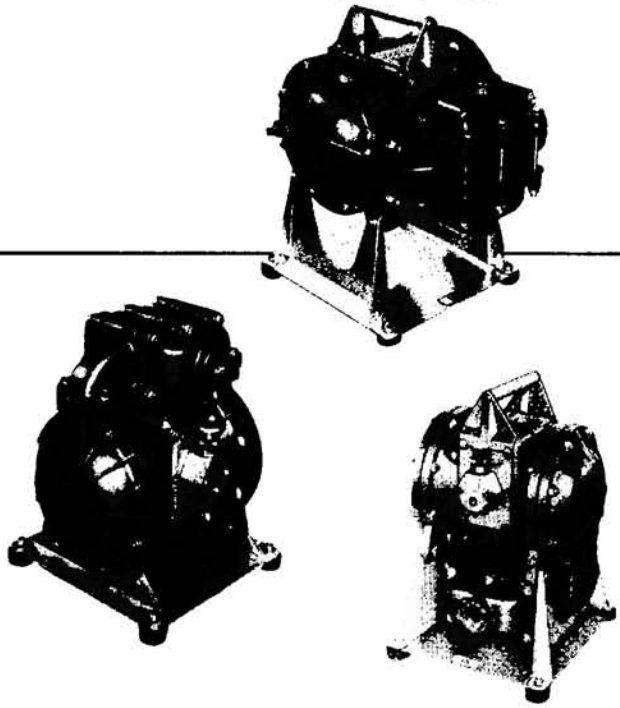
WARREN RUPP

ONE OF THE HOUDAILLE PUMP GROUP

Models: SA1-A, SB1-A

SandPIPER®

Operating Instructions, Service Manual and Repair Parts List



Operating and Service Instructions

PRINCIPLE OF OPERATION:

The SandPIPER pump is designed to be powered only by compressed air which alternately pressurizes inner side of one diaphragm chamber while simultaneously exhausting the other inner chamber. Both diaphragms are connected by a common rod. When the inner side of one diaphragm is pressurized, moving the diaphragm outward on discharge stroke, the opposite diaphragm is pulled inward on a suction stroke. As diaphragms approach the end of a stroke, the spring loaded actuator moves over center and shifts sliding air distribution valve to send the flow of compressed air to the opposite chamber. This reciprocating movement of diaphragms creates an alternating suction and discharge action in each outer diaphragm chamber. A manifold with a suction and discharge check valve for each chamber provides a common inlet and outlet for the pump.

INSTALLATION PROCEDURES:

Always locate pump as close as possible to liquid being pumped. Avoid long or small suction lines and always use minimum number of fittings.

For permanent installations involving use of rigid piping, short flexible sections of hose are recommended between pump and piping. This reduces strains and provides for easier removal of pump for service when required. At time of installation, inspect all external gasketed fasteners for looseness caused by gasket creep. Retorque loose fittings to insure against leakage.

CHAMBER PORTING:

SA1-A with bottom chamber porting of check valve manifolding is recommended for general portable pumping applications, low head transfer pumping, and for pumping solids laden liquids which tend to settle out.

For low flow, high pressure applications and for pumping highly viscous liquids, top porting of chambers to check valve manifold is recommended. Model SA1-A Sandpiper with flap type valves can be arranged in either bottom chamber porting or top chamber porting of check valve manifold by simply rotating outer diaphragm chambers 180 degrees and reversing flap valves and seats in manifold so as to remain in proper operating position of hanging downward. Make certain that flap valves are opening outward from manifold on side of unit marked "out" and opening inward toward manifold on the side marked "in." Carrying handle is not used with top porting arrangement.

NOTE: Low profile mounting feet are available for use with top porting, for SA1-A pump.

AIR SUPPLY:

Do not connect unit to air supply in excess of 125 PSI (8.61 bars). Install shutoff valve in air supply line to permit removal of unit for servicing. When connecting air supply of rigid piping, use a section of flexible line to pump to eliminate piping strain. In permanent installations, an air line filter is recommended.

LUBRICATION:

A small amount of lightweight oil (SAE 10wt. max.) poured into air inlet daily is desirable to provide lubrication for air distribution valve. An air line filter and lubricator is recommended on permanent installations. Set at a rate of 1 drop of oil for every 20 SCF (Standard Cubic Feet) (9.4386 lit./sec.) of air being used. When using EPDM RUBBER (diaphragms and ball valves) eliminate the use of all oil in the system; chemical attack may otherwise result. Consult factory for oil recommendations.

OPERATION:

Your Sandpiper pump has been tested prior to shipment and is ready for use as received. Pump is completely self-priming, without initial filling with liquid.

If unit is to be used totally submerged, make certain that air exhaust is piped above liquid level to prevent entrance of liquid and foreign material into air distribution valve mechanism.

Open inlet air valve control on side of unit at least one turn to allow sufficient cycling rate for pump to prime (30 to 60 cycles per minute). After unit starts pumping, adjust inlet air valve for pumping capacity desired. When further opening of inlet air valve increases cycling rate without increasing flow rate, pump is being starved of liquid due to suction limitation. Further opening of air inlet valve will only waste compressed air. Set inlet air valve for lowest cycling rate that does not decrease flow rate for most efficient operation.

FREEZING OR ICING OF EXHAUST:

Icing of air exhaust can be experienced under certain conditions of temperature and humidity on all compressed air power equipment. When performance loss due to icing is experienced, a non-sticky anti-freeze lubricant can be used in an air line lubricator to eliminate this condition. Icing will be more prevalent at high discharge pressures.

AIR EXHAUST:

Sandpiper pumps can be used submerged if the materials of construction are compatible with the liquid and the exhaust is piped above the liquid level. Piping used for the exhaust should not be smaller than 1" pipe size. Reduced pipe size can restrict the exhausted air and cause reduced pump performance.

CAUTION: Should a diaphragm fail, the product and/or fumes from the product being pumped can enter the air side of the pump. The air side of the pump is exhausted through the exhaust port (muffler).

When the product being pumped is a hazardous or toxic material, the exhaust should be piped to an appropriate area for safe disposition.

When the product being pumped is at a level above the pump (flooded suction), the exhaust should be piped to a higher level than the product in order to prevent spillage caused by siphoning.

MAINTENANCE AFTER USE:

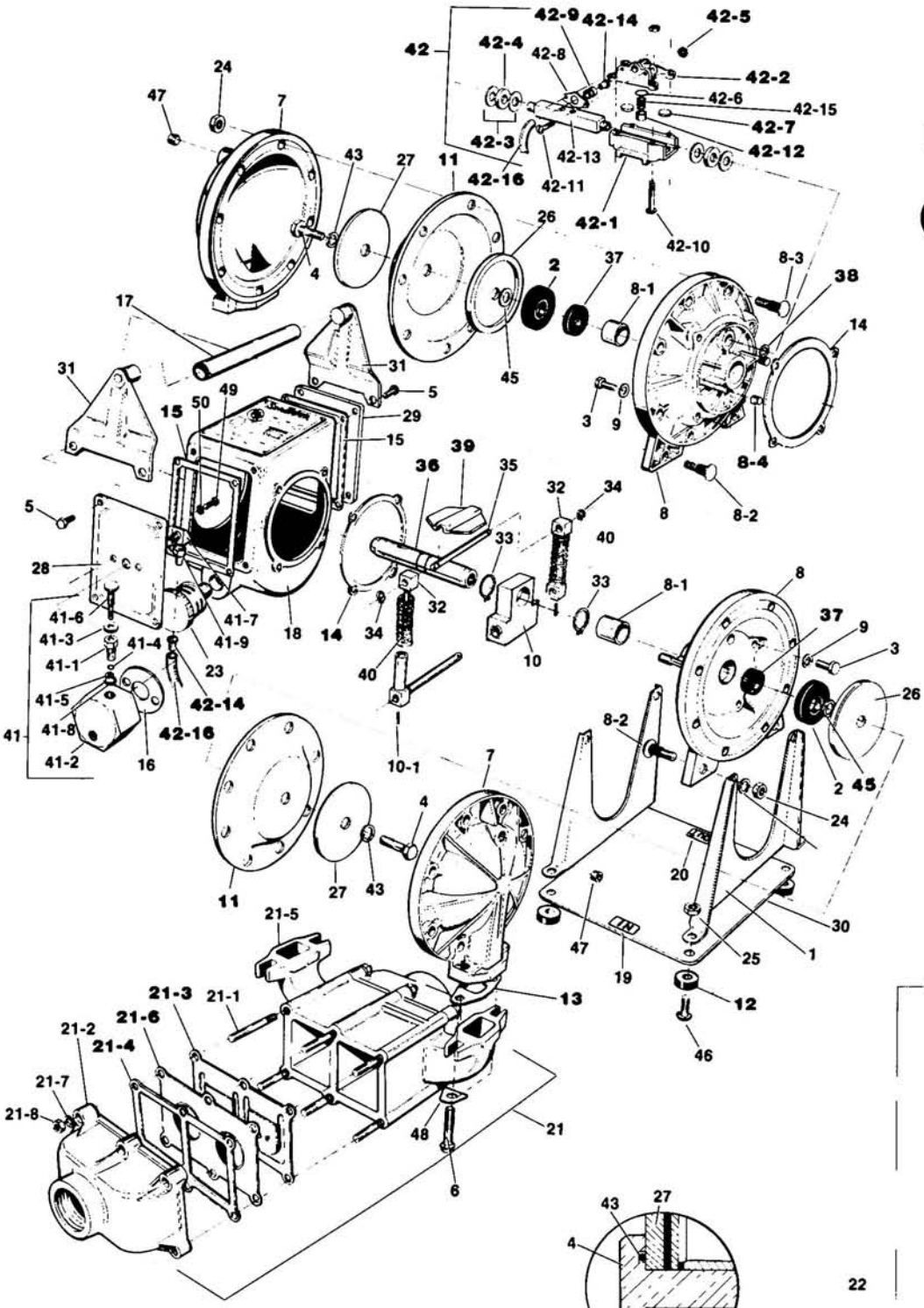
When pump is used to handle materials that tend to settle out or transform from liquid to solid form, care must be taken after each use or during idle periods to remove and flush these materials as required to prevent damage.

In freezing temperatures make certain that unit is completely drained when idle. SA1-A bottom porting arrangement is self draining, however, other chamber porting arrangements must be tilted in position as required to allow liquid to run out of discharge port from chambers.

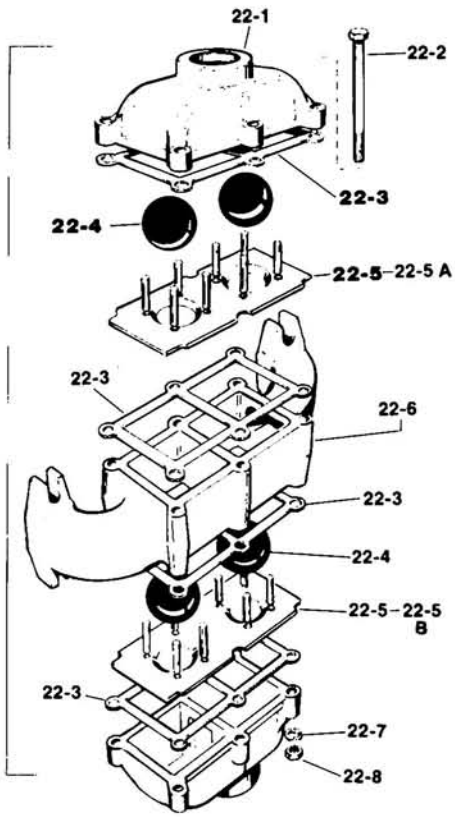
Should unit cycle sluggish or slowly under no load condition, it will indicate sticky movement of sliding actuator and air distribution valve. A small amount of kerosene or Stoddard Solvent poured into air inlet and a few seconds of wide open cycling rate will normally restore cycling speed. On permanent installations, an air line lubricator may be used to apply moderate quantities of WD-40, L.P.S. or non-sticky solvent-type lubricants.

SA1-A
BOTTOM/TOP PORTING (FLAP VALVES)

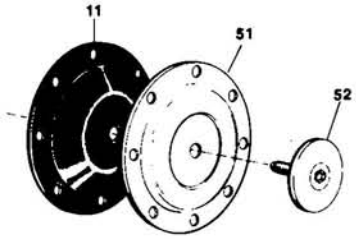
Repair parts shown in bold face (darker) type are more likely to need replacement after extended periods of normal use. They are readily available from most Warren Rupp distributors. The pump owner may prefer to maintain a limited inventory of these parts in his own stock to reduce repair downtime to a minimum.



MANIFOLD ASSEMBLY



For Types STN-1-A, STN-1-SS



SB1-A
SIDE PORTING (BALL VALVES)

REPAIR PARTS LIST — SA1-A, SB1-A

ITEM	PART NUMBER	QTY. RQD.	DESCRIPTION
1	115-033-330	2	Foot Bracket (used with bottom porting unit)
1	115-041-330	2	Foot Bracket (used with top porting unit)
2	**132-007-360**	**2**	**Bumper Diaphragm**
3	170-032-330	8	Capscrew
4	170-034-330	2	Capscrew (Aluminum unit)
4	170-059-110	2	Capscrew (for each ordered also order #43 O-ring)
5	170-050-330	8	Capscrew
6	171-010-330	4	Capscrew, Flanged
7	196-012-157	2	Chamber, Diaphragm (Aluminum)
7	196-012-110	2	Chamber, Diaphragm (#316 Stainless Steel)
8	196-013-000	2	Chamber, Diaphragm
8-1	070-012-170	2	Bearing
8-2	099-002-330	4	Bolt, Ribbed Neck
8-3	099-003-330	16	Bolt, Ribbed Neck
8-4	**132-015-540**	**4**	**Bumper — Actuator**
9	901-024-180	8	Sealing Washer
10	220-006-000	1	Collar Assembly
10-1	690-008-080	2	Roll Pin
11	**286-008-365**	**2**	**Diaphragm (Neoprene)**
11	286-008-360	2	Diaphragm (Buna-N)
11	286-008-363	2	Diaphragm (Viton)
12	**350-002-360**	**4**	**Rubber Foot**
13	**360-030-425**	**2**	**Gasket Manifold**
13	360-030-600	2	Gasket Manifold (TFE) (use with Viton)
14	**360-032-408**	**2**	**Gasket Chamber**
15	**360-033-408**	**2**	**Gasket Cover**
16	360-034-408	1	Gasket Air Valve
17	405-003-330	1	Handle (not required for top porting unit)
18	430-017-156	1	Housing Intermediate
19	485-004-000	1	Label "In"
20	485-005-000	1	Label "Out"
21		1	Manifold Assembly (Flap Valves)
21-1	807-029-330	12	Stud
21-2	334-013-157	2	Flange
21-2	334-013-110	2	Flange
21-3	**338-007-365**	**2**	**Flap Valve (Neoprene)**
21-3	338-007-360	2	Flap Valve (Buna-N)
21-3	338-007-363	2	Flap Valve (Viton)
21-4	**360-031-365**	**2**	**Gasket (Neoprene)**
21-4	360-031-360	2	Gasket (Buna-N)
21-4	360-031-363	2	Gasket (Viton)
21-5	518-015-156	1	Manifold (Aluminum)
21-5	518-015-110	1	Manifold (Stainless Steel)
21-6	**722-021-365**	**2**	**Valve Seat (Neoprene)**
21-6	722-021-360	2	Valve Seat (Buna-N)
21-6	722-021-363	2	Valve Seat (Viton)
21-7	900-004-330	12	Lockwasher, 5/16
21-8	545-004-330	12	Hex Nut
22		1	Manifold Assembly
22-1	334-013-157	2	Flange (Aluminum)
22-1	334-013-110	2	Flange (Stainless Steel)
22-2	170-075-330	6	Capscrew
22-3	**360-031-360**	**4**	**Gasket Flange (Buna-N) (SB1-A)**
22-3	360-031-600	4	Gasket Flange (TFE) (use with Viton)
22-4	**050-008-360**	**4**	**Check Ball (Buna-N) (SB1-A)**
22-4	050-008-365	4	Check Ball (Neoprene)
22-4	050-011-600	4	Check Ball (Teflon)
22-5	**722-026-580**	**2**	**Valve Seat (Buna-N & Neoprene balls only) (SB1-A)**
22-5-A	722-024-110	1	Valve Seat (discharge TFE balls only)
22-5-B	722-025-110	1	Valve Seat (suction TFE balls only)
	REPAIR PARTS NOT SHOWN		
	210-005-080	**1**	**Assembly Clip**
	545-005-330	4	Hex Nut (for use with 196-012-110 chamber)
	800-008-000	1	Strainer (available Aluminum unit only)

ITEM	PART NUMBER	QTY. RQD.	DESCRIPTION
22-6	518-006-110	1	Manifold
22-6	518-006-156	1	Manifold
22-7	900-004-330	6	Lockwasher 5/16
22-8	545-004-330	6	Hex Nut
23	530-007-000	1	Muffler
24	545-004-330	20	Hex Nut
25	547-002-330	4	Elastic Stop Nut
26	612-022-330	2	Plate (Inner)
27	612-023-330	2	Plate (Outer) (Steel Plated)
27	612-023-110	2	Plate (Outer) (#316 Stainless Steel)
28	612-027-330	1	Cover Plate
29	612-028-330	1	Cover Plate
30	612-034-330	1	Base Plate
31	115-042-330	2	Handle Bracket (not required for top porting unit)
32	620-003-080	2	Plunger
33	675-011-080	2	Retaining Ring
34	675-019-115	2	Retaining Ring
35	685-023-331	1	Rod
36	**685-024-331**	**1**	**Diaphragm Rod**
37	**720-010-360**	**2**	**U-Cup Seal**
38	**720-011-360**	**2**	**Quad Ring Seal**
39	**745-003-592**	**1**	**Sliding Shoe**
40	780-016-080	2	Spring
41	893-029-000	1	Air Inlet Valve Assembly
41-1	095-025-162	1	Body Air Valve Stem
41-2	095-026-152	1	Body, Valve
41-3	478-003-162	1	Knob, Locking
41-4	560-037-360	1	O-Ring
41-5	675-018-080	1	Ring, Retaining
41-6	790-002-330	1	Stem, Valve
41-7	866-026-162	1	Tube Fitting
41-8	901-011-180	1	Washer, Sealing
41-9	548-001-162	1	Nut and Ferrule
42	**893-030-000**	**1**	**Air Distribution Valve Assembly**
42-1	**095-027-590**	**1**	**Body, Valve Lower**
42-2	**095-028-590**	**1**	**Body, Valve Upper**
42-3	**132-008-358**	**4**	**Bumper**
42-4	**132-011-358**	**2**	**Bumper**
42-5	**547-004-330**	**6**	**Nut Stop Elastic**
42-6	560-038-360	1	O-Ring
42-7	**570-004-550**	**2**	**Pad, Bearing**
42-8	670-011-152	1	Retainer, Tubing
42-9	**755-017-550**	**1**	**Sleeve**
42-10	706-011-330	4	Screw Machine
42-11	706-012-330	2	Screw Machine
42-12	**720-009-570**	**1**	**Seal**
42-13	755-012-017	1	Sleeve Valve
42-14	**755-016-162**	**2**	**Sleeve Tubing**
42-15	780-025-115	1	Spring, Compression
42-16	**860-018-540**	**1**	**Tubing, Plastic**
43	900-003-330	2	Lockwasher
43	560-030-360	2	O-Ring (Buna-N)
43	560-030-363	2	O-Ring (Viton)
44	900-004-330	4	Lockwasher
45	**901-012-180**	**2**	**Sealing Washer**
46	706-013-330	4	Machine Screw
47	618-003-115	2	Pipe Plug (Stainless Steel)
47	618-003-330	2	Pipe Plug (Steel Plated)
48	905-001-330	4	Taper Washer
49	706-012-330	2	Machine Screw
50	900-002-330	2	Lockwasher
51	286-015-604	2	Diaphragm,
52	612-067-110	2	Diaphragm Plate, Outer

MATERIAL CODES

The Material Code Is The Last 3 Digits Of The Part Number

000 ... Assembly, sub-assembly; and some purchased items
010 ... Cast Iron
080 ... Carbon Steel, AISI B-1112
100 ... Alloy 20
110 ... 316 Stainless Steel (Austenitic)
015 ... Ductile Iron
112 ... Hastelloy-C
114 ... 303 Stainless Steel
115 ... 302/304 Stainless Steel
117 ... 440-C Stainless Steel (Martensitic)
120 ... 416 Stainless Steel (Wrought Martensitic)
123 ... 410 Stainless Steel (Wrought Martensitic)
148 ... Hardcoat Anodized Aluminum
149 ... 2024-T4 Aluminum
150 ... 6061-T6 Aluminum
151 ... 6063-T6 Aluminum
152 ... 2024-T4 Aluminum (2023-T351)
154 ... Almag 35 Aluminum
155 or 156 ... 356-T6 Aluminum
157 ... Die Cast Aluminum Alloy #380
159 ... Anodized Aluminum
162 ... Brass, Yellow, Screw Machine Stock
165 ... Cast Bronze, 85-5-5-5
170 ... Bronze, Bearing Type, Oil Impregnated
180 ... Copper Alloy
310 ... Kynar Coated
330 ... Cadmium Plated Steel
331 ... Chrome Plated Steel
332 ... Electroless Nickel Plated
335 ... Galvanized Steel
357 ... Rupplon (Urethane Rubber) Color coded: PURPLE (Injection Mold)
358 ... Rupplon (Urethane Rubber) Color coded: PURPLE (Some Applications) (Compression Mold)
360 ... Buna-N Rubber. Color coded: RED
363 ... Viton (Fluorel). Color coded: YELLOW
364 ... E.P.D.M. Rubber. Color coded: BLUE
365 ... Neoprene Rubber. Color coded: GREEN
366 ... F.D.A. Nitrile. Color coded: WHITE
370 ... Butyl Rubber. Color coded: BROWN
375 ... Fluorinated Nitrile
405 ... Cellulose Fibre
408 ... Cork and Neoprene
425 ... Compressed Asbestos
440 ... Vegetable Fibre
465 ... Fibre
500 ... Delrin 500
505 ... Acrylic Resin Plastic
520 ... Injection Molded Kynar, Natural Color, FDA/USDA Acceptable
540 ... Nylon
550 ... Polyethylene
570 ... Rulon II
580 ... Ryton
590 ... Valox
591 ... Nylatron G-S
592 ... Nylatron NSB
600 ... Teflon (virgin material) Tetrafluoacarbon (TFE)
601 ... Teflon (Bronze and moly filled)
602 ... Filled Teflon
603 ... Blue Gylon
604 ... TuffRUPP

SERVICE INSTRUCTIONS

TROUBLE SHOOTING

1. Pump will not cycle

A. Check to make certain unit has air pressure available to operate and that air inlet valve is open.

B. Check discharge line to make certain that discharge is not closed or blocked.

C. Remove side cover and check spring loaded actuator and sliding air distribution valve for hang up.

Note: When diaphragms reach end of stroke, spring loaded actuator moves over center of vertical position and snaps sliding shoe opposite direction to reverse air flow when operating properly. Should actuator be in the vertical position at one end of stroke and be in contact with rubber bumpers without shifting, snap upper end of spring loaded actuator toward opposite chamber with fingers. If actuator wants to hang at one end without shifting it will indicate sticky condition of sliding shoe. Lubricate with WD-40 oil or add kerosene to sliding parts to free sliding parts of friction. Bumpers are used to insure shifting at end of stroke and may be worn. Replace if wear of bumpers is evident.

D. Excessive air leakage in pump can prevent cycling, however, this condition will be evident. Air leakage into discharge line will indicate ruptured diaphragm. Air leakage from exhaust port will mean leakage in air distribution valve. See further service instructions.

E. Blockage can occur in liquid chamber to prevent endwise movement of diaphragm. Shift air distribution valve by hand to determine if endwise movement in one direction is restricted.

2. Pump cycles but will not pump

A. Suction side of pump pulling in air. Check suction line for air leaks and submergence of end of suction line in liquid. Check flange bolting of pump. Check valve flanges and manifold to chamber flange joints.

B. Make certain suction line or strainer is not plugged. Restriction at suction will be evident by high vacuum reading when vacuum gauge is installed in suction line.

C. Check valves in pump may not be seating properly. To check, remove suction line and cover suction port with hand. If unit does not pull good suction (vacuum) on hand, check valves should be inspected for proper seating.

D. Static suction lift may be too high. Priming can be improved by elevating suction and discharge line higher than check valves and pouring liquid into unit through suction inlet. When priming at high suction lifts or long suction lines operate pumps at maximum cycle rate.

3. Low performance

A. Capacity is reduced as discharge pressure increases as indicated by performance curve. Performance capability varies with available inlet air supply. Check air pressure at pump inlet when pump is operating to make certain that adequate air supply is maintained.

B. Check vacuum at pump suction. Capacity is reduced as vacuum increases. Reduced flow rate due to starved suction will also be evident when cycle rate can be varied without change in capacity. This condition will be more prevalent when pumping viscous liquids. When pumping thick, heavy materials, suction line must be kept as large and short as practical to keep suction loss at a minimum.

C. Low flow rate and slow cycling rate indicates restricted discharge of liquid through discharge line. Low flow rate and fast cycling rate indicates restriction of liquid through suction line or presence of air leakage into suction.

Note: Use of bottom chamber porting on SA1-A pump on thick liquids may create air trap in outer liquid chambers causing reduced displacement and low capacity performance. Use of air vent lines from top of chamber back to liquid source will correct this or converting to top chamber porting will eliminate any possible air trap in liquid chambers of pump.

D. Unstable cycling of pump will indicate improper check valve seating on one chamber. This condition is confirmed when unstable cycling repeats consistantly on every other exhaust. When cycling is not consistently unstable it may indicate partial exhaust restriction due to freezing and thawing of exhaust air. Use of anti-freeze lubricant in air line lubricator will eliminate.

Note: Unstable cycling can also be caused by a sticky condition in air distribution valve sliding shoe. Pour small amount of kerosene in air inlet to correct this condition.

CHECK VALVE SERVICING:

Remove six flange bolts securing inlet and outlet flanges to manifold. Inspect seat surfaces of both check valve and seat for wear or damage that may prevent proper sealing. For good priming capability, valves must seat air tight.

SA1-A flap type models can be assembled with manifold position under diaphragm chambers (bottom porting) or above (top porting). However, inlet and outlet flange pipe threads run horizontal in either case. Flap valves and seats must be reassembled to unit in proper manner to agree with "IN" and "OUT" marking on base plate. Install valve seat and flap valve on side of unit marked "OUT" with flap valve hanging downward and swinging away from manifold into flange. Install flap valve and seat on side of unit marked "IN" with flap valve hanging downward and swinging into manifold away from flange. Which side of unit is inlet and outlet is controlled by how check valves are installed.

DIAPHRAGM SERVICING:

Remove four bolts securing manifold flange to chamber. Remove eight nuts securing outer diaphragm chamber flange and remove chamber. Loosen capscrew securing diaphragm and plate to rod by allowing diaphragm to remain engaged with capscrews around outer flange to prevent rotation of rod. DO NOT USE WRENCH ON DIAPHRAGM ROD DIAMTER. MARKS ON ROD SURFACE WILL DAMAGE BEARINGS AND SEAL.

During reassembly make certain that rubber bumper is on rod on each side. Install diaphragm with natural bulge outward as marked on diaphragm. Install heavier plate on outer side of diaphragm and make certain that large radius side of both plates are toward diaphragm and make sealing washer between inner diaphragm plate and end of rod. Tighten capscrew to approximately 20 FT. LBS. (2.766 kilograms/meters). Torque while allowing diaphragm to turn freely with plates. Use wrench on capscrew of opposite side to porevent rotation of rod. If opposite chamber is assembled, rod will not require holding.

When reassembling outer chambers and manifold, bolts securing manifold flange to chamber should be snugged prior to tightenting chamber bolts to make certain that chamber port flange is square with manifold flange. Finish tightening manifold flange bolts after chamber bolting is secured.

ACTUATOR AND AIR VALVE SERVICING:

Remove side cover plates from center housing. When removing cover plate with inlet air valve, care must be taken in supporting cover to prevent kinking of plastic hose until disconnected from cover. After diaphragms have been disassembled, move diaphragm rod endwise until actuator springs are compressed and install U-shaped clip, (furnished with unit) to retain spring loaded actuator in shorter position. Move diaphragm rod endwise away from upper sliding shoe to permit acutator cross pin to drop away. After diaphragms have been disassembled, remove inner diaphragm chamber from one end which is secured by four bolts. Opposite end of air distribution valve will now move endwise away from remaining inner chamber and entire air distribution valve and hose assembly can be removed through side cover opening. Rod and actuator can be removed. Slide air distribution valve body off sleeve to inspect seal face. Inspect bearings, seals, springs and all surfaces for possible wear.

REASSEMBLY—AIR DISTRIBUTION VALVE:

When air distribution valve has been removed from air porting sleeve, it will be necessary to separate body at four bolts in order to reassemble sleeve due to spring loaded seal face. Sliding sleeve endwise into body after removal, without separating body, may damage seal face.

Before reassembling the air distribution air valve, clean all valve parts with solvent (Stoddard Solvent, etc.) to remove all residue from sliding surfaces. After valve is assembled all sliding surfaces on the valve and valve actuator can be coated with a film of lightweight lubricant such as WD-40 or equal, to insure lubrication at start up.

Reassemble air distribution valve into position and slide end of porting sleeve into installed inner chamber. Make certain that Buna-N seal is in place and that Urethane bumpers are on end of sleeve with the thick washer between the two thin wahsers. Install diaphragm rod and actuator assembly. After air valve assembly is in position to previously installed inner chamber and bumpers are in position on the other end, install other inner chamber (make certain seal is in place in bore) guide entrance of air valve sleeve end into bore through side cover openings. Secure chamber with four bolts and sealing washers. Move rod endwise to opposite end of air distribution valve position and install sliding shoe and actuator crosspin into position and release spring clip. Move diaphragm rod endwise back and forth to check for proper shifting of air distribution valve. Make certain that Urethane bumpers are in place and come in contact with actuator springs to insure shifting. Reassemble hose to side cover and balance of unit per previous instruction.

WARRANTY: This unit is guaranteed for a period of one year against defective material and workmanship.