

IWAKI PUMPS

**IWAKI BELLOWS PUMP**

**KBR SERIES**

**INSTRUCTION MANUAL**

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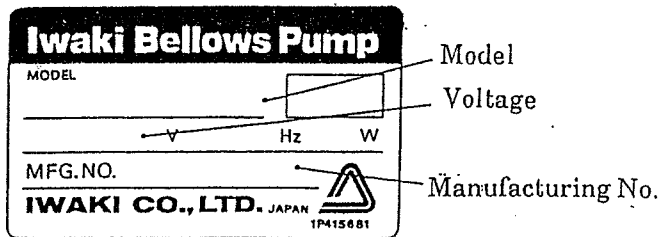
Thank you for selecting the IWAKI Bellows Pump KBR Series. This Instruction Manual provides you with details of the correct handling method, maintenance and inspection procedure, and troubleshooting procedure for the bellows pump.

Please read this manual carefully so as to make maximum use of the pump and to ensure safe and long operation. Please keep this manual easily accessible so that you can consult it at any time.

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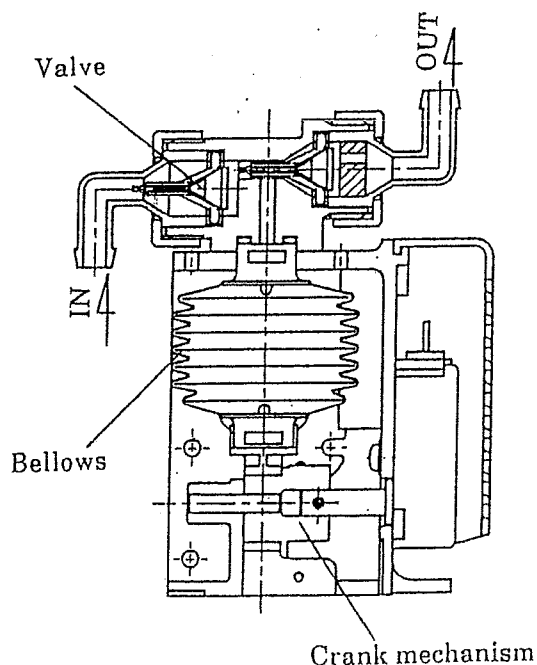
## 1 Inspection After Unpacking



Open the package and check whether the product conforms with the order you placed. Also check each of the following items. In case of any problem or discrepancy in the delivered product, contact your dealer.

- ① Check that the model, voltage, etc., marked on the nameplate of the pump conform with the specifications in your order.
- ② Check visually or by touching, whether any section — such as the frame or cover — of the pump is damaged or deformed, or any bolt or nut has been loosened due to transportation.

## 2 Principle of Operation



The Iwaki bellows pump KBR Series is a simply structured, economical, mini-type, liquid feeding pump.

In this KBR Series pump, liquid is sucked in and discharged by the valve, which opens or closes as a result of the mechanical expansion and contraction of the bellows having a number of folds to expand and contract. The bellows section is completely divided and sealed off from the outside, and the crank mechanism activates the bellows mechanically.

## 3 Pump Identification Codes

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### ■ Pump identification

**KBR - 3 X A U 1 M - S 0 1 F**  
①②③④⑤⑥      ⑦   ⑧

- ① Bellows type
  - 0 ... Type 0 bellows (14mm O.D.)
  - 1 ... Type 1 bellows (23mm O.D.)
  - 2 ... Type 2 bellows (26mm O.D.)
  - 3 ... Type 3 bellows (50mm O.D.)
- ② Number of strikes (50/60Hz)
  - X ... 20/24 spm
  - Z ... 10/12 spm
- ③ Cam type
  - A ... Fixed cam (for standard model type 1,2 and 3 bellows)
  - B ... Adjustable cam (for standard model type 1,2 and 3 bellows)
  - C ... Fixed cam (for hole I.C. model type 2 and 3 bellows)
  - D ... Adjustable cam (for hole I.C. model type 2 and 3 bellows)
  - E ... Fixed cam (for both standard and hole I.C. models type 0 bellows)
- ④ Approved standard
  - No code ... not approved by any standard
  - U ... UL recognition
- ⑤ Power source voltage
  - 1 ... AC100V
  - 2 ... AC115V
  - 3 ... AC230V
  - 4 ... AC200V
  - 5 ... AC24V
  - D ... DC
- ⑥ Motor type
  - No code ... MG8 type motor
  - M ... M8 type motor
- ⑦ Suffix for custom made
- ⑧ Material of elastomer (Poppet valve B, Valve gasket and O-ring)
  - No code ... EPDM (for type 1,2 and 3 bellows)
  - F ... FKM

## 4 Performance and Dimensions

### ■ Pump performance Standard model

Pump Model	Max. flow (ml/min)		Stroke rate (spm)		Max. disch. press. (MPa)	Self-priming height (cm)	Motor type	Hose size (mm I.D.)
	50Hz	60Hz	50Hz	60Hz				
KBR-0ZE	4.1	4.9	10	12	0.01	50	MG8	Ø4
KBR-1Z	17	20				30		
KBR-2Z	25	30				50		
KBR-3Z	90	108						
KBR-0XE	8.2	9.8	20	24		50	M8	Ø4
KBR-1X	34	40				30		
KBR-2X	50	60				50		
KBR-3X	180	216						

### Hole I.C. model

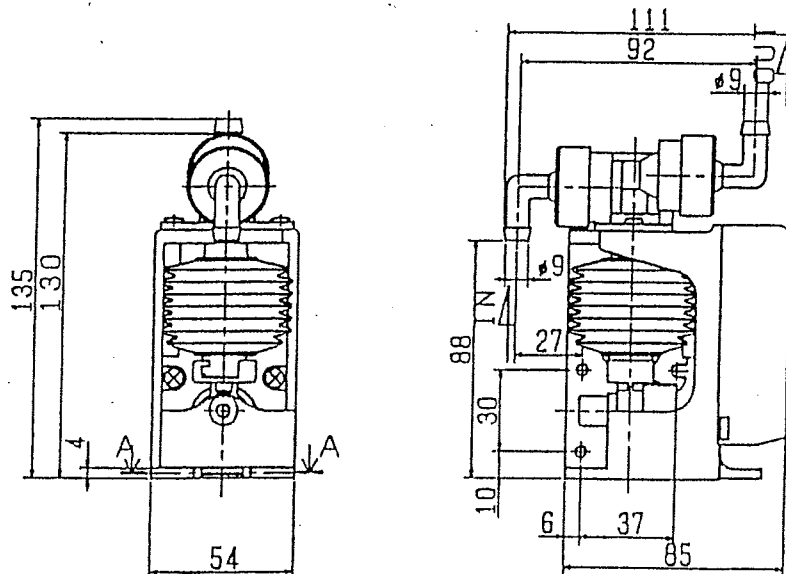
Pump model	Max. flow (ml/min)		Stroke rate (spm)		Max. disch. press. (MPa)	Self-priming height (cm)	Motor type	Hose size (mm I.D.)	
	50Hz	60Hz	50Hz	60Hz					
KBR-0ZE-H	4.1	4.9	10	12	0.01	50	MG8	Ø4	
KBR-2Z-H	29	35							
KBR-3Z-H	103	123							
KBR-0XE-H	8.2	9.8	20	24		50	M8	Ø4	
KBR-2X-H	58	70							
KBR-3X-H	206	247							

Note) The discharge value is based on test operation at open pressure, 100% stroke length, with pure water at 20°C.  
The discharge may change depending on liquid temperature.

### ■ Rated input of motor

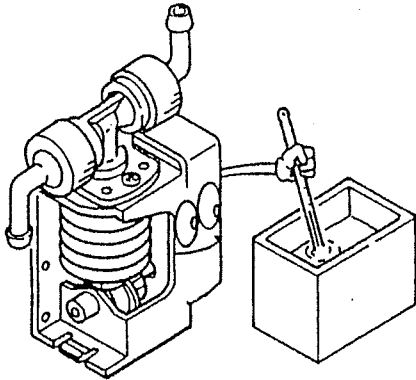
Power source voltage	Motor type	
	MG8	M8
100V	3.5W	4.5W
115V		
230V	4W	
24V	3W	3.5W

### ■ Outer dimensions

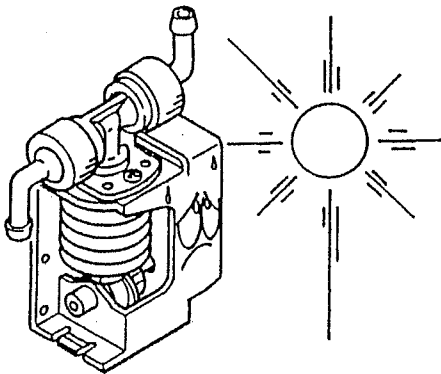


## 5 Precautionary Measures

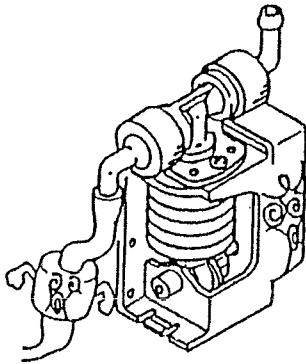
- ① The applicable liquid temperature range is 0~40°C.



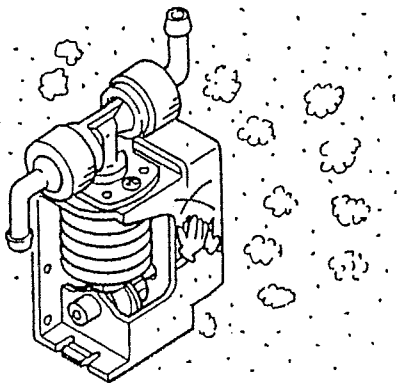
- ② Do not let the pump section get scaled with a cover, etc. Also, do not operate the pump in an ambient temperature higher than 40°C. The relative humidity must be maintained below 90%.

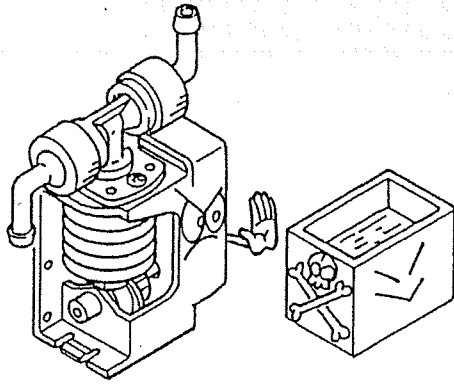


- ③ If there is a filter installed on the suction side, be careful that it does not get clogged. A clogged filter causes increased suction resistance, resulting in lowered pump performance and a shortened pump service life.



- ④ Do not use the pump in a location where corrosive gas such as chlorine gas is generated. Do not splash the motor with water or the liquid used during operation.

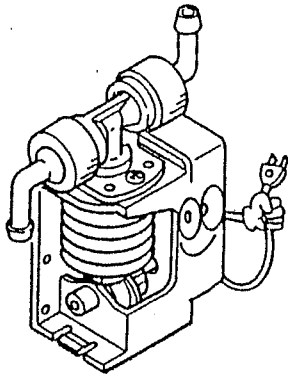




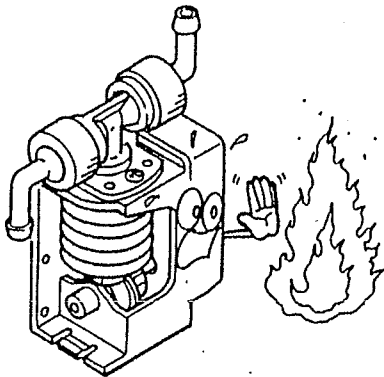
- ⑤ Do not use any liquid that causes polypropylene to expand.

Example

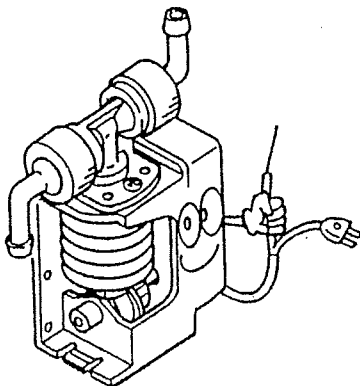
- Paraffinic hydrocarbons such as gasoline or kerosene
- Halogenated hydrocarbons such as trichloroethylene and tetrachloride hydrocarbon



- ⑥ When adjusting the discharge volume (in the case of adjustable cam), be sure to stop the pump first. (Discharge adjustment during pump operation is prohibited.)

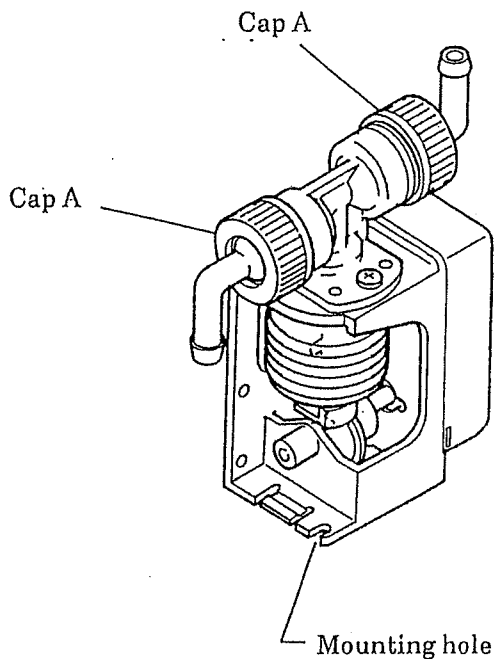


- ⑦ As a safety measure, do not place any inflammable material or other dangerous substance near the pump.



- ⑧ Grounding must be set properly. If grounding wire is not available, connect the grounding wire to the motor mounting screw.

## 6 Installation, Piping, and Wiring



### ■ Installation

① Install the pump at a site where the ambient temperature is within the range of 5~40°C and the relative humidity does not exceed 90%. The pump should not be exposed to ambient gas.

② Select a level installation site, and use two screws to fix the pump. (Mounting holes are located at the bottom or the side.)

### ■ Piping

① Use hoses having suitable diameters for the pump size both on suction and discharge sides. The direction of the suction side and discharge side is freely changed by loosening cap A. After changing the direction, be sure to tightly fasten cap A.

② Tightly connect the hose joint section to prevent leakage. Inadequate connection on the suction side may lead to air suction, resulting in lowered pump performance.

● This pump carries out self-priming, and requires no foot valve.

[Self-priming height]

▶ Dry condition ..... Approximately 0.5m (KBR-3 type), approximately 0.3m (KBR-1 type)

\* The above values are obtained with pure water at room temperature, with 100% stroke length. If self-priming does not start, find out the cause of the problem by referring to "Causes of Trouble and Troubleshooting".

### ■ Wiring

① When preparing the wiring for the motor, use the crimp type terminal for reliable connection.

② The grounding wire (green) must be set properly. If grounding wire is not available, connect the grounding wire to the motor mounting screw.

## 7 Pump Operation and Adjustment

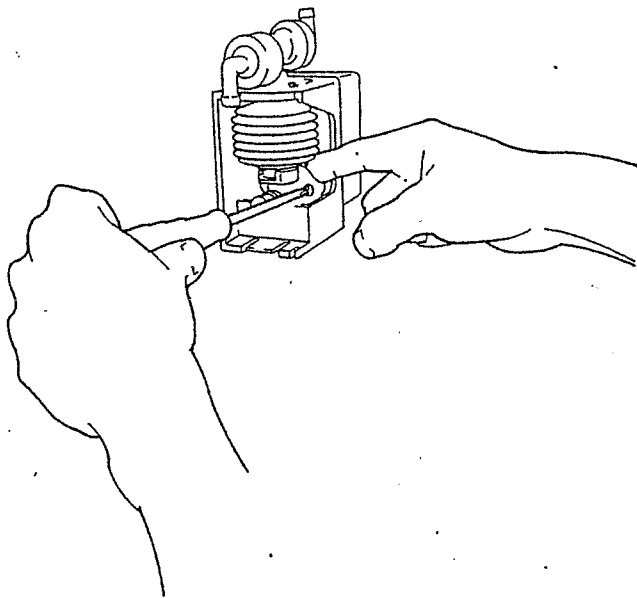
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### ■ Operation

- ① After the installation, piping, and wiring, check for any loosened screws or connections.
- ② If there is any resistance, such as a cock on the piping, be sure to open it fully.
- ③ Turn ON the power supply and start pump operation. Check thoroughly whether there is any leakage in the pump body.
- ④ In the case of variable cam type, set the pump discharge level as desired. The stroke length is set at 100%. Refer to the "Discharge Adjustment" section.
- If pump operation is suspended for a long time, take out the bellows and get rid of the liquid. (Refer to the "Disassembling and Reassembling" section.)

### ■ Discharge adjustment (only for adjustable cam type)

In the adjustable cam type pump, discharge can be adjusted. The adjustment can be made continuously for a discharge range of 50 to 100% with the pump stroke length changed. Follow the adjustment steps described below.



- ① Stop the pump so that the stroke length adjustment screw goes to the position indicated in the figure.
- ② Hold the nut with a finger, and loosen the stroke length adjustment screw with a philips-head screwdriver.
- ③ Rotate the cam on the bellows side and set the discharge as required.
- ④ By the same method as in step [2], tighten the screw to restore the original condition.

## 8 Maintenance and Inspection

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### ■ Inspection



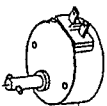


Pay special attention to the pump driving condition and leakage. If any abnormality is observed, turn OFF the power supply immediately and deal with the problem referring to "Causes of Trouble and Troubleshooting".

When the consumable parts reach their replacement time or the performance is extremely lowered, replace the bellows, poppet valve, etc.

### ■ Consumable Parts

For continuous operation over a considerable length of time, the following consumable parts should be available at hand.

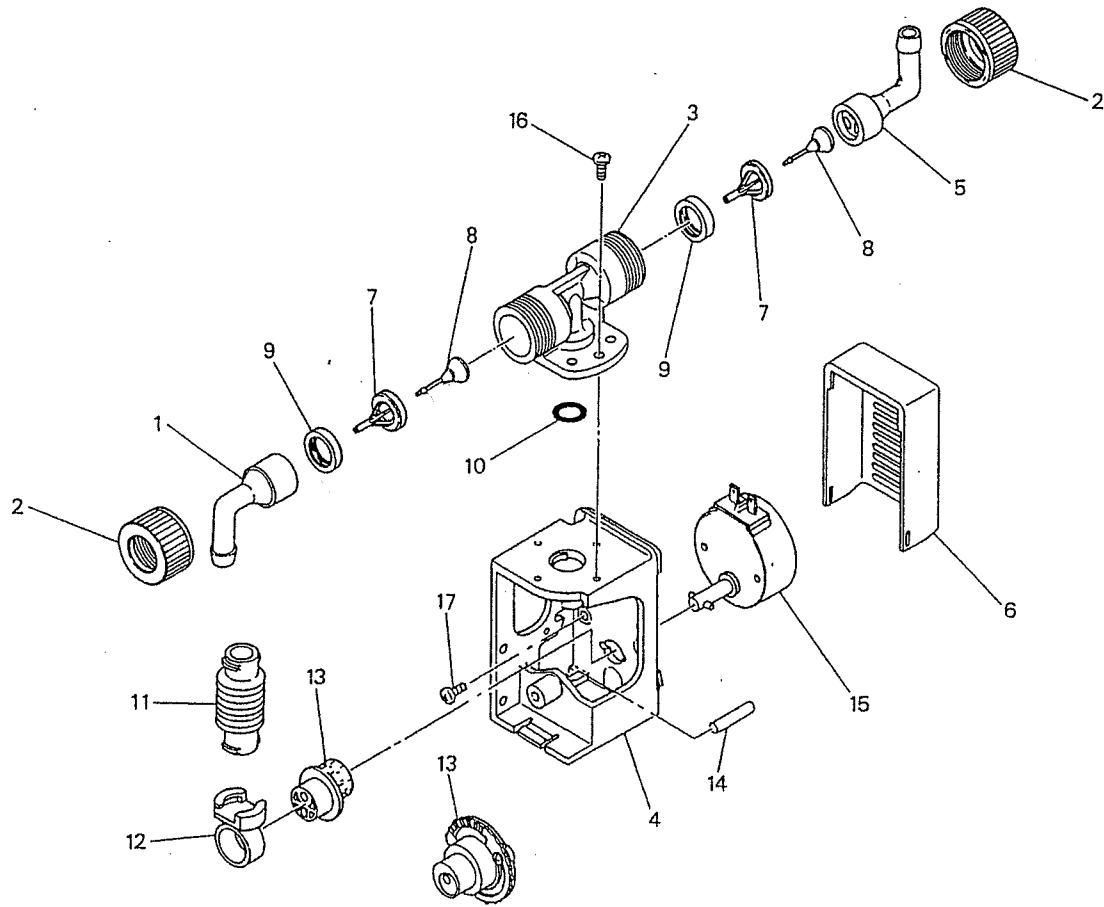
#### ● Replacement Time of Consumable Parts (Reference)

	Part		Replacement time
11	Bellows		After 5 million cycles
7 8	Poppet valve		After 3,000 hours
15	Motor		After 3,000 hours
9	Valve gasket		At the same time as the replacement of bellows, or poppet valve
10	O ring		

- The durability of each consumable part depends on the pressure, temperature, and characteristics of the liquid used.
- The values shown in the above table are obtained from continuous operation with pure water at a temperature of 20~25°C. Take these values as guidelines for replacement.

Countermeasure	Liquid leaks	Discharge is very little	Liquid is not discharged	Liquid is not sucked in	Cause	Trouble
Set correct direction			<input type="radio"/>	<input type="radio"/>	Valve mounting direction is wrong	
Clean valve		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Valve has foreign matter adhering to it	
Replace valve			<input type="radio"/>	<input type="radio"/>	Valve is broken	
Fasten cap A	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	Gasket is inadequately fastened.	
Mount O ring	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	O ring is not mounted	
Tighten pump head installation screws	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	O ring is inadequately fastened.	
Correct position of bellows and fix with pump head	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	Bellows are out of position	
Replace bellows	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	Bellows are damaged	
Remove discharge side hose and fill bellows with liquid. Then, connect hose			<input type="radio"/>	<input type="radio"/>	Pump is air-locked	
Check and complete hose connections		<input type="radio"/>		<input type="radio"/>	There is air suction at suction port	
Drive pump with 100% stroke length and let liquid be discharged. Then, set stroke length again				<input type="radio"/>	Stroke length is too short	
Check power supply			<input type="radio"/>	<input type="radio"/>	Motor does not run	
Supply tank with proper liquid			<input type="radio"/>	<input type="radio"/>	Liquid is not supplied	

# 10 Name of Parts and Structure



Adjustable cam type

No.	Element	Quantity	Remark	No.	Element	Quantity	Remark
1	Inlet	1		10	O ring	1	P-11
2	Cap A	2		11	Bellows	1	
3	Pump head	1		12	Connecting rod	1	
4	Frame	1		13	Drive cam	1	
5	Outlet	1		14	Cam shaft	1	
6	Motor cover	1		15	Motor	1	
7	Poppet valve A	2		16	Tapping screw	2	M4
8	Poppet valve B	2		17	Machine screw	2	M4
9	Valve gasket	2		18			

## 11 Disassembling and Reassembling

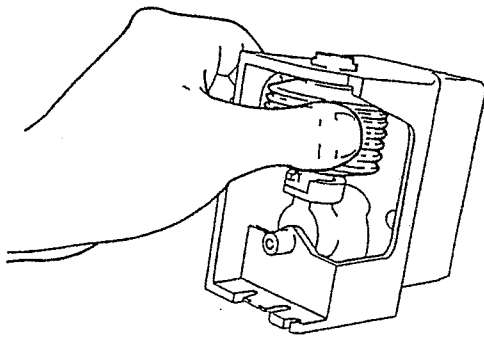
In most cases, prior to the disassembly of a pump there is liquid remaining in it. Particularly when using dangerous liquids, clean the inside of the pump. Be careful not to lose the small parts.

### ■ Replacement of poppet valve

- ① Disconnect the hoses on both the discharge and suction sides.
  - ② Rotate cap A [2] counterclockwise, then take out the outlet [5], inlet [1], and pump head [3].
  - ③ Take out the valve set (consisting of poppet valve A [7], poppet valve B [8] and valve gasket [9]). (This completes the disassembling process.)
  - ④ Replace the old valve set with a new one, and assemble the parts in the reverse order of disassembly.
- Pay close attention to the direction of the poppet valve in the assembling process. (Refer to the "Name of Parts and Structure" section.)

### ■ Replacement of bellows

- ① Use a philips-head screwdriver to loosen the two tapping screws [16] and remove the pump head [3]. Be careful not to lose the O ring [10] attached in the section where the bellows [1] come in contact with the pump head.
- ② If there is liquid remaining in the bellows, get rid of it with the use of a syringe.
- ③ Rotate the bellows [11] 90° counterclockwise.
- ④ Turn ON the power switch, turn the geared motor [15], and stop the connecting rod [12] at the lower dead point.
- ⑤ Contract the bellows [11] and pull them out. (This completes the disassembling process.)
- ⑥ Assemble new bellows [11] in accordance with the following steps.



- ① Set the bellows on the connecting rod [12].
- ② Turn ON the power supply to the geared motor [15] to stop the connecting rod [12] at the upper dead point.
- ③ With this condition maintained, push the bellows [11] toward the connecting rod slightly and rotate the bellows 90°.

- ◇ Turn the geared motor [15] again to stop the connecting rod [12] at the lower dead point. (With this step completed, the bellows up/down positions are fixed.)
- ◇ Install the pump head [3]. Be careful that the tapping screw [16] goes back into the same hole it was taken out of.

■ Replacement of motor

- ① Remove the motor cover [6] from the frame [4].
- ② Remove the two motor mounting screws [17] with a philips-head screwdriver.
- ③ Hold the drive cam [13] with the hand, and pull out the motor [15]. (This completes the disassembling process.)
- ④ Assemble a new motor [15] and make the groove of the drive cam [13] meet the pin on top of the motor shaft.
- ⑤ Fix the motor [15] with the motor mounting screws [17].
- ⑥ Attach the motor cover [6].