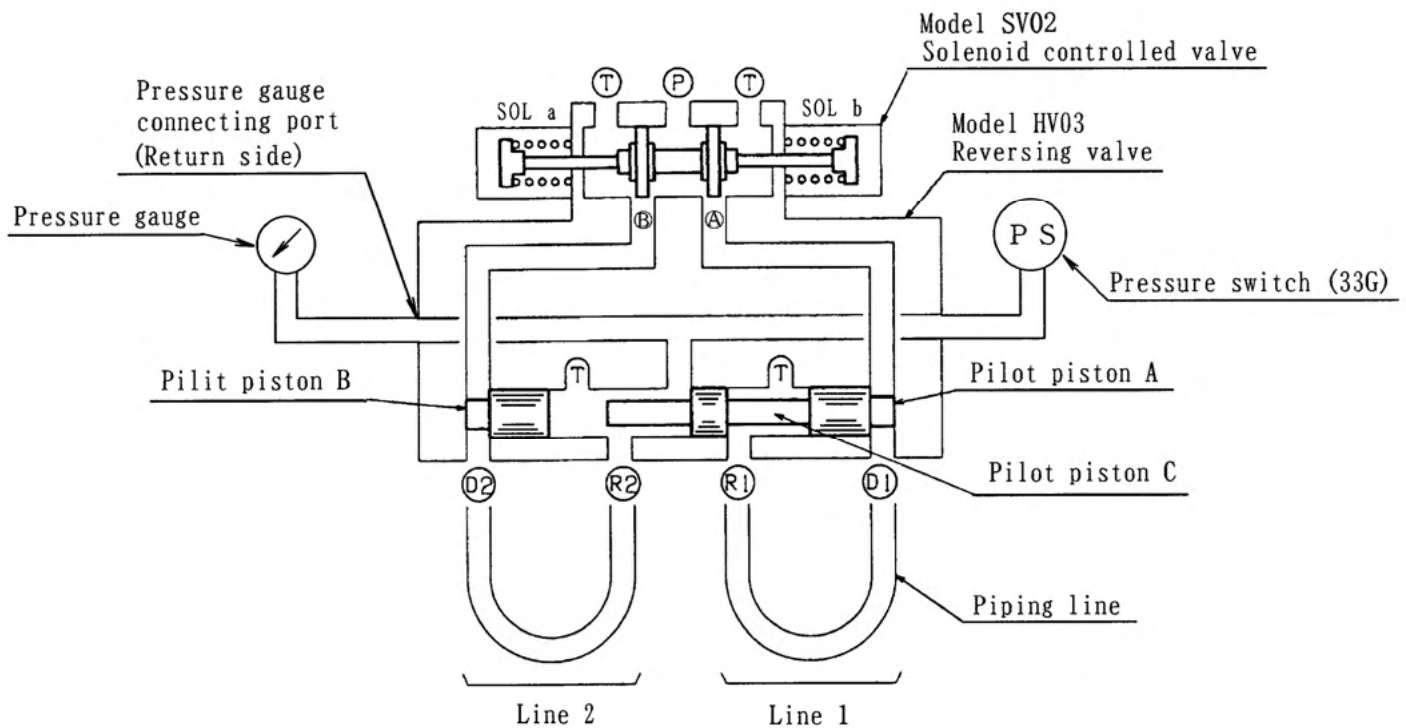
- 1) Loop system....Connects the pressure switch to the rerurn line.
- 2) End system.....Connects the pressure switch or the pressure control valve to the end of piping.
- 3) Lance system...Connects the pressure switch to the pump line

#### • Loop system

The pressure grease pressurized at the pump goes through the reversing valve and activates every distribution valve. When the pressure rises to the preset reversing pressure (preset value of the pressure switch), the signal causes switching by the solenoid controlled valve. After this switching operation has been completed, the rest of the pressure of the main pipe and the branch pipes will be entirely released to the tank.

#### Position 1(before operation)

Before the peration, ③, ④ and ⑤ ports are released to the tank. Therefore, all ports are released to the tank, piping line (line 1,2) ① and ②.



Position 1

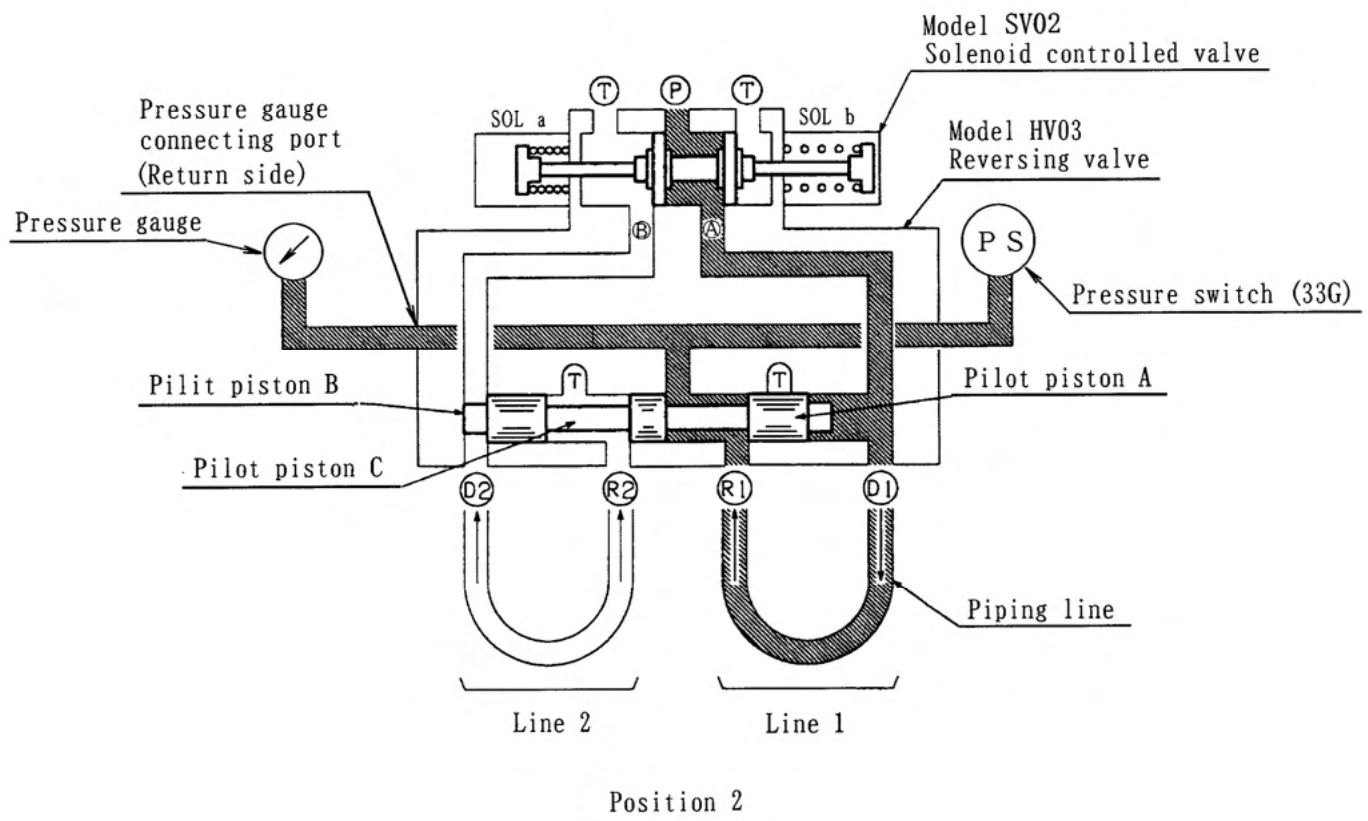
### Position 2 (lubricating line 1)

After starting the pump and exciting the solenoid controlled valve SOLa, the pressure grease goes through outlet port ① of the solenoid controlled valve and moves the reversing valve pilot piston A,B and C to the left and then will be delivered to ① port. (Note 1)

After every distribution valve has been activated by the pressure grease delivered from line 1, the pressure of line 1 return port ② rises rapidly.

Then the pressure will be transferred to the pressure switch(33G). When the value reaches the preset value, the contact point will be ON. SOLa will be demagnetized by the signal and the pump will be stopped at the same time.

(Note 1) Line 2 is released to ② port (delivery port) and the tank.



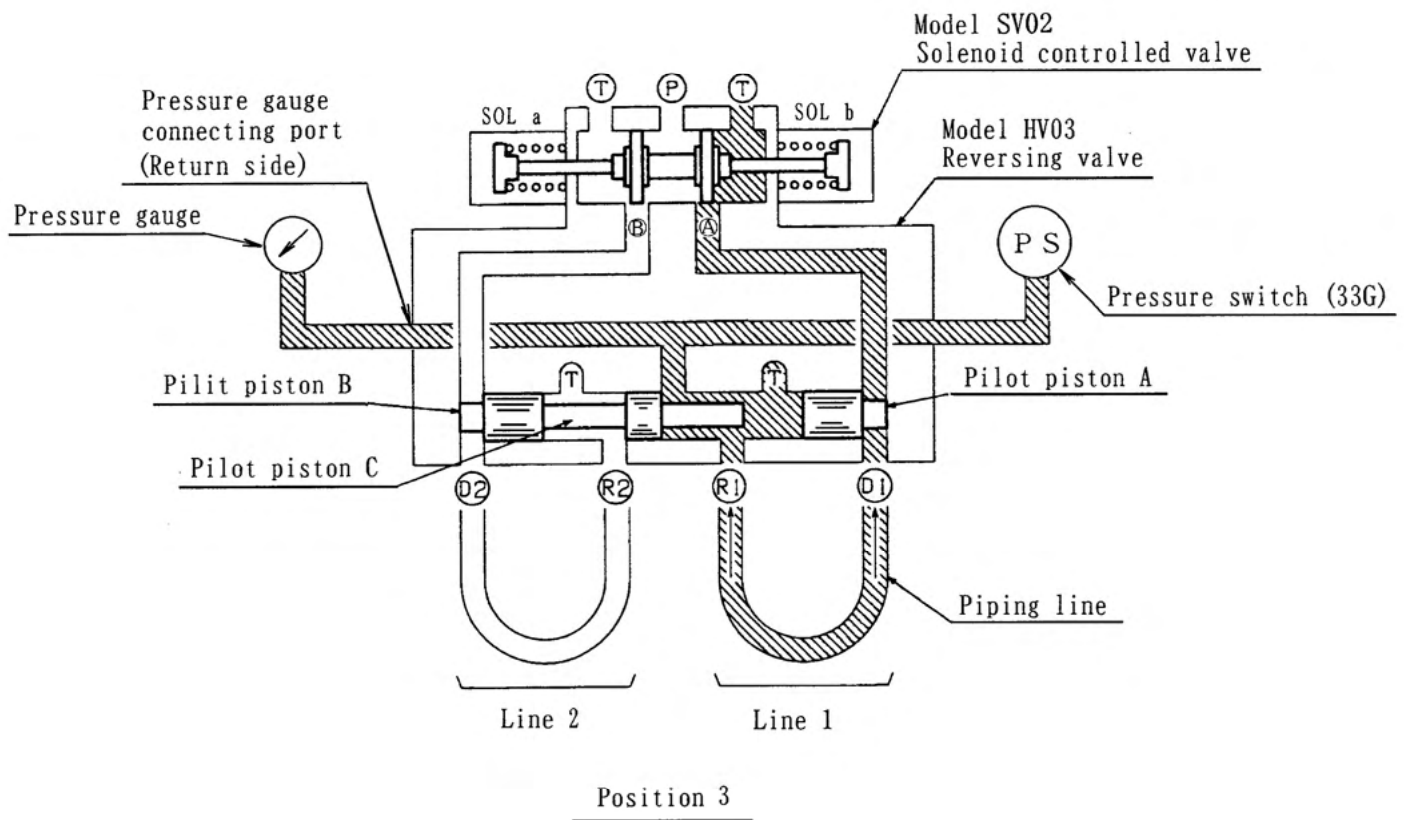
Note : Pilot pistons A,B and C are divided. When using in Lance system, these 3 pistons do not have any functions.

Position 3 (lubrication of line 1 is completed)

As a result of the demagnetization of SOLa,  $\textcircled{A}$  port will be connected to the tank through  $\textcircled{T}$  port. The pressure of port  $\textcircled{A}$  will be released to the tank via  $\textcircled{T}$  port (solenoid) and then will drop quickly.

At this time, the pressure which works on the left side (the  $\textcircled{R}$  side) of the pilot piston A rises higher than the pressure of the right side (the  $\textcircled{D}$  side). The pilot piston A moves to the right side and  $\textcircled{R}$  port is connected to  $\textcircled{T}$  port.

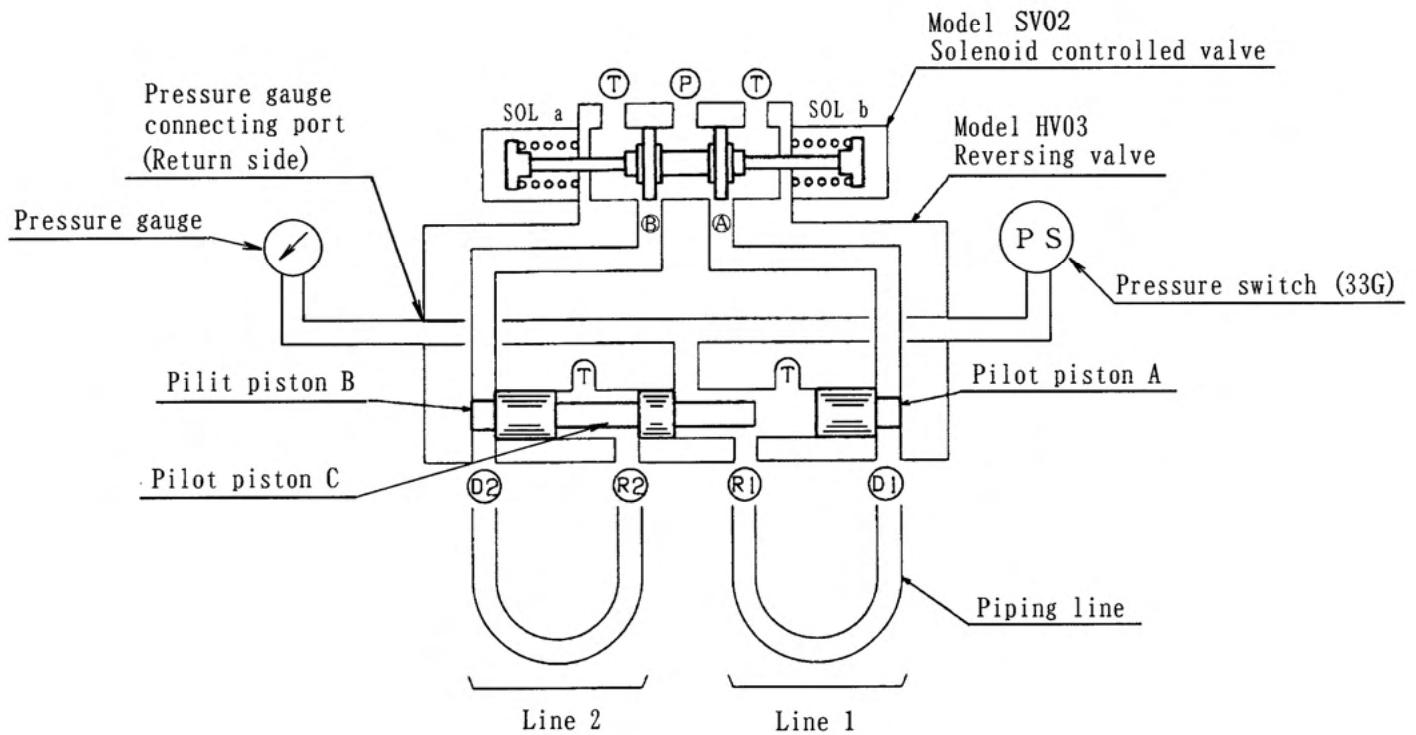
The release of all port's pressure results in the state of position 4.



#### Position 4 (stop)

The operation of line 1 (SOLa) stops. Line 2 operation will be awaited. Once it runs, the lubrication by line 2 excites solenoid controlled valve SOLb.

The pump starts working and executes the operation opposite of line 1 (SOLa).



Position 4

#### 4. Precautions for Handling:

- 1) Care should be exercised not to mix dust, bubbles, etc. into the grease to be used.
- 2) First charging of grease is to be made after the air vent valve at the upper end of the piston is opened up for the purpose of completely removing the air inside the pump housing and tank, and the valve is to be closed upon confirmation that grease is fully charged down to the bottom of the pump housing and tank follower plate and the grease is coming out of the air vent valve.
- 3) Before starting the Pump, ensure that Crankcase is properly filled with oil. The oil (Gear oil class 2 ISO VG 220 JIS K2219 or the equivalent) should be replaced every 2000 hours operation except the first time replacement which must be conducted in 200 hours operation.
- 4) The reversing pressure of SP-R-250 Pressure switch is usually set at 5MPa.  
The adjustment range is 3MPa to 25MPa.
- 5) The cracking pressure of the relief valve is usually set at 23MPa.

#### 5. Maintenance and Adjustment:

When a cause is thought attributable to the wear in the pump cylinder, i.e. failure of increase in the pressure, decrease in the discharge amount, etc. due to long time operation, adjustment is to be taken as follows:

- 1) First remove the drain plug of the crank chamber of the pump housing and discharge oil.
- 2) Release the pistons plug of the upper side of the cylinder from the upper side of the pump housing, remove five bolts of the pump cylinder and take up the cylinder.

- 3) Next, remove the cover attached to the oil gauge, take the eccentric shaft out of the cover hole.

Then, the eccentric piston, connecting rod assembly and worm wheel are all seen coming out. Following with this, leave the cover of the opposite side removed.

- 4) Insert a new pump cylinder from the upper side and slightly tighten it with bolts.
- 5) Replace the main piston and pilot piston with new ones to set to the connecting rod, re-assemble them to the eccentric shaft in the same condition as the disassembly before, and incorporate two pistons to the pump cylinder inserting them from the cover hole.
- 6) Next, apply small quantity of oil from over the pump housing and turn it clockwise by hand in the same manner as before.

It is good that the worm turns smoothly with a slight feeling of resistance at certain point of revolution (When the main piston clogs the suction hole.)



MODEL U-40ALV MOTOR DRIVEN GREASE PUMP  
INSTRUCTION MANUAL

The motor driven grease pump of U-40ALV type is intended for the use of supply source of a centralized lubricating system which serves automatic and concentrating supply of appropriate amount of grease and is a high pressure grease pump forcibly forwarding a fixed amount of grease by pressure.

1. Main Particulars :

- Reduction ratio : 1/20
- Pump revolution : 75 min<sup>-1</sup> (50Hz), 90 min<sup>-1</sup> (60Hz)
- Discharge capacity : 195 cm<sup>3</sup>/min(50Hz), 234 cm<sup>3</sup>/min(60Hz)
- Discharge pressure : Max. 21MPa
- Motor : 0.75kW 4P 3φ totally enclosed fan cooled type
- Reservoir capacity : 35L

2. The pump consisted of as follows :

- Model P-40A motor driven grease pump (reduction gear is built in.)
- Model T-35A grease reservoir
- Model HV03 Reversing valve
- Model SV02 Solenoid controlled valve
- Model SP-R-250 Pressure switch
- Motor

For others, relief valves and pressure gauges are equipped with, the motor is directly connected to the pump, being in compact construction in general.

3. Explanation of Construction and Operation :

3-1 Model P-40A Grease pump (Refer to Figs. I and II):

The turning effort obtained by motor starting is reduced by the Worm ① and Worm Wheel ② in the pump where a reduction gear is built in and is transferred to the Cam ④ through the Eccentric Shaft ③.

Further, this turning effort is converted by the eccentric movement of the cam into the reciprocating movement of the Pilot Piston ⑥ and the Main Piston ⑦ fitted at the end of the Connecting Rod ⑤.

The pilot piston and main piston is driven by the cam keeping certain phase difference with each other, therefore the main piston acts the suction pressurizing transfer of grease and the piston rod works complying with it as a valve.

Grease is sucked up from the suction port ① and ② of the Pump Cylinder ⑧ simultaneously, and during compression cycle of the Piston it goes through the passage ③ to reach the discharge port ④ where it may be discharged. Pressurized grease is put into HV03 Hydraulic change-over valve ⑩, transferred to the discharging ports of Line I and Line II simultaneously, with this, the grease is transferred to the Pressure Gauge ⑨ and the Relief valve ⑪, serving confirmation of discharge pressure and access to drainage into a tank in case of abnormal high pressure.

This pump can discharge grease by right turn of its motor drive shaft. Please refer next page for details of the pump structure.

### 3-2 Model T-35A Grease reservoir (Refer to Fig. I):

The reservoir to store grease is equipped with the Follower Plate ⑬ for keeping proper fluctuation of the oil level, the plate coming up and down the tank inside according to increase and decrease in the grease.

The oil level can be confirmed by the scale of the Piston Rod ⑭, but, when it comes down to the bottom by its decreasing, the Low Level Switch ⑰ turns on according to the Cam ⑯ fitted on the upper part of the piston rod, and when the oil level comes up to the top by its increasing, the High Level Switch ⑱ turns on according to the cam fitted to the Cam Holder ⑮. With this electrically connected, it is possible to be automatically furnished with grease other than lamp indication, alarm signals, etc.

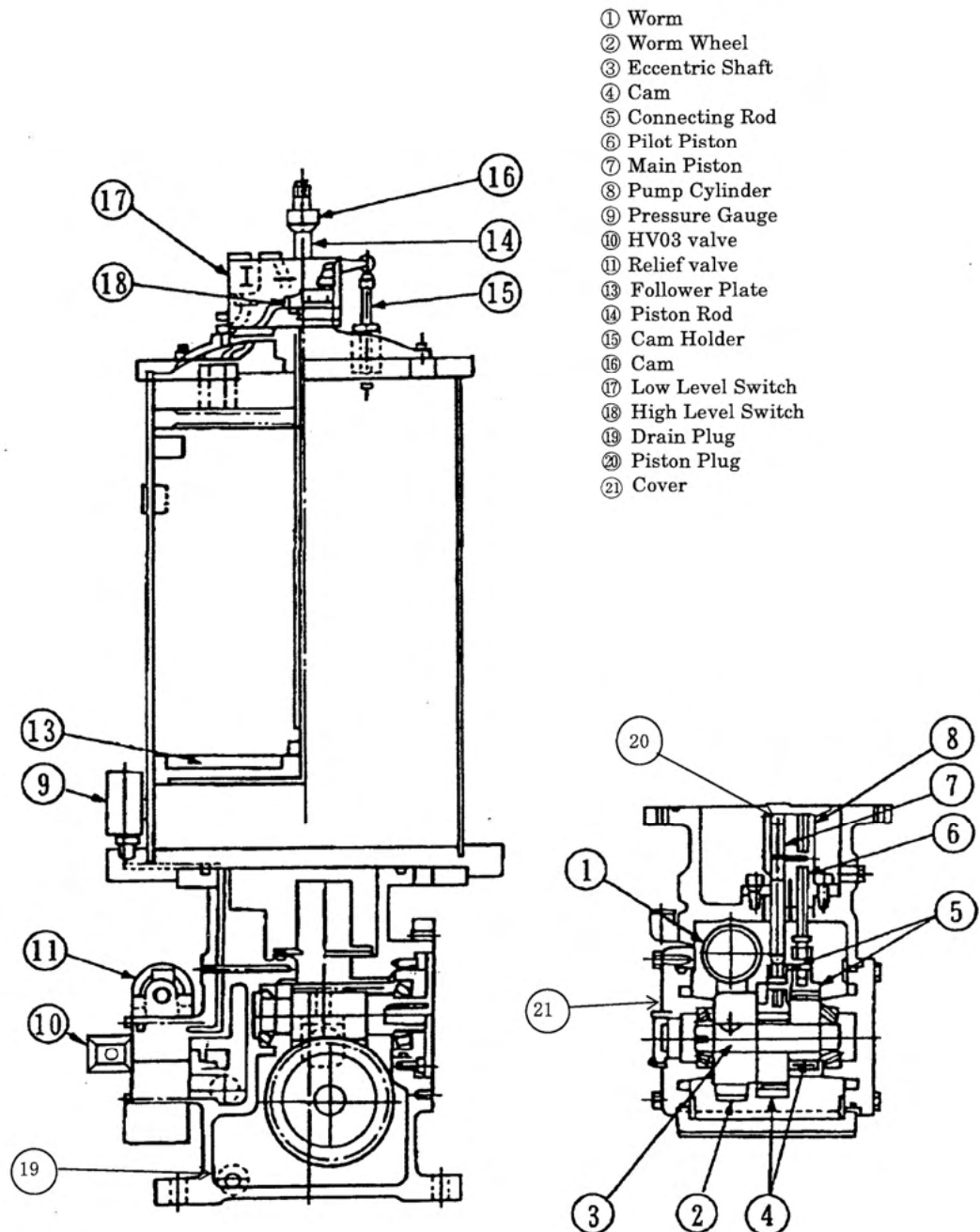
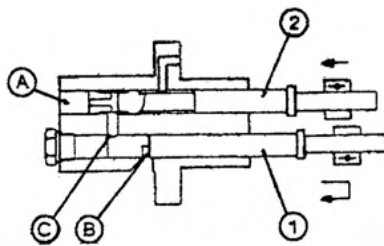
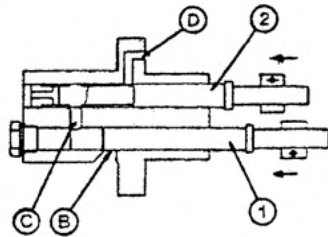


Fig. I

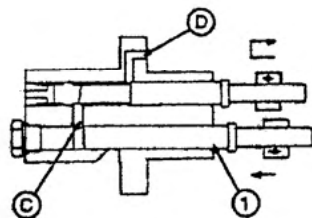
# ■ Structure and operation of double piston type pumps



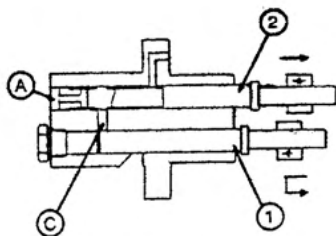
- Pilot piston ② operates in a way that connecting port ③ is open to suction port ①, so lubrication oil can be drawn in from suction ports ① and ② by the operation of main piston ①.



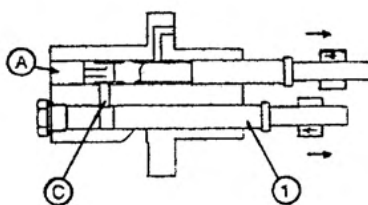
- When main piston ① moves forward, suction port ② is closed and pilot piston ② moves in a way that connecting hole ③ starts opening to discharge port ④.



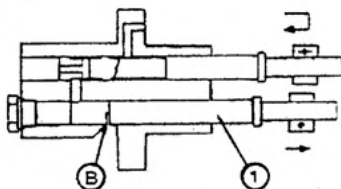
- When connecting hole ③ is open to discharge port ④, main piston ① continues to move forward and the lubricating oil in the cylinder is forcibly discharged from discharge port ④.



- When main piston ① stops forwarding and before retreating, pilot piston ② works in a way connecting port ③ starts opening to suction port ①.



- When connecting port ③ is open to suction port ①, main piston ① continues to retreat, and the lubricating oil is drawn into the cylinder from the reservoir.



- When suction port ② is open, main piston ① draws in the lubricating oil from suction port ②.

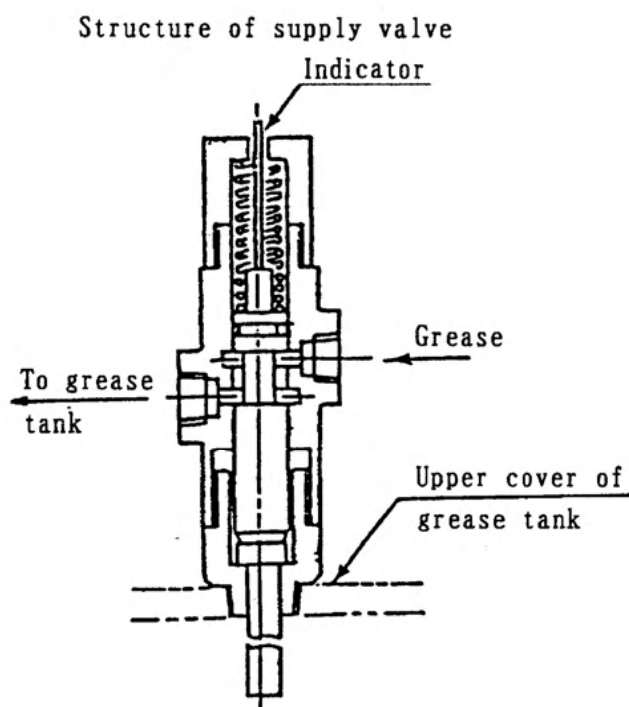
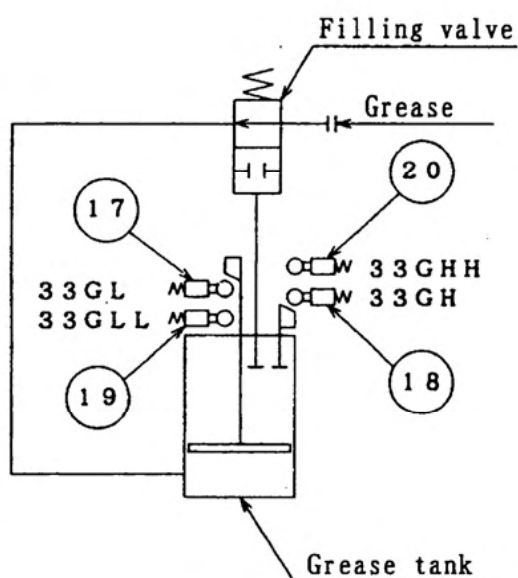
Fig. II

3-3 Two-step Low Level Switch, Two-step High Level Switch or Filling valve.  
Grease can be automatically supplied.

When the Tank Low Level Switch ⑰ (33GL) is turned on, grease supply is started. It ends when the Tank High Level Switch ⑱ (33GH) is turned on.

The Low-Low Level Switch ⑲ (33GLL) is used for warning of the empty tank in case of malfunction of Low level Switch, and the High-High Level Switch ⑳ (33GHH) is used for warning of the filled tank in case of malfunction of High Level Switch.

The supply valve is designed to prevent mechanically overflow of grease in the tank. If the follower plate ⑬ rises abnormally, the spool is pushed up to close the supply line.



### 3-4 Model HV03 Reversing Valve , model SV02 Solenoid controlled valve

This reversing valve is attached to the dual line lubrication system pump and can be used with the following piping systems:

- 1) Loop system.....Connects the pressure switch to the return line.
- 2) End system.....Connects the pressure switch or the pressure control valve to the end of piping.
- 3) Lance system...Connects the pressure switch to the pump line.

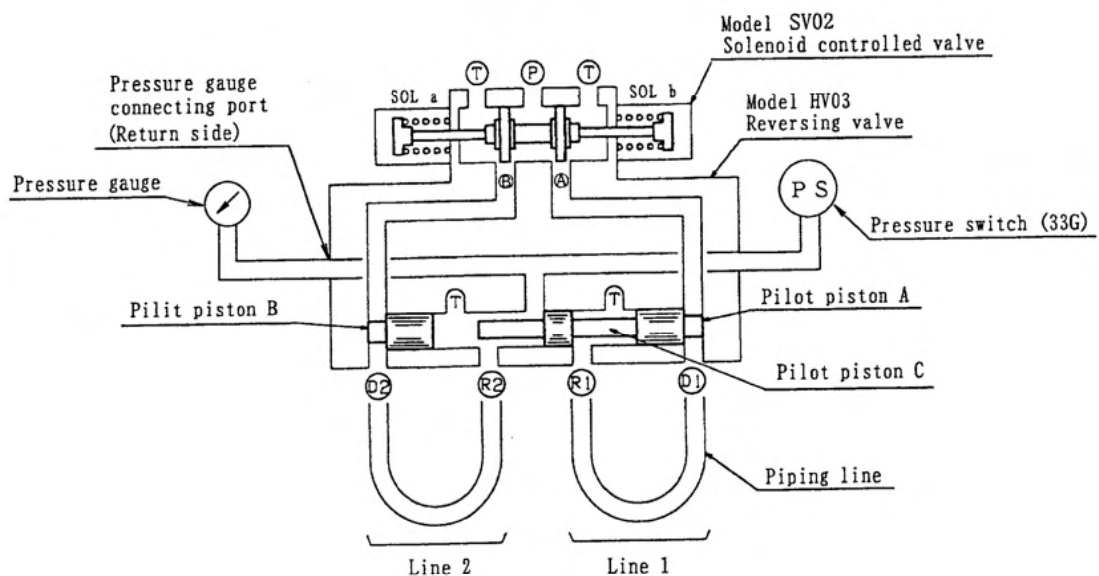
Only Loop system is explained below since this is the instruction manual for Loop system.

#### • Loop system

The pressure grease pressurized at the pump goes through the reversing valve and activates every distribution valve. When the pressure rises to the preset reversing pressure (preset value of the pressure switch), the signal causes switching by the solenoid controlled valve. After this switching operation has been completed, the rest of the pressure of the main pipe and the branch pipes will be entirely released to the tank.

#### Position 1(before operation)

Before the operation, (P), (A) and (B) ports are released to the tank. Therefore, all ports are released to the tank, piping line (line 1, 2) (D1) and (D2).



Position 1

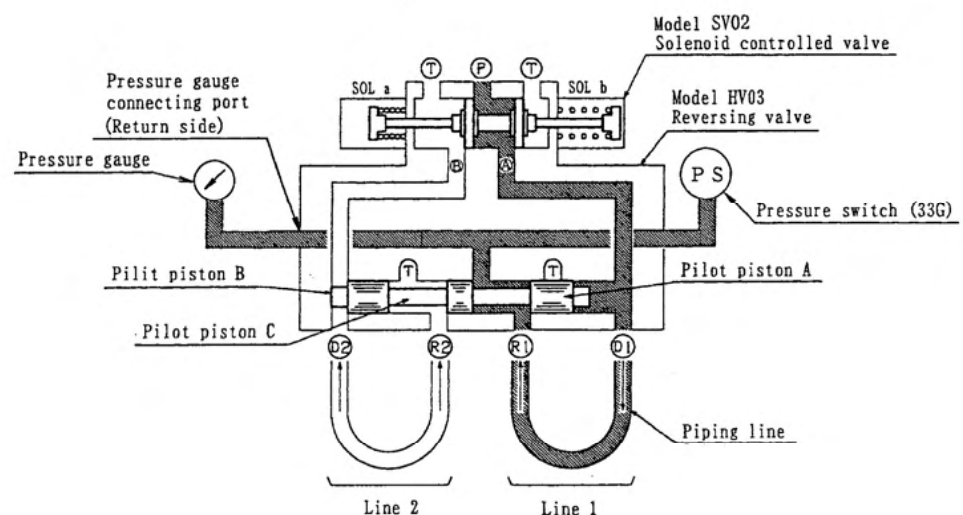
### Position 2 (lubricating line 1)

After starting the pump and exciting the solenoid controlled valve SOLa, the pressure grease goes through outlet port ① of the solenoid controlled valve and moves the reversing valve pilot piston A, B and C to the left and then will be delivered to ① port. (Note 1)

After every distribution valve has been activated by the pressure grease delivered from line 1, the pressure of line 1 return port ① rises rapidly.

Then the pressure will be transferred to the pressure switch (33G). When the value reaches the preset value, the contact point will be ON. SOLa will be demagnetized by the signal and the pump will be stopped at the same time.

(Note 1) Line 2 is released to ② port (delivery port) and the tank.



### Position 2

Note : Pilot pistons A, B and C are divided. When using in Lance system, these 3 pistons do not have any functions.

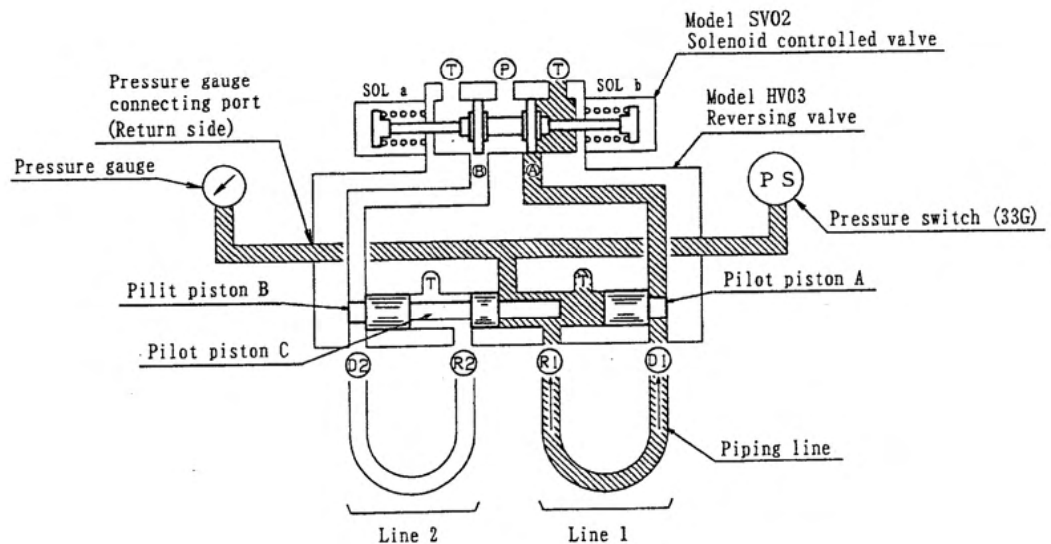


Position 3 (lubrication of line 1 is completed)

As a result of the demagnetization of SOLa, (A) port will be connected to the tank through (T) port. The pressure of port (A) will be released to the tank via (T) port (solenoid) and then will drop quickly.

At this time, the pressure which works on the left side (the (R1) side) of the pilot piston A rises higher than the pressure of the right side (the (D1) side). The pilot piston A moves to the right side and (R1) port is connected to (T) port.

The release of all port's pressure results in the state of position 4.



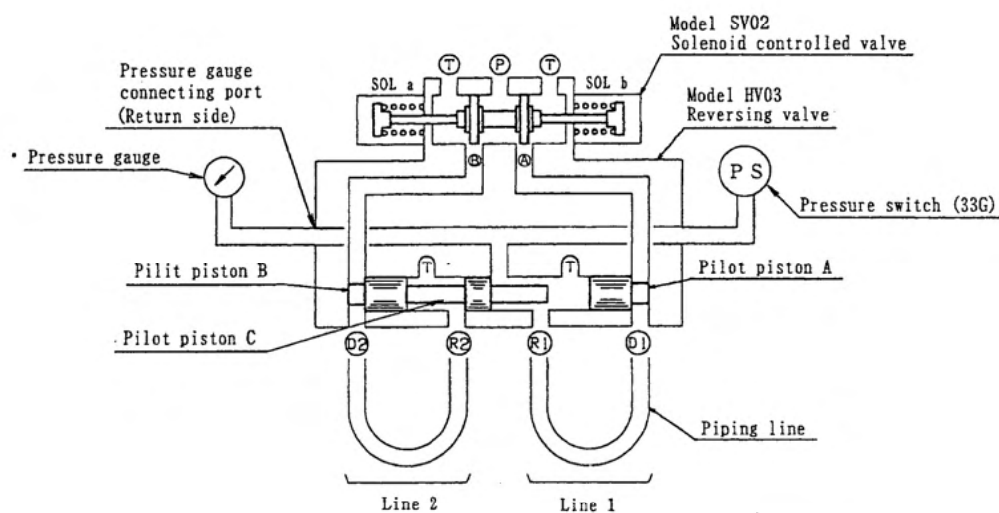
Position 3



#### Position 4 (stop)

The operation of line 1 (SOLa) stops. Line 2 operation will be awaited. Once it runs, the lubrication by line 2 excites solenoid controlled valve SOLb.

The pump starts working and executes the operation opposite of line 1 (SOLa).



#### Position 4

#### 4. Precautions for Handling :

- 1) Care should be exercised not to mix dust, bubbles, etc. into the grease to be used.
- 2) First charging of grease is to be made after the air vent valve at the upper end of the piston is opened up for the purpose of completely removing the air inside the pump housing and tank, and the valve is to be closed upon confirmation that grease is fully charged down to the bottom of the pump housing and tank follower plate and the grease is coming out of the air vent plug.
- 3) Before starting the Pump, ensure that Crankcase is properly filled with oil. The oil (Gear oil class 2 ISO VG 220 JIS K2219 or the equivalent) should be replaced every 2000 hours operation except the first time replacement which must be conducted in 200 hours operation.
- 4) The reversing pressure of SP-R-250 Pressure switch is usually set at 5MPa.  
The adjustment range is 3MPa to 25MPa.
- 5) The cracking pressure of the relief valve is usually set at 23MPa.
- 6) When filling valve is on operation, filler connection maintains block conditions. To restore filler connection at open condition, hit the top end of indicator lightly with resin hammer.

## 5. Maintenance and Adjustment :

When a cause is thought attributable to the wear in the pump cylinder, i.e. failure of increase in the pressure, decrease in the discharge amount, etc. due to long time operation, adjustment is to be taken as follows:

- 1) First remove the drain plug ⑱ of the crank chamber of the pump housing and discharge oil.
- 2) Release the pistons plug ⑳ of the upper side of the cylinder from the upper side of the pump housing, remove five bolts of the pump cylinder and take up the cylinder.

- 3) Next, remove the cover ㉑ attached to the oil gauge, take the eccentric shaft ㉒ out of the cover hole.

Then, the cam ㉓, piston ㉔ ㉕, connecting rod ㉖ assembly and worm wheel ㉗ are all seen coming out. Following with this, leave the cover of the opposite side removed.

- 4) Insert a new pump cylinder from the upper side and slightly tighten it with bolts.
- 5) Replace the main piston ㉕ and pilot piston ㉔ with new ones to set to the connecting rod, re-assemble them to the eccentric shaft in the same condition as the disassembly before, and incorporate two pistons to the pump cylinder inserting them from the cover hole.
- 6) Next, apply small quantity of oil from over the pump housing and turn it clockwise by hand in the same manner as before.

It is good that the worm turns smoothly with a slight feeling of resistance at certain point of revolution (When the main piston clogs the suction hole.)

MODEL U-40ANM MOTOR DRIVEN GREASE PUMP  
INSTRUCTION MANUAL

The motor driven grease pump of U-40ANM type is intended for the use of supply source of a centralized lubricating system which serves automatic and concentrating supply of appropriate amount of grease and is a high pressure grease pump forcibly forwarding a fixed amount of grease by pressure.

1. Main Particulars :

- Reduction ratio : 1/20
- Pump revolution : 75 min<sup>-1</sup>(50Hz), 90 min<sup>-1</sup>(60Hz)
- Discharge capacity : 195 cm<sup>3</sup>/min(50Hz), 234 cm<sup>3</sup>/min(60Hz)
- Discharge pressure : Max. 21MPa
- Motor : 0.75kW 4P 3 $\phi$  Totally enclosed fan cooled type
- Reservoir capacity : 35L

2. The pump consisted of as follows :

- Model P-40A motor driven grease pump (reduction gear is built in.)
- Model T-35A grease reservoir
- Model HV03 Reversing valve
- Model SV02 Solenoid controlled valve
- Model SP-R-250 Pressure switch
- Motor

For others, relief valves and pressure gauges are equipped with, the motor is directly connected to the pump, being in compact construction in general.

3. Explanation of Construction and Operation :

3-1 Model P-40A Motor driven pump (Refer to Figs. I and II):

The turning effort obtained by motor starting is reduced by the Worm ① and Worm Wheel ② in the pump where a reduction gear is built in and is transferred to the Cam ④ through the Eccentric Shaft ③.

Further, this turning effort is converted by the eccentric movement of the cam into the reciprocating movement of the Pilot Piston ⑥ and the Main Piston ⑦ fitted at the end of the Connecting Rod ⑤. The pilot piston and main piston is driven by the cam keeping certain phase difference with each other, therefore the main piston acts the suction pressurizing transfer of grease and the piston rod works complying with it as a valve.

Grease is sucked up from the suction port (A) and (B) of the Pump Cylinder ⑧ simultaneously, and during compression cycle of the Piston it goes through the passage (C) to reach the discharge port (D) where it may be discharged. Pressurized grease is put into HV03 Hydraulic change-over valve ⑩, transferred to the discharging ports of Line 1 and Line 2 simultaneously, with this, the grease is transferred to the Pressure Gauge ⑨ and the Relief valve ⑪, serving confirmation of discharge pressure and access to drainage into a tank in case of abnormal high pressure.

This pump can discharge grease by left turn of its shaft.

### 3-2 Model T-35A Grease reservoir (Refer to Fig. I):

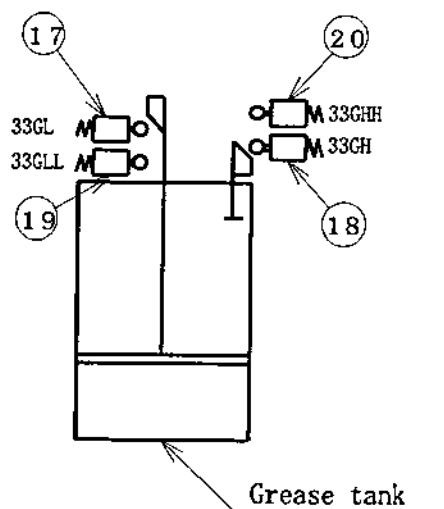
The reservoir to store grease is equipped with the Follower Plate ⑬ for keeping proper fluctuation of the oil level, the plate coming up and down the tank inside according to increase and decrease in the grease.

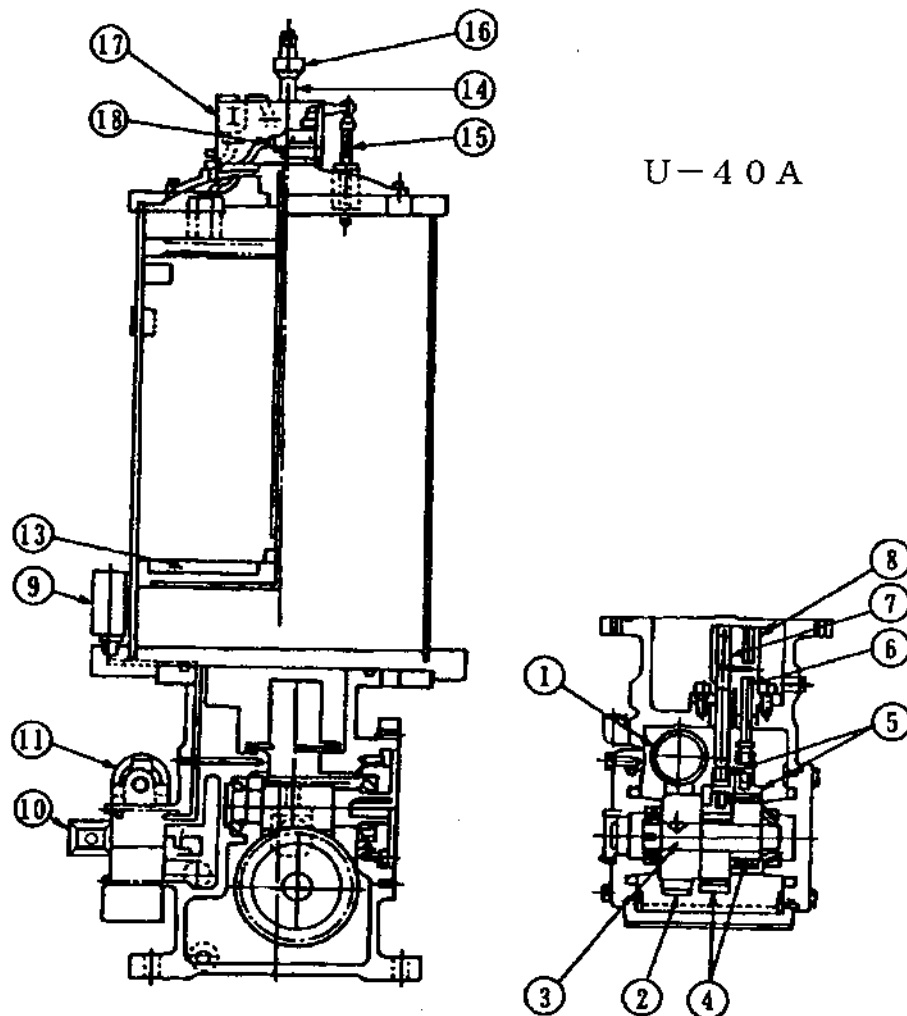
The oil level can be confirmed by the scale of the Piston Rod ⑭, but, when it comes down to the bottom by its decreasing, the Low Level Switch ⑰ turns on according to the Cam ⑯ fitted on the upper part of the piston rod, and when the oil level comes up to the top by its increasing, the High Level Switch ⑱ turns on according to the cam fitted to the Cam Holder ⑮. With this electrically connected, it is possible to be automatically furnished with grease other than lamp indication, alarm signals, etc.

3-3 Two-step Low Level Switch, Two-step High Level Switch Grease can be automatically supplied.

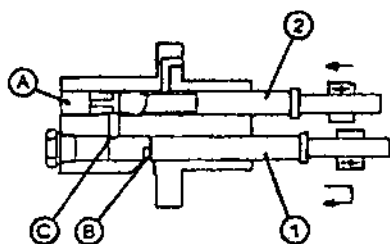
When the Tank Low Level Switch ⑰ (33GL) is turned on, grease supply is started. It ends when the Tank High Level Switch ⑱ (33GH) is turned on.

The Low-Low Level Switch ⑲ (33GLL) is used for warning of the empty tank in case of malfunction of Low Level Switch, and the High-High Level Switch ⑳ (33GHH) is used for warning of the filled tank in case of malfunction of High Level Switch.

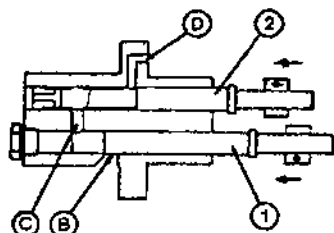


Fig. I

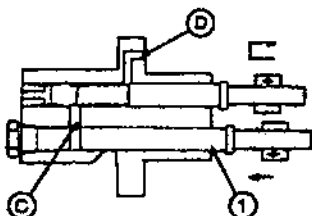
■ Structure and operation of double piston type pumps



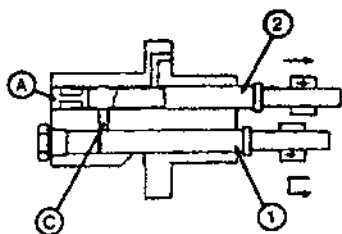
- Pilot piston ② operates in a way that connecting port C is open to suction port A, so lubrication oil can be drawn in from suction ports A and B by the operation of main piston ①.



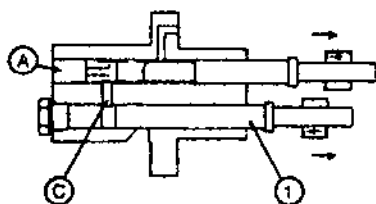
- When main piston ① moves forward, suction port B is closed and pilot piston ② moves in a way that connecting hole C starts opening to discharge port D.



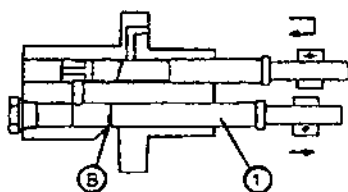
- When connecting hole C is open to discharge port D, main piston ① continues to move forward and the lubricating oil in the cylinder is forcibly discharged from discharge port D.



- When main piston ① stops forwarding and before retreating, pilot piston ② works in a way connecting port C starts opening to suction port A.



- When connecting port C is open to suction port A, main piston ① continues to retreat, and the lubricating oil is drawn into the cylinder from the reservoir.



- When suction port B is open, main piston ① draws in the lubricating oil from suction port B.

Fig. II



### 3-3 Model HV03 Reversing valve, model SV02 Solenoid controlled valve

This reversing valve is attached to the dual line lubrication system pump and can be used with the following piping systems:

- 1) Loop system.....Connects the pressure switch to the return line.
- 2) End system.....Connects the pressure switch or the pressure control valve to the end of piping.
- 3) Lance system.....Connects the pressure switch to the pump line.

#### • Lance system

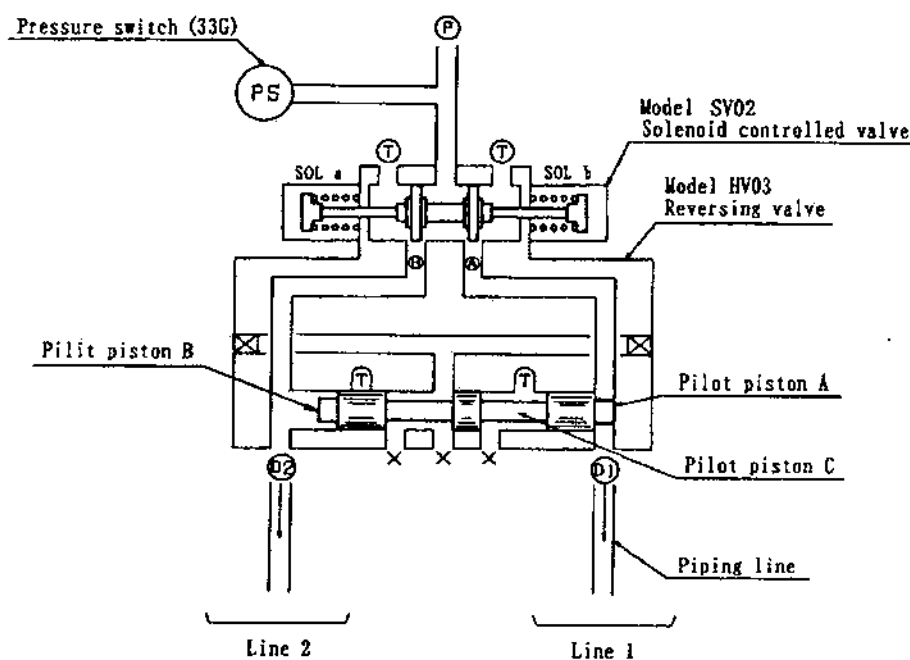
The pressure grease pressurized at the pump goes through the reversing valve and activates every distribution valve.

When the pressure rises to the preset reversing pressure (preset value of the pressure switch), the signal causes switching by the solenoid controlled valve.

After this switching operation has been completed, the rest of the pressure of the main pipe and the branch pipes will be entirely released to the tank.

#### Position 1 (before operation)

Before the operation, (P), (A) and (B) ports are released to the tank. Therefore, all ports are released to the tank, piping line (line 1,2) (D1) and (D2).



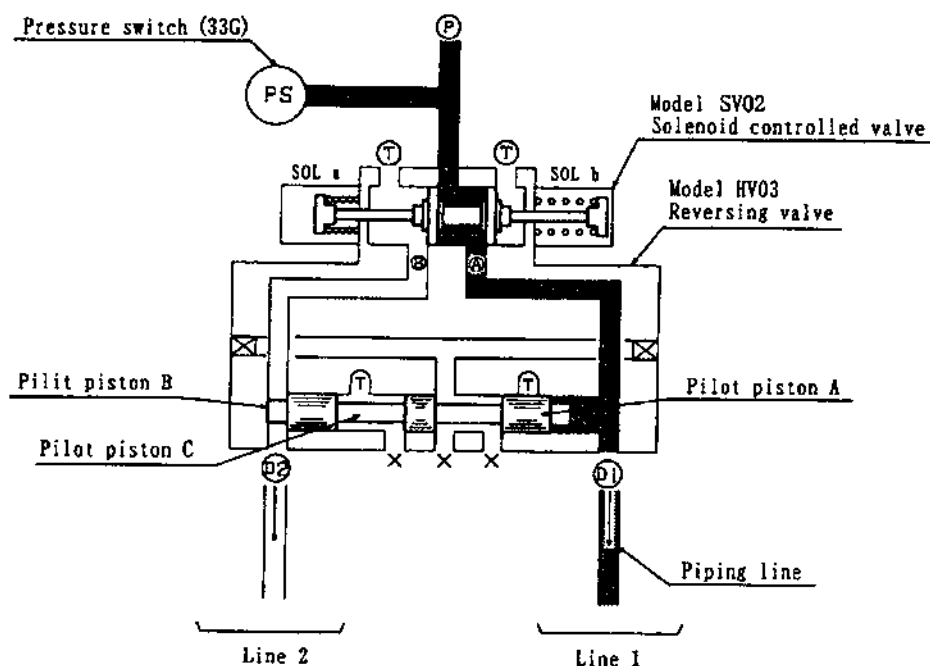
Position 1

### Position 2 (Lubrication line 1)

After starting the pump and exciting the solenoid controlled valve SOLa, the pressure grease goes through outlet port (A) of the solenoid controlled valve and moves the reversing valve pilot piston A to the left and then will be delivered to (D) port. (Note 1)

After every distribution valve has been activated by the pressure grease delivered from line 1, the pressure of line 1 rises rapidly. Then the pressure will be transferred to the pressure switch (33G). When the value reaches the preset value, the contact point will be ON. SOLa will be demagnetized by the signal and the pump will be stopped at the same time.

(Note 1) Line 2 is released to D2 port (delivery port) and the tank.



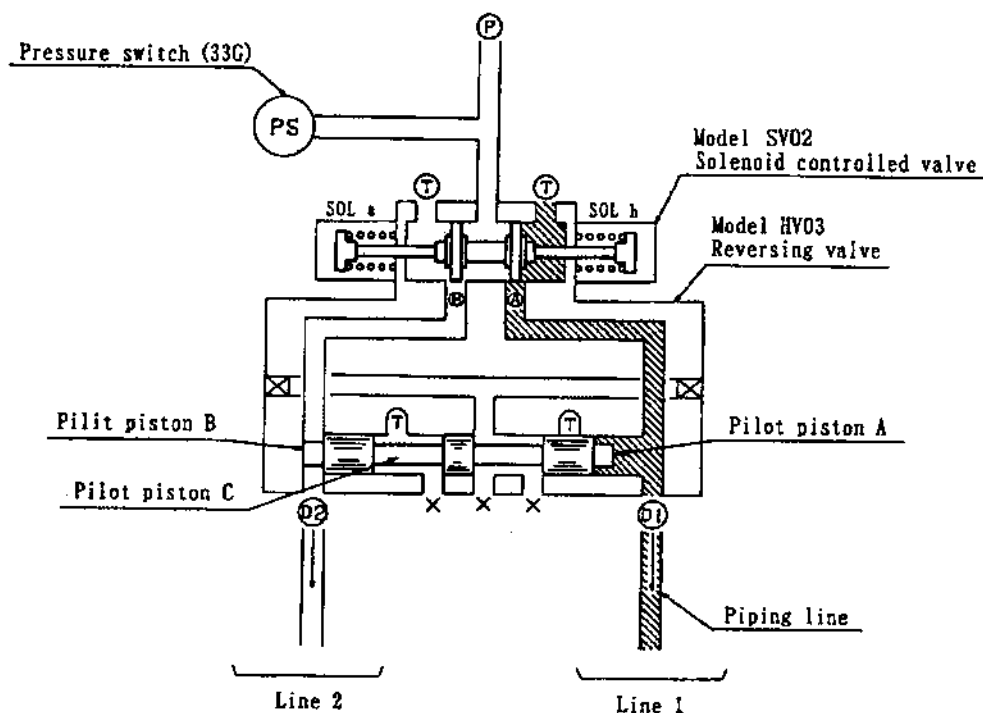
### Position 2

Note : Pilot pistons A, B and C are divided. When using in Lance system, these 3 pistons do not have any functions.

Position 3 (Lubrication of line 1 is completed)

As a result of the demagnetization of SOLa, (A) port will be connected to the tank through T port. The pressure of port (A) will be released to the tank via T port (solenoid) and then will drop quickly.

The release of all port's pressure results in the state of position 4.

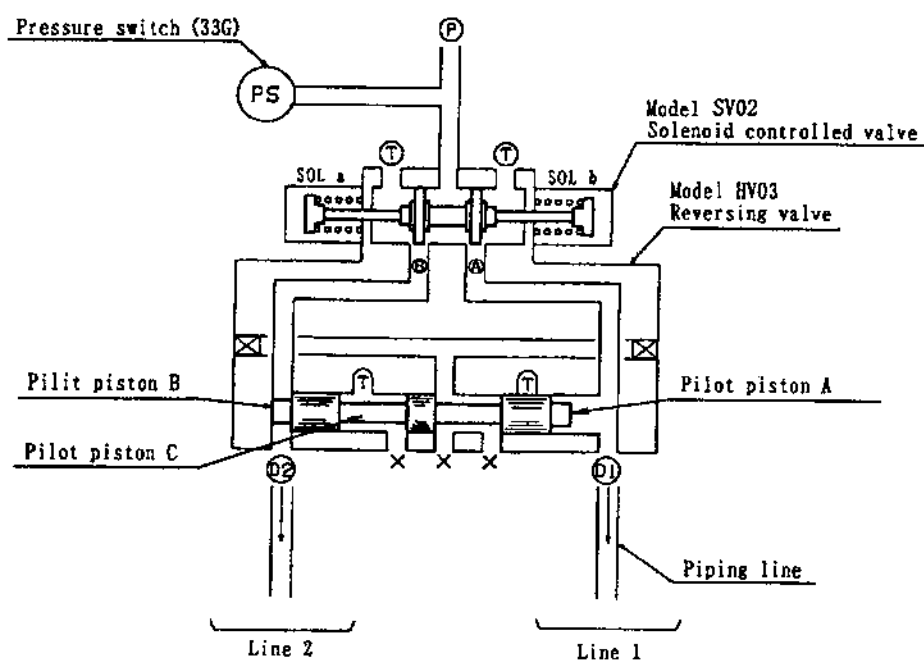


Position 3

### Position 4 (Stop)

The operation of line 1 (SOLa) stops. Line 2 operation will be awaited. Once it runs, the lubrication by line 2 excites solenoid controlled valve SOLb.

The pump starts working and executes the operation opposite of line 1 (SOLa).



Position 4

#### 4. Precautions for Handling :

- 1) Care should be exercised not to mix dust, bubbles, etc. into the grease to be used.
- 2) First charging of grease is to be made after the air vent plug at the upper end of the follower plate rod is opened up the purpose of completely removing the air inside the pump housing and tank, and the plug is to be tighter confirmation that grease is fully charged down to the bottom of the pump housing and tank follower plate and the grease is coming out of the air vent .
- 3) Before starting the Pump, ensure that Crankcase is properly filled with oil. The oil (Gear oil class 2 ISO VG 220 JIS K2219 or the equivalent) should be replaced every 2000 hours operation except the first time replacement which must be conducted in 200 hours operation.
- 4) The reversing pressure of SP-R-250 Pressure switch is usually set at 21MPa.  
The adjustment range is 3MPa to 25MPa.
- 5) The cracking pressure of the relief valve is usually set at 23MPa.

#### 5. Maintenance and Adjustment :

When a cause is thought attributable to the wear in the pump cylinder, i.e. failure of increase in the pressure, decrease in the discharge amount, etc. due to long time operation, adjustment is to be taken as follows:

- 1) First remove the drain plug of the crank chamber of the pump housing and discharge oil.
- 2) Release the pistons plug of the upper side of the cylinder from the upper side of the pump housing, remove five bolts of the pump cylinder and take up the cylinder.

- 3) Next remove the cover attached to the oil gauge, take the eccentric shaft out of the cover hole.
- Then, the eccentric piston, connecting rod assembly and worm wheel are all seen coming out. Following with this, leave the cover of the opposite side removed.
- 4) Insert a new pump cylinder from the upper side and slightly tighten it with bolts.
- 5) Replace the main piston and pilot piston with new ones to set to the connecting rod, re-assemble them to the eccentric shaft in the same condition as the disassembly before, and incorporate two pistons to the pump cylinder inserting them from the cover hole.
- 6) Next, apply small quantity of oil from over the pump housing and turn it clockwise by hand in the same manner as before.
- It is good that the worm turns smoothly with a slight feeling of resistance at certain point of revolution (When the main piston clogs the suction hole.)

## MODEL U-40ANV MOTOR DRIVEN GREASE PUMP INSTRUCTION MANUAL

The motor driven grease pump of U-40ANV type is intended for the use of supply source of a centralized lubricating system which serves automatic and concentrating supply of appropriate amount of grease and is a high pressure grease pump forcibly forwarding a fixed amount of grease by pressure.

### 1. Main Particulars:

- Reduction ratio : 1/20
- Pump revolution : 75 min<sup>-1</sup>(50Hz), 90 min<sup>-1</sup>(60Hz)
- Discharge capacity : 195 cm<sup>3</sup>/min(50Hz), 234 cm<sup>3</sup>/min(60Hz)
- Discharge pressure : Max. 21MPa
- Motor : 0.75kW 4P 3φ totally enclosed fan cooled type
- Reservoir capacity : 35ℓ

### 2. The pump consisted of as follows:

- Model P-40A motor driven grease pump (reduction gear is built in.)
- Model T-35A grease reservoir
- Model HVL-04 Fulfilling valve
- Model HV03 Reversing valve
- Model SV02 Solenoid controlled valve
- Model SP-R-250 Pressure switch
- Motor

For others, relief valves and pressure gauges are equipped with, the motor is directly connected to the pump, being in compact construction in general.

### 3. Explanation of Construction and Operation:

#### 3-1 Model P-40A Motor driven pump (Refer to Figs. I and II):

The turning effort obtained by motor starting is reduced by the Worm ① and Worm Wheel ② in the pump where a reduction gear is built in and is transferred to the Cam ④ through the Eccentric Shaft ③.

Further, this turning effort is converted by the eccentric movement of the cam into the reciprocating movement of the Pilot Piston ⑥ and the Main Piston ⑦ fitted at the end of the Connecting Rod ⑤.

The pilot piston and main piston is driven by the cam keeping certain phase difference with each other, therefore the main piston acts the suction pressurizing transfer of grease and the piston rod works complying with it as a valve.

Grease is sucked up from the suction port ④ and ⑤ of the Pump Cylinder ⑧ simultaneously, and during compression cycle of the Piston it goes through the passage ⑥ to reach the discharge port ⑦ where it may be discharged. Pressurized grease is put into HV03 Reversing valve ⑩, transferred to the discharging ports of Line I and Line II simultaneously, with this, the grease is transferred to the Pressure Gauge ⑨ and the Relief valve ⑪, serving confirmation of discharge pressure and access to drainage into a tank in case of abnormal high pressure.

This pump can discharge grease by left turn of its shaft.

### 3-2 Model T-35A Grease reservoir (Refer to Fig. I):

The reservoir to store grease is equipped with the Follower Plate ⑬ for keeping proper fluctuation of the oil level, the plate coming up and down the tank inside according to increase and decrease in the grease.

The oil level can be confirmed by the scale of the Piston Rod ⑭, but, when it comes down to the bottom by its decreasing, the Low Level Switch ⑰ turns on according to the Cam ⑱ fitted on the upper part of the piston rod, and when the oil level comes up to the top by its increasing, the High Level Switch ⑲ turns on according to the cam fitted to the Cam Holder ⑳. With this electrically connected, it is possible to be automatically furnished with grease other than lamp indication, alarm signals, etc.



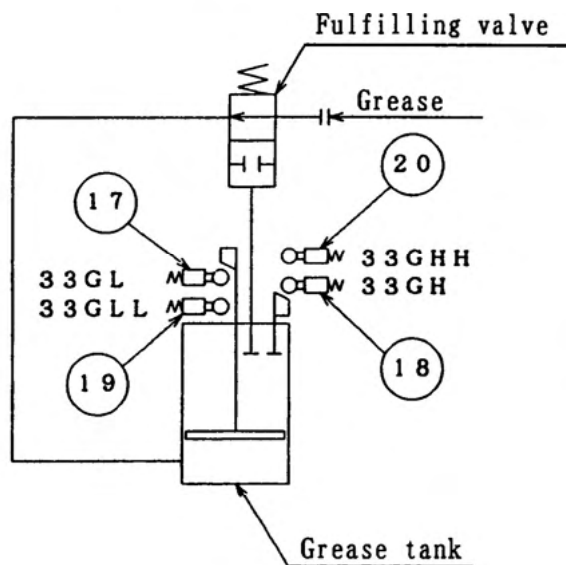
### 3-3 Two-step Low Level Switch, Two-step High Level Switch or Fulfilling Valve.

Grease can be automatically supplied.

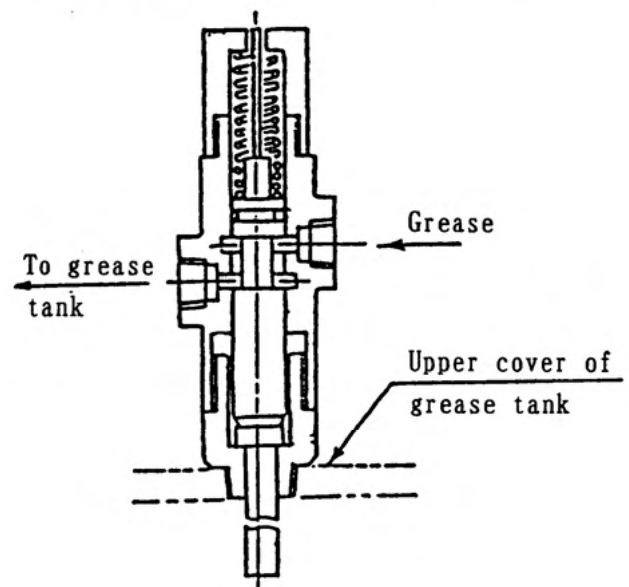
When the Tank Low Level Switch ⑰ (33GL) is turned on, grease supply is started. It ends when the Tank High Level Switch ⑱ (33GH) is turned on.

The Low-Low Level Switch ⑲ (33GLL) is used for warning of the empty tank in case of malfunction of Low Level Switch, and the High-High Level Switch ⑳ (33GHH) is used for warning of the filled tank in case of malfunction of High Level Switch.

The supply valve is designed to prevent mechanically cverflow of grease in the tank. If the follower plate (13) rises abnormally, the spool is pushed up to close the supply line.



Structure of supply valve



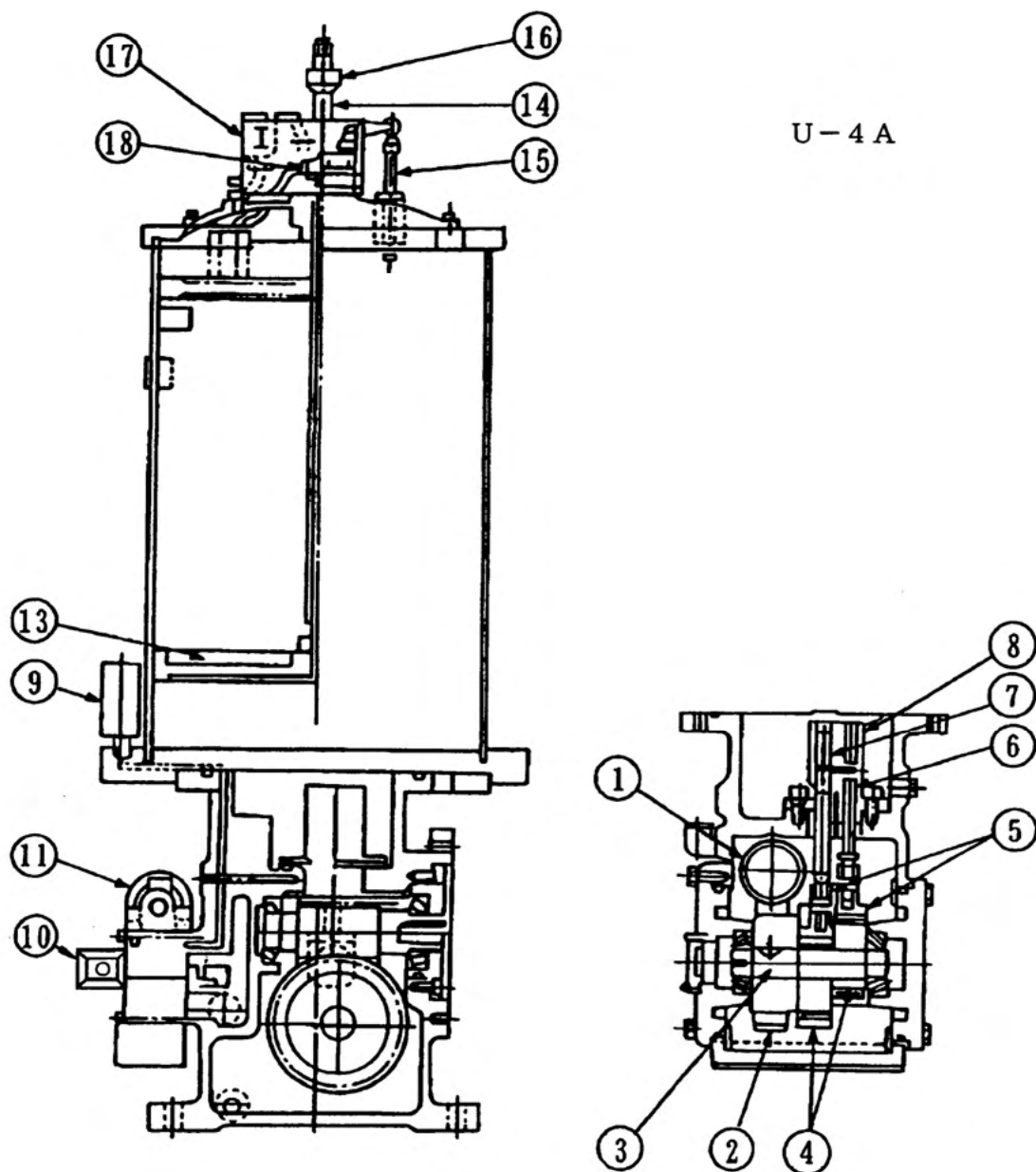


Fig. I

# ■ Structure and operation of double piston type pumps

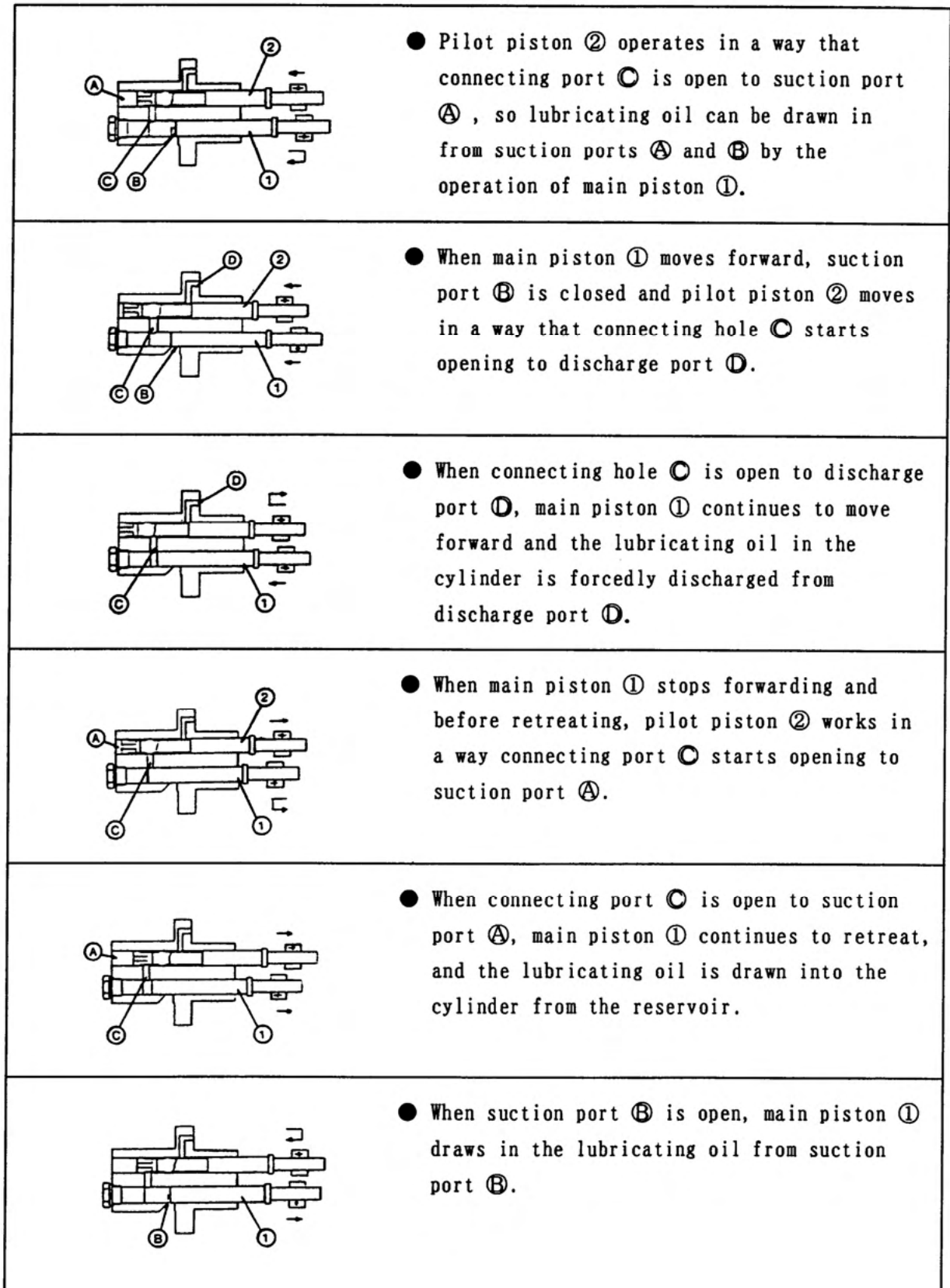


Fig. II

### 3-3 Model HV03 Reversing valve , model SV02 Solenoid controlled valve

This reversing valve is attached to the dual line lubrication system pump and can be used with the following piping systems:

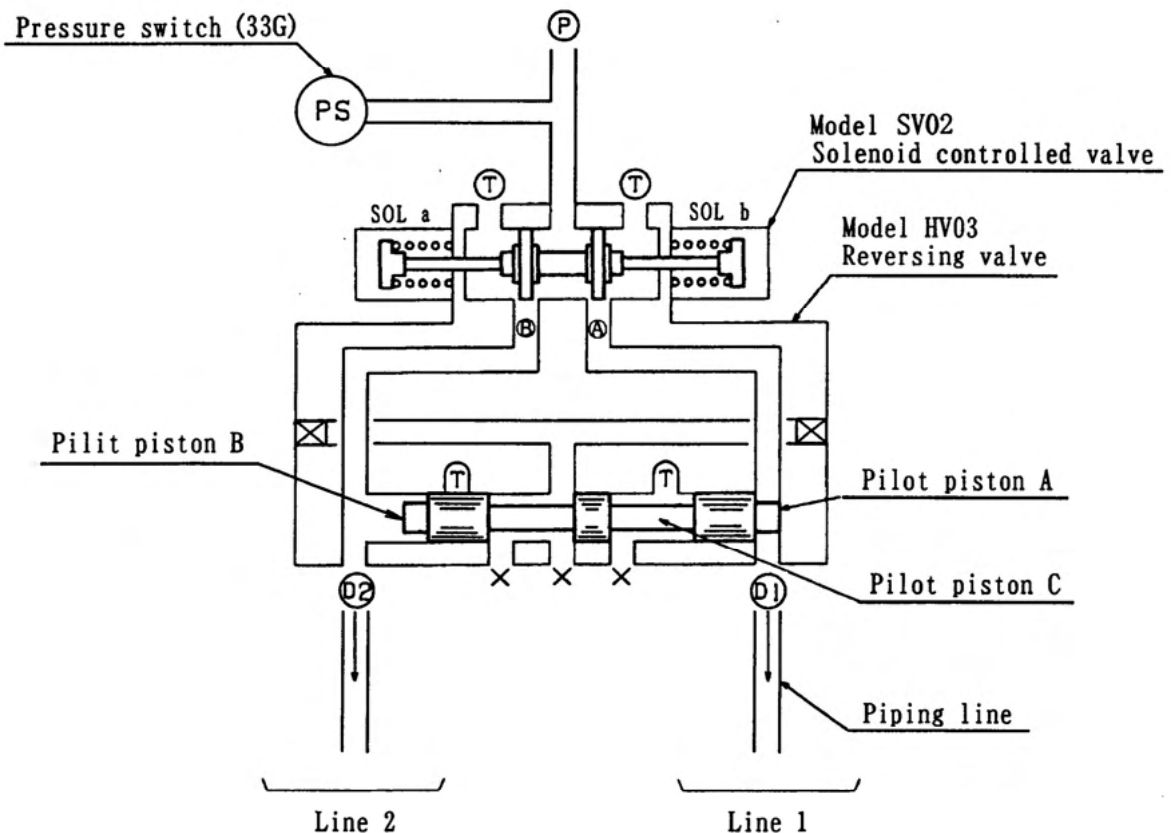
- 1) Loop system....Connects the pressure switch to the rerurn line.
- 2) End system....Connects the pressure switch or the pressure control valve to the end of piping.
- 3) Lance system...Connects the pressure switch to the pump line

#### • Lance system

The pressure grease pressurized at the pump goes through the reversing valve and activates every distribution valve. When the pressure rises to the preset reversing pressure (preset value of the pressure switch), the signal causes switching by the solenoid controlled valve. After this switching operation has been completed, the rest of the pressure of the main pipe and the branch pipes will be entirely released to the tank.

#### Position 1(before operation)

Before the peration, ①, ② and ③ ports are released to the tank. Therefore, all ports are released to the tank, piping line (line 1,2) ① and ②.



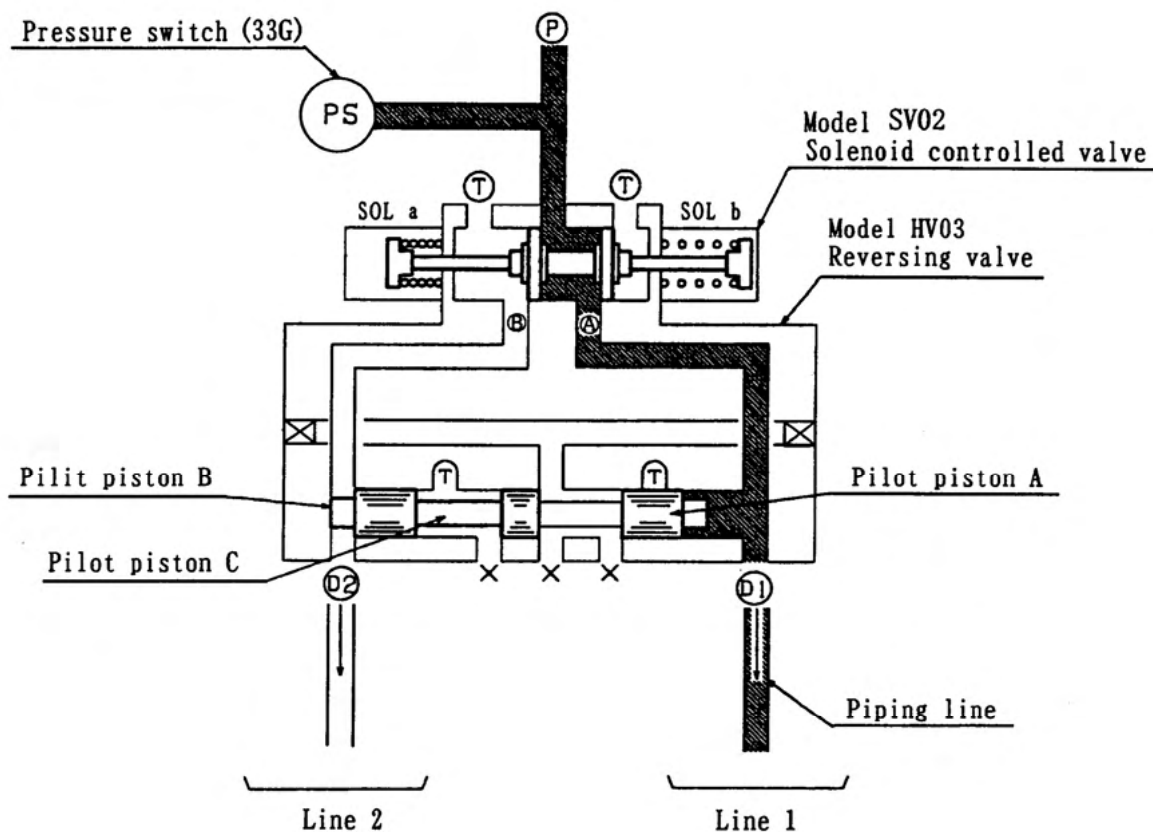
Position 1

### Position 2 (lubricating line 1)

After starting the pump and exciting the solenoid controlled valve SOLa, the pressure grease goes through outlet port ④ of the solenoid controlled valve and moves the reversing valve pilot piston A to the left and then will be delivered to ② port. (Note 1)

After every distribution valve has been activated by the pressure grease delivered from line 1, the pressure of line 1 rises rapidly. Then the pressure will be transferred to the pressure switch(33G). When the value reaches the preset value, the contact point will be ON. SOLa will be demagnetized by the signal and the pump will be stopped at the same time.

(Note 1) Line 2 is released to ② port (delivery port) and the tank.



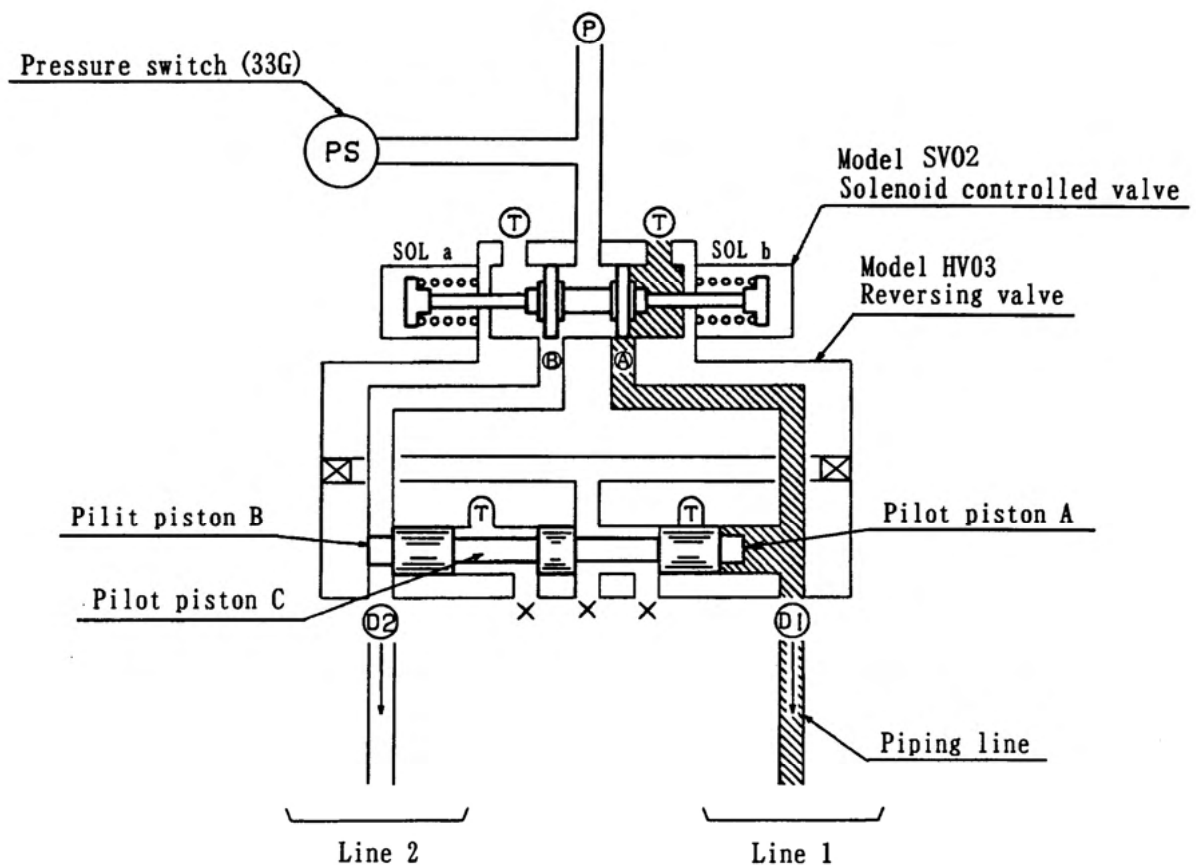
### Position 2

Note : Pilot pistons A,B and C are divided. When using in Lance system, these 3 pistons do not have any functions.

Position 3 (lubrication of line 1 is completed)

As a result of the demagnetization of SOLa, ① port will be connected to the tank through ① port. The pressure of port ① will be released to the tank via ① port (solenoid) and then will drop quickly.

The release of all port's pressure results in the state of position 4.

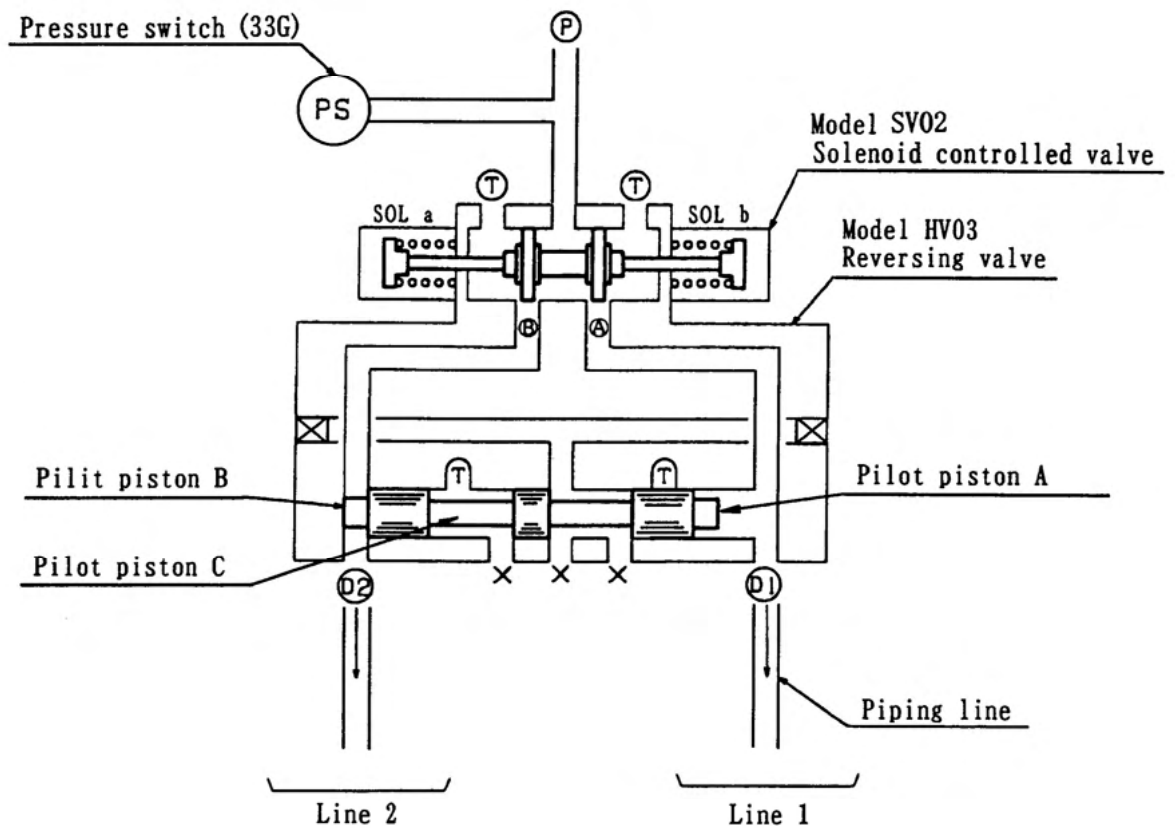


Position 3

**Position 4 (stop)**

The operation of line 1 (SOLa) stops. Line 2 operation will be awaited. Once it runs, the lubrication by line 2 excites solenoid controlled valve SOLb.

The pump starts working and executes the operation opposite of line 1 (SOLa).



Position 4

#### 4. Precautions for Handling:

- 1) Care should be exercised not to mix dust, bubbles, etc. into the grease to be used.
- 2) First charging of grease is to be made after the air vent valve at the upper end of the piston is opened up for the purpose of completely removing the air inside the pump housing and tank, and the valve is to be closed upon confirmation that grease is fully charged down to the bottom of the pump housing and tank follower plate and the grease is coming out of the air vent valve.
- 3) Before starting the Pump, ensure that Crankcase is properly filled with oil. The oil (Gear oil class 2 ISO VG 220 JIS K2219 or the equivalent) should be replaced every 2000 hours operation except the first time replacement which must be conducted in 200 hours operation.
- 4) The reversing pressure of SP-R-250 Pressure switch is usually set at 17 MPa.  
The adjustment range is 3MPa to 25MPa.
- 5) The cracking pressure of the relief valve is usually set at 23MPa.

#### 5. Maintenance and Adjustment:

When a cause is thought attributable to the wear in the pump cylinder, i.e. failure of increase in the pressure, decrease in the discharge amount, etc. due to long time operation, adjustment is to be taken as follows:

- 1) First remove the drain plug of the crank chamber of the pump housing and discharge oil.
- 2) Release the pistons plug of the upper side of the cylinder from the upper side of the pump housing, remove five bolts of the pump cylinder and take up the cylinder.



- 3) Next, remove the cover attached to the oil gauge, take the eccentric shaft out of the cover hole.

Then, the eccentric piston, connecting rod assembly and worm wheel are all seen coming out. Following with this, leave the cover of the opposite side removed.

- 4) Insert a new pump cylinder from the upper side and slightly tighten it with bolts.
- 5) Replace the main piston and pilot piston with new ones to set to the connecting rod, re-assemble them to the eccentric shaft in the same condition as the disassembly before, and incorporate two pistons to the pump cylinder inserting them from the cover hole.
- 6) Next, apply small quantity of oil from over the pump housing and turn it clockwise by hand in the same manner as before.

It is good that the worm turns smoothly with a slight feeling of resistance at certain point of revolution (When the main piston clogs the suction hole.)

INSTRUCTION MANUAL  
OF  
MOTOR DRIVEN GREASE PUMP  
  
U-5AEM-11

The motor driven grease pump U-5AEM is used as a grease supply source of a centralized lubricating system, which serves automatic and concentrating supply of appropriate amount of grease and is a high pressure grease pump capable of feeding lubrication grease at a constant feed rate by means of pressure.

### 1. Main specifications

- Reduction ratio : 1/20
- Pump revolution : 75 min<sup>-1</sup> (50Hz), 90 min<sup>-1</sup> (60Hz)
- Discharge volume : 585 cm<sup>3</sup>/min (50Hz), 702 cm<sup>3</sup>/min (60Hz)
- Rated pressure : Max. 21MPa
- Motor : 1.5kW 4P 3φ totally enclosed fan cooled type
- Reservoir capacity : 90ℓ

### 2. The pump construction

- Model P-50A Motor driven grease pump (built-in pump reduction gear.)
- Model T-90A-450 Grease tank
- Model SV-32MK Solenoid operated valve
- Electric motor

This pump is provided with relief valve and pressure gauge, and the motor is directly connected to the pump, thus being compact construction in general.

### 3. Explanation of construction and operation

#### 3-1 Model P-50A Grease pump (Refer to Figs. I and II)

The rotating torque obtained by motor is reduced by the ① Worm and ② Worm wheel in the pump with a built-in reduction gear and is then transferred to the ④ Cam through the ③ Electric shaft. Further, this torque is converted by the eccentric movement of the cam to the reciprocating movement of the ⑥ Pilot piston and the ⑦ Main piston connected to the ends of the ⑤ Connecting Rod.

The ⑥ Pilot piston and ⑦ Main piston move while keeping certain phase difference from each other by means of ④ Cam, so that the ⑦ Main piston acts to suction and discharge grease and the piston rod acts as valve, harmonized with the suction-discharge cycle.

- • • Refer to structure and operation of double piston type pumps

Grease is sucked up from the suction port ① and ② of the ⑧ Pump cylinder simultaneously, and during compression cycle of the Piston it goes through the passage ③ to reach the discharge port ④ where it may be discharged.

Pressurized grease put into port P of SV-32MK Solenoid valve through the pipes, transferred to Outlet 1 or 2 by pressure ; simultaneously with this, the grease is transferred to the ⑨ Pressure gauge and Relief valve, serving confirmation of discharge pressure and access to drainage into a Tank in case of abnormally high pressure.

This pump can discharge grease by right turn of its shaft.

### 3-2 Model T-90A-450 Grease tank (Refer to Fig. 1)

The grease storage reservoir is equipped with the ⑬ Follower plate to keep properly the high and low oil levels, and the plate comes up and down inside the tank according to increase and decrease of the grease. The oil level can be confirmed by the scale of the ⑭ Piston rod, but, when it comes down to the bottom, the ⑰ Low level switch turns on according to the ⑯ Cam fitted on the upper part of the piston rod, and when the oil level comes up to the top, the ⑱ High Level Switch turns on according to the cam fitted to the ⑮ Cam holder. If a relevant electric wiring is connected to this level switch circuit, automatic grease replenishment becomes available in addition to lamp indication, alarm signals, etc.

### 3-3 Two-step Low level switch, Two-step High level switch

Grease can be automatically supplied.

When the ⑰ Low level switch (33GL) is turned on, grease supply is started. It ends when the ⑱ High level switch (33GH) is turned on.

⑲ Low-low level switch (33GLL) is used for warning of the empty tank in case of malfunction of Low level switch, and the ⑳ High-high level switch (33GHH) is used for warning of the filled tank in case of malfunction of High level switch.

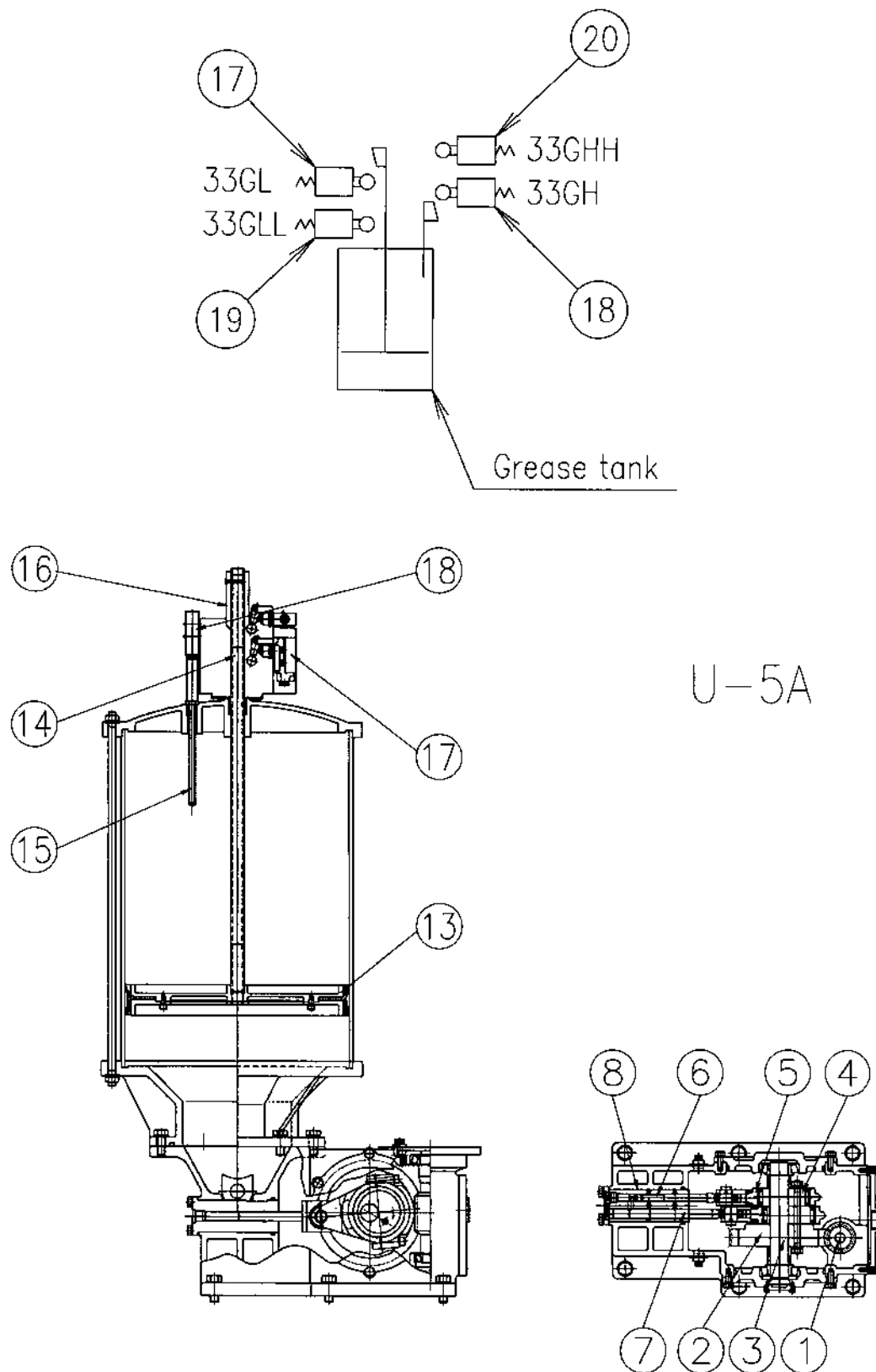


Fig. 1

### ■ Structure and operation of double piston type pump

	<ul style="list-style-type: none"> <li>● ② Pilot piston operates in a way that passage ③ is open to suction port ①, so lubrication oil can be drawn in from suction ports ① and ② by the operation of ① Main piston.</li> </ul>
	<ul style="list-style-type: none"> <li>● When ① Main piston moves forward, suction port ② is closed and ② Pilot piston moves in a way that passage ③ starts opening to discharge port ④.</li> </ul>
	<ul style="list-style-type: none"> <li>● When passage ③ is open to discharge port ④, ① Main piston continues to move forward and lubricating oil in the cylinder is forcibly discharged from discharge port ④.</li> </ul>
	<ul style="list-style-type: none"> <li>● When ① Main piston stops forwarding and before retreating, ② Pilot piston works in a way that passage ③ starts opening to suction port ①.</li> </ul>
	<ul style="list-style-type: none"> <li>● When passage ③ is open to suction port ①, ① Main piston continues to retreat, and lubricating oil is drawn into the cylinder from the reservoir.</li> </ul>
	<ul style="list-style-type: none"> <li>● When suction port ② is open, ① Main piston draws in lubricating oil from suction port ②.</li> </ul>

Fig. II

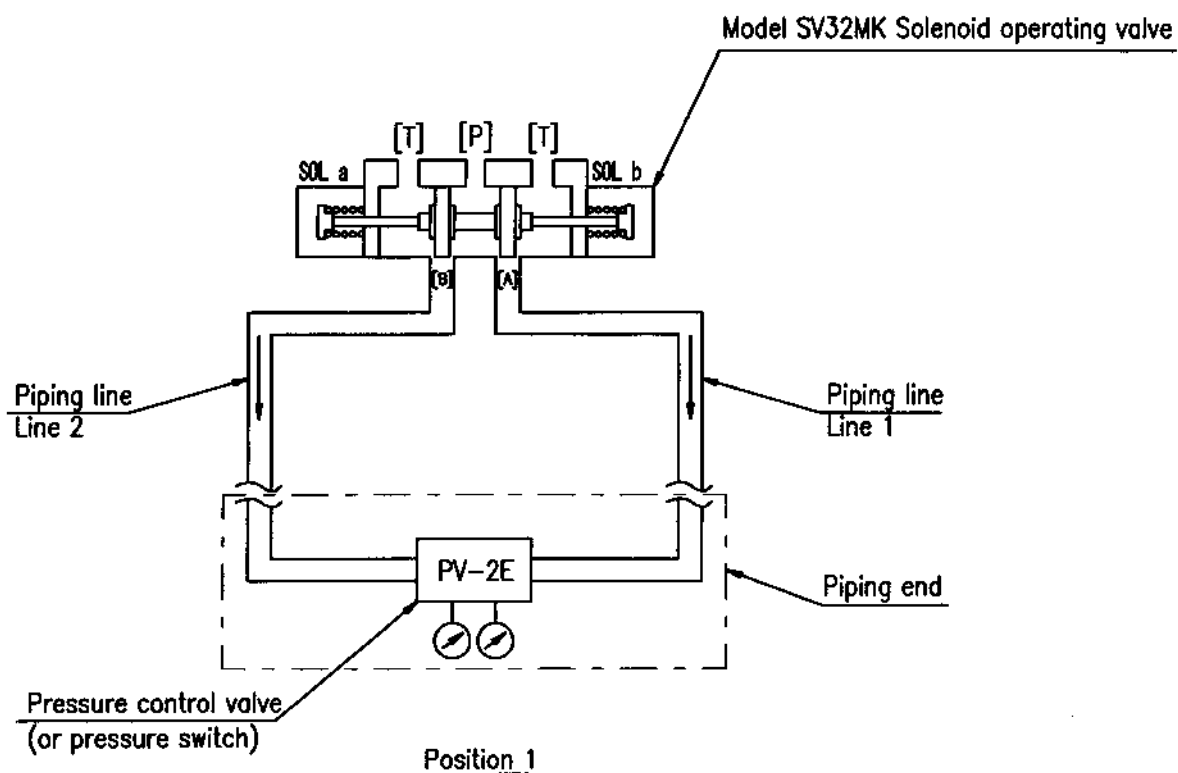
### 3-4 Model SV32MK Solenoid controlled valve

#### • End type

Grease pressurized by the pump flows through the reversing valve and activates all the distributing valves. When the pressure increases to switching pressure (preset with the pressure control valve or the pressure switch), a signal is sent and the solenoid valve is operated. Upon completion of this switching operation, the residual pressure in the main pipes and branch pipes are released into the tank.

#### Position 1 (stopped state)

Before operating the pump, ports [P], [A] and [B] are open to the tank, and therefore, all ports of Line 1 and Line 2 are also open to the tank.



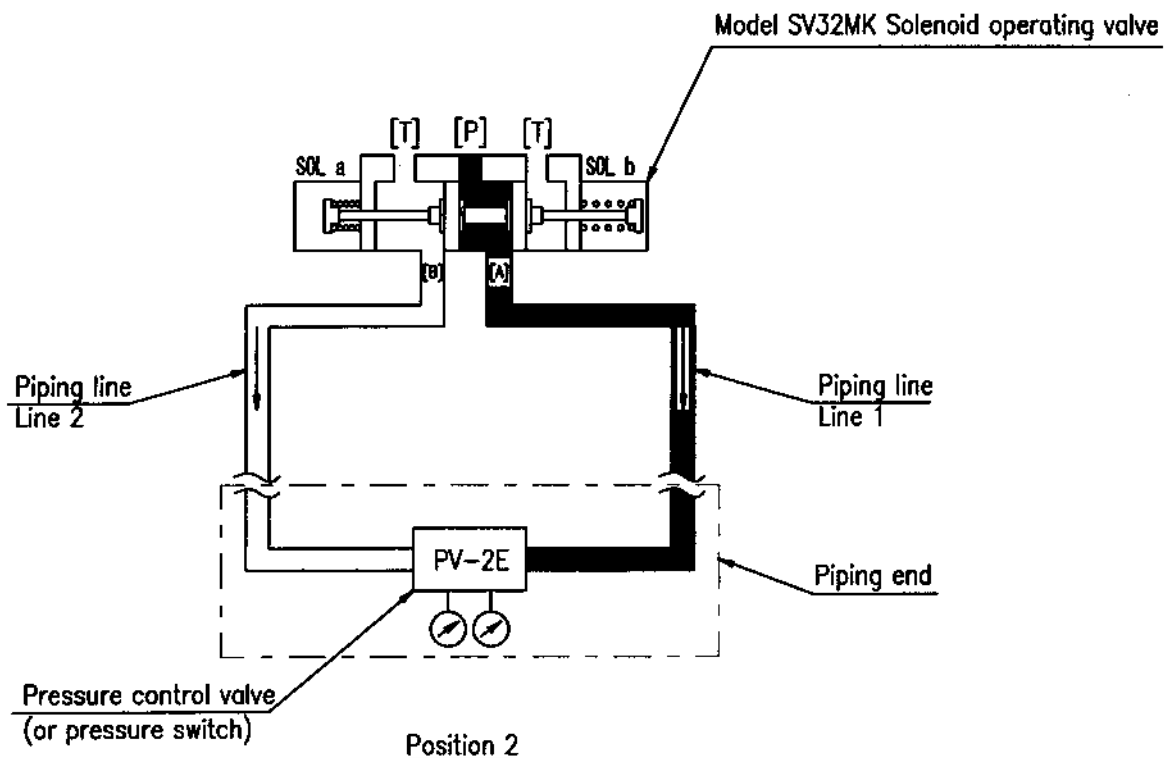
**Position 2 (grease being delivered to Line 1)**

Activate the pump to energize the solenoid valve SOLa. Pressurized grease flows through port [A] (outlet of the solenoid valve), and discharges. (Note 1)

Pressurized grease discharged from Line 1 activates all the distributing valves.

Pressure in Line 1 rapidly increases and is transmitted to the pressure control valve (PV-2E) or pressure switch. When the pressure reaches the preset value, the switch turns ON and sends a signal to demagnetize SOLa and stop the pump.

Note 1) Line 2 is open to the tank.

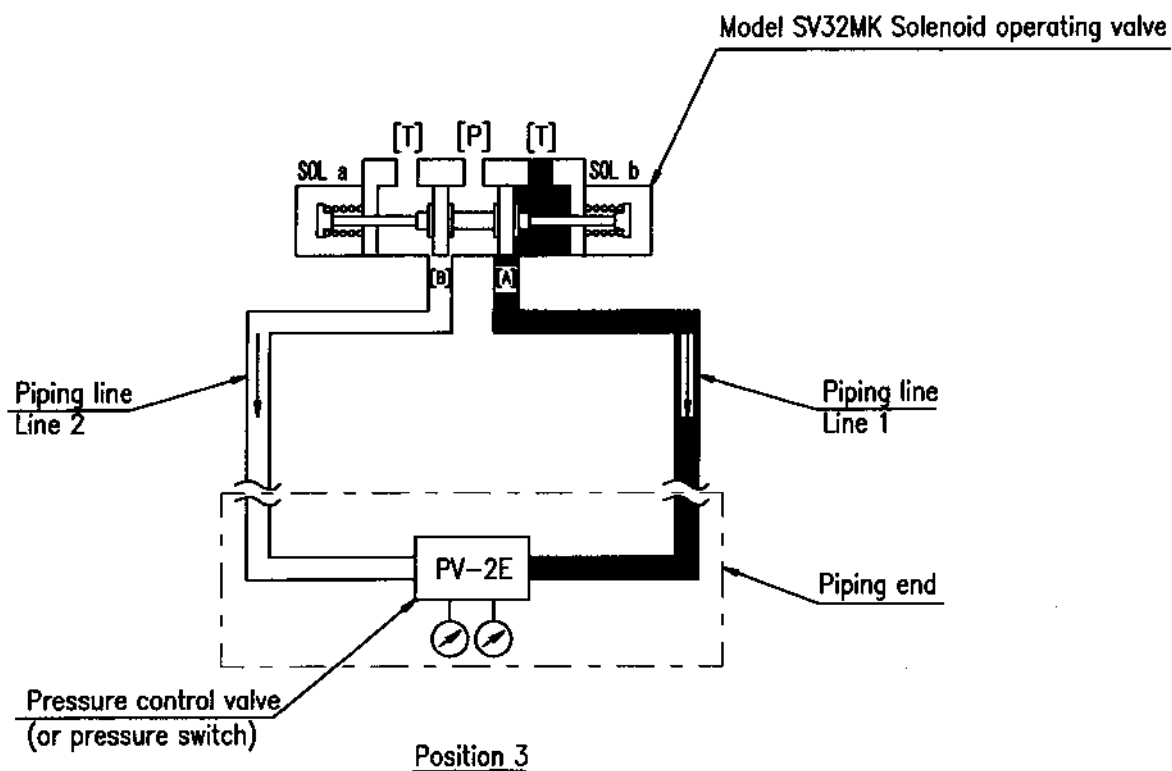




**Position 3 (completion of grease delivery to Line 1)**

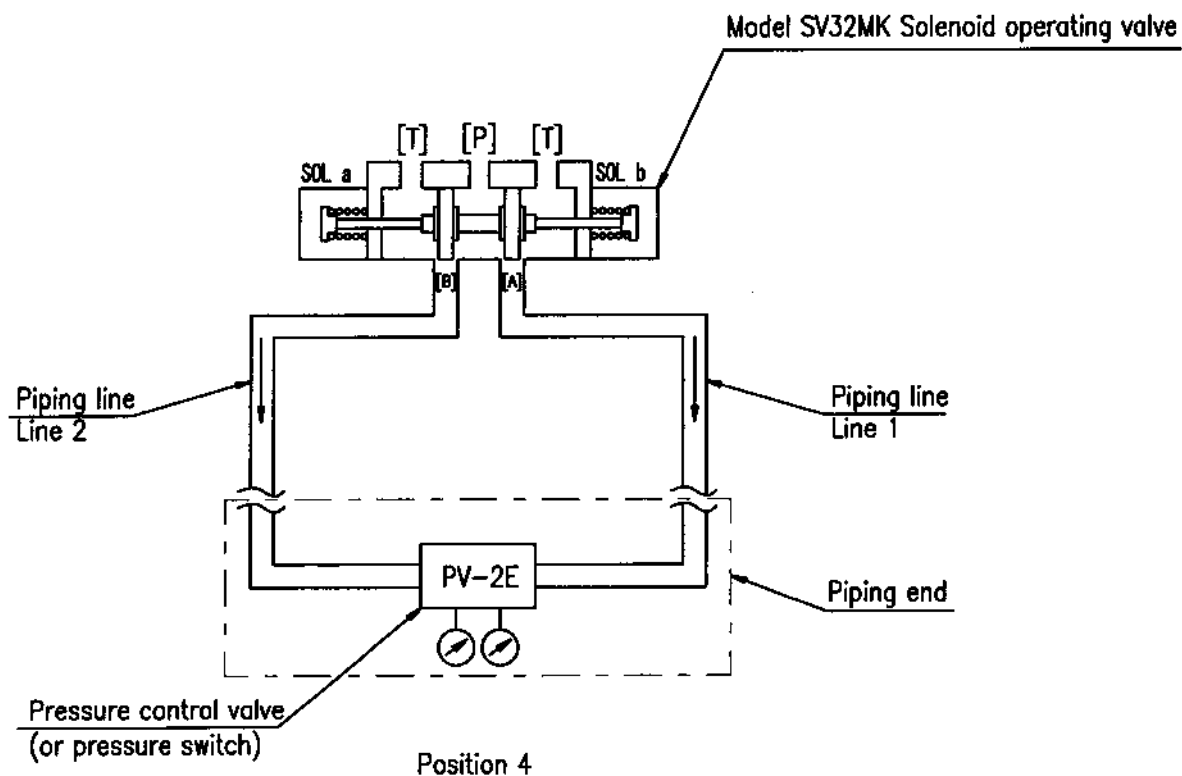
After SOLa is demagnetized, port [A] is connected to the tank through port [T] and pressure in port [A] decreases rapidly since it is released to the tank through port [T] (solenoid).

Pressure in all the ports is released and the state shifts to Position 4.



**Position 4 (stopped state)**

After operation on Line 1 (SOLa), wait for Line 2 operation. When it starts, the solenoid valve SOLb is energized and the pump is activated and the operation on Line 1 (SOLa) is reversed.



#### 4. Handling precautions

- 1) Take care so that dust or air bubbles are not mixed in grease used.
- 2) Before filling with grease initially, open the air vent valve at the top of the piston to remove air from the pump housing and the tank completely. Then, completely fill the pump housing and the tank with grease up to their lower part of tank follower plate to such an extent that grease flows out from the air vent valve.
- 3) Make sure that the crank chamber is filled with lubricating oil before starting the pump. Lubricating oil should gear oil, Class 2 ISO VG220 JISK2219, or the equivalent. Fill oil up to the specified oil level. Change it after 200 hours of operation, and then every 2,000 hours or so.
- 4) The cracking pressure of relief valve shall be usually set at 23MPa.

#### 5. Maintenance and Adjustment

If the pressure does not rise in long time operation, or discharge amount decreases, possibly resulting from wear of the pump cylinder set, adjust in the following procedure.

- 1) Discharge of gear oil  
Remove the drain plug at the lower part of the pump housing to discharge gear oil from the crank chamber.
- 2) Removal of bearing holder  
Remove the mounting bolt, screw the mounting bolt into the tap hole (two holes) in the bearing holder end face, and remove it slightly prying the bearing holder.
- 3) Removal of worm shaft  
Remove the bearing holder to take the worm shaft manually.
- 4) Removal of cover  
Remove the cover with the oil level gauge.
- 5) Removal of rod cap  
Remove 2 hexagon socket bolts to remove the rod caps of connecting rods for the main piston and the pilot piston.
- 6) Removal of reduction gear unit  
Remove the bearing boxes A and B at both sides of the pump housing. At this time take care not to damage O-rings and gaskets. Pull out the main shaft from the hole of the bearing box at the worm gear side.  
The eccentric and worm gears are taken out together.

- 7) Removal of piston set  
Withdraw the main piston and pilot piston from the cover hole together with the connecting rods.  
(Take care not to damage the surface of the pistons.)
- 8) Removal of pump cylinder  
Remove 4 hexagon bolts to remove the pump cylinder from the pump housing.  
(Slightly tap with hammer shank at the side of the crank chamber. If the pump cylinder appears above the mounting surface, it can be withdrawn manually.)
- 9) Removal of piston  
Remove the main piston and the pilot piston from the connecting rods.
- 10) Mounting of pump cylinder  
Make sure that the connection holes (5 places) of the pump cylinder have been plugged. Plug the piston holes. (Be sure to set the copper gasket.)  
Set the gasket in the cylinder, and fit the O-ring, and then mount the cylinder in the pump housing so that the discharge port is positioned at lower side.
- 11) Assembling of piston connection part  
Set the roller bearing in the bearing hole of the main piston and pilot piston, and then set in the split slot of the connecting rod.  
Drive the pin with hammer, and insert split pin and bend it to lock.
- 12) Mounting of piston  
Insert the main piston and the pilot piston which have been connected to the connecting rods into the piston holes of the pump cylinder from the crank chamber of the pump housing. (Take care not to damage the surface of the pistons.)
- 13) Mounting of reduction gear unit  
Inclining the main shaft slightly, insert the reduction gear unit into the housing hole from the eccentric side.
- 14) Mounting of bearing boxes  
Mount the bearing boxes A and B.  
(Adjust play (axial clearance) of the bearing to 0.05 to 0.15 mm by using the gasket.)

15) Mounting of rod cap

Set the connecting rod connected to the main piston and the pilot piston to the needle bearing of eccentric. Fit the rod cap to the needle bearing, and fix it to the connecting rod with hexagonal socket bolt.

16) Mounting of worm shaft

Mount the worm shaft and the bearing holder in the pump housing, and then the handle to the worm shaft.

Make sure that it can be rotated smoothly by hand.

If it does not rotate smoothly, adjust the gasket again.

17) Mounting of bearing box

Fit the O-ring in the bearing boxes A and B, and then mount the bearing boxes to the pump housing.

## MODEL PV-2E PRESSURE CONTROL VALVE

### INSTRUCTION MANUAL

The pressure control valve positioned at the end of the supply pipe of the end-type system is to detect the grease pressure alternately transferred to Line 1 and Line 2 and control the pump equipment in place of the electric signal.

#### 1. Main Particulars:

Max. Working Pressure	: 21MPa
Pressure Control Range	: 3~6MPa
Amount of Loss	: 1.5cm <sup>3</sup>
Net Weight	: 8.2kg

#### 2. Explanation of Construction and Operation (Refer to Fig. 1):

The two supply pipes coming from the pump is connected to the Ports A and B; if one side becomes a pressure line, the other one turns to be an opening line connected to a tank; the Piston ① moves according to the pressure difference.

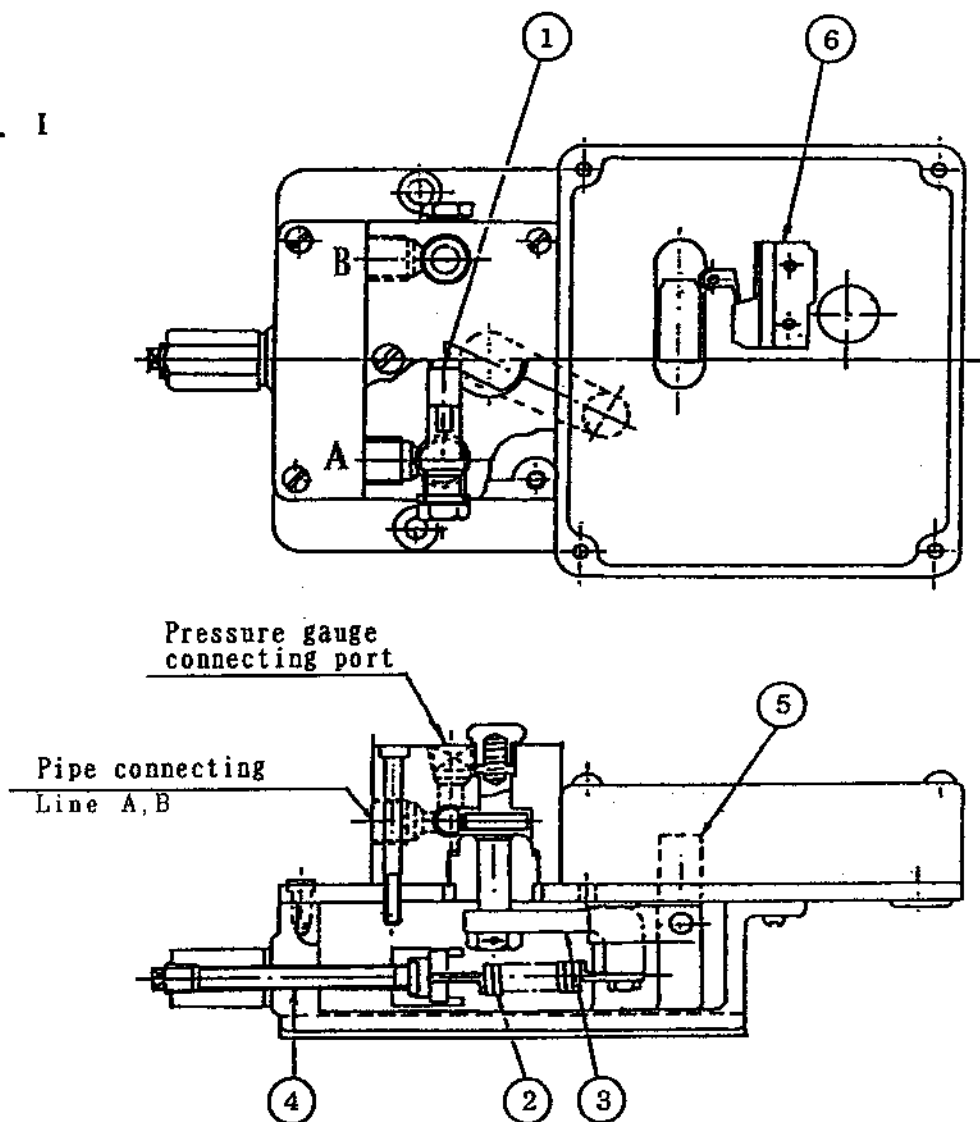
Since the force stems the control spring ②, the pressurizing line increases to the pressure overcoming the spring force and then presses the Piston at last to the opposite side, and the Control Arm ③ moves simultaneously to the opposite side.

Since the control arm has a control spring supporting the Adjusting Screw ④, The ahead half of the work of the control arm is subjected to the spring resistance, but the rear half receives the help of the spring.

When the control arm operates, the Fork ⑤ is operated, the Limit Switch ⑥ connected to the fork operates to send electric signal, and the coil of SV-32 solenoid operated valve is extinguished at the same time the pump stops.

In the next operation, the pressure line and opening line turn vice versa; as the line pressure rises, the same operation is repeated and the piston is pressed to the opposite side to the foregoing.

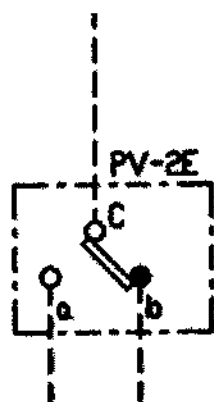
Fig. 1



### 3. Precaution for Handling :

- 1) The fitting place of the valve shall be planned to have it located at the extreme end of the line (the most-affected part of pressure loss).
- 2) It is recommended that a branch pipe be taken out just before the Ports a and b which are piped to the valve and the last distributing valve of more than one unit be connected.
- 3) The pressure (reversing pressure) of the control spring can be optionally adjusted, but the permissible scope is 3MPa to 6MPa. The reversing pressure becomes high by taking off the adjusting valve to outside and becomes low by pushing it into inside.

## 4. Wirering diagram



Line A apply pressure → b side close

Line B apply pressure → a side close

This figure shows the state pressurize Line A.