P A L A U

Instruction Manual

Maintenance Manual

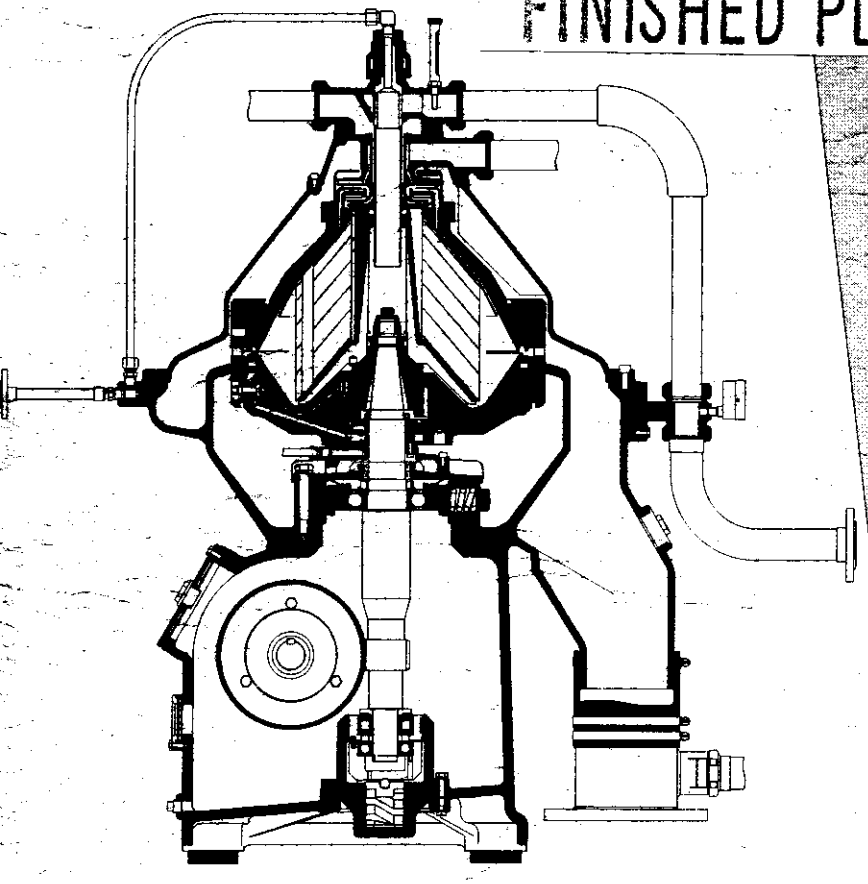
- Precaution in safety.
- How to disassemble and reassemble.
- Maintenance and checkup procedure.
- Trouble shooting.

MITSUBISHI

SELFJECTOR

FUTURE-SERIES

FINISHED PLAN



Future series

FIE-2000-01-MM1

ITEM No. 61

IMPORTANCE

The manual is edited for treating mineral oils such as for purifying fuel oil or lubricating oil.

⚠ WARNING

The instruction manual is a guidebook for using the automatic discharge type oil purifier , MITSUBISHI SELFJECTOR FUTURE SERIES (hereinafter referred to as SELFJECTOR).
SELFJECTOR is a fast rotating centrifugal machine. Before using it, sufficiently be versed in details of the manual.
Handle it safely and so as to fully exhibit the function of SELFJECTOR.

SELFJECTOR is basically available in the following three versions. The operation manual describes the operations and control devices of the individual versions separately from what is common to all. With this in mind, it is expected that the manual will be read.

No.	Available Version		TypeID Code*
1	Total discharge type	Automatic specification Manual specification	F
2	Partial discharge type	Automatic specification	FP
3	HIDENS type	HIDENS specification	FH
4	SUPER HIDENS type	SUPER HIDENS specification	SH

*: These type codes are suffixed to model designations to identify the respective SELFJECTOR versions such as SJ10F, SJ10FP or SJ10SH.

The composition of instruction manual for SELFJECTOR is as follows.
The present manual is **Part 5 "Maintenance manual"**.

Use each manual according to the particular purpose to sufficiently understand the information.

Part	Manual	Description	Intended for ①	②	③
1	Aboard fitting-out procedure	Information for machine transport, handling and storage. Instructions on how to install and dimensions. System diagram and connection diagram.	○	○	
2	Operation manual 1	Precautions in safety. Configuration and structure of SELFJECTOR. Motor, starter and control panel. Detector.			○
3	Operation manual 2	Precautions in safety. Functions of component devices. Operation setting items and adjusting method. How to start and stop.			○
4	Operation manual 3A	Precautions in safety. Functional, operational and maintenance information concerning FSC-1A type automatic control panel.			○
	Operation manual 3B	Precautions in safety. Functional, operational and maintenance information concerning FBC-1A type automatic control panel.			○
	Operation manual 3C	Precautions in safety. Functional, operational and maintenance information concerning FBC-2A type automatic control panel.			○
	Operation manual 3D	Precautions in safety. Functional, operational and maintenance information concerning FSH-1A type automatic control panel and Water Detector.			○
	Operation manual 3E	Precautions in safety. Functional, operational and maintenance information concerning FSP-1A type automatic control panel.			○
	Operation manual 3F	Precautions in safety. Functional, operational and maintenance information concerning FSH-PA type automatic control panel and Water Detector.			○
5	**Maintenance manual**	**Precautions in safety.** **How to disassemble and reassemble.** **Maintenance and checkup procedure.** **Trouble shooting.**			○

① : for Design engineer. ② : for Installer. ③ : for Operator or Engine engineer.

NOTE

Relevant operation manual only is furnished out of Part 4 (Operation manual 3A to 3F) when SELFJECTOR with any types of the automatic specifications indicated below is purchased.

Type of automatic specification : FSC , FBC , FSP , FSH , FSH-PA

CONTENTS

1 Precautions in safety

For correct use, carefully read the "Precautions in safety" beforehand.

Precautions in safety given in the instruction manual are intended for safely and correctly using the product and avoiding danger or damage to user. Carefully read the precautions and do not operate, maintain or handle SELFJECTOR before you are fully versed in them.

1.1 Symbols related to safety

In the manual, precautions are headed by the following marks. Be sure to observe them because they are important for ensuring the safety.

> ⚠ **WARNING: indicates a potentially hazardous situation which ,if not heeded, could result in death or serious injury.**

> ⚠ **CAUTION: indicates a hazardous situation which ,if not heeded ,may result in minor or moderate injury or damage to the purifier or facilities.**

> **NOTE: indicate precautionary instructions that given contain what must be done without fail and what should be kept in mind as a guide in operating SELFJECTOR and doing related work.**

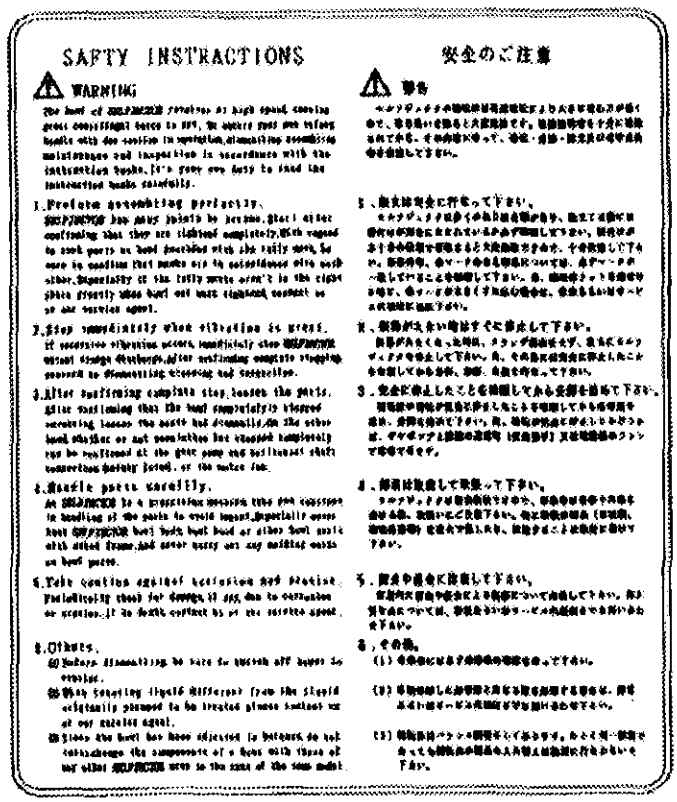
1.2 Labels for safety

There are 3 different labels for safety.

The one shown in **Pic 1** is put in the spare part box. After fitting-out aboard, the person in charge of installation is requested to attach it on an easily visible place near SELFJECTOR.

Pic 2, **Pic 3**are factory attached direct on SELFJECTOR. Do not smear them by painting but keep them visible at all times.

Safety labels are available any time. Request them as required.



Pic 1

Pic 2

Pic 3

1.3 Safety precautions

⚠ WARNING

The bowl of SELFJECTOR produces a large centrifugal force when it rotates. Wrong handling is very dangerous. Pay utmost attention according to the manual for operation, disassembly, reassembly, maintenance, checkup, etc. Use of non-genuine parts might damage SELFJECTOR or impair human safety. Be sure to employ genuine parts.

- **Perfectly assemble.**

Many points of SELFJECTOR are connected by screws. When assembling, make sure tightening is complete. Running with poor tightening is very dangerous. Doubly make sure of secure tightening particularly of:

(A) Bowl nut
(B) Disk nut
(C) Cap nut of Vertical shaft
(D) Set bolt of Frame cover
(E) Lock nut (hexagon) of Inlet pipe

Be sure that tally marks of the bowl and other so marked parts are aligned.
If the tally mark is excessively mis-aligned when the Bowl nut is tightened, contact our company or service agency.

- **Immediately stop if vibration is excessive.**

Vibration of SELFJECTOR is caused by unbalance, ship oscillation, SELFJECTOR installation, etc. If the vibration is excessive, immediately stop SELFJECTOR **without discharging sludge**.

Then, check for the cause and take necessary corrective action to ensure safety before restarting SELFJECTOR.

To be more specific, if the vibration at the point A of Fig. 1-1 exceeds 100 μm (peak to peak) at rated speed, stop *SELFJECTOR*.

Even if readings are below 100 μm, continuous cruising ship vibrations 4-5 times higher than registered when external vibrating forces are small, such as when the main engine is not in operation, could adversely affect the durability of SELFJECTOR. In such case, implement routine and periodic checkups to ensure that SELFJECTOR performs trouble-free as it should.

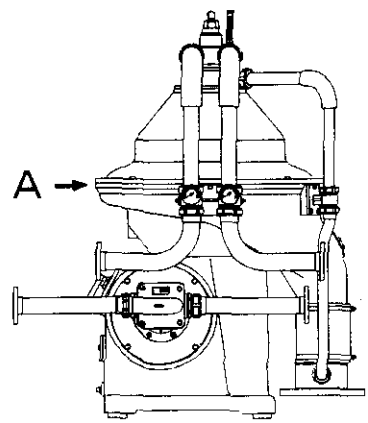


Fig. 1-1

⚠ WARNING

- **Make sure of complete stoppage before loosening each section.**

Make sure the bowl has complete stopped rotating before loosening or disassembling each section.

Whether completely stopped or not can be checked at the motor fan or Gear pump and Horizontal shaft connecting section (Safety joint).

- **Take care in handling the parts.**

SELFJECTOR is a precision machine. Handle it attentively away from impact and high temperature.

Particularly never heat the bowl parts (Bowl body, Bowl hood, etc.) by open flame nor weld them.

- **Beware of corrosion and erosion.**

Periodically check whether any damage is produced by corrosion or erosion.

For details, contact our company or service agency.

- **Others**

1. Before disassembling, turn off the starter.
2. Before treating a treating liquid other than specified initially, contact our company or service agency.
3. The bowl is factory balanced. Never interchange bowl parts [Disc (1)] even within the same model.

For ambiguous points in the instruction manual, contact our company or service agency.

1.4 Definition of terms

Density (ρ): Mass per unit volume.

Specific gravity (τ): Ratio of mass to mass of water of the same volume. Varies with temperature.

Feed rate: Volume per unit time of untreated liquid upstream the purifier expressed in terms of L/h or m^3/h.

Actual capacity: *Purifier treating capacity based* on SM Standard (eliminating sludge with 1.8 of specific gravity and 2μm of diameter or more). (See "Feed rate" above.)

Feed liquid: Untreated oil to feed to purifier.

Light liquid: Oil treated by purifier or purified oil.

Heavy liquid: Separated moisture and heavy components in oil or simply "water".

Sludge: Solids accumulated in bowl in narrow sense. Mixture of solids, water and oil discharged from bowl in wide sense.

Interface: Boundary surface between heavy and light liquids in bowl.

Purifier operation (purifying operation):
Operation of separating into 3 phases or liquid, liquid and solid or, here, into oil, water and solids. (See "Purifier operation".)

Clarifier operation (clarifying operation):
Operation of separating into 2 phases or liquid and solid or, here, into oil and solids. (See "Clarifier operation".)

Parallel operation:
Operation with oil fed proportionally to several purifiers arranged in parallel. (See "Parallel operation".)

Series operation:
Operation by several purifiers arranged in series. (See "Series operation".)

Total discharge type SJ
Purifier designed to totally discharge all contained in the bowl.

Partial discharge type SJ
Purifier designed to partially discharge water and solids only in the bowl. This type has the total discharge function as well.

Abbreviations and units

L: Liter: Unit of volume.
h: Hour(s): Unit of time.
min^{-1}: Number of revolutions per minute.
Hz: Number of frequency. (cycles per second)
ϕ: Unit of diameter in mm.
mm^2/S: unit of kinetic viscosity of oil.
ISO: Standards established by International Standardization Organization.
VG: Indication of viscosity of lubricating oil in accordance with ISO.

2 Disassembly and reassembly

2.1 Disassembly

Points to remember when disassembling

⚠ WARNING

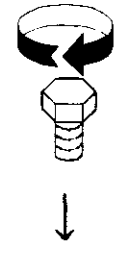
- Check to ensure that the machine is in the completely stopped state.

Check the fan of the motor to determine whether the machine is stationary.

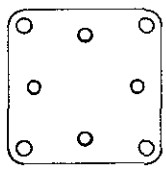
- If an optional Discharge Detector is provided, the LED will flash during rotation, and will light when the machine stops, enabling you to determine that the machine has stopped. (The Discharge Detector is standard equipment on the automatic specifications FSH-1A, FSP-1A, FSH-PA.)
- Turn off the power supply of the starter to eliminate the possibility of sudden rotation of the SELFJECTOR.
- Close the valves of feed liquid inlet and light liquid outlet.
- When a steam type oil heater is provided, close the steam supply pipe.
- The piping and main body (the bowl in particular) are heated to a high temperature by the treatment liquid. To prevent burns, take proper steps such as wearing protective gloves.
- Do not attempt any further scope of disassembly than covered in this manual.
- Make sure that the SELFJECTOR is always operated with the main body fully assembled. Never operate the machine with the bowl exposed by removing the cover, as accidents could result.

NOTE

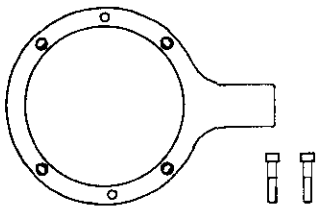
All the screws used in the SELFJECTOR are "threaded clockwise".



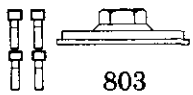
A list of required tools



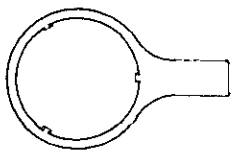
801
Dismantling stand



802
Bowl nut handle

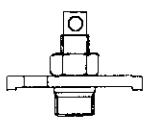


803
Jack(1)

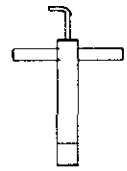


804
Disc nut handle

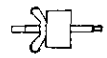
805
Light liquid chamber handle



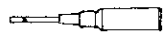
807
Disc clamp plate



808
Cap nut spanner



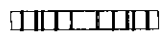
809
Jack(3)



810
Main sealing cutter

811
bolt× 2

812
Protective plate



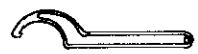
813
Jack(5)

814
Jack(6)

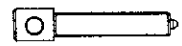
815
Jack(7)

816
Jack(8)

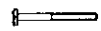
817
Jack(10)



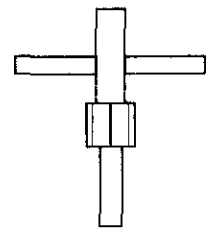
818
Hook spanner



819
Push bolt_

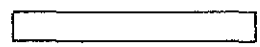


820
Push bolt(5) × 2_

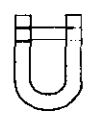


821
Jack(4)

822
Jack(9)
(SJ40F～SJ80F)



823
handle (1)



824
shackle

2.1.1 Trap

Remove the plug mounted in the lateral direction of the bracket to remove the oil from inside the piping.

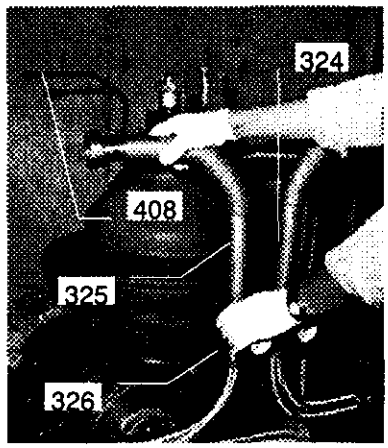


Fig. 2-1

(Automatic specification machine)

Loosen the cap nuts at the top and bottom of the sealing water tube (408) and remove the top of the sealing water tube.

(Manual specification machine)

Remove the measuring hopper together with the globe valve.

Remove the cap nuts of the connecting pipes (2) (324) and connecting tube (2) with the hook spanner (818). Loosen the union nuts (326) at the bottom of the connection pipes and tube with the hook spanner (818) and direct them sideways to make sure that when the trap is removed, they do not get in the way. (**Fig. 2-1**)
Use care to prevent loss of the flow rate regulating orifice inserted in the portion indicated by the arrow. (**Fig. 2-2**)

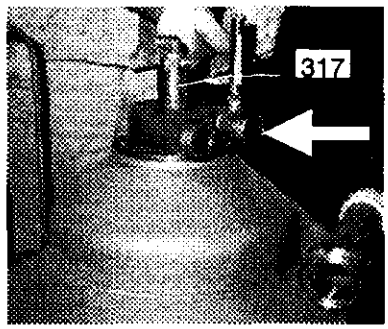


Fig. 2-2

Remove the cover nut (317) with a spanner. (**Fig. 2-2**)

Using a spanner, remove the nut (320) tightening the inlet pipe.
(**Fig. 2-3**)

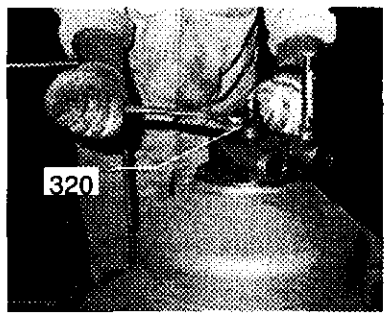


Fig. 2-3

Loosen the socket set screw (313) (M6). Use care to prevent loss.
(**Fig. 2-4**)

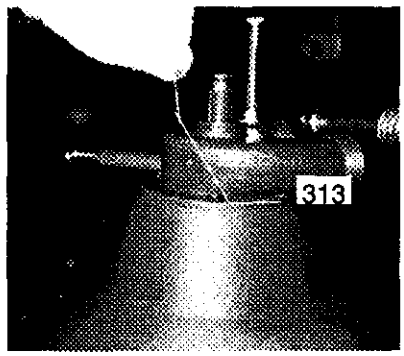


Fig. 2-4

Lightly strike the top of the inlet pipe with a wooden hammer to detach the tightly held taper portion. (**Fig. 2-5**)

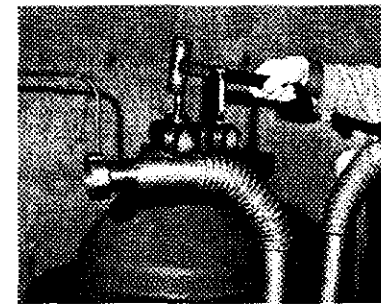


Fig. 2-5

Remove the socket cap screws (302) (in four places) locking the frame and trap. Use care to prevent loss of the socket cap screws. (**Fig. 2-6**)

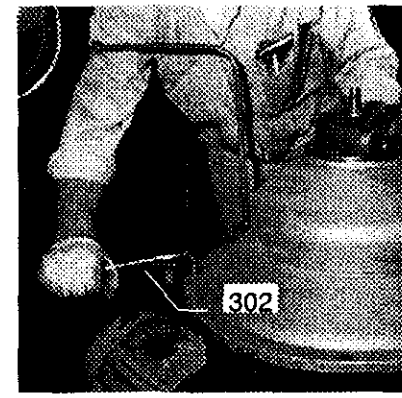


Fig. 2-6

Thread the jack (6) (814) into the threaded portion of the upper hood and mount the handle (823). (**Fig. 2-7**)

⚠ CAUTION

When it is withdrawn by the chain block, use care to *make sure that the wire does not get out of the handle.*

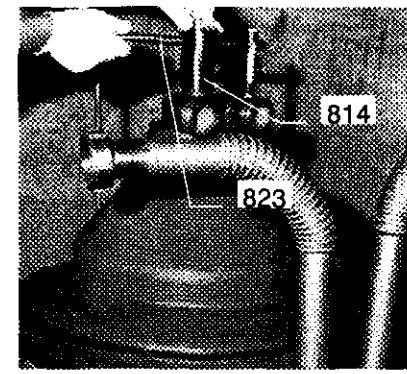


Fig. 2-7

⚠ CAUTION

Don't install the wire on the grip of the trap (301) to withdraw the trap {Models SJ10F~30F (FH/FP/SH types are the same as F type.)}. Damage to the trap may result.

Install the wire on the handle of the jack (6) and withdraw the sludge cover (trap) (301) in the vertical direction through use of the chain block. (**Fig. 2-8**)

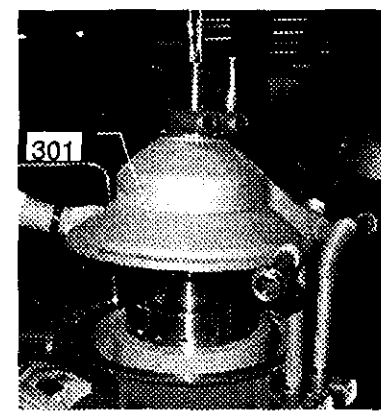


Fig. 2-8

2.1.2 Bowl

Refer to the Bowl Assembly Drawing (Fig. 2-31,Fig. 2-32)

2.1.2.1 Removing gravity disc

Mount the disc nut handle (804) on the disc nut (122) and hold it down by hand to make sure that it does not go up, and strike it with a hammer counter-clockwise to remove it. (**Fig. 2-9**)

Fig. 2-9

Remove the heavy liquid chamber (134), impeller (2) (321), packing (133) and gravity disc (121). (**Fig. 2-10**)
On the Models SJ10F～30F (FH/FP/SH types are the same as F type.), the heavy liquid chamber, impeller (2) and packing are not provided.

The gravity disc can be replaced after disassembly up to this step.

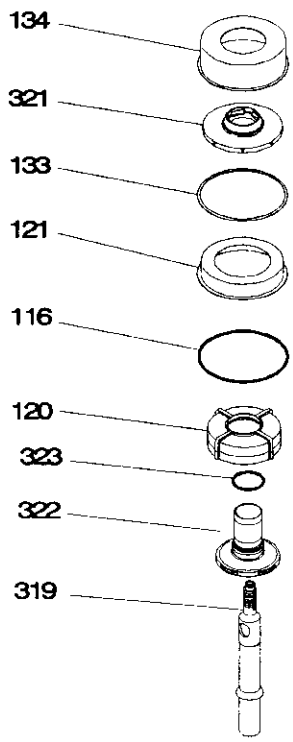


Fig. 2-10

Mount the light liquid chamber handle (805) to the light liquid chamber (120), hold it down by hand to make sure that it does not go up, and strike it with a hammer to remove it. (**Fig. 2-11**)

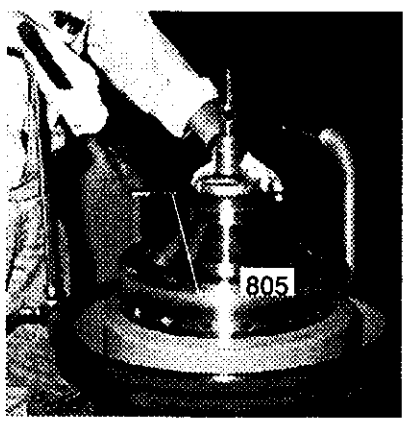


Fig. 2-11

Pull and remove the impeller (1) (322) and inlet pipe (319) by hand. **(Fig. 2-12)**

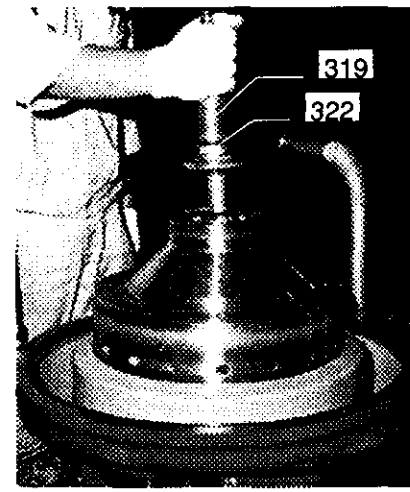


Fig. 2-12

2.1.2.2 Withdrawing bowl

Secure the dismantling stand (801) on the dismantling site through use of the drilled holes in four places. **(Fig. 2-13)**

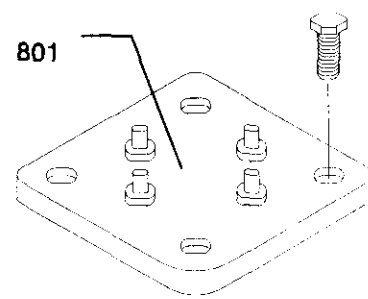
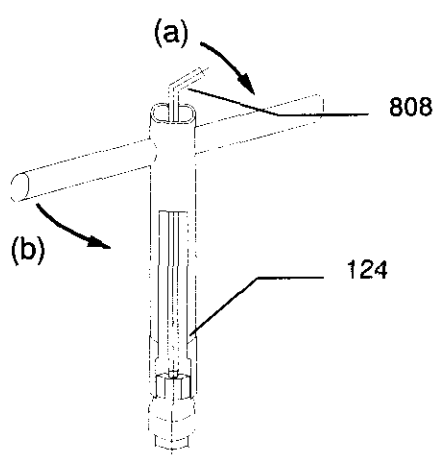


Fig. 2-13

Remove the cap nut (124) tightening the bowl on the vertical shaft, using the cap nut spanner (808). **(Fig. 2-14)**

※ How to use cap nut spanner
Insert the cap nut spanner in the bowl, set the spanner on the cap nut, and thread the threaded rod of the spanner into the threaded hole at the head of the cap nut (a), turn the handle of the spanner (b), and draw it up. The bowl can then be removed with the cap nut (124) mounted.

Fig. 2-14



Mount the jack (4) (821) by threading it into the threaded portion of the distributor (108). (**Fig. 2-15**)

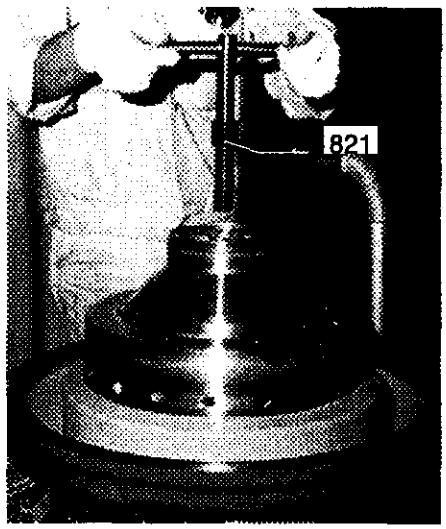


Fig. 2-15

Turn down the handle of the jack (4) (821) until the bowl is slightly raised. (***Fig. 2-16***)

NOTE

When the push bolt is brought into contact with the end of the vertical shaft by rotation of the handle, the resistance of the handle will increase. The bowl is held tightly against the vertical shaft by the taper portion. To loosen the bowl, further rotate the handle by striking with a hammer, and turn it down until the bowl is slightly raised.

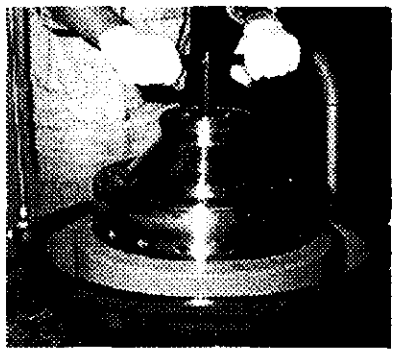


Fig. 2-16

⚠ CAUTION

If the bowl held tightly against the vertical shaft by the taper portion is directly lifted, the vertical shaft will also be drawn up, and damage to parts may result.

Mount the shackle (824) to the handle of the jack (4) (821) and slowly draw up the bowl in the vertical direction by use of the chain block. (**Fig. 2-17**)

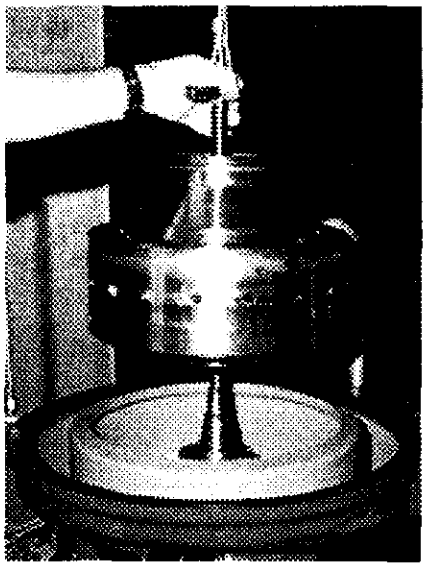


Fig. 2-17

NOTE

The bowl might be withdrawn with the bow bush attached.

⚠ CAUTION

When the bowl is placed on the dismantling stand, use care to make sure that your hands are not caught.

Place the lifted bowl on the dismantling stand (801). In this case, make sure that the four pins of the dismantling stand fit in the holes at the bottom of the bowl.
Remove the jack (4) (821). (**Fig. 2-18**)

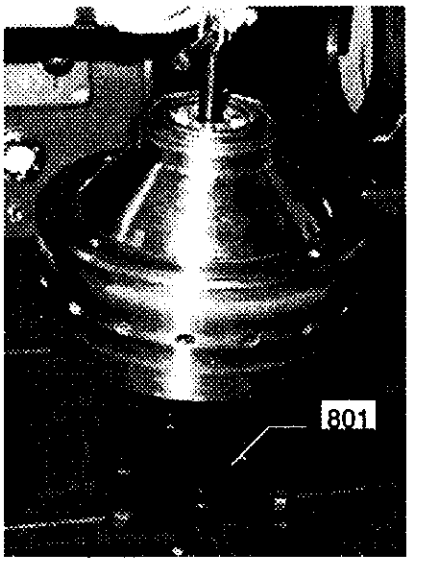


Fig. 2-18

2.1.2.3 Detaching bowl nut and withdrawing disc (1)

Thread the disc clamp plate (807) into the distributor (108) and tighten it with the nut. (**Fig. 2-19**) (Turn down the nut firmly by striking with a hammer.)
Before tightening the nut, check to ensure that the disc clamp plate bolt has been threaded all the way into distributor.
The bowl nut can be removed easily compressing the disc (1).

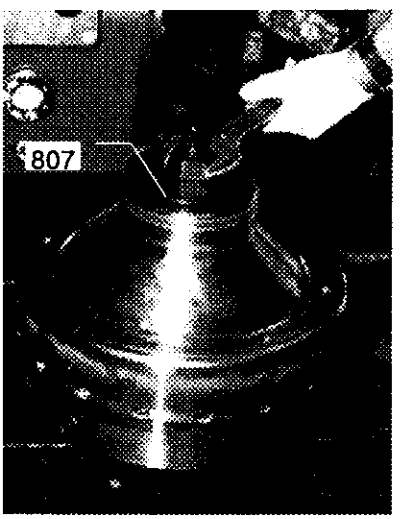


Fig. 2-19

NOTE

If the bowl nut is removed directly without use of the disc clamp plate, application of undue pressure may cause damage to the bowl hood and body. Make sure that the above-mentioned procedures are followed.

After securing the bowl nut handle (802) on the bowl nut (119) with the nut, rotate it by striking with a hammer to remove the bowl nut. (**Fig. 2-20**)

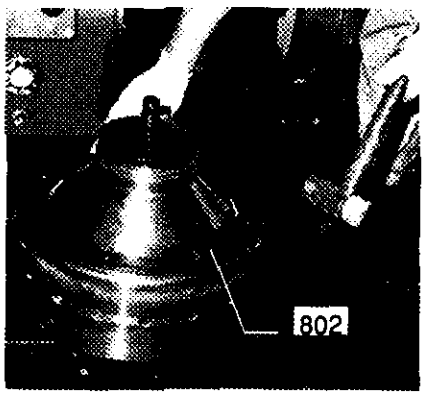


Fig. 2-20

NOTE
If the bowl nut handle is not secured with the nut, when it is struck with a hammer, it may lift and cause damage to the pins.

NOTE
When the bowl nut does not rotate even if lightly struck with a hammer, it means that the disc (1) shown in Fig. 2-19 has not be fully tightened. Do not attempt to remove the bowl nut by forcibly striking with a hammer. Damage to the bowl parts and tools may result.

Loosen the nut to remove the disc clamp plate (807). Place the protective plate (812) on the top of the distributor. (**Fig. 2-21**)

Fig. 2-21

Place the jack (1) (803) on the bowl hood. (**Fig. 2-22**)

Fig. 2-22

Secure it with the disc nut (122). **(Fig. 2-23)**

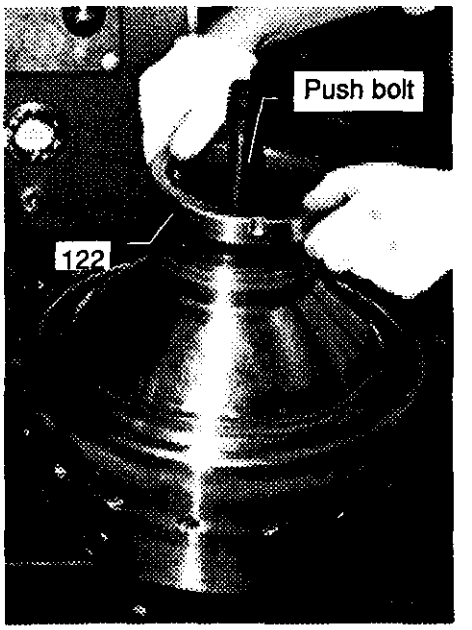


Fig. 2-23

Turn the push bolt (819) to raise the bowl hood. **(Fig. 2-24)** Install the wire and remove the bowl hood with a chain block.
(If the top disc (113) comes out with the hood, remove it by lightly striking with a wooden hammer.)

Fig. 2-24

NOTE
The main seal ring (108) is provided under the bowl hood. When the bowl hood is removed, use care to prevent damage to the seal surface.

NOTE
Withdraw the bowl hood vertically. If it is removed with an undue force in a tilted state, the fitting portion might be damaged, making reassembly difficult.

※ Main seal ring removal procedures

⚠ CAUTION

In this case, care should be taken not to damage the main seal ring groove (its side surfaces in particular) on the bowl hood side. Liquid leakage may result.

Turn the bowl hood (115) over, and cut the main seal ring with the main seal ring cutter (810), using a hammer.
Cut the main seal ring in two places 1 to 2cm apart and remove the cut piece. Then lift the ring with a screwdriver. By so doing, the main seal ring can be removed relatively easily. (**Fig. 2-25**)

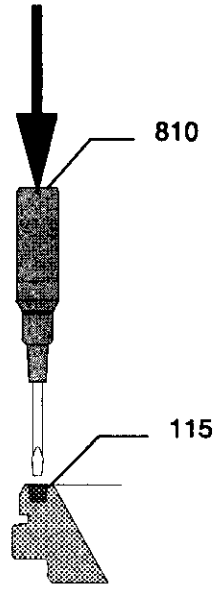


Fig. 2-25

Mount the jack (4) (821) in the distributor and lift it. Then the disc (1) (111), upper discs (112) and top disc (113) will come out in the condition that they were mounted in the distributor. (**Fig. 2-26**)
The uppermost portion of the disc (1) accommodates three upper discs (112) which do not have any fringe in their circumferential portions.

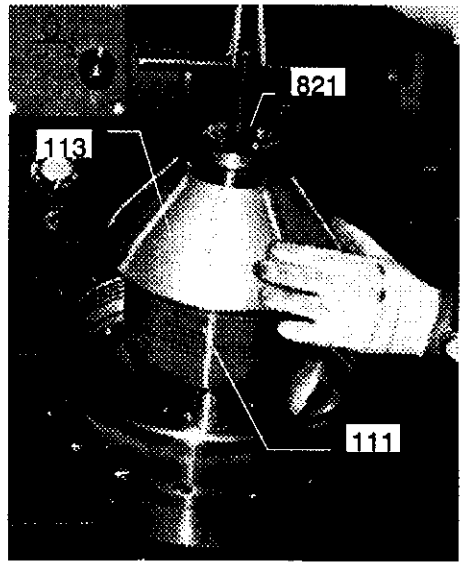


Fig. 2-26

2.1.2.4 Removing main cylinder

⚠ CAUTION

Use care to prevent damage to the sheet surface and sliding portions.

NOTE

- **To remove the main cylinder, mount the jack (1) and then strike the jack evenly all around with a protective rod or something else in between to lower the main cylinder all the way. Then draw up the main cylinder by use of the tool.**
- **Spray a penetrating lubricant against the inside *and outside circumferential sliding portions* of the main cylinder beforehand. An effective auxiliary means is to put cubes of ice inside the main cylinder (indicated by the arrow) and remove them 2 or 3 minutes later.**

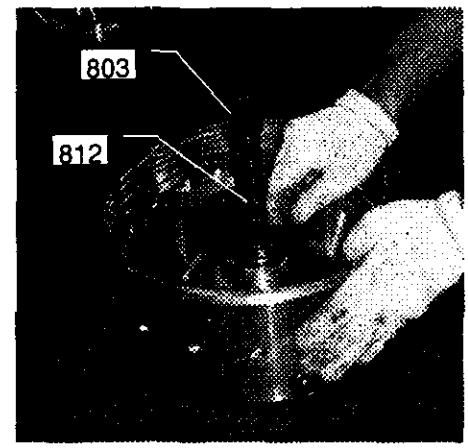


Fig. 2-27

After installing the protective plate (812) in the cap nut installing portion of the bowl body, secure the jack (1)(803) on the main cylinder with the socket cap screw. (**Fig. 2-27**) Turn down the jack with the push bolt (819) and handle(1) (823) to remove it. (**Fig. 2-28**)

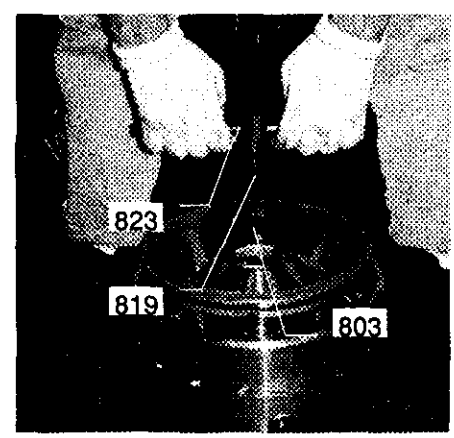


Fig. 2-28

NOTE

There is only a slight clearance between the main cylinder and body. When the main cylinder is removed, if it is only slightly inclined, it can no longer be withdrawn.

When the handle resists, do not blindly continue to rotate the handle. Each time the handle resists, strike the top of the push bolt with a hammer, or temporarily back it off. By so doing, withdraw the main cylinder little by little. (Hammering will correct the inclination of the *main cylinder and will also eliminate* the eccentricity of the tool.)

2.1.2.5 Withdrawing pilot valve

Using a hexagon rod spanner, remove the valve nut (132). (**Fig. 2-29**)

NOTE

Be sure to insert the hexagon rod spanner securely in the hexagon hole of the valve nut. Otherwise damage to the hexagon hole might result.

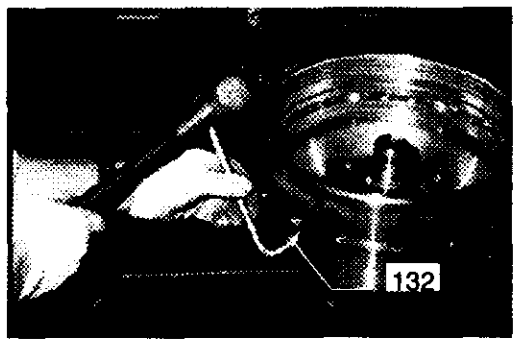


Fig. 2-29

Hold the jack (3) (809) against the pilot valve portion, thread the dismantling bolt into the pilot valve (128), and then turn down the nut to remove it. Withdraw the other one by the same procedures. (**Fig. 2-30**)

Remove the jack (3) and withdraw the pilot valve (128) and valve sheet (130) from the valve guide (125).

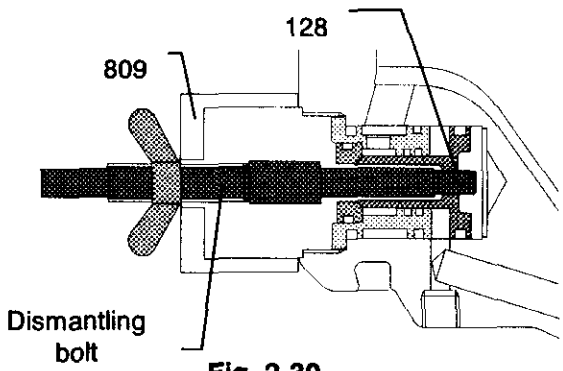


Fig. 2-30

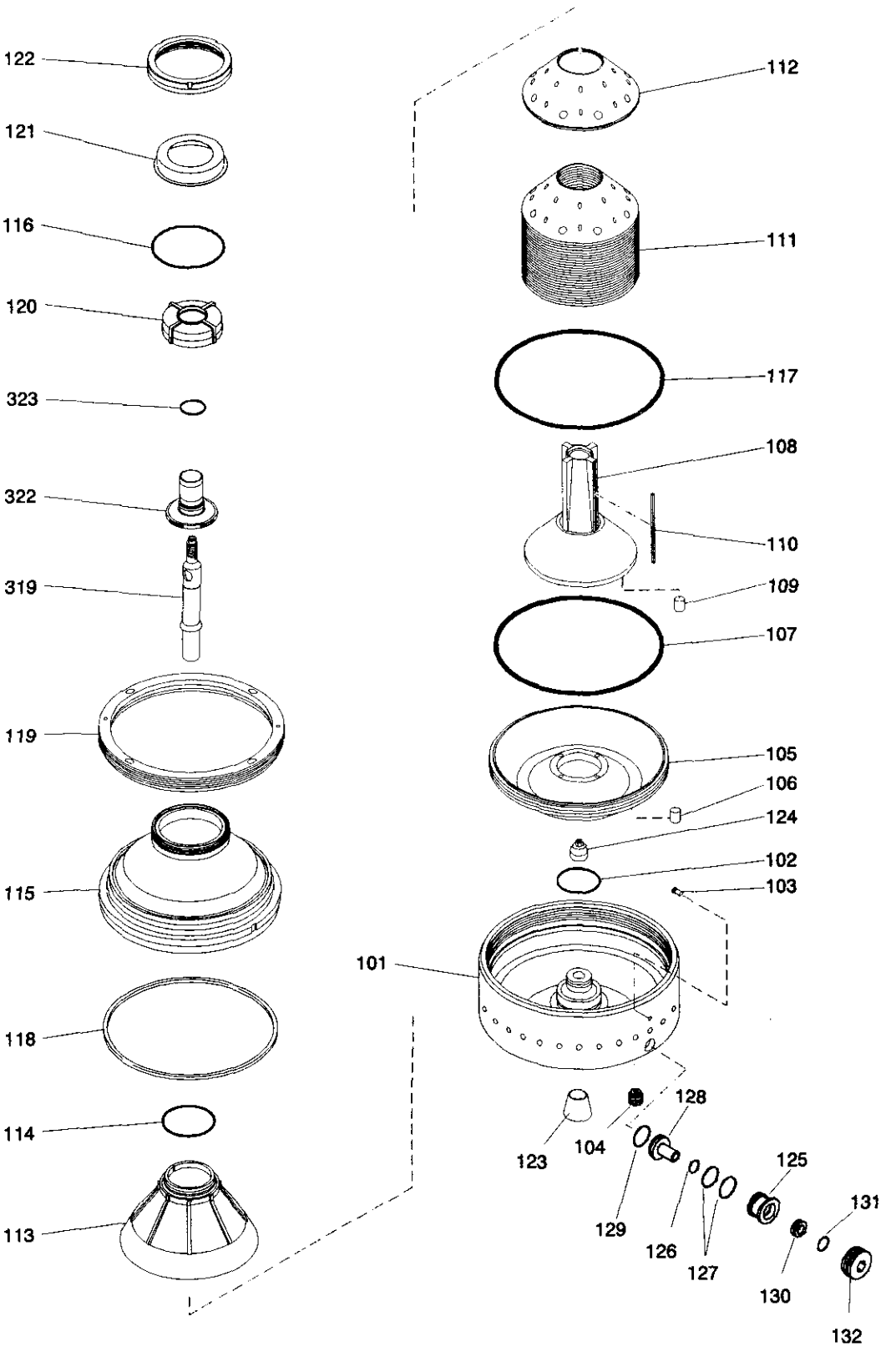


Fig. 2-31 Bowl Assembly Drawing (SJ10F, 15F, 30F)

NOTE: FH/FP/SH types are the same as F type.

Bowl Parts List **Table 2-1**

101	Bowl body	1	119	Bowl nut	1
102	O ring	1	120	Light liquid chamber	1
103	Knock pin	1	121	Gravity disc	1set
104	Drain nozzle	2	122	Disc nut	1
105	Main cylinder	1	123	Bowl bush	1
106	Spring pin	2	124	Cap nut	1
107	O ring	1	125	Valve guide	2
108	Distributor	1	126	O ring	4
109	Pin	1	127	O ring	4
110	Key	1	128	Pilot valve	2
111	Disc (1)	1set	129	O ring	2
112	Upper disc	3	130	Valve sheet	2
113	Top disc	1	131	O ring	2
114	O ring	1	132	Valve nut	2
115	Bowl hood	1	319	Inlet pipe	1
116	O ring	1	322	Impeller (1)	1
117	O ring	1	323	O ring	1
118	Main seal ring	1			

When ordering parts, let us know the parts Nos. and names shown in the finished drawing manual, not the numbers in the above list.

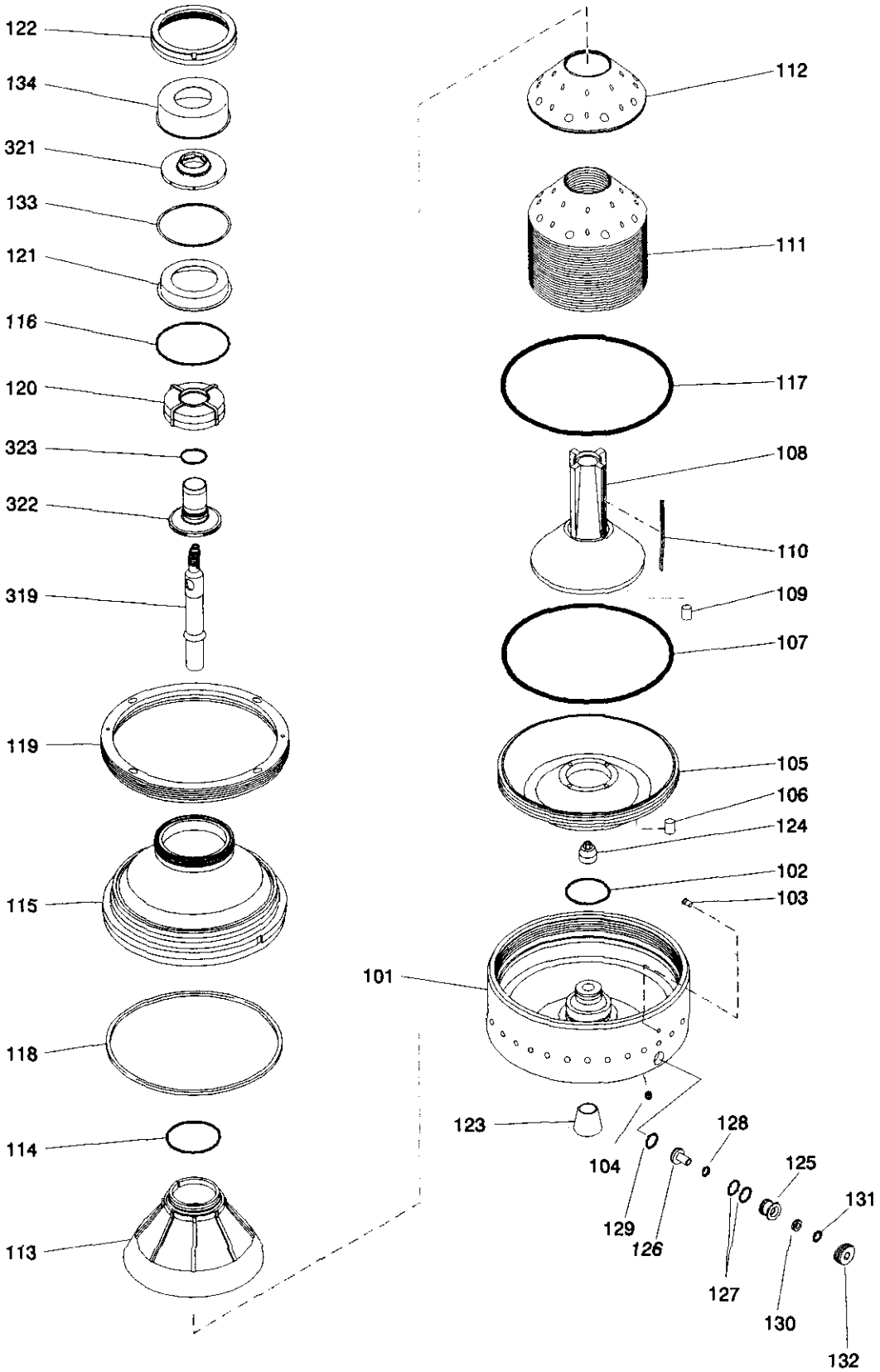


Fig. 2-32 Bowl Assembly Drawing (SJ40F, 50F, 80F)

NOTE: FH/FP/SH types are the same as F type.

Bowl Parts List **Table 2-2**

101	Bowl body	1	120	Light liquid chamber	1
102	O ring	1	121	Gravity disc	1set
103	Knock pin	1	122	Disc nut	1
104	Drain nozzle	2	123	Bowl bush	1
105	Main cylinder	1	124	Cap nut	1
106	Spring pin	1	125	Valve guide	2
107	O ring	1	126	O ring	4
108	Distributor	1	127	O ring	4
109	Pin	1	128	Pilot valve	2
110	Key	1	129	O ring	2
111	Disc (1)	1set	130	Valve sheet	2
112	Upper disc	3	131	O ring	2
113	Top disc	1	132	Valve nut	2
114	O ring	1	133	Packing	1
115	Bowl hood	1	134	Heavy liquid chamber	1
116	O ring	1	319	Inlet pipe	1
117	O ring	1	321	Impeller (2)	1
118	Main seal ring	1	322	Impeller (1)	1
119	Bowl nut	1	323	O ring	1

When ordering parts, let us know the parts Nos. and names shown in the finished drawing manual, not the numbers in the above list.

2.1.3 Horizontal shaft

> **WARNING**
>
> **Re-check that the power supply of the starter has been turned off.**

Refer to the Horizontal Shaft Assembly Drawing (Fig. 2-46), and Gear Pump Assembly Drawing (Fig. 2-63).

Remove the drain plug to remove the lubricant from inside the gear case. (**Fig. 2-33**)

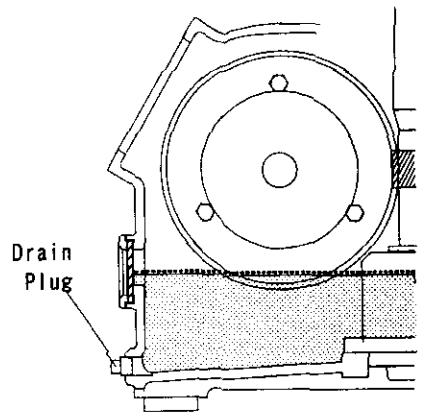


Fig. 2-33

> **CAUTION**
>
> **When the motor is to be lifted, mount the chain block just above the eyebolt for the sake of safety.**

Disconnect the motor, lift and support it by the chain block, and then remove the bolts and withdraw the motor.
(**Fig. 2-34**) (In this case, pay heed to the friction block which might come off and fall down.)

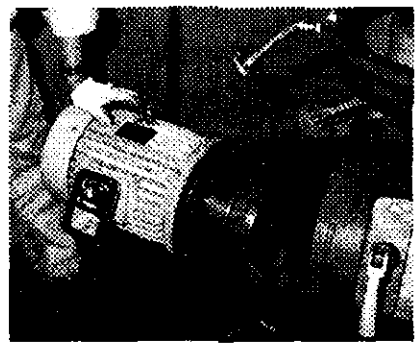


Fig. 2-34

Remove the friction block (621) inserted in the friction boss (619) mounted in the motor. (**Fig. 2-35**)

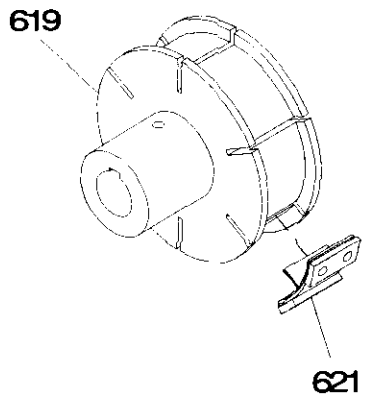


Fig. 2-35

When the proximity switch of the Discharge Detector (standard equipment on the automatic specifications FSH-1A, FSP-1A, FSH-PA) is provided on the pump housing, remove the cover (G07) located on the top of the housing, and remove the lock nut of holder tightening the proximity switch and remove the proximity switch.

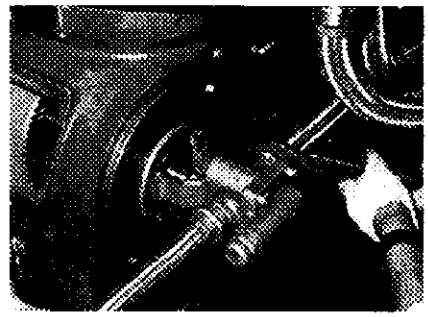


Fig. 2-36

NOTE
Handle the proximity switch with great care, as it is a precision machine.

NOTE
Before removing the gear pump, remove the oil collected before and behind the gear pump piping (by use of the drain cock, etc.). In addition, place a tray under the pump to receive the oil.

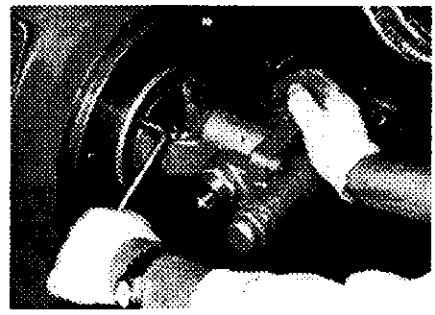


Fig. 2-37

Remove the cap nuts of the connecting tubes (1) (connecting tube(2)) at the gear pump. (**Fig. 2-36**) (Place an oil receiving container under the pump beforehand.)

Remove the bolts tightening the gear pump with the hexagon rod spanner (M10), and remove the gear pump from the main body. (**Fig. 2-37**)

Remove the gear cover and remove the socket cap screws (M8) (626) securing the bearing retainer (611) to the bearing housing (3) (608). (**Fig. 2-38**)

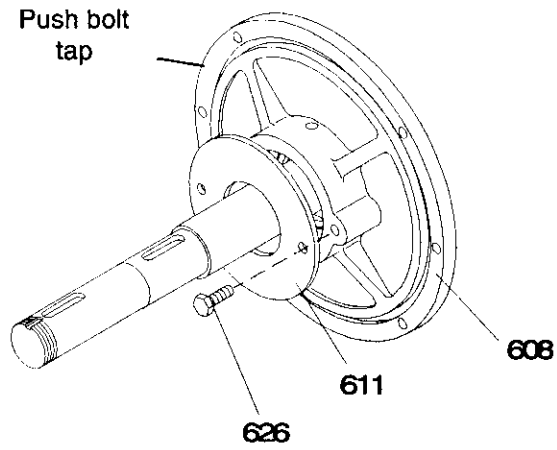


Fig. 2-38

Remove the bolts (612) tightening the bearing housing (3) (608) and use them as push bolts to remove the bearing housing (3). (**Fig. 2-39**)

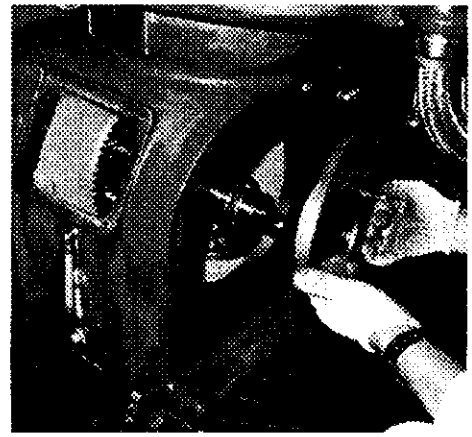


Fig. 2-39

Remove the lock nut (604) and lock washer (605) securing the friction pulley (618) on the horizontal shaft. (**Fig. 2-40**)

Using the jack (5), bolt (811) , push bolt (819) and handle (823), withdraw the friction pulley. (**Fig. 2-41**)

NOTE

Check to ensure that the brakes are free.

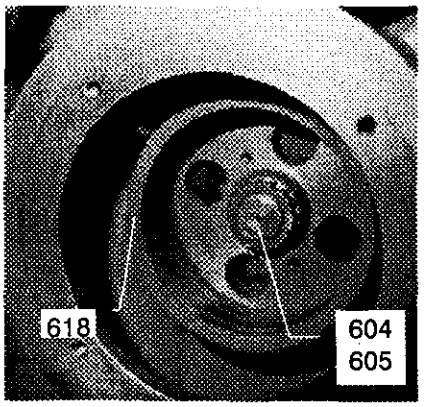


Fig. 2-40

Withdraw the horizontal shaft toward the pump side. (**Fig. 2-42**)。

If the horizontal shaft is hard to withdraw, hold a copper rod or wooden board against the friction pulley side of the horizontal shaft and lightly strike it, while using care to make sure that the oil seal (625), etc. are not damaged by the threaded portion of the horizontal shaft and the keys (603) of the friction pulley. (When the horizontal shaft is withdrawn, there is danger of damage to the spiral gear (616). Therefore, it is desirable that the horizontal shaft be supported by another person when it is struck.)

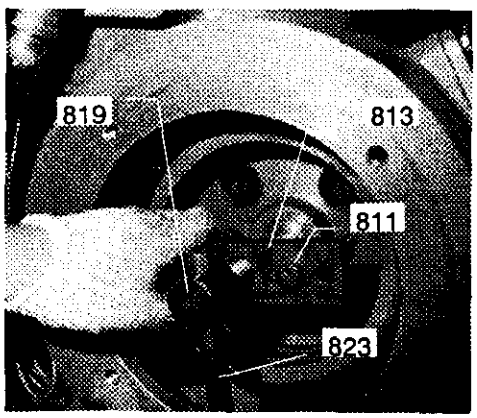


Fig. 2-41

Remove the bolt securing the spiral gear on the gear boss to remove the spiral gear.

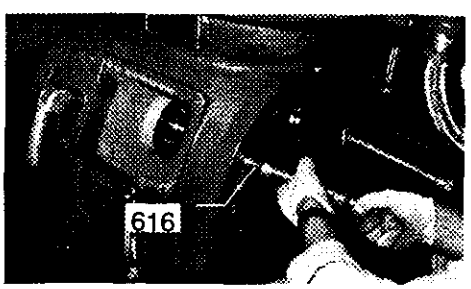


Fig. 2-42

⚠ CAUTION

- **Do not re-use the removed bearing.**
- **Do not remove the bearing except when it has to be replaced**

Remove the socket set screw (607) securing the safety joint to remove the safety joint. Then remove the retaining ring (C) (606)

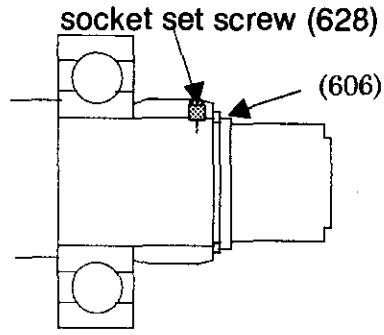


Fig. 2-43

Loosen the socket set screw (628) securing the collar (2) (627). **(Fig. 2-43)**

Using the jack (5) (813), jack (8) (816), bolt (811), push bolt (819) and handle (823), remove the pump side bearing (602) together with the collar (2) (627). **(Fig. 2-44)**

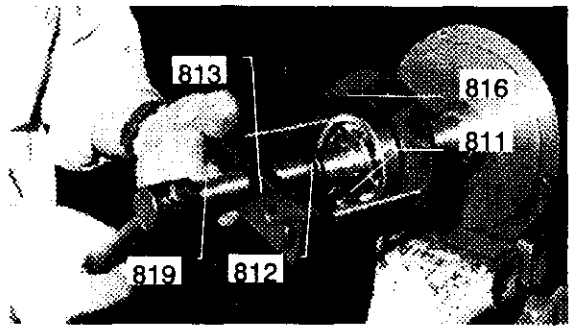


Fig. 2-44

NOTE
Set the protective plate (812) between the end of the horizontal shaft and the bolt (819) to prevent damage to the end of the horizontal shaft.

Remove the pulley side key (602).
Support the gear boss with a pipe or something else and strike it with a copper hammer from the friction pulley side of the horizontal shaft to remove the friction pulley side bearing (602), collar (1) (617) and gear boss (613) from the horizontal shaft.
(Fig. 2-45)

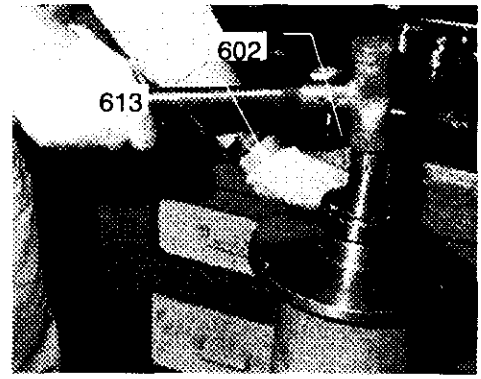


Fig. 2-45

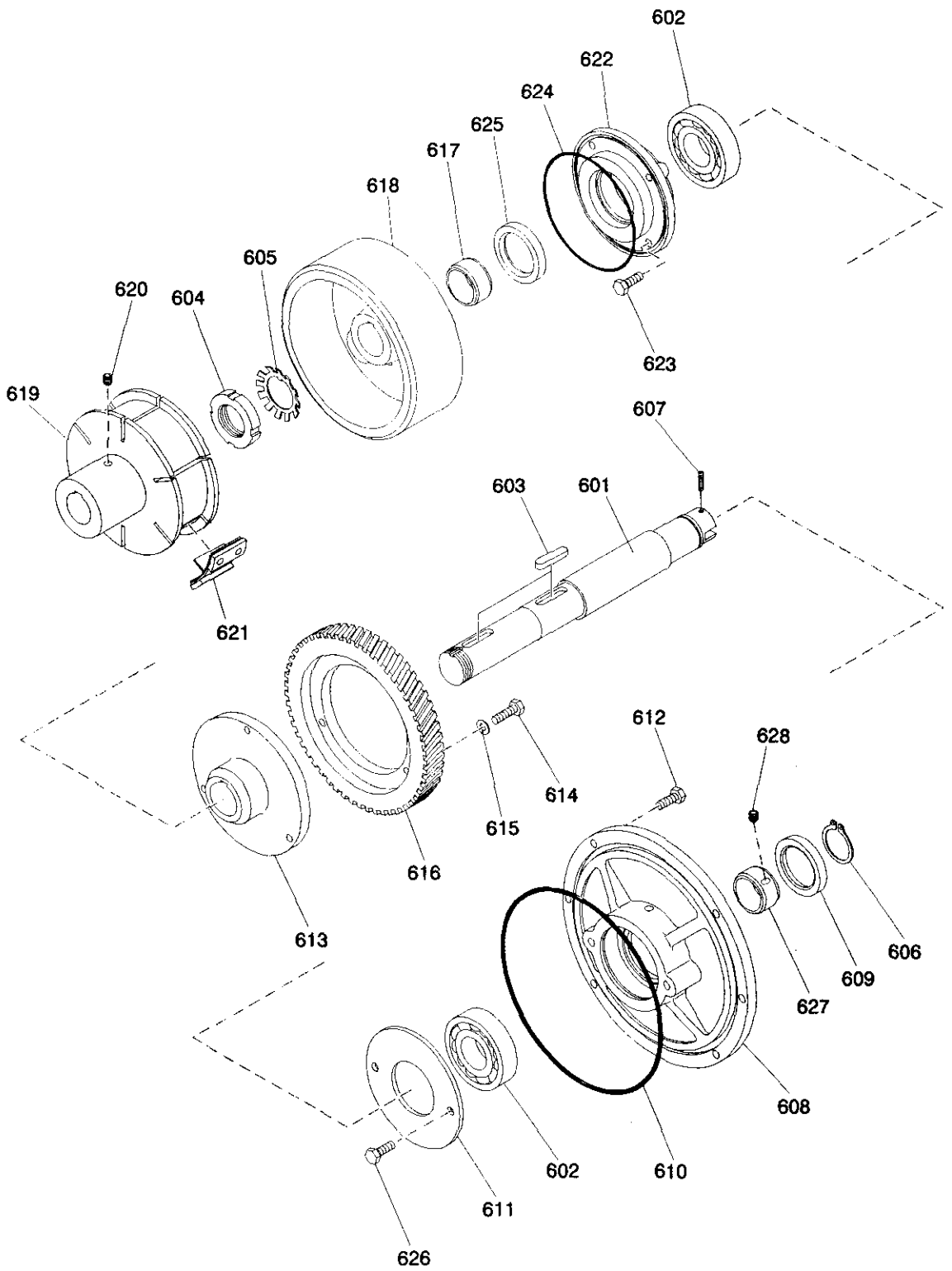


Fig. 2-46 Horizontal Shaft Assembly Drawing

Horizontal Shaft Parts List **Table 2-3**

601	Horizontal Shaft	1	616	Spiral gear	1
602	Ball bearing (1)	2	617	Collar (1)	1
603	Key	2	618	Friction pulley	1
604	Lock nut	1	619	Friction boss	1
605	Lock washer	1	620	Socket set screw	1
606	Retaining ring (C)	1	621	Friction block 50Hz	4
607	Socket cap screw	1		Friction block 60Hz	3
608	Bearing housing (3)	1	622	Bearing housing (4)	1
609	Oil seal	1	623	Bolt	4
610	O ring	1	624	O ring	1
611	Bearing retainer	1	625	Oil seal	1
612	Bolt	4	626	Bolt	2
613	Gear boss	1	627	Collar (2)	1
614	Bolt	3	628	Socket set screw	1
615	Spring washer	3			

When ordering parts, let us know the parts Nos. and names shown in the finished drawing manual, not the numbers in the above list.

2.1.4 Water supplying device

Refer to the Water Supplying Device Assembly Drawing (Fig. 2-52)

Remove the bowl bush mounted in the tapered portion of the upper part of the vertical shaft, using the jack (5) (813), push bolt (819), handle (823), bolt (811) and jack (10) (817). (**Fig. 2-47**)

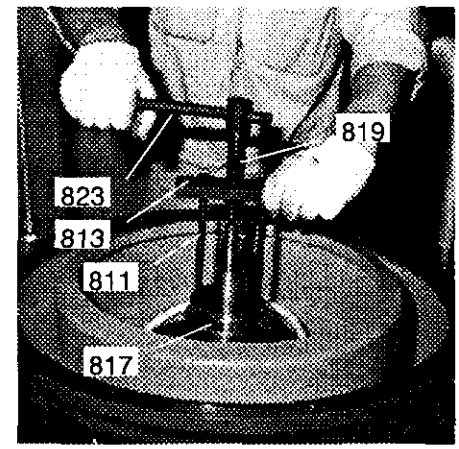


Fig. 2-47

Loosen the socket set screw (710) with the hexagon rod spanner (M6). (**Fig. 2-48**)

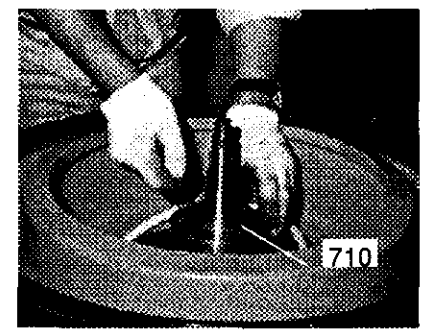


Fig. 2-48

Loosen the cap nut to remove the operating water tube (Teflon tube) mounted on the operating water disc (701). (**Fig. 2-49**)

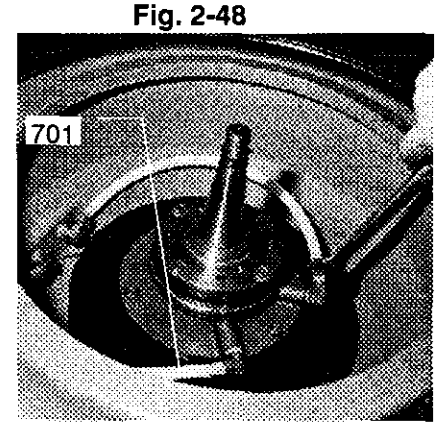


Fig. 2-49

Remove the socket cap screws (702) located in three places of the operating water disc, using the hexagon rod spanner (M8). (**Fig. 2-50**)

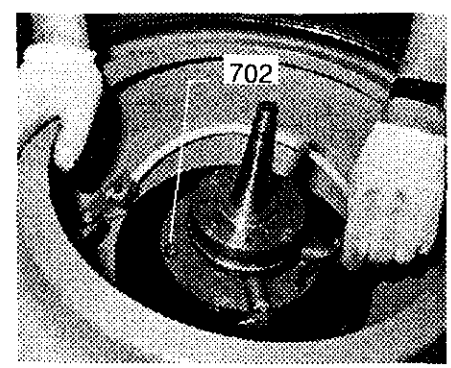


Fig. 2-50

Place the jack (5) on the head of the vertical shaft, and set up the push bolt (819), handle (823) and bolt (811). Then thread the end of the bolt (811) into the chamber cover (709) and turn down the handle. The whole of the water supplying device will then go up and get out of the vertical shaft. (**Fig. 2-51**)

Remove the bolts (706) located in four places of the operating water chamber (705), using a spanner. Using a hexagon rod spanner, remove the socket cap screw (704) located under the water supplying device. Remove the operating water nozzle (703) from the operating water chamber (705). Use care to prevent loss of small parts like bolts, washers, etc.

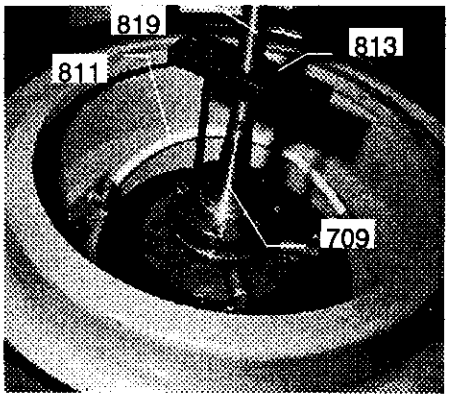
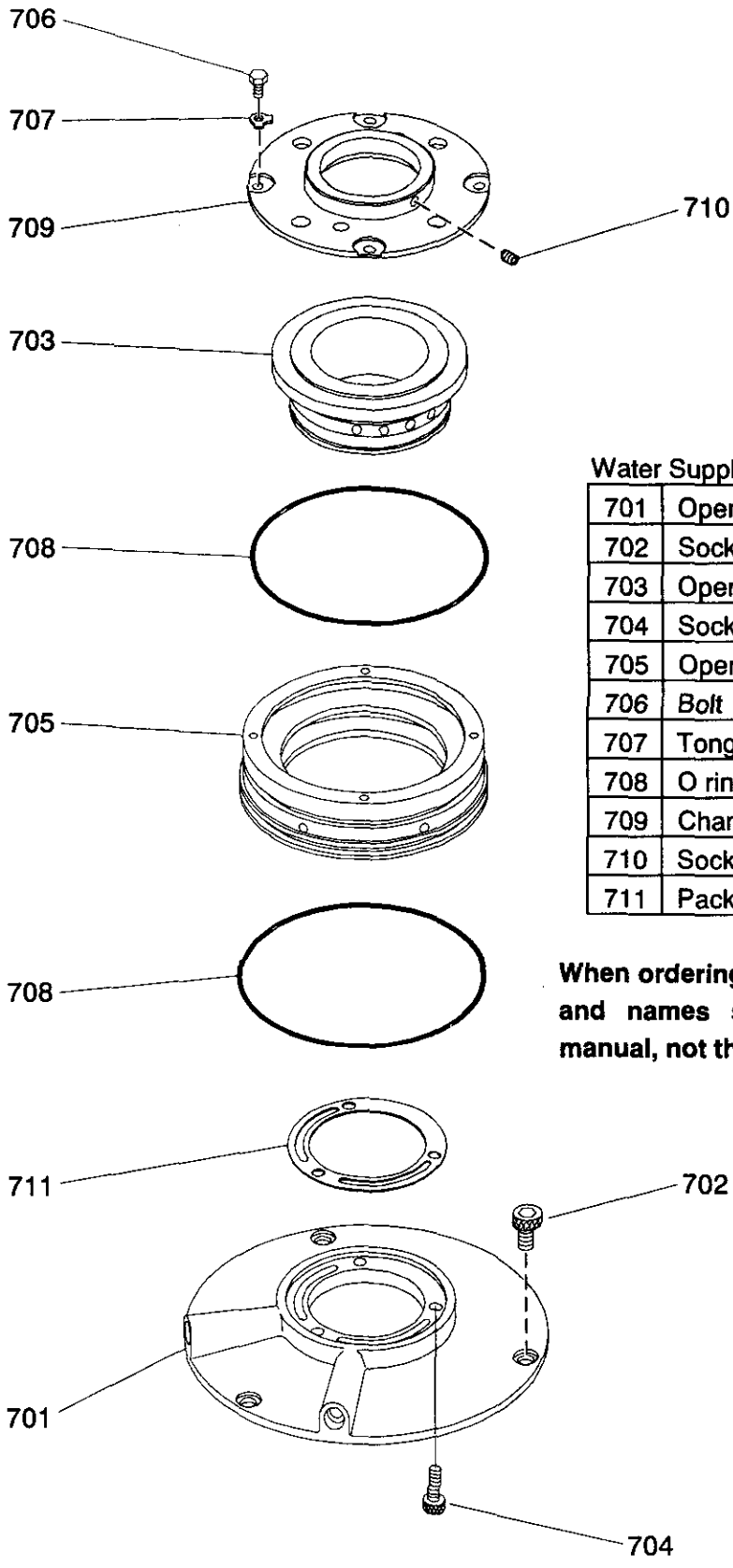


Fig. 2-51



Water Supplying Device Parts List **Table 2-4**

701	Operating water disc	1
702	Socket cap screw	3
703	Operating water nozzle	1
704	Socket cap screw	3
705	Operating water chamber	1
706	*Bolt*	4
707	Tongued washer	4
708	O ring	2
709	Chamber cover	1
710	Socket set screw	1
711	Packing	1

When ordering parts, let us know the parts Nos. and names shown in the finished drawing manual, not the numbers in the above list.

Fig. 2-52 **Water Supplying Device Assembly Drawing**

2.1.5 Vertical shaft

Refer to the Vertical Shaft Assembly Drawing (Fig. 2-57).

(Now, already withdraw the water supplying device and bowl bush.) Withdraw the mist cover (522).

Using a T-shaped wrench, remove the three bolts (514) of the bearing cover (1) (513), and take out the bearing cover (1) together with the bearing cap (1) (**Fig. 2-53**). When they are taken out, the O ring (505) might come out together. Use care to prevent loss of the O ring. Take out the bearing cap (2) (518), flat spring (520) and spacer (1) (521) as well. Withdraw the bearing housing (1).

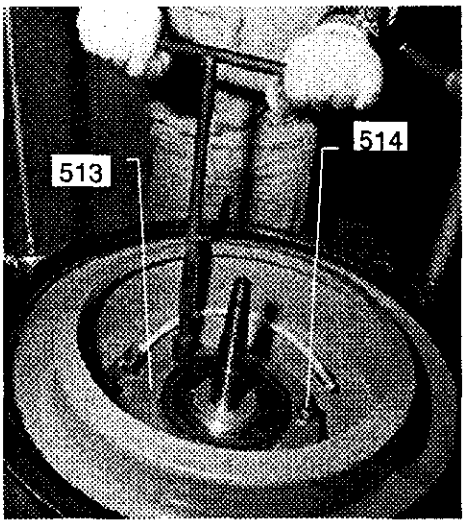


Fig. 2-53

<When the upper spring is to be replaced>

Remove the spring retainer (1) (506), and withdraw the upper spring (508), spring case (507) and bearing sleeve (509).

NOTE

- **Before the vertical shaft is lifted, check to ensure that the spiral gear or the whole of the horizontal shaft has been removed.**
- **When the vertical shaft alone is to be withdrawn without disassembly of the horizontal shaft, remove the spiral gear from the gear boss.**

Remove the gear cover. Using a spanner, remove the three bolts (614) tightening the spiral gear (616).

Using a wooden hammer, remove the spiral gear from the gear boss (613). (The spiral gear will come off from the motor side toward the bearing housing (3).) Shift the position of the spiral gear toward the bearing housing (3) to make sure that it does not interfere when the vertical shaft is lifted.

Hold the top thread of the vertical shaft and Pull out the vertical shaft above. The vertical shaft will come out with the bearing and bearing case attached.(SJ10F~30F)

Mount the jack (7) (822) on the top thread of the vertical shaft, and slowly withdraw the vertical shaft in the vertical direction by the chain block. The vertical shaft will come out with the bearing and bearing case attached. (**Fig. 2-54**) (SJ40F~80F)

Take out the bearing case (1) (510) by striking with a copper or lead hammer to prevent damage.

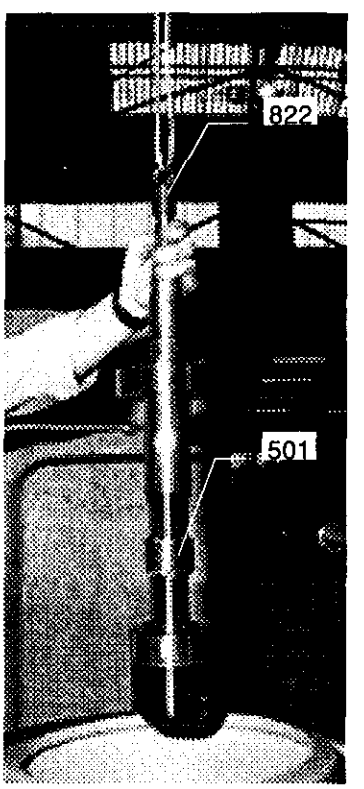


Fig. 2-54

SJ40F,50F,80F

Take out the steel ball (536), spring seat (536) and lower spring (539) from inside the bearing housing (2) (523).

NOTE
When the vertical shaft was disassembled, be sure to carefully check the bearing.

Thread two push bolts (5) equally into the bearing case (3) (531) to withdraw the bearing case (3). Remove the spacer (2) (534). (**Fig. 2-55**)

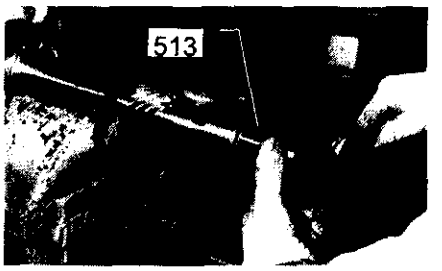


Fig. 2-55

CAUTION

- **Do not re-use the removed bearing.**
- **Do not remove the bearing except when it has to be replaced.**

Assemble the jack (7) (815), jack (5) (813), bolt (811), push bolt (819) and handle (823), and withdraw the bearing case (2) (528), bearing cover (2) (537), collar (538), bearing (2) (529) and ball bearing (3) (532) together. (**Fig. 2-56**)

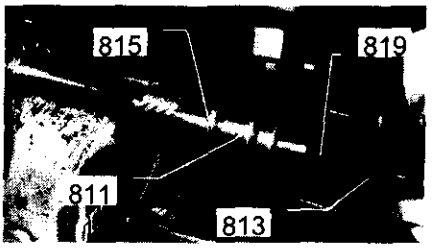


Fig. 2-56

Remove the lock nut located at the top, using the hook spanner (818). Remove the ball bearing (1) located at the top by striking the inner race through use of a chisel to prevent damage to the vertical shaft.

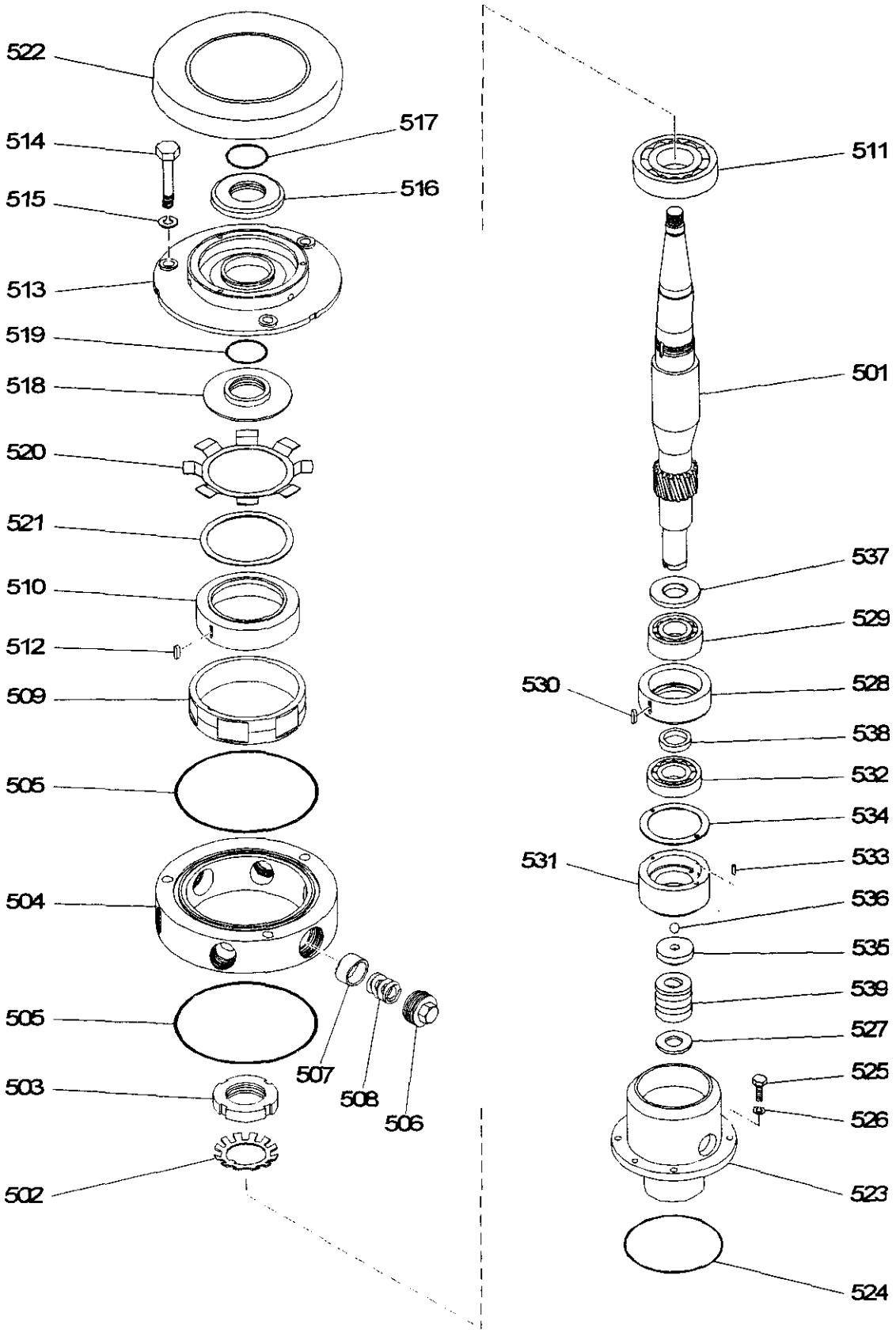


Fig. 2-57 Vertical Shaft Assembly Drawing

Vertical Shaft Parts List **Table 2-5**

501	Vertical shaft	1	521	Spacer (1)	1
502	Lock washer	1	522	Mist cover	1
503	Lock nut	1	523	Bearing housing (2)	1
504	Bearing housing (1)	1	524	O ring	1
505	O ring	2	525	Bolt	4
506	Spring retainer (1)	6	526	Spring washer	4
507	Spring case	6	527	Washer	1
508	Upper spring	6	528	Bearing case (2)	1
509	Bearing sleeve	1	529	Bearing (2)	1
510	Bearing case (1)	1	530	Key	1
511	Ball bearing (1)	1	531	Bearing case (3)	1
512	Key	1	532	Ball bearing (3)	1
513	Bearing cover (1)	1	533	Spring pin	2
514	Bolt	3	534	Spacer (2)	1
515	Spring washer	3	535	Spring seat	1
516	Bearing cap (1)	1	536	Steel ball	1
517	O ring	1	537	Bearing cover (2)	1
518	Bearing cap (2)	1	538	Collar	1
519	O ring	1	539	Lower spring	1
520	Flat spring	1			

When ordering parts, let us know the parts Nos. and names shown in the finished drawing manual, not the numbers in the above list.

2.1.6 Gear pump

Refer to the Gear Pump Assembly Drawing (Fig. 2-63).

Remove the socket cap screws (G13) located in four places to remove the valve case (G12). (**Fig. 2-58**)

Fig. 2-58

Lightly strike the safety joint side of the drive gear with a copper hammer to withdraw the valve case side bush (G11) and driven gear (G10) together with the drive gear.
(***Fig. 2-59***)

Fig. 2-59

Withdraw the safety joint side bush (G11). (**Fig. 2-60**)

Fig. 2-60

Normally, the valve stem need not be removed. When it is disassembled, however, measure the dimension A with the lock nut removed. When it is reassembled, be sure to turn down the adjusting screw until the dimension A is reached. (**Fig. 2-61**)

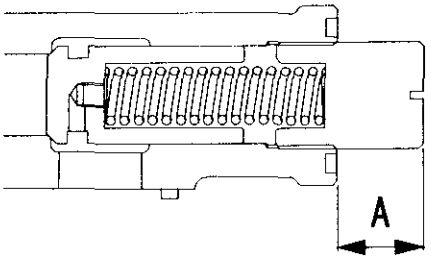


Fig. 2-61

※ **Replacement of safety joint**

When the safety joint only is to be replaced, the gear pump need not be removed from the bearing housing (3). After removing the socket set screw with a hexagon rod spanner, push the safety joint toward the horizontal shaft, and directly pull it sideways to remove it and replace it with a new one.

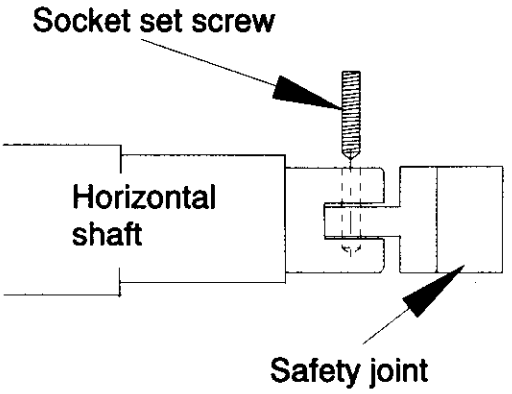


Fig. 2-62

Pump Parts List **Table 2-6**

G01	Pump housing	1	G12	Valve case	1
G02	O ring	1	G13	Socket cap screw	4
G03	Oil seal	1	G14	Spring washer	4
G04	Retaining ring (C)	1	G15	O ring	1
G05	Socket cap screw	4	G16	Valve stem	1
G06	Gasket	2	G17	Adjusting screw	1
G07	Cover	1	G18	Nut	1
G08	Set screw (3)	2	G19	Valve spring	1
G09	Drive gear	1	G20	Cap nut	1
G10	Driven gear	1	G21	O ring	1
G11	Bush	4	G22	Safety joint	1

When ordering parts, let us know the parts Nos. and names shown in the finished drawing manual, not the numbers in the above list.

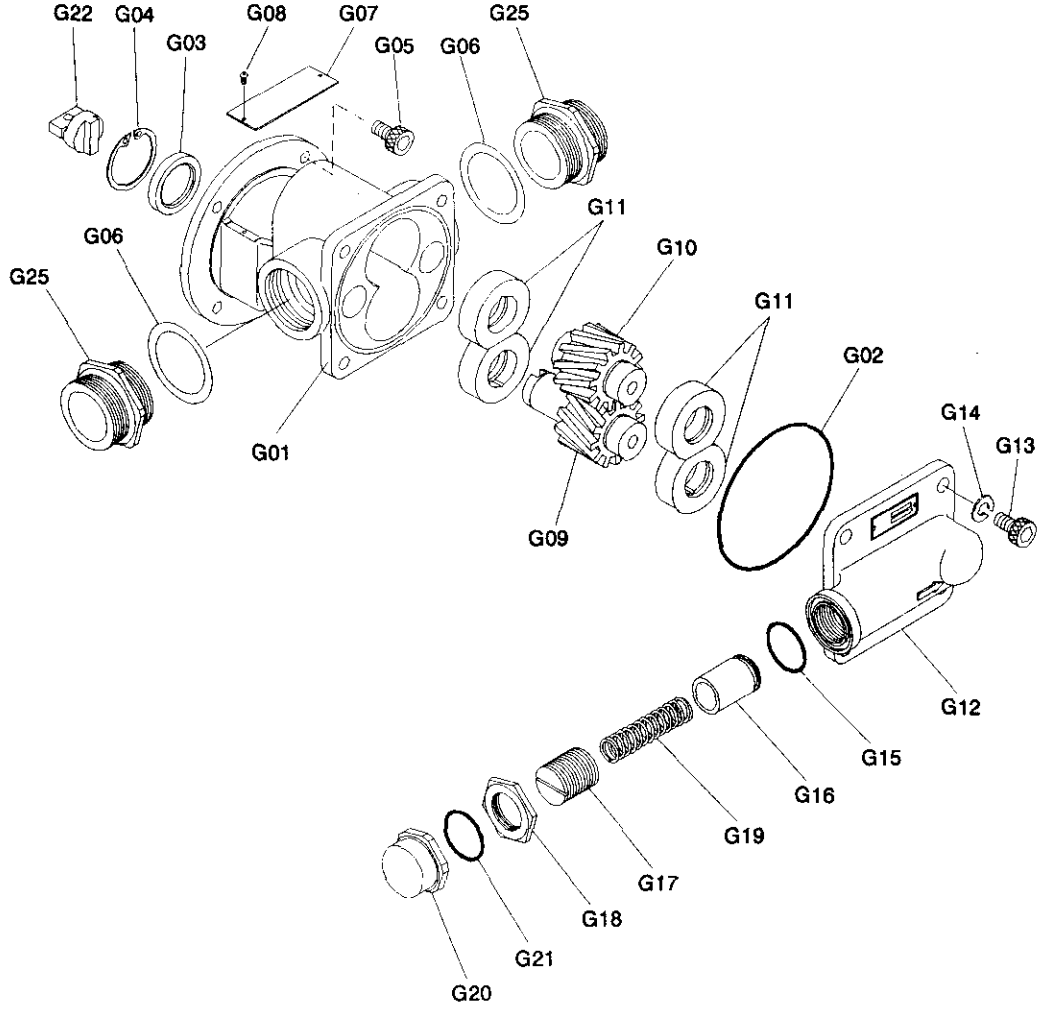


Fig. 2-63 **Gear Pump Assembly Drawing**

2.2 Reassembly

Points to note at reassembly

⚠ WARNING

- **Thoroughly perform all the steps required for reassembly.**
  The SELFJECTOR has many screw coupled parts. At the time of reassembly, check to ensure that all these parts have been thoroughly tightened.

Remember that operation of the SELFJECTOR in a loosely tightened state could be very dangerous.

Re-check that the following parts in particular have been thoroughly tightened.

(A) Bowl nut
(B) Disc nut
(C) Cap nut of vertical shaft
(D) Frame cover (trap) tightening bolt
→ Refer to P2-4 **Fig. 2-6**
(E) Inlet pipe tightening nut
→ Refer to P2-41 **Fig. 2-79**

- **Pay heed to corrosion and erosion**
  Check for damage caused by corrosion or erosion at regular intervals. If there are questionable points, contact our company or service agency.

- **Never interchange bowl parts (except the disc (1)) even if the models are same.**

- **Confirmation of tally marks**
  On the bowl and other parts which have tally marks, be sure to check that the tally marks are in alignment. When the bowl nut has been tightened, if the tally marks are out of alignment, please notify our company or service agency. The following parts have tally marks. Check the parts for confirmation.

<Bowl> (Refer to **Fig. 2-64**)

① Bowl body
② Bowl nut
③ Light liquid chamber
④ Heavy liquid chamber (0SJ40F~SJ80F)
NOTE: FH/FP/SH types are the same as F type.

<Trap>

⑤ Nut (320)

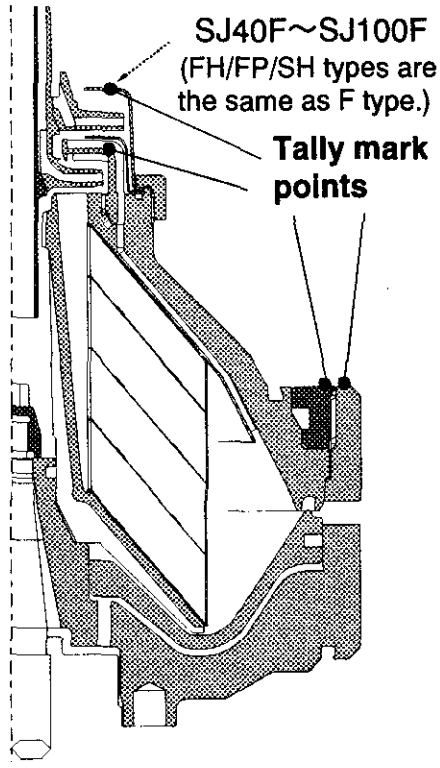
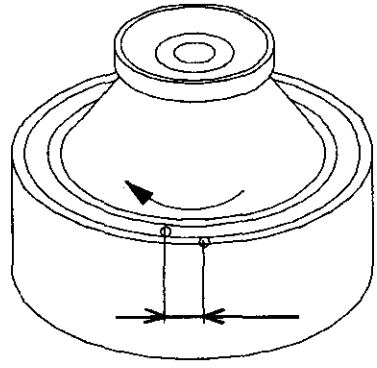


Fig. 2-64

⚠ CAUTION

When the bowl nut has been tightened by threading it into the bowl body, if the tally mark has gone more than 20mm ahead in the turning direction, notify our *company or service agency. (Fig. 2-65)*



More than 20mm
out of alignment

Fig. 2-65

The reassembly sequence is reversal of the disassembly sequence. The points to note at reassembly are described below.

Prior to reassembly, thoroughly remove the dust and deposits from all the parts and carefully check the parts. If there are defective parts, replace them.

For detailed information on the standard dimensions at reassembly, refer to the maintenance inspection procedures.

2.2.1 Bowl

(1) Make sure that when all of the O rings are mounted, they are not twisted.
To install O ring evenly in the valve guide, apply a coat of machine oil to it and the groove.

(2) Be sure to check the tapered portion of the bowl body. If there are scratches, correct them by an oil stone or something else.

(3) To install the pilot valve, apply a machine oil to its outer circumferential portion, and slowly press the pilot valve in by hand. If it is installed by striking with a hammer or something else, damage to the O ring will result.

NOTE

Note that if the pilot valve is installed in a tilted state by applying an undue pressure, its sliding surface will be damaged.

When installing the pilot valve assembly, do not use MOLYCOAT.

(4) Main seal ring installation procedures

①Press the main seal ring in the main seal ring groove of the bowl hood by hand.

②The main seal ring will be placed in a state where it is lifted from the groove. Place a wooden board (50 to 100mm wide) across the main seal ring and strike it with a hammer to install the main seal ring.

⚠ CAUTION

If the sheet plane of the main seal ring is wavy, oil leakage will result. Install the main seal ring in such a way that the sheet plane will be flat.

(5) To install the main cylinder in the bowl body, apply a lubricant to the sliding surfaces of the main cylinder. Line up the positions of the knock pins and install the main cylinder, while using care to make sure that it is not tilted.

(6) Make sure that the threaded portion of each of the parts is coated with the MOLYCOAT.

(7) Make sure that all of the knock pins and keys are completely lined up.

(8) When the disc (1) is installed, the upper discs which **do not have a fringe should be installed in the uppermost position.** Install the other disc by pressing one at a time in the order that they were installed whenever possible. **(Fig. 2-68)**

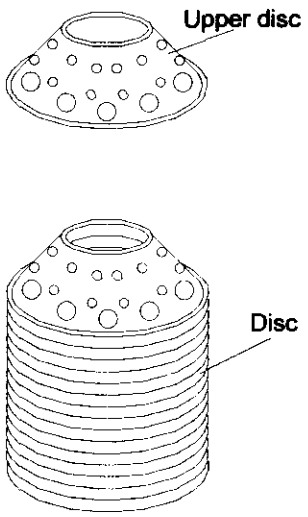


Fig. 2-66

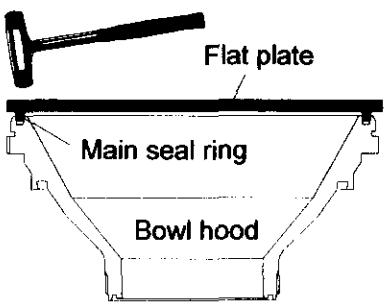


Fig. 2-67

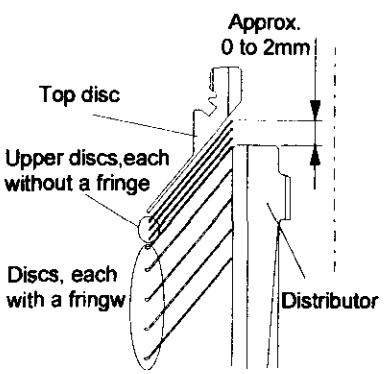


Fig. 2-68

⚠ WARNING

If the machine is operated with the discs in a loose state, large vibration could occur.

(9) The discs tend to produce some looseness because of their seating phenomenon. In such a case, add an appropriate number of spare discs according to **Fig. 2-68** (to the extent that the discs are exposed 0 to 2mm from the distributor).

(10) Bowl nut tightening procedures

(a) Securely tighten the bowl hood with the disc clamp plate (807).(**Fig. 2-69**)

(b) Tighten the nut of the disc clamp plate (807) so that the bowl nut can be turned smoothly by hand until the distance between the tally marks of the bowl nut and bowl body reaches 10 to 15mm. (**Fig. 2-70**)

(c) Tighten the bowl nut with the bowl nut handle by use of a hammer until the tally marks are in alignment. **(Fig. 2-71)**

(11) When the bowl is to be installed in the main body of the machine, apply a lubricant to the operating water chamber of the water supplying device to prevent the O ring of the operating water chamber from being caught. Do not apply MOLYCOAT to the tapered portions of the bowl body and vertical shaft.

(12) After the bowl has been installed in the main body, tighten the cap nut firmly through use of the cap nut spanner and hammer.

(13) When the light liquid chamber is to be threaded in, thread it in by hand to prevent damage to the threaded portion. As a final step, tighten it with the light liquid chamber handle.

(14) When the heavy liquid chamber is installed, line up its tally mark with the tally mark of the bowl body.

(15) Check the installed height of the bowl. (Refer to Fig. 4-14 and **Table 4-6**.)

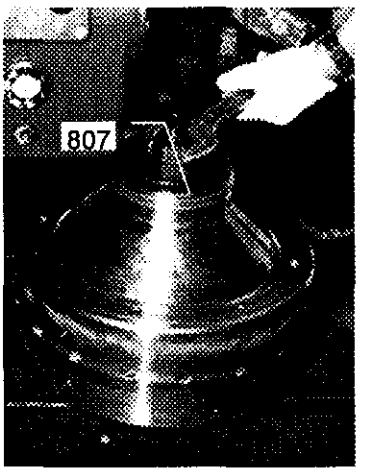


Fig. 2-69

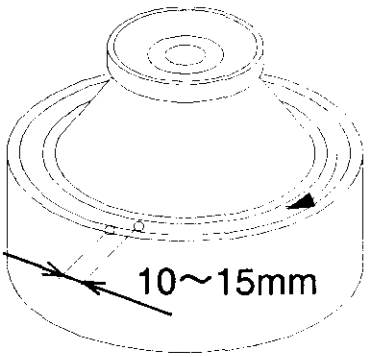


Fig. 2-70

Fig. 2-71

2.2.2 Vertical shaft

(1) Install the vertical shaft in the main body before installing the horizontal shaft.

⚠ CAUTION

Install the vertical shaft correctly in the direction of the ball bearing (3).

(2) Install the flat spring and ball bearing (3) without confusion of their up and down sides.
(Fig. 2-72, Fig. 2-73)

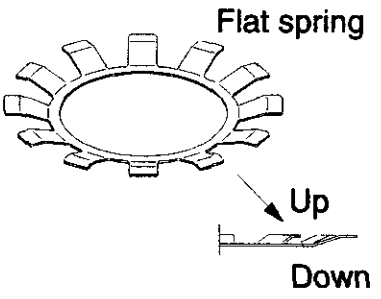


Fig. 2-72

<Installation of bearing>
To install a new bearing, put it in a 80 to 90℃ oil for about 20 minutes before installing it onto the shaft.

NOTE

When the bearing is installed in the bearing case

- **If the bearing is forced in a tilted state by applying an undue pressure, damage to the bearing might result.**
- **After the bearing has been installed, if the inner race can be turned by hand, replace the vertical shaft.**

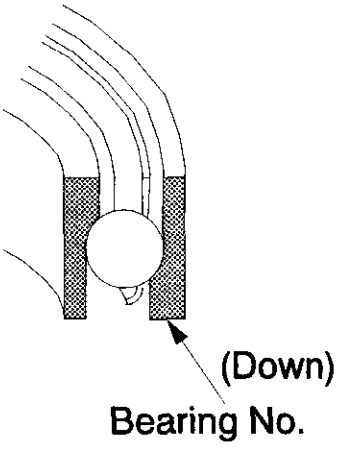


Fig. 2-73

Install the bearing in the bearing case by equally striking the inner ring with a hammer. Before installing the O ring under the bearing housing (1), apply grease to several places of the groove. By so doing, the O ring won't come off and fall.

Before installing the flat spring, install a spacer on the top of the bearing housing (1). Two types of spacers (1) 0.5mm and 1.0mm thick will be supplied. Use a spacer (1) of appropriate thickness to adjust the dimension A of **Fig. 2-74** to the value shown in **Table 2-7**. Measure the dimension A with the O ring removed from under the bearing housing (1).

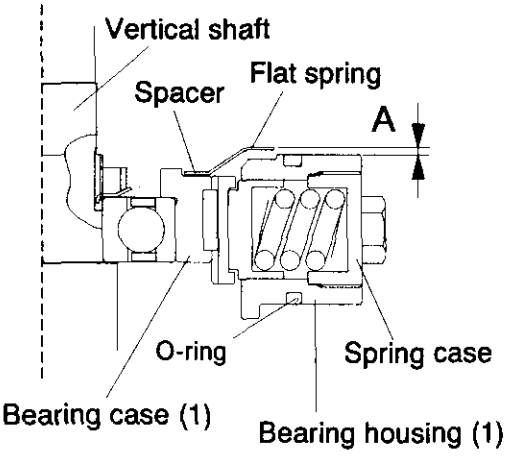


Fig. 2-74

(3) Firmly tighten the spring retainer (1) on the bearing housing (1).
(4) After installation in the main body, check to ensure that the vertical shaft can be lightly turned by hand.

Table 2-7

Model No	SJ10F~SJ80F
Dimension A	0.5~1.0

(FH/FP/SH types are the same as F type.)

2.2.3 Water supplying device

(1) When the O ring is installed on the operating water chamber, use care to make sure that the O ring is not twisted.

(2) After the water supplying device has been installed on the vertical shaft, tighten the socket set screw of the chamber cover and check to ensure that the water supplying device rotates with the vertical shaft as a single unit. (**Fig. 2-75**)

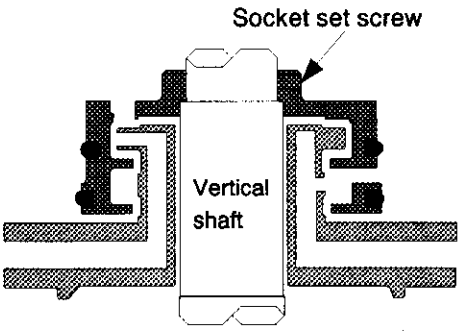


Fig. 2-75

2.2.4 Horizontal shaft

(1) After the vertical shaft has been installed, install the horizontal shaft.

(2) Before installing the bearing, install the bearing retainer in such a way that it will be positioned between the spiral gear and bearing.

(3) Make sure that the mounting surfaces of the spiral gear and gear boss are in tight contact.

(4) When the horizontal shaft is installed in the main body, use care to prevent damage to the lip surface of the oil seal. Apply grease to the lips before inserting the horizontal shaft.

(5) Evenly tighten the bearing retainer when installing it.

⚠ WARNING

For cleaning, avoid using a highly volatile oil such as gas oil which could cause a fire.

(6) If oils are deposited on the inside surface of the friction pulley and the lining of the friction block, wipe them away.

(7) The bearing housings (3) and (4) have a drilled hole. Install the bearing housings so that the drilled holes will be faced down. (**Fig. 2-76**)

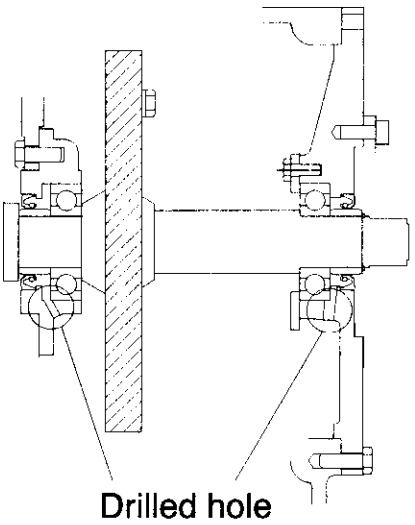


Fig. 2-76

⚠ CAUTION

- **Avoid confusion of collars (1) and (2) when installing them.**
- **Make sure that the collars are installed with the socket set screw side toward you.**

(8) After the collar (2) on the bearing housing (3) side has been installed on the horizontal shaft, be sure to tighten the socket set screw. (**Fig. 2-77**)

Socket Set screw
(Never install the collar with the socket set screw on the opposite side.)

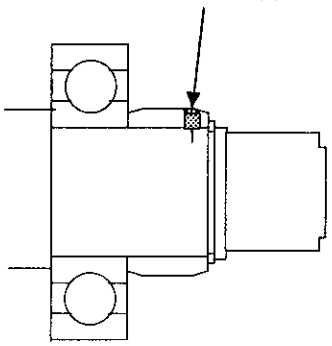


Fig. 2-77

(9) To install the oil seal, hold a protective plate against the end surface and lightly strike it with a hammer to force the oil seal in little by little.

(10) When the friction block installed in the friction boss is to be installed in the main body, secure the friction block with a rubber ring or something else to prevent the fall of the friction block intermediately during installation.

(11) After the horizontal shaft has been installed, check to ensure that it can be turned lightly by hand.

2.2.5 Reassembly of trap

(1) To make sure that the trap does not hit the inlet pipe when it is placed on the frame, check to ensure that the socket set screw (313) on the top of the trap has been loosened. (**Fig. 2-78**)

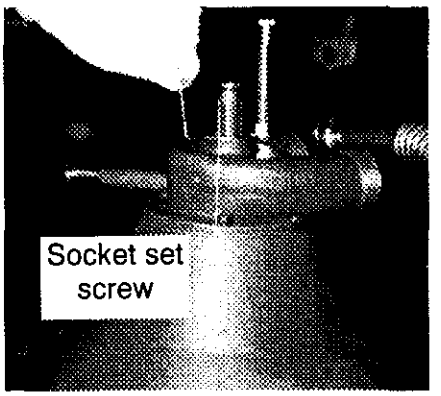


Fig. 2-78

⚠ CAUTION

The nut and cover nut are of double nut construction to prevent looseness. Make sure that they are fully tightened.

(2) Turn down the nut with a spanner and tighten it with a hammer until the tally marks are in alignment. (**Fig. 2-79**)

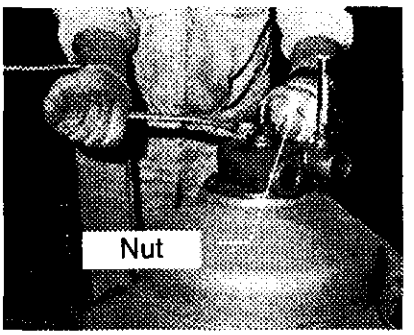


Fig. 2-79

NOTE

The tally mark of the nut (320) will tend to go ahead of that of the upper hood because of the seating or wear of the tapered portion of the impeller. Even if the tally marks are slightly out of alignment, no problem will be caused. Therefore, turn down the nut all the way with a hammer.
Tighten the nut to the following torque.
SJ10F~SJ30F : 700 kg · cm
SJ40F~SJ100F : 1,000 kg · cm
(FH/FP/SH types are the same value as F type.)
If the tally marks are more than 180° out of alignment, replace the impeller (1) with a new one.

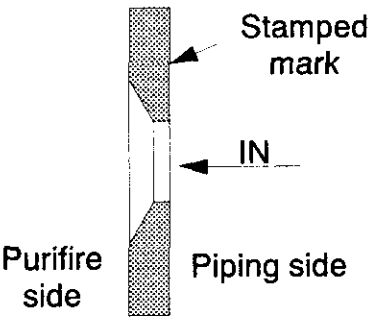


Fig. 2-80

(3) When the inlet pipe is to be installed, do not forget to install the orifice put in the arrow mark portion (☞) of **Fig. 2-81** according to the installing direction shown in **Fig. 2-80**. (Unless the orifice is correctly installed, the flow meter won't indicate a correct flow rate.)

Fig. 2-81

(4) The trap, upper frame (SJ10F ~ SJ30F) and heavy liquid bracket (SJ40F~SJ100F) are provided with plugs for inspection.

⚠ WARNING

Check to ensure that the plugs of the bracket have been fully tightened. If the liquid is supplied with the plugs not fully tightened, ejection of a high temperature treatment liquid could cause burns. (Refer to Fig. 2-82)

(5) Fully tighten the plugs of the bracket.

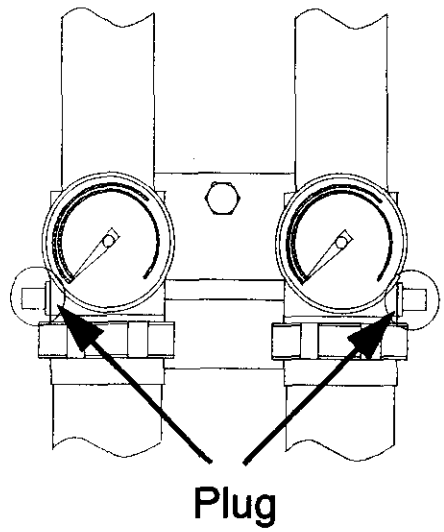


Fig. 2-82

2.2.6 Gear pump

(1) When the bush is to be installed in the pump housing, face the internally grooved side inward (toward the gear side). (**Fig. 2-83**)

(2) Before installation of the gears, apply grease or machine oil to the gear tooth surfaces and bush.

(3) When the drive gear is installed, use care to prevent damage to the oil seal lips.

(4) Turn down the adjusting screw of the valve stem up to the predetermined position. Measure the tightened position at disassembly. Turn down the screw up to that position.

(5) If the gear pump is provided with a proximity switch for the Discharge Monitor, install it to the bearing housing (3) and check that the proximity switch-to-horizontal shaft clearance is correct (normally 1.8mm).

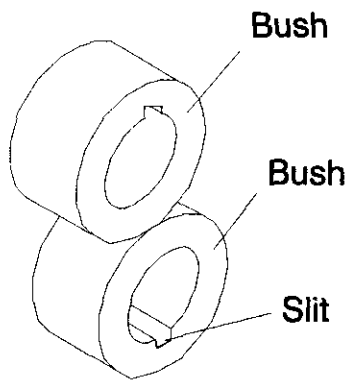


Fig. 2-83

After reassembly, turn the shaft by hand to check that it can be lightly turned. Then install the gear pump in the SELFJECTOR.

3 Maintenance inspection procedures

⚠ WARNING

The SELFJECTOR is a high speed rotating machine. Always be careful of its vibrating condition. Be careful of its operating sound, sludge discharge sound, etc. as well. If any change occurs, stop the machine, locate the cause, and take corrective action. If the cause cannot be located, do not operate the machine but ask our company or service agency.

⚠ WARNING

When parts are replaced, make sure that the genuine parts are used. If non-genuine parts are used, the SELFJECTOR could be damaged and personal safety could be jeopardized.

⚠ CAUTION

For the sake of safety, be sure to perform routine checks and periodic disassembly, cleaning and inspection.

Perform maintenance inspection according to the inspection table (Section 5 of this manual) and parts inspection procedures (Section 4 of this manual), although the intervals vary with the properties of treatment oil, operating environment, etc.

3.1 Routine checks

The routine check items are the items to check every day when patrolling at regular intervals.

Table 3-1

Check Item	Description
Feed rate	Has it changed with respect to the set Feed rate?
Feed thermometer	Has it changed with respect to the set temperature?
Pressure of light liquid outlet	Does it coincide roughly with the set pressure of the Leakage
Frame vibration	Hasn't vibration increased?
Operation noise	Isn't a strange sound generated (from the bearing, gear pump, etc.)?
Current	Isn't the rated current exceeded or changing?
Gear pump	Isn't the oil quantity low?
Safety joint of Gear pump	Isn't it deformed or broken?
Pipe joint	Aren't there oil leaks?
Leakage Monitor	Is the Adjust pressure LED (green) lit or flashing?
Discharge Monitor	Is the Indicate revolution LED (green) flashing?

3.2 Lubricant replacement intervals

⚠ CAUTION

If replacement of the oil is neglected, wear of the spiral gear and damage to the bearing could result.

Replace the lubricant of the SELFJECTOR at regular intervals according to **Table 3-2**.

NOTE

To replace the lubricant, remove the gear cover, and thoroughly clean the inside of the oil tank before installing a fresh oil.

Table 3-2

Number of times	Replacement intervals	Remarks
First time	After two weeks of operation (After approx. 300 hours)	It takes about two weeks before seating of the contact surfaces of gears.
Second time	After a month of operation (after approx. 600 hours)	
Third and subsequent times	Every three months	

NOTE1) When the spiral gear has been replaced, replace the lubricant at intervals, beginning with the first time.

NOTE2) If the oil is badly contaminated, replace it with a fresh one at shorter intervals than *shown in* ***Table 3-2***.

NOTE3) If water, sludge, etc. are contained in the oil tank, remove the oil, clean the inside of the oil tank, and install a fresh oil.

NOTE4) Avoid mixed use of different types or brands of lubricants.

NOTE5) When the types of lubricants are to be changed, clean the inside of the frame and the parts of the shafts before replacement.

NOTE6) When the machine has been overhauled, replace the lubricant.

For information on the lubricant replacement procedures, refer to the "Operation Manual 2".

3.3 Expendable parts replacement intervals

To prevent occurrence of troubles in the SELFJECTOR and operate it in normal condition at all times, it is necessary to replace the expendable parts at regular intervals.

> **⚠ CAUTION**
>
> **The wear of parts varies with the properties of treatment oil, operating condition, etc. Perform checks according to the inspection procedures described in Section 5. If there is anything wrong, replace the parts for the sake of safety even before the specified intervals.**

※ The replacement intervals for the expendable parts in the following table are shown for general guidance and are not intended to guarantee the replacement intervals.

Name of part	Replacement intervals	Remarks
• **Bowl**		
Main seal ring	6 months	
O ring and the like	6 months	
Valve sheet	6 months	
• **Frame, Trap (Cover)**		
O ring and the like	12 months	24 months on those used to seal the upper and lower frames
Gasket (for piping)	12 months	24 months on gaskets for gear cover and oil gauge
Rubber plate	24 months	
Sludge pipe	24 months	
• **Vertical shaft, Water supplying device**		
O ring and the like	12 months	24 months on those used for bearing housing (2)
Upper spring	12 months	
Lower spring	24 months	
Flat spring	24 months	
Spring case	24 months	
Gasket	12 months	
Bearing	24 months	
Spring seat	24 months	
Steel ball	24 months	

Name of part	Replacement intervals	Remarks
● **Horizontal shaft**		
Oil seal	12 months	
O ring and the like	24 months	
Bearing	24 months	
Friction block	12 months	
Friction lining	24 months	
● **Gear pump**		
Oil seal	12 months	
Safety joint	12 months	
O ring and the like	12 months	
Bush	24 months	

1. **It is advisable to replace the expendable parts of the bowl with new ones in keeping with the bowl opening intervals.**
2. On parts not supplied as spare parts, place orders with our company. For spare parts to be furnished with SELFJECTOR, see the spare parts list submitted by us.

3.4 Bowl opening intervals (guidelines) (Note1)

To operate the SELFJECTOR in normal condition at all times, it is necessary to open and clean the bowl at regular intervals. Although the opening intervals vary with the properties of treatment oil, operating condition, etc., the general opening intervals are shown below for general guidance.

(NOTE 1) The rotor opening intervals which vary with the operating condition are shown for general guidance and are not intended to guarantee the intervals.

◎ First time to open the bowl → **A month after trial run**

Since the inside contamination varies with the properties of oil, etc., open the bowl and check the inside after the first month (whether unevenly deposited sludge exists or not, contaminated discs, etc.), and determine whether **the discharge intervals are appropriate or not.**

◎ Second and subsequent times → Open, check and clean **every 6 months (longest).**

If the bowl opening intervals are too long, contamination might affect separation or even cause vibration. Set the proper opening intervals suitable for the type of oil.

When the SELFJECTOR is used for cleaning the trunk piston engine lubricant, the bowl is generally contaminated earlier. It is therefore advisable to set shorter intervals (2 to 3 months).

The opening intervals may be extended (longest interval is 1 year) by joint use of a cleaning equipment. However, it is necessary to check the effectiveness of cleaning before determining the opening intervals.

3.5 Overhaul (guidelines) (Note 2)

⚠ CAUTION

When increased vibration is evident, check and maintenance the machine according to the inspection procedures described in Section 5 even before the overhaul intervals for the sake of safety. If there is anything wrong, replace the parts.

⚠ CAUTION

Although the overhaul (Note 3) intervals vary with the operating condition, inspection and maintenance according to the inspection procedures described in Section 5 at regular intervals, overhaul the machine every 2 years (longest) at least.

(NOTE 2) Overhaul intervals which vary with the operating condition are shown for general guidance and are not intended to guarantee the intervals.

(NOTE 3) Overhaul refers to disassembly of all of the parts of the bowl, vertical and horizontal shaft systems, inspection and cleaning according to the inspection procedures described in Section 5, and replacement of expendable and defective parts.

4 Maintenance inspection procedures for major parts

4.1 Bearing replacement intervals

⚠ WARNING

For the vertical and horizontal shafts, use bearings that are up to specification. The upper bearing of the vertical shaft in particular is important. If an out-of-specification bearing is used, personal safety could be jeopardized because of reduced bearing life.

⚠ CAUTION

For the sake of safety, replace the bearings of the vertical and horizontal shafts before the elapse of 2 years regardless of whether they have been in service or not.

The bearings are expendable parts. Place separate orders for bearings other than supplied as spare ones.

4.2 Bowl

4.2.1 Corrosion of bowl

The bowl parts except some are made of special stainless steel. Under stringent operating condition, however, corrosion might occur in the form of pitting.
Since the bowl is exposed under a high stress, a very fine crack originating in the pitting could occur. Be very careful when you check.

- What to do to prevent corrosion

Corrosion readily occurs in the portions that are in contact with sludge. Perform the following steps to prevent corrosion.

(1) Set proper discharge intervals.
(2) Clean those portions when the bowl is opened.

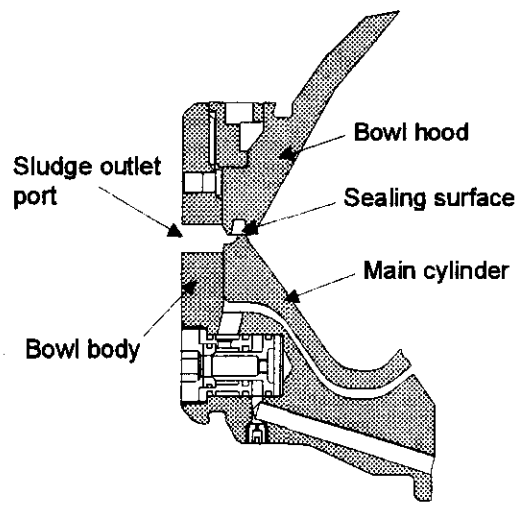


Fig. 4-1

Perform checks with special stress on the following portions on which sludge is deposited.

(1) Seat portion of main cylinder.
(2) Sludge discharge port.
(3) Heavy liquid chamber (SJ40F～SJ80F).
Note: FH/FP/SH types are the same value as F type.

- Check procedures

(1) Thoroughly clean to remove deposits.
(2) Visual check.
(3) If anything wrong was found under (1) and (2), perform color check test.

4.2.2 Corrective steps for corrosion

CAUTION

To prevent distortion of the base materials and alteration of their composition, never make repairs by welding cracks, pinholes or corroded portions.

If there is pitting in a part, remove the corroded portion by a grinder. Perform visual check and color check test for confirmation. If there is nothing wrong, continued use of the part is allowed. The margin removable by a grinder should be limited to **0.5mm** maximum (except the main cylinder for FO). After grinding, do buffing (#250 or more).

- When there is a line defect (crack),
- When more than 0.5mm grinder finishing is necessary,

it is necessary to replace the parts with new ones and perform balance adjustments. Contact our company or service agency.

4.2.3 Disc 1

⚠ CAUTION

Do not make repairs by welding cracks, pinholes or corroded portions.

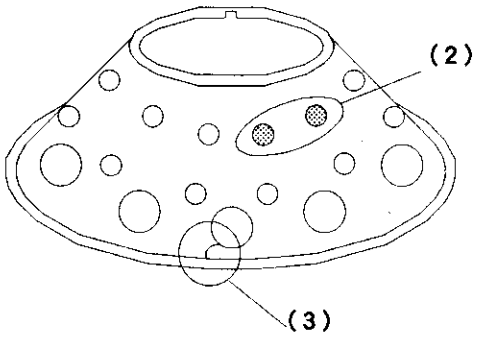


Fig. 4-2

- Replace the disc 1 with a new one

(1) When corrosion is evident
(2) When two or more adjoining aperture pieces are out of position
(3) When a crack is evident

- Addition of disc
  Over a long period of service, the seating of the disc (1) will create a gap between the disc (1) and top disc. Add a disc, while referring to the Fig. 2-68

- Points to note when handling disc (1)

⚠ CAUTION

When handling the cleaning agent, observe the following points

- **Never put the cleaning agent in your mouth.**
- **Wear protective glasses or protective gloves, etc. to prevent eye or skin contact.**
- **If the cleaning agent was deposited on your skin, immediately wash away in water.**
- **Since the cleaning agent contains an organic solvent, make sure that the room is ventilated well.**
- **Store the cleaning agent in a cool, dark place.**

Remove the sludge deposited on the disc (1) by use of a cleaning oil and a waste cloth or a soft copper wire brush. Avoid using a scraper or any other thing that damages the surface.

Immerse the disc in our company's cleaning solution at 50 to 70℃ for about 3 hours before cleaning. The deposits will be easier to remove.

4.2.4 Bowl body

(1) Clean the O ring groove. If the groove is rough, repair it with a fine emery cloth (#320). If roughness cannot be repaired by an emery cloth, do machining to widen the groove width, provided that the machining margin is limited to 0.5mm maximum.

(2) If the operating water passage hole or any of the water pressure chambers is clogged with scale, do thorough cleaning.

(3) When the bowl body was subjected to an abnormal shock by allowing it to fall, or by the fall of a heavy object, let our company or service agency check it.

(4)

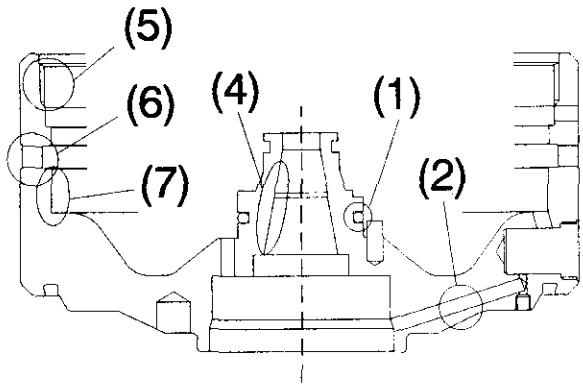


Fig. 4-3

⚠ CAUTION

If the bowl body and bowl bush are in poor contact, vibration could occur. If the contact area of the contact surface is less than two thirds of the whole, replace the bowl bush with a new one.

Check the fitted portions of the bowl body and bowl bush and check the condition of contact with the vertical shaft. Check to ensure that the contact area of the contact surface is more than **2/3** of the whole.

Check for scratches caused by slipping. If there are scratches, remove the scratches with an emery cloth (#320) and apply finishes with polishing paper (#600).

(5) Check the threaded portion for the bowl nut. If scoring is evident, make repairs with set files.

(6) Check the sludge discharge port for wear. If the wear is less than 0.5mm, continued use of the port is allowed. If the wear is more than that, let our company or service agency check it.

(7) Check the main cylinder sliding surface for scratches. If there are scratches, repair them with an emery cloth (#320) and then apply finishes with polishing paper (#600).

(8) Check the knock pin for deformation. If deformation is evident, replace the knock pin with a new one.

4.2.5 Bowl hood

Check the following portions of the bowl hood for scratches.

(1) Bowl nut fitting portion
(2) Bowl body fitting portion
(3) Threaded portion
(4) Light liquid chamber fitting portion
(5) O ring groove (when the O ring was removed)
(6) Knock pin groove

If there are scratches on the above-mentioned portions, make repairs by use of set files, grinding stone, emery cloth (#320), etc.

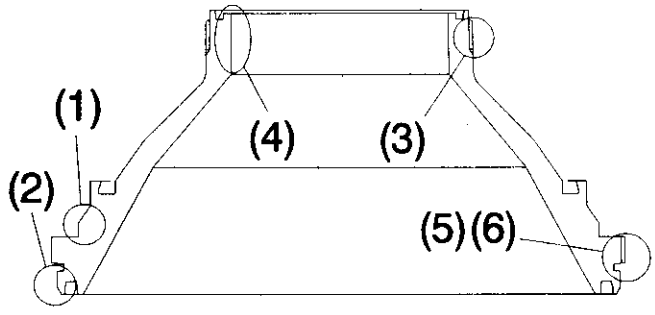


Fig. 4-4

4.2.6 Main seal ring

NOTE
When the main seal ring is removed, use care not to damage its bowl hood side groove (especially the side surface). Damaged groove may cause a leakage.

With the main seal ring mounted on the bowl hood, clean and carefully check the seal surface. Normally, the main seal ring is deformed as shown in **Fig. 4-5**. In the following cases, replace the main seal ring with a new one.

(1) When dimension A is 0.5mm or more
(2) When the seal surface is galled by metallic power more than 60% of its length B.

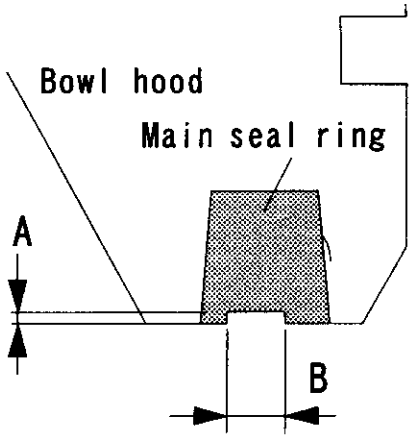


Fig. 4-5

4.2.7 Distributor

(1) If the top end of the key is deformed, correct or replace.
(2) Check the threaded portion for scratches.
(3) Check the knock pin which might have been deformed.

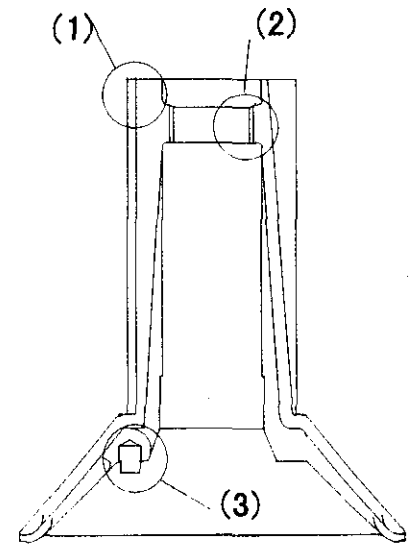


Fig. 4-6

4.2.8 Various types of O rings of bowl

Recommendation is to replace the O rings in keeping with the bowl opening intervals. Before installing an O ring, be sure to clean the O ring groove.

4.2.9 Main cylinder

(1) Check the seal surface (that surface which makes contact with the main seal ring) for scratches. If there are scratches, damage to the main seal ring and leakage of sealing water will result, making normal operation impossible. Scratches are often made on the surface at the time of disassembly. Therefore, be careful when handling it.

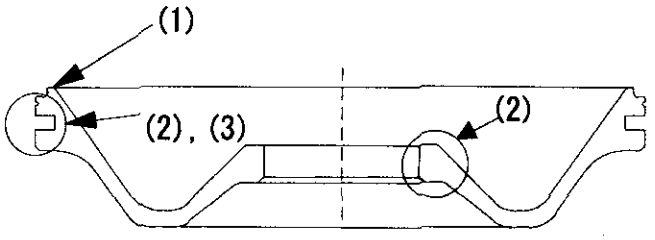


Fig. 4-7

In the case of the main cylinder for lubrication oil, repair small scratches by use of an oil stone or something else. In the case of the main cylinder for fuel oil (C heavy oil), contact our company or service agency, as the seal surface has a special coating.

(2) Check the bowl body sliding surface for scratches. If there are scratches, the O ring will wear down earlier. Repair the scratches with an emery cloth (#320) and then apply finishes with polishing paper (#600).

(3) Clean the O ring groove. If the groove is rough, make repairs with an emery cloth.

4.2.10 Pilot valve assembly

(1) Check the valve guide and bowl body sliding surfaces for scratches. If there are small scratches, make repairs with an oil stone or something else.
When the pilot valve assembly is disassembled and reassembled, use care to prevent damage to the O ring.
(Apply a lubricant to the sliding surfaces for easier reassembly.)

(2) Check the seal surface (that surface which makes contact with the valve sheet) for scratches. If there are small scratches, make repairs with an oil stone or something else.

(3) Take out the valve sheet from the valve guide, and clean and carefully check the seal surface.
If the valve sheet has caught a foreign substance or is deformed (0.3mm or more), replace it with a new one.

(4) After cleaning and before installing in the bowl, complete the pilot valve assembly and check to ensure that pilot valve is moved smoothly by hand.

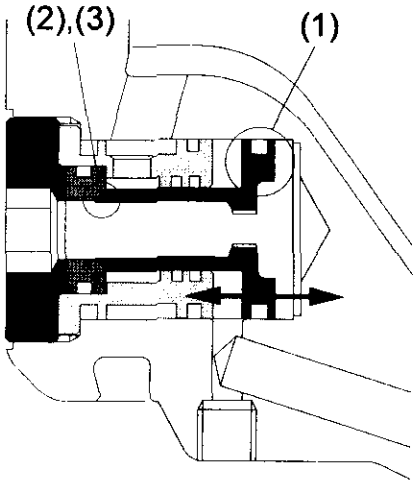


Fig. 4-8

4.3 Vertical shaft system

4.3.1 Vertical shaft

(1) Carefully check the portion above the upper bearing fitting portion, as there is a high likelihood of corrosion. If the dimension A shown in **Fig. 4-9** is more than 1mm smaller in diameter than the value shown in **Table 4-1**, replace the vertical shaft with a new one.

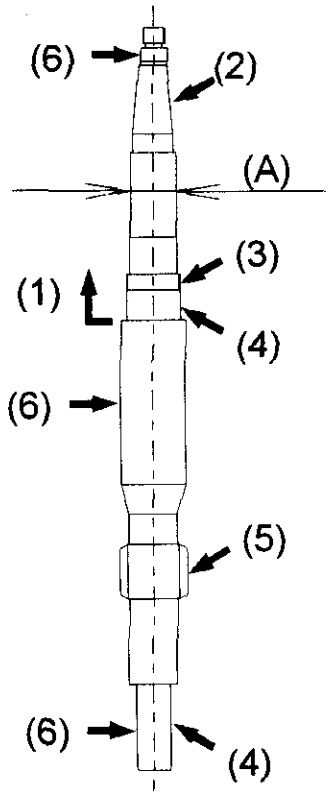


Fig. 4-9

Table 4-1

Model No.	SJ10F SJ15F SJ30F	SJ40F	SJ50F	SJ80F SJ100F
Dimension A	34	44	47	59

FH/FP/SH types are the same value as F type. (mm)

(2) If there are partial scratches in the bowl bush fitting portion, make repairs with set files or an emery cloth (#320). If there is a ring-like continuous groove flaw, replace the vertical shaft with a new one.

(3) If there is a localized flaw like a pounding in the threaded portion, make repairs to smooth it out, using set files, emery cloth (#320), etc.

(4) In regard to the secular wear of the bearing fitting portion, if the inner race of the bearing slips, replace the vertical shaft with a new one.

(5) If the pinion tooth surface is rough and is lightly worn, make repairs with set files, emery cloth (#320), oil stone, etc.

(6) Measure the runout of the shaft center in three places, the straight portion at the end of the shaft, the middle portion of the shaft, and bearing fitting portion, with the upper and lower bearing fitting portions supported by the measuring jigs. The runout should be limited to 5/100mm maximum. If the runout is larger than that, replace the vertical shaft with a new one.

4.3.2 Upper springs

(1) If there is even a broken or cracked upper spring, replace all of them with new ones.

(2) Measure the free length of each of the upper springs. If any of them is more than 1mm shorter than the dimension A, replace all of the upper springs. Six upper springs equal in free length (dimension A) are grouped as a set. (Refer to Table 4-2)

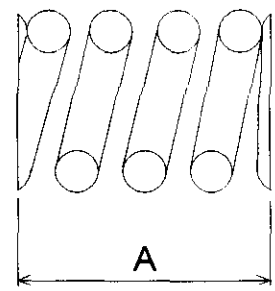


Fig. 4-10

Table 4-2

Model No.	SJ10F SJ15F SJ30F	SJ40F SJ50F	SJ80F SJ100F
Dimension A	34	44	46

FH/FP/SH types are the same value as F type. (mm)

4.3.3 Lower bearing block

If the dimension A shown in **Fig. 4-11** with the lower spring retainer, steel ball and bearing case (2) put together is more than 1mm smaller than the value shown in **Table 4-3**, re-check all of these parts, and replace a defective part with a new one. (Refer to **Fig. 4-11**, **Table 4-3**)

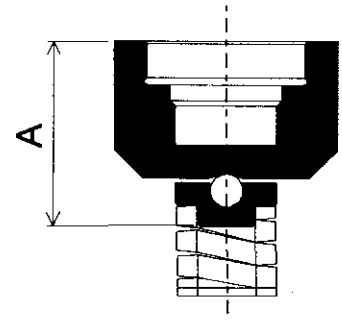


Fig. 4-11

Table 4-3

Model No.	SJ10F SJ15F SJ30F	SJ40F SJ50F	SJ80F SJ100F
Dimension A	71.5	83.5	90.5

FH/FP/SH types are the same value as F type. (mm)

4.3.4 Flat spring

(1) A broken or cracked flat spring should be replaced with a new one.

(2) Measure the spring height as shown in **Fig. 4-12**. If it is less than the A mm, replace the flat spring with a new one. (Refer to **Table 4-4**)

Fig. 4-12

Table 4-4

Model No.	SJ10F SJ15F SJ30F	SJ40F SJ50F	SJ80F SJ100F
Dimension A	4.5	6.5	7.5

FH/FP/SH types are the same value as F type. (mm)

4.3.5 Steel ball

A steel ball with a deep ring-like groove flaw in those portions which make contact with the lower spring retainer, etc. or a deformed one should be replaced with a new one.

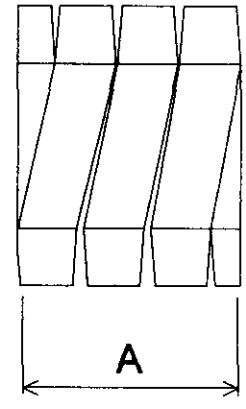


Fig. 4-13

4.3.6 Lower spring

(1) A broken or cracked lower spring should be replaced with a new one.

(2) Measure the free length. If it is more than 1mm smaller than the dimension A, replace the lower spring. (Refer to **Table 4-5**)

Table 4-5

Model No.	SJ10F SJ15F SJ30F	SJ40F SJ50F	SJ80F SJ100F
Dimension A	32.5	55.5	60.5

FH/FP/SH types are the same value as F type. (mm)

4.3.7 Height of vertical shaft

WARNING

If the height of the vertical height is out of the standard limits (Table 4-6), re-check the vertical shaft system to locate the cause. If the cause cannot be located, do not operate the machine but contact our company or service agency.

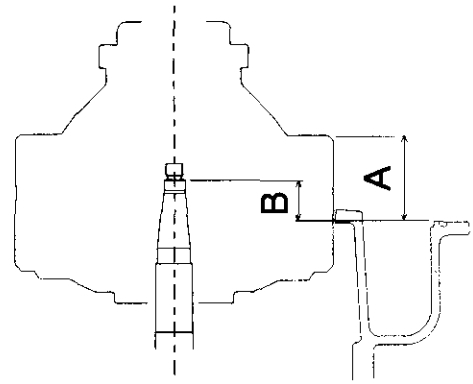


Fig. 4-14

After installation of the vertical shaft, the standard height shown in **Fig. 4-14** should be as shown in **Table 4-6**.

Table 4-6

Model No.	SJ10F SJ15F	SJ30F	SJ40F	SJ50F	SJ80F SJ100F
Dimension A	80±1.0	93±1.0	113±1.0	120±1.0	130±1.0
Dimension B	39±1.0	39±1.0	74±1.0	63±1.0	69±1.0

FH/FP/SH types are the same value as F type. (mm)

4.3.8 Installed height of flat spring (adjustment of spacer)

When the parts like the lower spring retainer, bearing case, steel ball and flat spring have been replaced, or when the installed height of the flat spring (dimension A of **Fig. 4-15**) is out of range the dimension A of **Table 4-7**, change spacers (1) to adjust the compression force of the flat spring.

Table 4-7

Model No.	SJ10F~SJ100F
Dimension A	0.5~1.0

FH/FP/SH types are the same value as F type.

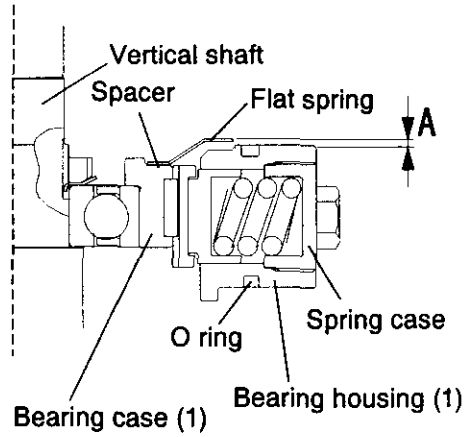


Fig. 4-15

4.4 Horizontal shaft system

4.4.1 Spiral gear

(1) The life of the spiral gear cannot be sweepingly determined, as it depends on various conditions. For general guidance, however, consider that the life of the spiral gear is over when it is in good contact and is normally worn to the extent that the groove width is reduced to 2/3 (about 3mm) of the normal dimension. If the spiral gear is worn more than that, replace it with a new one.

(2) During initial operation or when the spiral gear has been replaced, its wear will be temporarily accelerated until the contacting surfaces of the gear are seated. A while later the wear will cease to be accelerated. This is a normal phenomenon.
If the wear is excessively accelerated, something wrong is suspected in the other parts. Check the other parts.

(3) If there are burrs or high spots on the tooth surface, remove them with set files or emery cloth (#320).

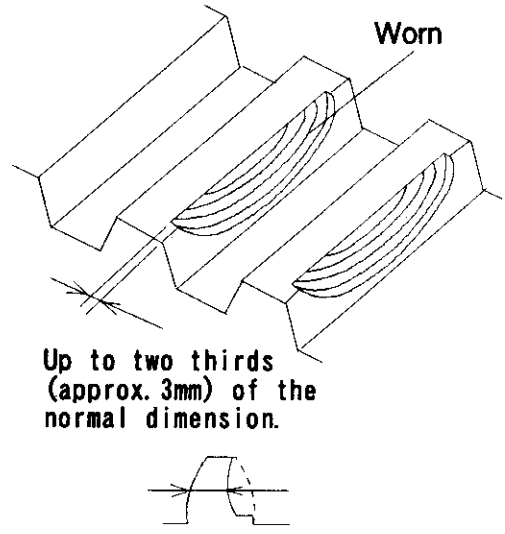


Fig. 4-16

4.4.2 Horizontal shaft

(1) If there is a localized flaw like a pounding on the threaded portion, make repairs to smooth it out, using set files, emery cloth (#320), etc.

(2) In regard to the secular wear of the bearing fitting portion, if the inner race slips, replace the horizontal shaft with a new one.

(3) If the key-way is wider because of wear, replace the horizontal shaft with a new one.

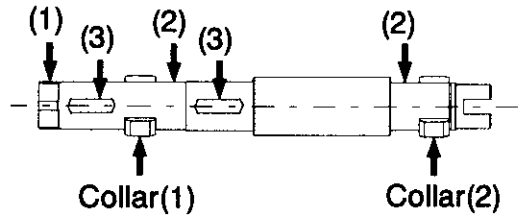


Fig. 4-17

4.4.3 Collar

If the diameter of the oil seal and collar sliding surface is more than 0.5mm worn than the specified dimension, replace the collar with a new one. (Refer to **Table 4-8**)

Table 4-8

	SJ10F SJ15F SJ30F	SJ40F SJ50F	SJ80F SJ100F
Motor side (1)	45	50	55
Gear pump side (2)	45	50	55

FH/FP/SH types are the same value as F type. (mm)

4.4.4 Friction block

The life of the friction block cannot be sweepingly determined, as it depends on the frequency of starts and stops. If any of the linings 6mm thick is worn to 3mm, replace all of the blocks.
(**Fig. 4-18**)

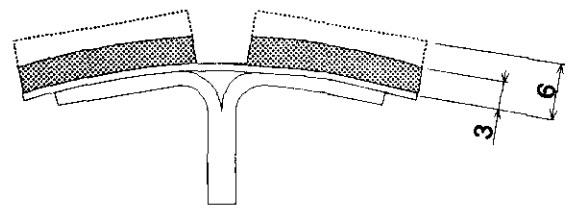


Fig. 4-18

4.4.5 Friction pulley

Check the inside surface of the friction pulley for wear. If it is worn more than 1mm, replace it with a new one. (**Fig. 4-19**)
The inside surface of the friction pulley allows machining up to 1mm deep to eliminate roughness.

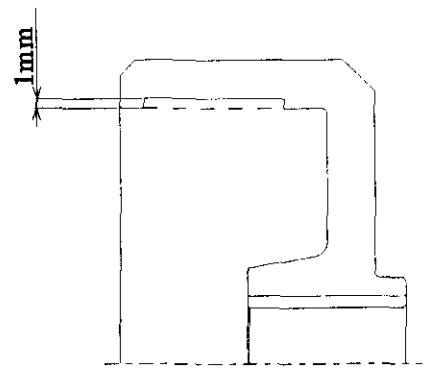


Fig. 4-19

4.5 Gear pump

4.5.1 Safety joint

Check the gear pump visually for distortion, wear, damage, etc. without being removed, and replace if necessary.

4.5.2 Drive gear, driven gear and bush

If the shaft is producing abnormal sound, disassemble the gear pump, and check whether the gears are in good contact, the spacing between the shaft and bush, wear or foreign substances which might have been caught. If there are small scratches, repair the tooth surfaces with an oil stone. If repairs cannot be made, replace.

4.5.3 Valve stem

When the capacity is insufficient or the suction is impossible, it is often due to foreign substances caught by the valve stem. Disassemble and thoroughly clean. In this case, it is necessary that the position of the adjusting screw (dimension A of **Fig. 4-20**) is confirmed beforehand (adjusting pressure 0.4MPa {4.0kg/cm^2}). If the screw is over-tightened, the pressure will become needlessly high, and overload could result. If it is under-tightened, a poor suction will result.

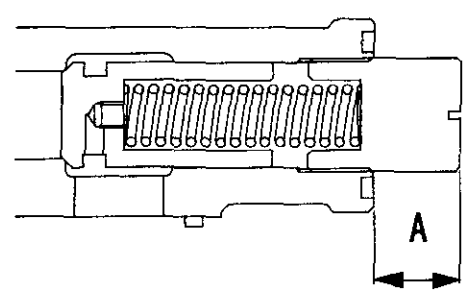


Fig. 4-20

4.6 Lubricant

- For information on the lubricant replacement intervals, refer to Section 3.2.
- For information on the lubricant replacement procedures, refer to Section 3.4 in Operation Manual 1.

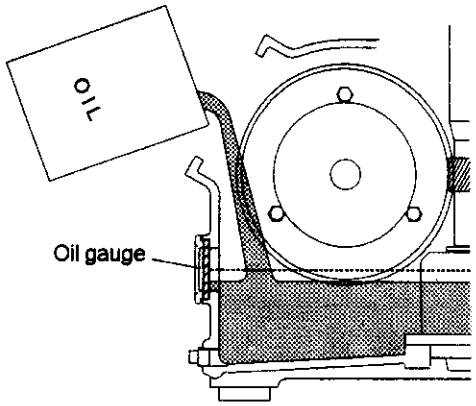


Fig. 4-21

4.7 Brake equipment

The life of brake lining cannot be sweepingly determined, as it varies widely, depending on the number of times it has been used. It is therefore necessary to check the brake lining at regular intervals. If the brake lining 10mm thick is worn to 5mm, replace the brake lining with a new one.

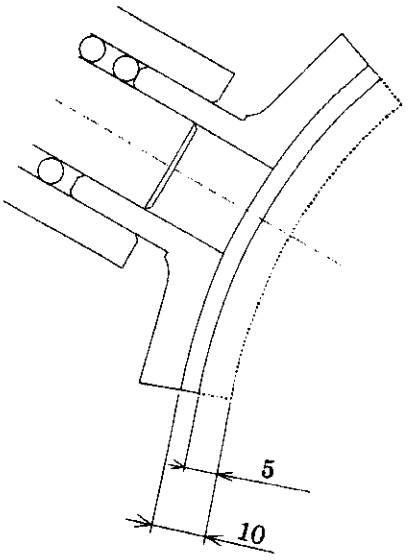


Fig. 4-22

4.8 Water supplying device

The water supplying device is designed to supply operating water to the bowl opening and closing mechanism which automatically discharges the sludge accumulated in the bowl.

If it is clogged by scale or the gasket or O ring is damaged, a low water pressure or a low water flow rate will result, and the mechanism might fail to open or close the bowl.

When the bowl is disassembled, be sure to check and clean the water supplying device.

4.9 Inspection of protective equipment

Check to ensure that a detector alarm is correctly output.

4.9.1 Leakage Monitor (LM)

The Leakage Monitor essentially determines that the outflow is abnormal as it detects the fall of the pressure at the outlet side of the SELFJECTOR. Create this state by simulation.

(1) Check that the SELFJECTOR is in automatic operation and that the liquid is being fed.
(2) Loosen the pressure control valve at the light liquid outlet side to reduce the pressure. Reduce the pressure to a level below a Pressure Drop (Δp) from Set Pressure.
(3) Check to ensure that an alarm is output after the elapse of the set time of the feeding timer.

4.9.2 Discharge Detector (DD)

⚠ CAUTION

When alarm check is performed by the following procedures, the machine will come to a stop without discharging the oil from inside the bowl. When the machine is restarted and the sludge is discharged, the oil will flow out. Therefore, perform operations with due consideration to safety.

(1) Check to ensure that the SELFJECTOR is in automatic operation and that the liquid is being fed.
(2) Close the source valve of the operating water solenoid valve unit to stop the supply of all operating water.
(3) Press the "DISCHARGE TEST" button of the control panel.
(4) Check to ensure that an alarm is output after the elapse of the discharge process time.

5 Periodic inspection chart

⚠ CAUTION

For the sake of safety, perform periodic inspection according to the following chart, repair or replace a defective parts. (Inspection service)

The chart describes the parts to check, the details to check for, and the check intervals (longest).

Parts to check	Details to check for	Check intervals (months)			Corrective action	Remarks	Check mark
		Every 3	Every 6	Every 12			
Frame, trap (cover)							
Inside of frame	Deposited sludge, Contamination		○				☐
Operating water drain outlet	Deposited sludge, Contamination		○				☐
Heavy liquid passage of trap	Contamination		○			SJ10F～30F	☐
Oil gauge	Contamination	○					☐
Foundation bolt	Looseness	○					☐
Impeller	Contamination, Contact damage, Deformation, Corrosion		○				☐
Inside of frame gear case	Contamination	○					☐
Sludge pipe	Deteriorated rubber			○			☐
Upper hood & Lower hood O ring	Damage, Wear, Hardened		○				☐
Rubber plate	Sagging			○			☐
Brake lining	Wear			○			☐

NOTE

Be sure to check the frame and trap (cover) not only at the intervals specified in the chart but also when the bowl is opened.

Parts to check	Details to check for	Check intervals (months)			Corrective action	Remarks	Check mark
		Every 3	Every 6	Every 12			
Bowl							
● **Whole of inside of bowl**	Deposited sludge, Corrosion		○		Refer to 4.2.1, 4.2.2		☐
● **Disc**							
Whole	Deposited sludge, Corrosion, Cracks, Deformation		○		Refer to 4.2.3		☐
Aperture piece	Loss		○				☐
No. of discs	Height of discs		○				☐
● **Bowl body**							
Sludge outlet port	Corrosion, Wear		○		Refer to 4.2.4		☐
O ring groove	Damage		○				☐
Operating water Passage	Clogging		○				☐
Bowl bush fitting Portion	Damage, Scoring, Fit, Wear		○				☐
Main cylinder sliding Portion	Damage		○				☐
Knock pin	Deformation		○				☐
● **Bowl nut**							
Threaded portion	Damage, Coring		○		Refer to 4.2.4		☐
Bowl fitting portion	Damage		○				☐
Groove	Contamination, Clogging		○				☐
● **Bowl hood**							
Bowl nut fitting Portion	Bowl body fitting portion		○		Refer to 4.2.5		☐
Bowl body fitting portion	Damage		○				☐
Threaded portion	Scoring		○				☐
Light liquid chamber fitting portion	Damage		○				☐
O ring groove	Damage, Contamination		○				☐
Knock pin groove	Damage, Deformation		○				☐

Parts to check	Details to check for	Check intervals (months)			Corrective action	Remarks	Check mark
		Every 3	Every 6	Every 12			
Bowl							
• **Main seal ring**							
Seal surface	Damage, Deterioration		○		Refer to 4.2.6		☐
Seal surface dimension① 〃 ②	Deformation		○				☐
• **Distributor**							
Keyway	Deformation		○		Refer to 4.2.7		☐
Threaded portion	Damage		○				☐
Knock pin	Deformation		○				☐
• **Various types of O rings of bowl**	Deterioration, Cracks, Wear		○		Refer to 4.2.8		☐
• **Main cylinder**							
Main seal ring seal surface	Damage, Wear, Corrosion		○		Refer to 4.2.9		☐
Bowl body sliding portion	Damage, Wear, Peeled plating		○				☐
O ring groove	Contamination		○				☐
• **Pilot valve**							
Bowl body sliding portion	Damage		○		Refer to 4.2.10		☐
Valve sheet seat surface	Damage, Deformation, Foreign substances caught		○				☐
• **Light liquid chamber**	Contamination, Worn threaded portion, Corrosion		○				☐
• **Heavy liquid chamber**	Contamination, Corrosion, Cracks		○			SJ40F～100F	☐
• **Gravity disc**	Contamination, Corrosion, Cracks		○				☐
• **Bowl bush**	Contact with bowl		○				☐
• **Drain nozzle**	Clogging		○				☐

Parts to check	Details to check for	Check intervals (months)			Corrective action	Remarks	Check mark
		Every 3	Every 6	Every 12			
Vertical Shaft							
● **Vertical shaft**							
Upper portion (above bearing (1))	Corrosion, Wear		○		Refer to 4.3.1		☐
Bowl bushing fitting portion	Damage, Corrosion, Fit			○			☐
Threaded portion	*Damage*		○				☐
Bearing fitting portion	Wear			○			☐
Pinion tooth surface	Wear		○				☐
Whole of shaft	Center runout			○		Overhaul interval	☐
Shaft height	Assembled Dimension			○	Refer to 4.3.7		☐
● **Upper spring**							
Whole	Broken, Cracks			○	Refer to 4.3.2		☐
Dimension	Free length			○			☐
● **Bearing cover (1)**	Damage, Contamination, Corrosion			○			☐
● **Bearing case (1)**							
Whole	Damage, Scoring, Wear			○			☐
Dimension	Free length			○			☐
● **Flat spring**							
Whole	Broken, Cracks			○	Refer to 4.3.4		☐
Dimension	Spring height			○			☐
● **Installed height of flat spring**	Assembled Dimension			○	Refer to 4.3.8		☐
● **Bearing case (2)**							
Whole	Damage, Scoring, Wear			○			☐
Dimension	Free length			○			☐
● **Bearing case (3)**							
Whole	Damage, Scoring, Wear			○			☐
Dimension	Free length			○			☐
● **Steel ball**	Deformation, Grooved damage			○	Refer to 4.3.5		☐

Parts to check	Details to check for	Check intervals (months)			Corrective action	Remarks	Check mark
		Every 3	Every 6	Every 12			
Vertical Shaft							
• **Lower spring**							
Whole	Broken, Cracks			○	Refer to 4.3.6		☐
Dimension	Spring height			○			☐
• **Spring seat**	Wear			○			☐
• **Bearing block (2)**	Assembled dimension			○	Refer to 4.3.3		☐
• **Bearing**	Corrosion *Broken a case*			○			☐
Horizontal Shaft							
• **Horizontal shaft**							
Threaded portion	Damage			○	Refer to 4.4.2		☐
Bearing fitting portion	Wear			○			☐
Keyway	Wear			○			☐
Safety joint groove	Wear, Deformation			○			☐
• **Spiral gear**	Wear, Burr			○	Refer to 4.4.1		☐
• **Collar**	Wear			○	Refer to 4.4.3		☐
• **Friction block**	Wear			○	Refer to 4.4.4		☐
• **Friction pulley**	Wear			○	Refer to 4.4.5		☐
• **Oil seal**	Leakage			○			☐
• **Bearing housing (3)**							
Bearing fitting portion	Wear			○			☐
• **Bearing housing (4)**							
Bearing fitting portion	Wear			○			☐
• **Bearing**	Corrosion Broken a case			○			☐

Parts to check	Details to check for	Check intervals (months)			Corrective action	Remarks	Check mark
		Every 3	Every 6	Every 12			
Water Supplying Device							
Operating water nozzle Operating water chamber	Contamination, Clogged drilled hole, Damage		○		Refer to 4.8		☐ ☐
O ring	Damage, Deterioration, Deformation		○				☐
Gear Pump							
Safety joint	Damage		○		Refer to 4.5.1		☐
Bush	Damage, Wear			○	Refer to 4.5.2		☐
Gear tooth surface	Damage, Wear			○			☐
Drive gear, Oil seal contact surface	Wear			○			☐ ☐
Valve stem	Operating pressure			○	Refer to 4.5.3		☐
Solenoid Valve							
Diaphragm	Deterioration, Deformation, Broken, Contamination			○			☐
Inside of valve	Deposited scale, Damage			○			☐
Seal part	Leakage		○				☐
Reducing Valve							
Diaphragm	Deterioration, Deformation, Broken			○			☐
Inside of valve, Sheet surface	Deposited scale, Damage			○			☐
Seal part	Leakage		○				☐
Pressure gauge	Pressure indication		○				☐
Y-Type Strainer							
Strainer	Contamination, Clogging	○					☐

Parts to check	Details to check for	Check intervals (months)			Corrective action	Remarks	Check mark
		Every 3	Every 6	Every 12			
Constant Flow Valve							
Inside of valve	Deposited scale, Contamination			○			☐
Piston	Piston stuck			○			☐
Leakage Monitor (LM)							
Function	Alarm check		○		Refer to 4.9.1		☐
Discharge Detector (DD)							
Function	Alarm check		○		Refer to 4.9.2		☐

6 Causes of troubles and corrective steps

⚠ WARNING

Before performing opening checks, check to ensure that the SELFJECTOR has come to a complete stop. Whether the SELFJECTOR has come to a stop can be checked by watching the safety joint section at the horizontal shaft gear pump side or the fan of the motor.

⚠ CAUTION

When an alarm occurs, perform checks and remove the cause of the alarm before re-starting the machine.

6.1 Alarms

6.1.1 Types of alarms

Table 6-1

	Automated type						Manual	Operation detector
	FSC-1A	FBC-1A FBC-2A	FSH-1A	FSP-1A	FSH-PA	FAP-11		
Oil leakage	○	○	○	○	○	○	○	Leakage Monitor (LM)
No opening of bowl	△	△	○	○	○			Discharge Detector (DD)
Hidens alarm			○		○			Water Detector (WD)

△ : option

- **Oil leakage**

  When the SELFJECTOR fails to operation and causes either of the following phenomena, it regards the phenomenon as "Oil leakage" and outputs an alarm.

(1) The treatment liquid (oil) flows out from the heavy liquid side.

(2) The treatment liquid (oil) flows out because of insufficient sealing of the sludge outlet of the bowl.

- **No opening of bowl**

  Despite the fact that the "discharge sludge" procedures were performed, no sludge has been actually discharged. The SELFJECTOR regards it as a No opening of bowl and outputs an alarm.

- **Hidens alarm**

  The HIDENS system configuration machine (FSH-1A, FSH-PA specification) equipped with a Water Detector outputs an alarm when the discharge instruction resulting from a rise in the water value is generated frequently. The alarm contains the "CPU ABNORMAL" and "A/D CONVERTER ABNORMAL" of the Water Detector control unit. To define a Hidens alarm, the time and frequency are set for use as the criteria for comparison.

6.1.2 Alarm indications

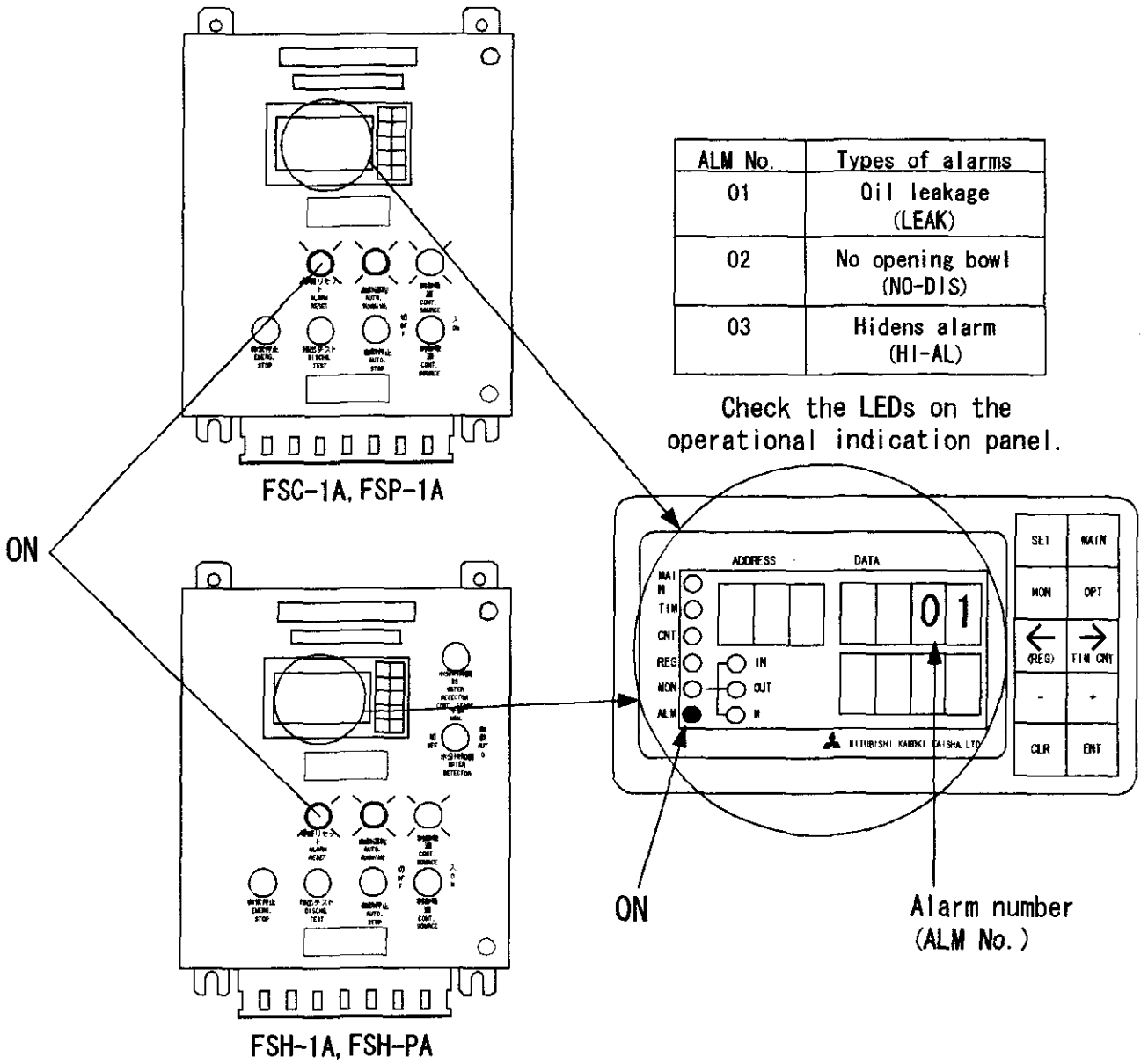
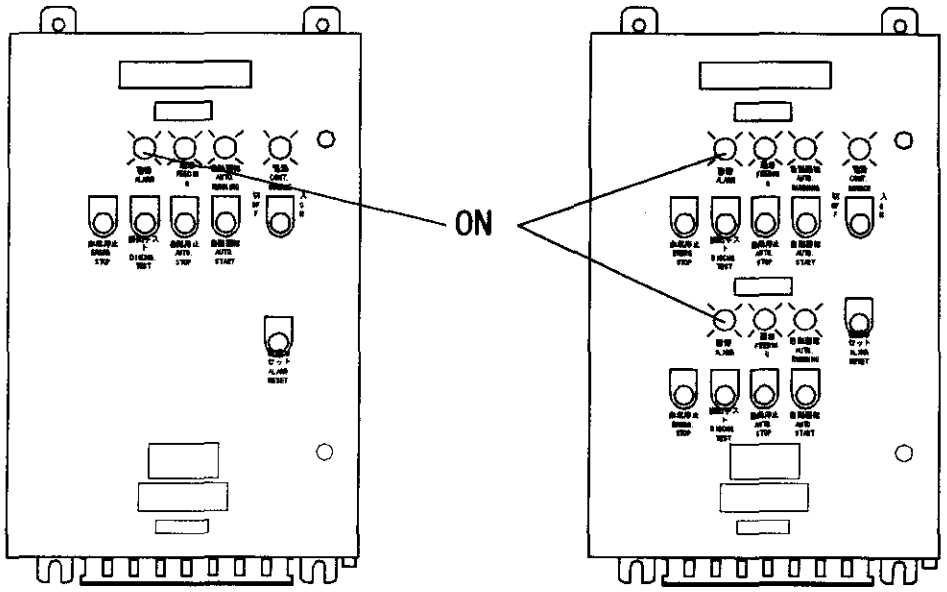


Fig. 6-1



Check the LEDs on the CPU unit.

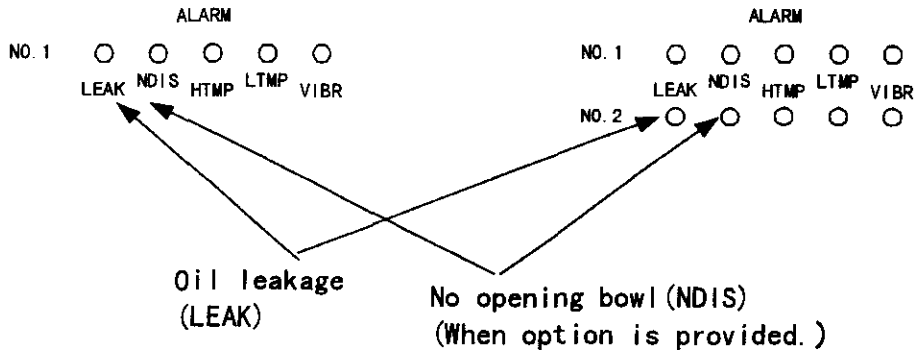
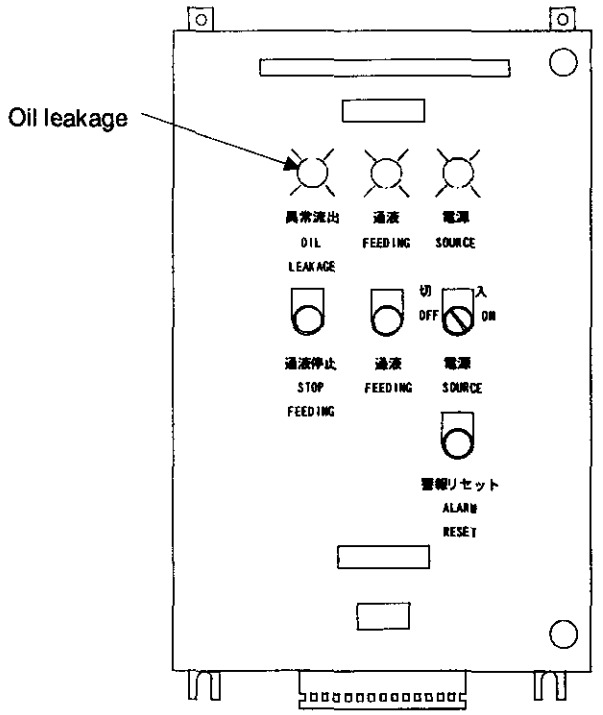


Fig. 6-2



FAP-11

Fig. 6-3

6.1.3 Processing sequence after occurrence of alarm

The processing sequence after occurrence of an alarm is shown in **Fig. 6-4** for the FSC-1A, FBC-1A, FBC-2A, FSH-1A, FSP-1A and FSH-PA and **Fig. 6-5** for the FAP-11.

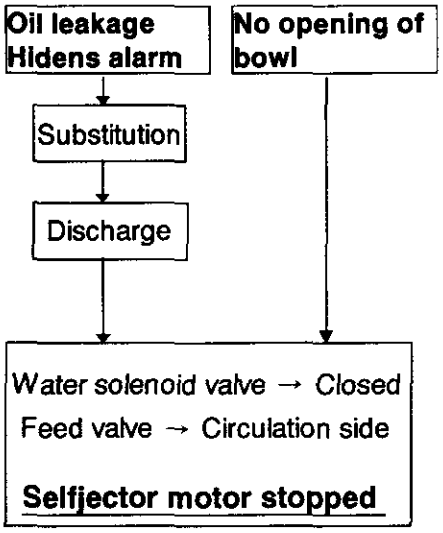


Fig. 6-4

FSC-1A, FBC-1A, FBC-2A
FSH-1A, FSP-1A, FSH-PA

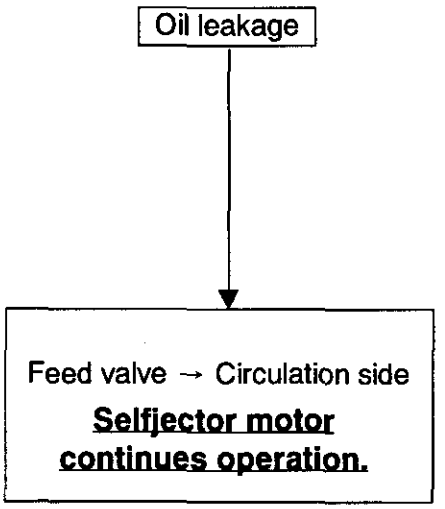


Fig. 6-5

FAP-11

6.1.4 Self-diagnostic fnction of detectors

6.1.4.1 Leakage Monitor (LM)

When fed with an abnormally high voltage of 450 kPa {4.5 kgf/cm^2}, the pressure sensor recognizes it as a detector failure and causes the trouble display LED (red) to light through feeding timer. At the same time, an error output is generated and the oil purifier is stopped after a sludge discharge.

The LED display and error output are held so that you can acknowledge the detector failure. In this case, the error cannot be reset unless power is turned off and then on.

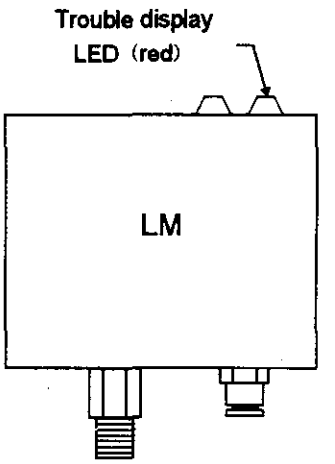


Fig. 6-6

6.1.4.2 Discharge Detector (DD)

As a self-diagnostic function, the LED lights any of the following cases.

① The output corresponds to 2500 r.p.m. of speed or higher
(A circuit failure is suspected.)

② The proximity switch input signal is unstable
(The proximity switch may be out of position.)
Correct its position. This LED goes out as soon as its input signal has been stabilized.
(When adjusting and confirming the position of the proximity switch, refer to 5. Discharge Detector in the Operation Manual 2.)

Unlike the Leakage Monitor, no alarm signal is delivered when the LED lights.

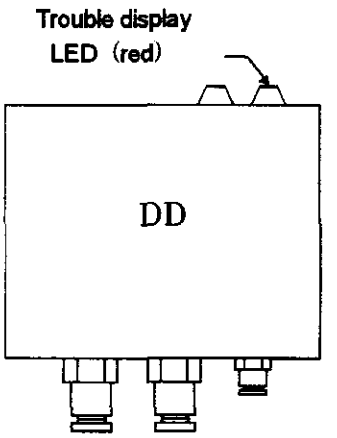


Fig. 6-7

NOTE
When the SELFJECTOR is in the process of being started or stopped, the Trouble display LED may temporarily come on, but this should not be taken to mean that the detector is out of order.

6.2 Occurrence of oil leakage

(The oil flows out from the sludge outlet or heavy liquid outlet.)

6.2.1 Check the flow rates of valve opening and closing operating water and sealing water.

● Remove the flange of the water connecting tube and place the manual handle of the solenoid valve in the "OPENED" position and measure the flow rate of valve closing operating water. (**Fig. 6-8,Fig. 6-9−1**)	The pressure to set for the pressure reducing regulator is 0.02MPa (0.2kgf/cm^2). (Flow rate of valve closing operating water is over 200cc/sec.) ● When the water flow rate is low, clean the Y-type strainer and piping line. ● Extend the time of the valve closing operating water timer. (30 sec. max.)
● Check the flow rate of sealing water (SV3): Automatic specification Disconnect the sealing water tube, place the manual handle of the solenoid valve in the "OPENED" position, and measure the flow rate of sealing water. (**Fig. 6-8,Fig. 6-9−2**)	Flow rate of sealing water for SJ10F, 15F, 30F, 40F 12 L/min SJ50F, 80F , 100F 16 L/min FH/FP/SH types are the same value as F type. ● When the flow rate is low, clean the piping line. ● Adjust the sealing water timer in keeping with the flow rate of sealing water. (Refer to OM2: "Sealing Water".) * Dynamic pressure (A state where water is flowing)
● Check the amount of partial discharge: Operate the partial charge type purifier to perform a discharge test with water kept running and measure the amount of partial discharge through the Discharge Detector.	● Adjust the reduction valve for partial discharge. (**Fig. 6-9−5**) (OM2: Refer to [Partial Discharge Measurement].)

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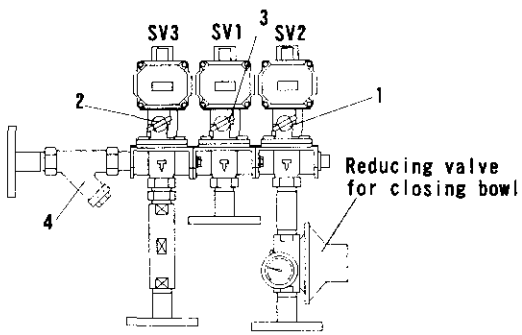

Fig. 6-8

FSC-1A,FBC-1A,FBC-2A,FSH-1A

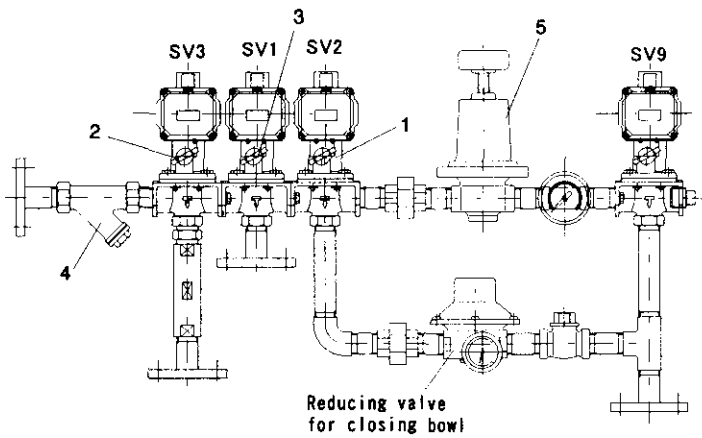

Fig. 6-9

FSP-1A, FSH-PA

6.2.2 Checks to perform by disassembling bowl

● Check for a flaw on the sheet surface of the main seal ring. (**Fig. 6-10－5**)	If the seal surface is galled by metallic powder more than 60% of its length, replace the main seal ring.
● Check for a flaw on the O ring of the valve case. (**Fig. 6-10－6**)	If there is a flaw, replace the O ring with a new one.
● Check for a flaw on the valve sheet. (**Fig. 6-10－7**)	If there is a flaw, replace the valve sheet with a new one.
● Check the pilot valve for contamination and operation. (**Fig. 6-10－8**)	Thoroughly clean the pilot valve. Set it in the valve case and check whether it can be operated by hand.
● Check the drain nozzle for clogging. (**Fig. 6-10－9**)	Clean.
● Check for a flaw on the sheet surface of the main cylinder. (**Fig. 6-10－10**)	If there is a fine scratch, repair it with an oil stone. (Refer to MM1: "Main Cylinder".) (The main cylinder for C heavy oil has a special coating. If there is a flaw, replace the main cylinder with a new one.)
● Check all the O rings for a flaw or loss of elasticity. (Particularly the O ring on the outside of the main cylinder) (**Fig. 6-10－11**)	Replace if defective.
● Check the diameter of the gravity disc. (**Fig. 6-10－12**)	Use a gravity disc suitable the specific gravity of the oil. Check whether the oil temperature and the oil feeding rate are appropriate. (Refer to the OM2: "Gravity Disc Selecting Procedures".)

6.2.3 Checks to perform by disassembling water supplying device

● Check the drilled hole of the water supplying device for clogging. (**Fig. 6-11－18**)	Clean.
● Check the O ring for a flaw or loss of elasticity. (**Fig. 6-11－19**)	Replace if defective.
● Check for water leakage from the operating water Teflon tube. (**Fig. 6-11－20**)	Re-tighten the cap nut of the joint. Replace the Teflon tube with a new one.

6.2.4 Other

● Check for a flaw and loss of elasticity on the O ring of the upper and lower hood.	Replace if defective.

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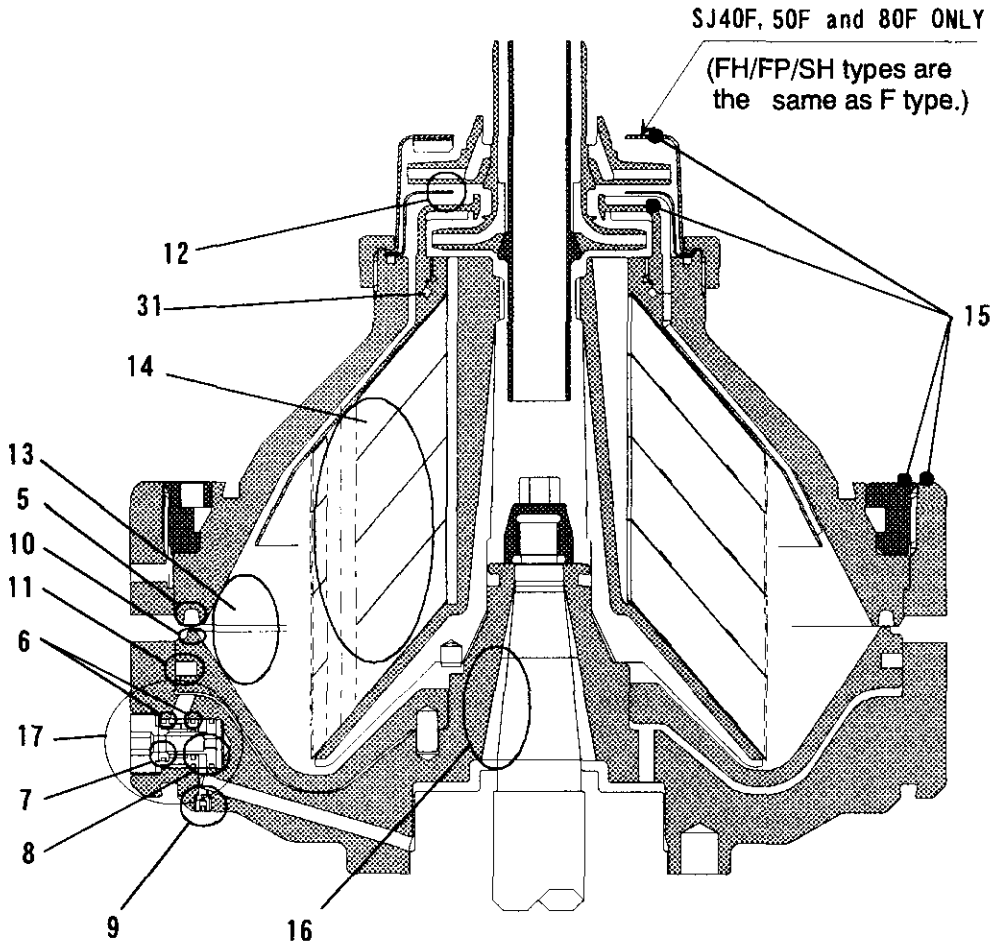


Fig. 6-10

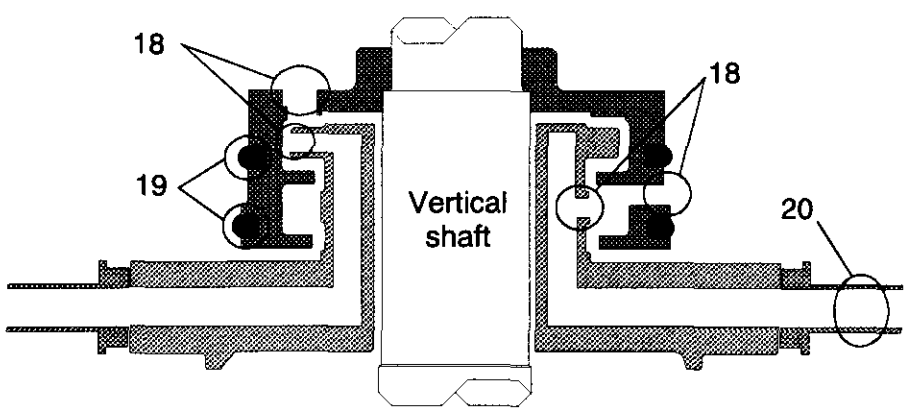


Fig. 6-11

6.3 Occurrence of abnormal vibration

6.3.1 Check for unbalance in the bowl.

● Isn't there an unevenly accumulated sludge in the bowl? (**Fig. 6-10－13**)	Clean the inside of the bowl. Adjust the discharge intervals properly. (Refer to the OM2: "Discharge Intervals".) Check for low valve opening operating water pressure. (0.2～0.5MPa {2.0～5.0kgf/cm^2})
● Aren't the discs insufficient because of the seating phenomenon? (**Fig. 6-10－14**)	Add if insufficient. (Refer to the MM1: "Maintenance Inspection".)
● Have you replaced the major parts of the bowl (the bowl body, bowl hood, distributor, main cylinder, heavy liquid chamber or light liquid chamber)?	Balance adjustment is necessary. (Contact our company or service agency.)
● Aren't the tally marks of the bowl nut, light liquid chamber and heavy liquid chamber out of alignment? (**Fig. 6-10－15**)	Reassemble them with their tally marks in alignment with the tally marks of the bowl body. (Refer to the MM1: "Reassembly".)
● Is the bowl bush in good contact? (**Fig. 6-10－16**)	If there is a fine scratch, repair or replace. (Refer to the MM1: "Maintenance Inspection".)

6.3.2 Checking for defects in vertical shaft system

● Check the upper spring, lower spring and flat spring for deformation. (**Fig. 6-12－21**)	Measure the dimensions. If they are out of the specified values, replace. (Refer to the MM1: "Maintenance Inspection".)
● Check the bearing for wear. (**Fig. 6-12－22**)	Replace if defective.
● Check the vertical shaft and bearing case fitting portions for wear. (**Fig. 6-12－23**)	Replace if defective.
● Check the portions with which the steel balls of the ball bearing case make contact, the spring seat and steel ball for wear and deformation. (**Fig. 6-12－24**)	Replace if defective.

6.3.3 Checking for defects in horizontal shaft system

● Check the bearing for wear. (**Fig. 6-13－27**)	Replace if defective.
● Check the friction block for uneven wear. (**Fig. 6-13－28**)	Replace if defective.
● Are the quantity and position of friction blocks correct? (**Fig. 6-13－28**)	Correct if incorrect. (Refer to the MM1: "Friction Block".)

OM1: Operation Manual 1　OM2: Operation Manual 2　MM1: Maintenance Manual

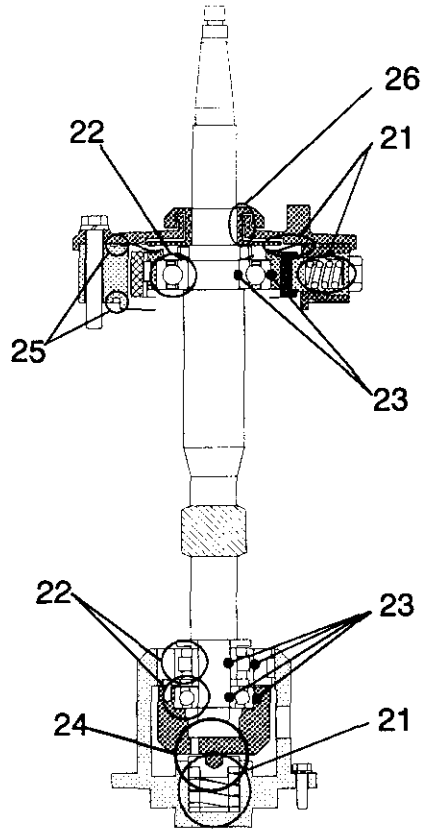


Fig. 6-12

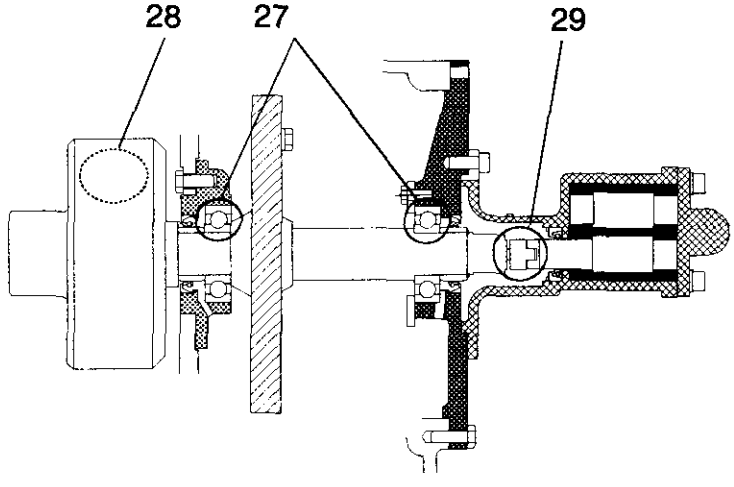


Fig. 6-13

6.4 Does not discharge sludge even if discharge procedures are performed.

● Check the solenoid valve (SV1) for operation. (**Fig. 6-8,Fig. 6-9—3**) ● Check the solenoid valve for partial discharge (SV9) for operation. (**Fig. 6-9**)	Replace defective parts.
● Check the strainer of the operating water piping for clogging. (**Fig. 6-8,Fig. 6-9－4**)	Clean.
● Check the O ring of the water supplying device for defective sealing. (**Fig. 6-11－19**)	Replace if defective.
● Check the pilot valve assembly for contamination. (**Fig. 6-10－17**)	Clean.
● Check the O ring for defective sealing.	Replace if defective.
● Check for low operating water pressure.	0.2～0.5MPa {2～5kgf/cm^2}。

6.5 Mixed flow of water toward light liquid outlet

● Aren't the sealing water and substitution water flow rates excessive?	Measure the flow rates of sealing water and substitution water. If they are in excess of the specified flow rates, adjust the timers. (Refer to the MM1.)
● Is the diameter of the gravity disc appropriate? (**Fig. 6-10－12**)	Use a gravity disc suitable for the properties of the oil. (Refer to the MM1.)
● Check the solenoid valve (SV3) for defective sealing. (**Fig. 6-8,Fig. 6-9－2**)	Replace defective parts.
● Is the sludge discharged?	Corrective steps in Section 6.4
● Check the heavy liquid outlet of the bowl for clogging.	Clean.

6.6 Low feeding rate or not fed at all

● Check the gear pump for reduced capability.	Disassemble and check. Replace defective parts.
● Isn't the suction capacity of the gear pump exceeded?	Suction pressure -4m.
● Isn't the suction piping of the pump too thin?	Use a piping diameter suitable for the flow rate.
● Isn't the air absorbed at an intermediate point of the suction piping?	Check and re-tighten the joint.
● Isn't the strainer at the inlet side clogged?	Clean.
● Isn't the safety joint broken? (**Fig. 6-13－29**)	Replace.

OM1: Operation Manual 1 OM2: Operation Manual 2 MM1: Maintenance Manual

6.7 Gear oil mixed with water

● Isn't the operating water drain pipe clogged?	Clean.
● Isn't the operating water supplied when the SELFJECTOR is in the stopped state?	Check the solenoid valve and replace defective parts. Note) Keep the source valve closed.
● Check the O ring of the bearing housing (1) for defective sealing. (**Fig. 6-12－25**)	Replace if defective.
● Check the O ring of the bearing cap for defective sealing. (**Fig. 6-12－26**)	Replace if defective.

6.8 Poor separation

● Isn't the treatment temperature low?	Adjust to the proper temperature. (Refer to the MM1: "Treatment Temperature".)
● Isn't the inside diameter of the gravity disc too small? (**Fig. 6-10－12**)	Replace the gravity disc with an appropriate one. (Refer to the MM1: "Gravity Disc Selecting Procedures".)
● Isn't the treatment quantity too large?	Adjust the treatment quantity properly. (Refer to the MM1: "Feeding Rate".)
● Isn't the speed low?	Check the power transmission system, including the friction clutch.
● Aren't the discs clogged with sludge? (**Fig. 6-10—14**)	Clean.

6.9 Low speed

● Check the friction block for wear. (**Fig. 6-13－28**)	Replace.
● Is the bowl valve closed?	Disassemble and check the bowl. Check the valve opening and closing operating water system.
● Motor out of order.	Check and repair.

6.10 Sludge unevenly accumulated in bowl

● Aren't the sludge discharge intervals too long?	Shorten the discharge intervals. (Refer to the MM1: "Discharge Intervals".)
● Isn't the valve opening operating water pressure low?	Adjust the valve opening operating water pressure to more than 0.2MPa {2.0kgf/cm^2}. Clean the strainer.
● Are both of the pilot valves performing well? (**Fig. 6-10－8**)	Check and clean the pilot valves.
● Check the drain nozzle for clogging. (**Fig. 6-10－9**)	Check and clean the drain nozzle.

OM1: Operation Manual 1 OM2: Operation Manual 2 MM1: Maintenance Manual

6.11 Mixed flow of oil toward heavy liquid outlet

● Isn't the inside diameter of the gravity disc too large? (**Fig. 6-10－12**)	Replace the gravity disc with an appropriate one. (Refer to the MM1: "Gravity Disc Selecting Procedures".)
● Isn't the flow rate of sealing water low?	Clean the strainer. Measure the flow rate of sealing water and adjust the timer.
● Isn't there leakage from the O ring of the light liquid chamber. (**Fig. 6-10－31**)	Replace.

6.12 Accessories

6.12.1 Solenoid valve unit for the operating water

6.12.1.1 Low flow rate

● Check the operating water piping for clogging.	Flush the piping.
Check the strainer for clogging. (**Fig. 6-9,Fig. 6-8, Fig. 6-14,Fig. 6-15－4**)	Clean.

6.12.2 Solenoid valve for water

6.12.2.1 Leaky

● Isn't the diaphragm broken? (**Fig. 6-14, Fig. 6-14－30**)	Replace if defective.
● Check the valve sheet surface for a flaw or a foreign substance caught. (**Fig. 6-15,Fig. 6-14－30**)	Check and clean. Replace if defective.

6.12.2.2 Does not operate. (Does not open the valve.)

● Isn't there a defect in electric wiring?	Check the wiring.
● Isn't the coil damaged by heat?	Replace if defective.

OM1: Operation Manual 1 OM2: Operation Manual 2 MM1: Maintenance Manual

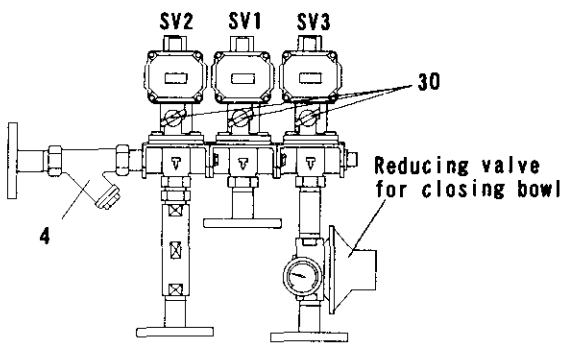


Fig. 6-14

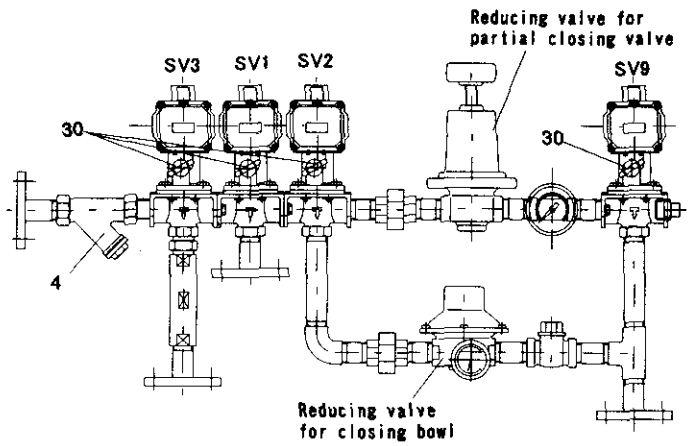


Fig. 6-15

6.12.3 Three-way raw liquid valve

6.12.3.1 Valve does not switch over.

● Isn't the supply of compressed air insufficient?	Check the three-way solenoid valve.
● Isn't the air pressure low?	Adjust the air pressure properly. (0.5～0.9MPa {5.0～9.0kgf/cm^2})
● Isn't there air leakage?	Check the O ring of the piston assembly. Replace if defective.

6.12.3.2 Leaky

● Check the valve sheet or disc for damage.	Check. Replace defective parts.

6.12.4 Leakage Monitor (LM)

[Refer to the OM2: "Leakage Monitor".]

6.12.4.1 Incorrect alarm is generated.

● Isn't the discharge pressure lower than the alarm pressure?	Adjust the discharge pressure to the set pressure.
● Isn't the feeding timer too short?	Adjust the feeding timer. (Normally 30~60 sec.)
● Isn't the fluctuation timer too short?	Adjust the fluctuation timer. (Normally 10~20 sec.)
● Aren't there large fluctuations in discharge pressure?	Remove the cause of fluctuations.

6.12.4.2 No alarm is output.

● Isn't there a defect in the electrical wiring to the control panel?	Check the wiring.
● Isn't the "Feeding" signal line open-circuited?	Check the wiring.

6.12.4.3 Alarm output during discharge process

● Board out of order.	Replace the detector.

6.12.4.4 Trouble display LED "Trouble" lights.

● Board out of order. (**Fig. 6-16**)	Replace the detector.

6.12.4.5 Does not operate when the power switch is set to ON.

● Blown fuse. (**Fig. 6-18**)	Check and replace fuse.

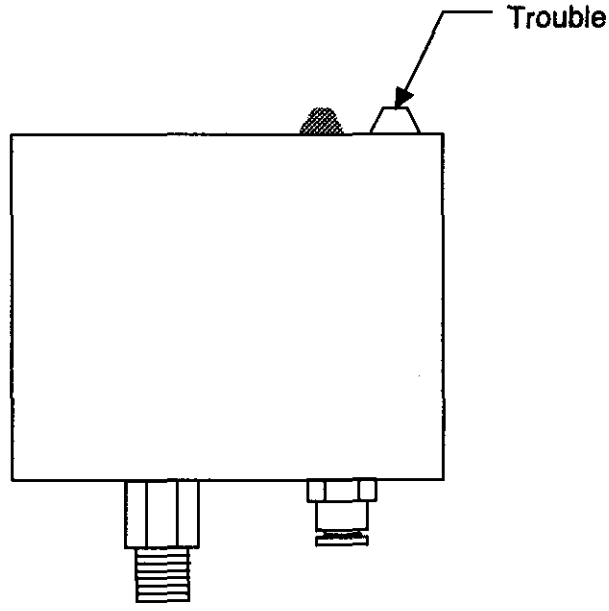


Fig. 6-16

6.12.5 Discharge Detector (DD)

[Refer to the OM2: "Discharge Detector".]

6.12.5.1 Incorrect alarm is generated.

● Is the proximity switch mounted at the right position?	Adjust the mounting position. (The normal proximity switch-to-horizontal shaft clearance is 1.8 mm.)

6.12.5.2 Trouble display LED "Trouble" lights.

● Is the proximity switch mounted at the right position? (**Fig. 6-17**) ● Board out of order.	Adjust the mounting position. Replace the detector.

6.12.5.3 Alarm is output during discharge process.

● Board out of order.	Replace the detector.

6.12.5.4 Does not operate when the power switch is set to ON.

● Blown fuse. (**Fig. 6-19**)	Check and replace the fuse.

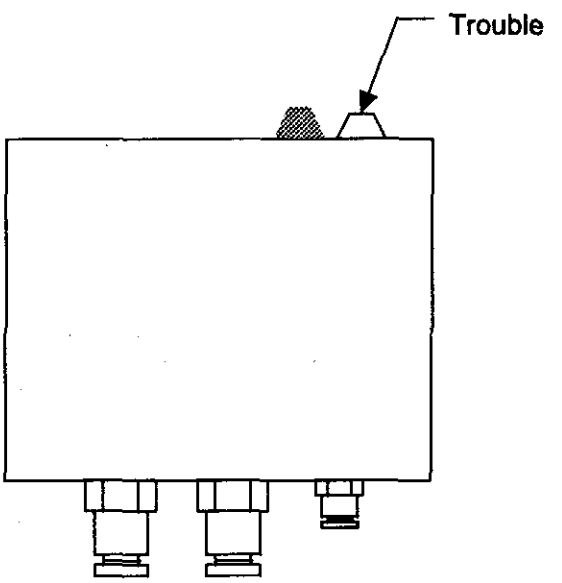


Fig. 6-17

6.12.6 Detector fuse replacement procedures

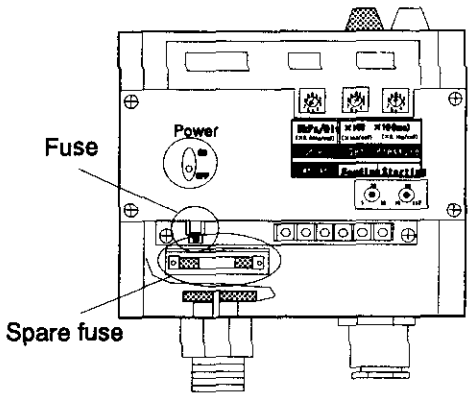


Fig. 6-18 Leakage Monitor

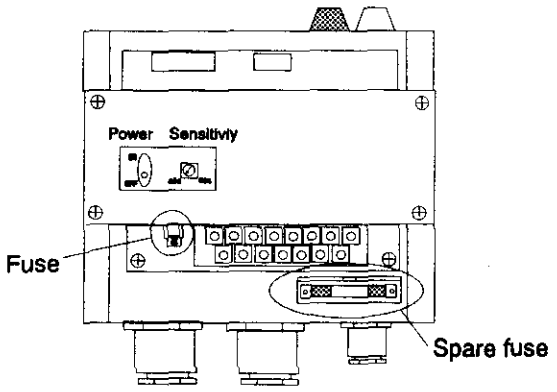


Fig. 6-19

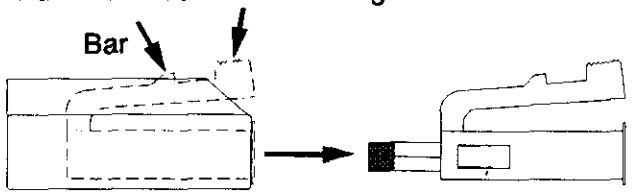
Discharge Detector

① Remove the fuse from the fuse box. Push the fuse until the bars get out, and then slide and pull it out.

② Replace the fuse with a new one and push the new fuse into the fuse box.
(until a click is heard.)

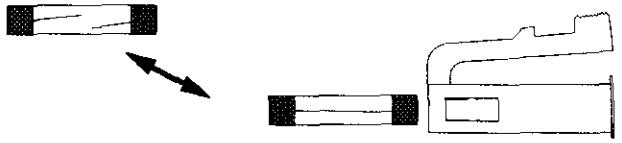
1. Remove the fuse from the fuse box.

Push the fuse until the bars get out.

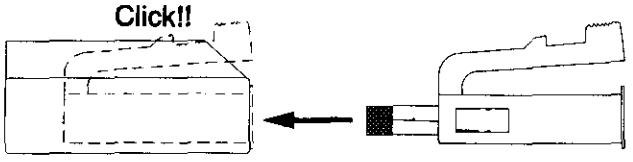


Slide and pull the fuse out.

2. Replace the fuse with a new one.



3. Insert the fuse into the fuse box.



Push the fuse in until a click is heard.

Fig. 6-20

6.12.7 Water Detector (WD)

[Refer to the OM2: "Water Detector".]

6.12.7.1 Alarm is frequently generated. (FSH-1P)

● No back pressure is applied to the light liquid side.	Apply a back pressure of 0.18~0.20MPa {1.8~2.0kgf/cm^2}.
● Large variations from settings.	Make adjustments so that the variations will Back pressure ±0.01MPa (±0.1kgf/cm^2) Oil temperature ±5℃ Flow rate ±5%
● Incorrect settings of control panel.	Re-enter correct settings according to the "Operation Manual 3D, 3F".

OM1: Operation Manual 1 OM2: Operation Manual 2 MM1: Maintenance Manual

NOTE

For information on the "Causes of Troubles and Corrective Steps" of the control panel, refer to the "Operation Manual 3A~3F".

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