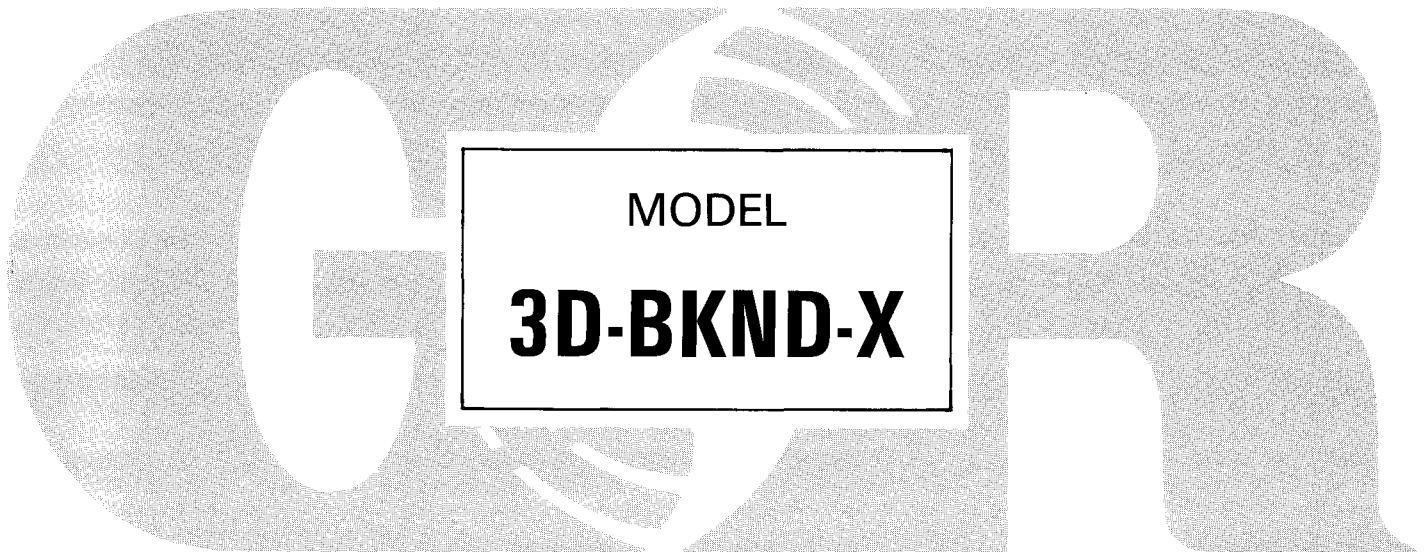

DSERIES

INSTALLATION, OPERATION, PARTS LIST, AND MAINTENANCE MANUAL



THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA

Printed in U.S.A.

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INTRODUCTION

This Installation, Operation, and Maintenance Manual is designed specifically to help you achieve the best performance and longest life from your Gorman-Rupp diaphragm pump.

This is a positive displacement type pump utilizing a single-action diaphragm to produce a straight-through flow of liquid. Since this pump handles liquids ranging from clear water to construction-site muck, it is ideally suited to industrial and contractors' applications. The pump is equipped with a spark-arrested engine designed for pumping petroleum products in a non-flammable atmosphere.

If you have any questions regarding the pump which are not covered in this manual or in other literature furnished with the unit, please contact your Gorman-Rupp distributor, or write:

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901

or
Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7

For information or technical assistance on the engine, contact the local dealer or representative of the engine manufacturer.

The following are used to alert maintenance personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:

NOTE

Instructions to aid in installation, operation, or maintenance, or which clarify a procedure.

CAUTION

Instructions which must be followed to avoid causing damage to the product or other equipment incidental to the installation. These describe the procedure required and the damage which could result from failure to follow the procedure.

WARNING

Instructions which must be followed to avoid causing injury or death to personnel. These describe the procedure required and the injury which could result from failure to follow the procedure.

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WARNINGS

THESE WARNINGS APPLY DIAPHRAGM PUMPS WITH SPARK-ARRESTED ENGINE DRIVE.

The engine used in this pump is not standard. It has been modified for pumping gasoline and other petroleum products in a well ventilated, non-flammable atmosphere free of combustible hazards. It cannot be further modified without affecting performance and safety factors. The spark arresting modifications must be inspected and maintained regularly while the unit is in use. Refer to the manual accompanying the engine before attempting to start the engine.

Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect the spark plug to ensure that the engine will remain inoperative.
3. Allow the pump to cool if overheated.
4. Drain the pump.

This pump has not been designed to pump corrosive materials. Corrosive liquids could attack pump components, and cause rapid deterioration and failure.

Overheated pumps can cause severe burns and injury. If overheating of the pump occurs:

1. Stop the pump immediately.
2. Allow the pump to cool.
3. Refer to instructions in this manual before restarting the pump.

Never install a positive shut-off valve in the discharge line; discharge restrictions will cause excessive friction loss resulting in overloading and destruction of pump and drive components. It is strongly recommended that unless absolutely necessary, no positive shut-off valve be installed in the suction line; excessive restriction will cause incomplete filling of the diaphragm chamber and result in short diaphragm life.



////////////////////////////////////
//
// Do not operate the pump without the eccentric guard assembly and cou-
// pling guard in place. Exposed rotating parts can catch clothing, fingers, or
// tools, causing severe injury to personnel.
//
////////////////////////////////////

////////////////////////////////////
//
// When operating internal combustion engines in an enclosed area, make cer-
// tain that exhaust fumes are piped to the outside. These fumes contain car-
// bon monoxide, a deadly gas that is colorless, tasteless, and odorless.
//
////////////////////////////////////

////////////////////////////////////
//
// Fuel used by internal combustion engines presents an extreme explosion
// and fire hazard. Make certain that all fuel lines are securely connected and
// free of leaks. Never refuel a hot or running engine. Avoid overfilling the fuel
// tank. Always use the correct type of fuel.
//
////////////////////////////////////

////////////////////////////////////
//
// This pump designed to operate with the engine governor set at 2600 RPM.
// Never tamper with the governor to obtain more power; the governor
// establishes safe operating limits that should not be exceeded.
//
////////////////////////////////////

////////////////////////////////////
//
// After the pump has been installed, make certain that the pump and all pip-
// ing or hose connections are secure before attempting to operate it.
//
////////////////////////////////////

////////////////////////////////////
//
// After the pump has been located in its operating position, make certain that
// the wheels have been blocked and secured before attempting to operate
// the pump.
//
////////////////////////////////////

INSTALLATION

Pump installations are seldom identical. This section summarizes recommended installation practice relative to inspection, pump positioning, and suction and discharge piping. For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Approximate physical dimensions of this pump are shown in figure 1.

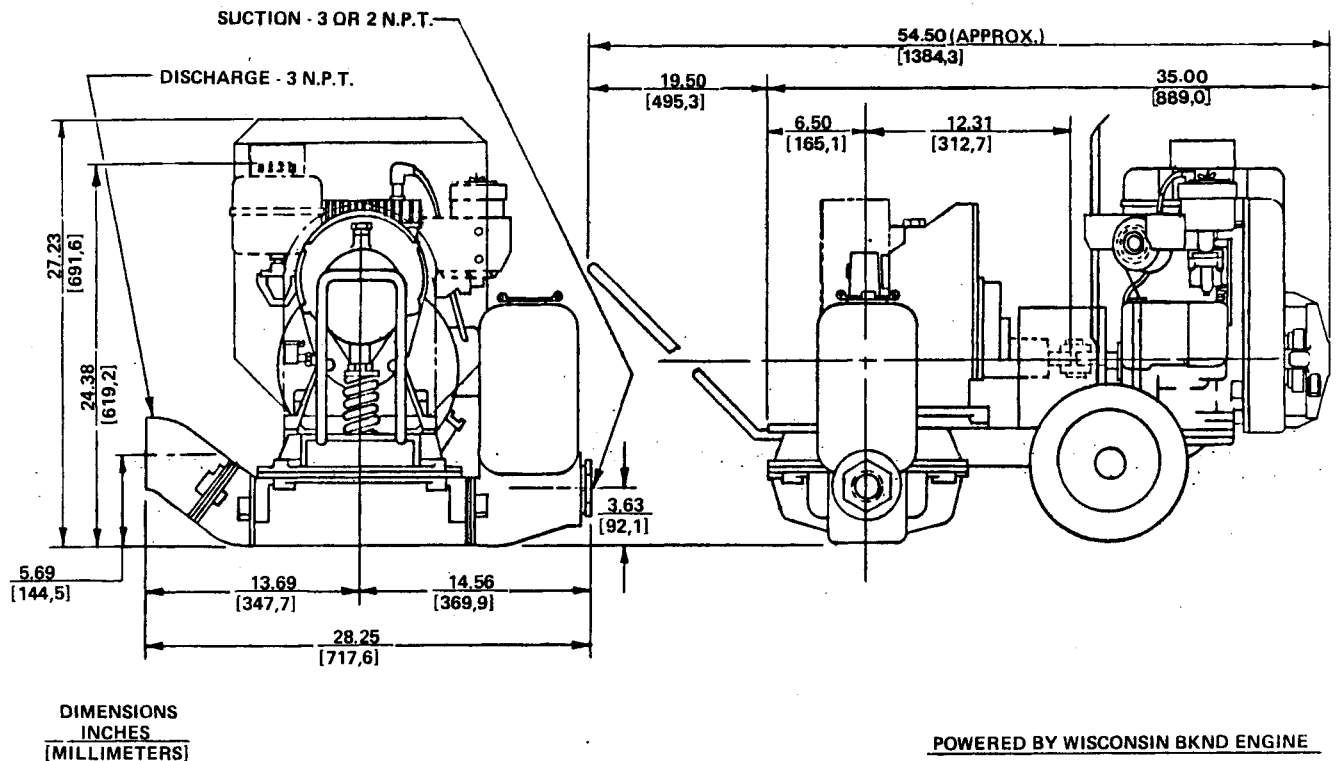
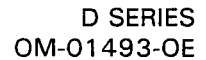


Figure 1. Pump Model 3D-BKND-X

Preinstallation Inspection

The pump assembly was inspected and tested before it was shipped from the factory. Before installation, check the pump for damage which may have occurred during shipment. Check as follows:

- Inspect the pump end, gear box assembly, and engine for cracks, dents, damaged threads, and other obvious damage.
- Check for and tighten loose bolts, nuts, capscrews, and other attaching hardware.
- Carefully read all tags, decals, and markings on the pump assembly, and follow the instructions indicated.
- Check all lubricant levels and lubricate as necessary (see LUBRICATION in Section E.)





//
//
// **WARNING** //
//
// Do not operate the pump without the coupling guard //
// and eccentric guard in place and secured. Exposed //
// rotating parts can catch clothing, fingers, or tools, //
// causing severe injury to personnel. //
//
//

OPERATION

WARNING

This pump is designed to pump only non-corrosive liquids. Do not attempt to pump liquids which may attack pump fittings.

The particular service in which this pump is used will affect pump performance, especially discharge velocities. Consult the Gorman-Rupp factory for actual performance levels of this pump.

Refer to **LUBRICATION** in Section E, and check that the gear box is properly lubricated.

CAUTION

The pump end is designed to operate at 60 cycles per minute through a gear box with a 43.36:1 ratio. Set the engine governor at 2600 RPM **maximum**. Operation at higher governor settings can cause pump components to break down.

Consult the manual(s) furnished with the pump engine before starting the pump.

WARNING

Before operating or servicing the pump, be certain proper safety practices are followed. Provide adequate ventilation, prohibit smoking, wear static-resistant clothing and shoes. Clean up all fuel spills immediately.

WARNING

The engine used in this pump is not standard. It has been modified for spark-arrested operation, and can not be further modified without affecting performance and safety factors. The spark-arresting modifications must be inspected and maintained regularly while the unit is in use.

Open any valves installed in the suction and/or discharge lines, and start the pump.

```

////////////////////////////////////
//
//                               WARNING
//
// Make certain that any positive shut-off valve installed
// in the suction line is open before operating the pump;
// excessive restriction will cause incomplete filling of
// the diaphragm chamber and result in short diaphragm
// life. No positive shut-off valve should be installed in
// the discharge line.
//
////////////////////////////////////
  
```

The pump may not prime immediately because the suction line must first fill with liquid. If the pump fails to prime within five minutes, stop the pump and check the suction line for leaks.

Check the pump for unusual noises or excessive vibration while it is operating.

No leakage should be visible at pump mating surfaces, or at pump connections or fittings. Keep all line connections and fittings tight to maintain maximum pump efficiency.

```

////////////////////////////////////
//
//                               WARNING
//
// Overheated pumps can cause severe burns and injury.
// If overheating of the pump casing occurs:
//   1. Stop the pump immediately.
//   2. Allow the pump to cool.
//   3. Refer to instructions in this manual before
//      restarting the pump.
//
////////////////////////////////////
  
```

```

////////////////////////////////////
//
//                               WARNING
//
// Overheating may produce dangerous fumes. Use ex-
// treme caution when venting the pump, or when
// removing plugs or fittings.
//
////////////////////////////////////
  
```

Check the strainer regularly during operation or if the flow rate begins to drop, and clean it as necessary. Be especially alert for unusual noises when pumping liquids containing solids.

After stopping the pump, disconnect the spark plug to ensure that the engine will remain inoperative.



In below freezing conditions, drain the water from the pump and the lines when the pump is not in operation. Also, clean out any solids by flushing with a hose.

If the pump will be idle for more than a few hours, or if it has been pumping liquids containing a large amount of solids, flush it with clean water.

GROUNDING

To eliminate static build-up of the liquid being pumped, the pump must be grounded by attaching the ground wire assembly to a ground rod. Install the ground rod in accordance with the National Electrical Codes and all local codes. Be sure the clamp or fastener has made a tight electrical connection with the rod.

CAUTION

Inspect and test the ground wire assembly for conductivity. Replace broken or frayed wire before resuming operating.

TROUBLESHOOTING

```

////////////////////////////////////
//
//                               WARNING
//
// Before attempting to open or service the pump:
//   1. Familiarize yourself with this manual.
//   2. Disconnect the spark plug to ensure that the
//      engine will remain inoperative.
//   3. Allow the pump to cool if overheated.
//   4. Drain the pump.
//
////////////////////////////////////

```

Trouble	Possible Cause	Probable Remedy
PUMP FAILS TO PRIME	Air leak in suction line. Lining of suction hose collapsed. Integral suction or discharge check valve clogged, binding, or not seating properly. Cracked or broken diaphragm. Diaphragm not securely in place. Strainer clogged.	Correct leak. Replace suction hose. Clean valves. Check that flange nuts are tight. Replace diaphragm. Secure diaphragm. Clean strainer.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE continued	Air leak in suction line. Suction intake not properly submerged. Strainer clogged. Lining of suction hose collapsed. Cracked or broken diaphragm. Diaphragm not securely in place.	Correct leak. Check installation. Clean strainer. Replace suction hose. Replace diaphragm. Secure diaphragm.



Trouble	Possible Cause	Probable Remedy
continued	<p>Suction lift or discharge head too high.</p> <p>Integral suction or discharge check valve clogged, binding, or not seating properly.</p>	<p>Check installation, and correct as required.</p> <p>Clean valves. Check that flange nuts are tight.</p>
PUMP REQUIRES TOO MUCH POWER	<p>Liquid solution too thick.</p> <p>Integral discharge check valve clogged or binding.</p> <p>Pump speed too high.</p> <p>Discharge head too high.</p> <p>Bearings in power source or gear box worn or binding.</p>	<p>Dilute if possible.</p> <p>Clean valve.</p> <p>Reduce engine speed.</p> <p>Shorten total discharge length or install larger diameter discharge line.</p> <p>Check bearings.</p>
PUMP CLOGS FREQUENTLY	<p>Integral suction or discharge check valve clogged, binding, or not seating properly.</p>	<p>Clean valves. Check that flange nuts are tight.</p>
EXCESSIVE NOISE	<p>Pump, gear box, or engine not securely mounted.</p> <p>Gear box not properly lubricated.</p>	<p>Check and tighten mounting bolts.</p> <p>See LUBRICATION, Section E.</p>



MAINTENANCE AND REPAIR

MAINTENANCE AND REPAIR OF THE WEARING PARTS OF THE PUMP WILL MAINTAIN PEAK OPERATING PERFORMANCE.

PERFORMANCE TEST DATA FOR PUMP MODEL 3D-BKND-X

In Gallons Per Minute, 60 Strokes Per Minute

STATIC LIFT IN FEET	STATIC DISCHARGE HEAD IN FEET			
	5	10	15	20
5	78	67	66	68
10	73	64	66	62
15	68	60	64	59
20	64	59	65	59
25	56	56	60	56

In Liters Per Minute, 60 Strokes Per Minute

STATIC LIFT IN METERS	STATIC DISCHARGE HEAD IN METERS			
	1,5	3,0	4,8	6,1
1,5	295,2	253,6	249,8	257,4
3,0	276,3	242,2	249,8	234,7
4,6	257,4	227,1	242,2	223,3
6,1	242,2	223,3	246,0	223,3
7,6	212,0	212,0	227,1	212,0

*STANDARD PERFORMANCE FOR PUMP MODEL 3D-BKND-X

*Based on 70°F clear water at sea level with minimum suction lift, using 2-inch (5.08 cm.) suction hose and 3-inch (7.62 cm.) non-collapsible discharge hose. Since pump installations are seldom identical, your performance may be different due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.

If your pump serial number is followed by an "N" or if you have a question on performance, contact The Gorman-Rupp Company.

SECTIONAL DRAWING

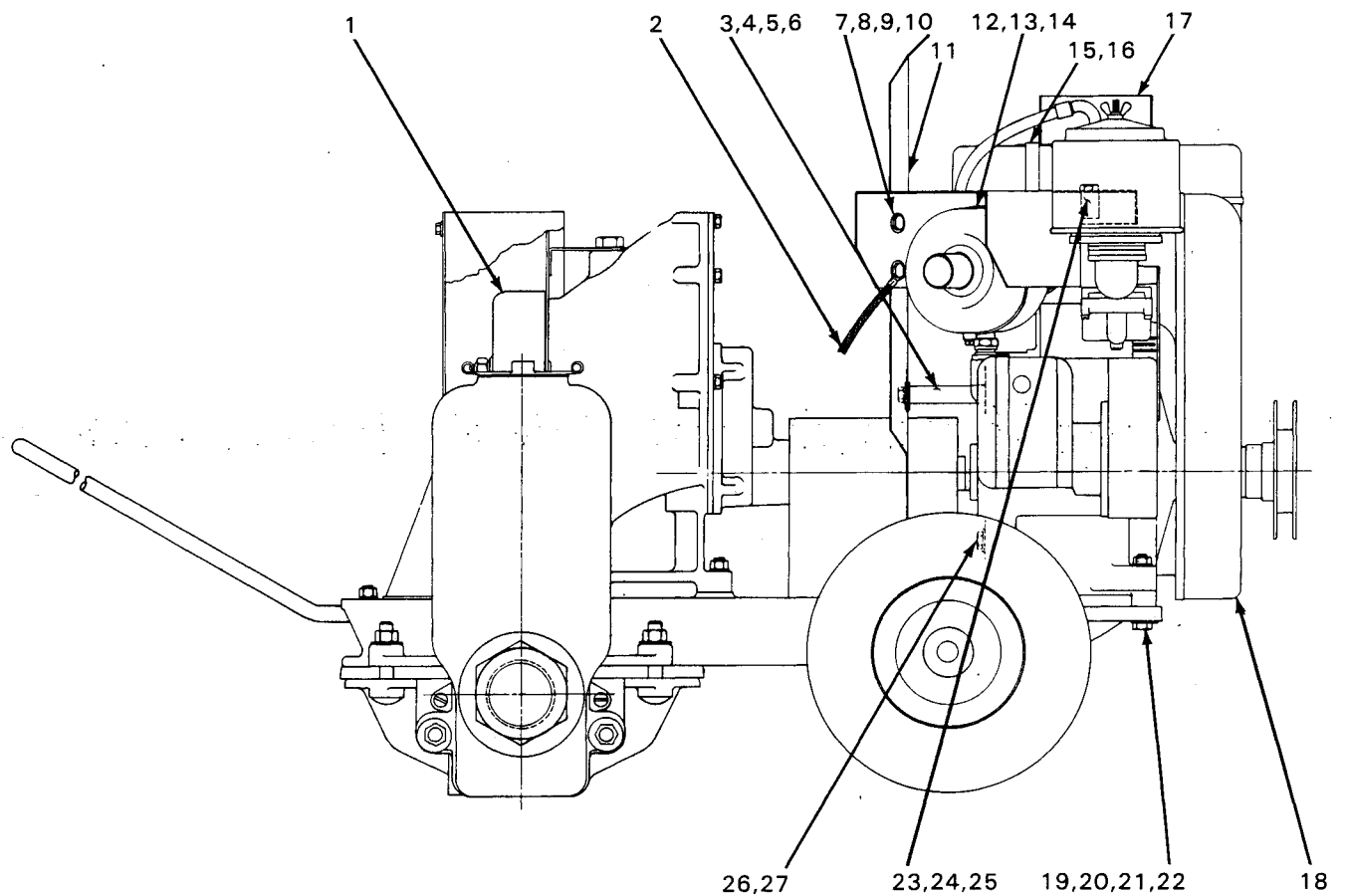


Figure 1. Pump Model Assembly 3D-BKND-X



PARTS LIST

PUMP MODEL ASSEMBLY 3D-BKND-X

(From S/N 576119 up)

ITEM NO.	PART NAME	PART NUMBER	MATERIAL CODE	QTY
1	PUMP END ASSEMBLY (See Fig. 2)	3D		1
2	GROUND WIRE ASSEMBLY	13830		1
3	SPACER	31411-115		1
4	HEX HEAD CAPSCREW	B-0613	15991	1
5	LOCK WASHER	J-06	15991	1
6	FLAT WASHER	K-06	15991	4
7	HEX HEAD CAPSCREW	B-0403	15991	2
8	HEX NUT	D-04	15991	2
9	LOCK WASHER	J-04	15991	2
10	FLAT WASHER	K-0467	15991	4
11	ENGINE SHIELD	34748-003		1
12	MUFFLER	29334-206		1
13	CLOSE NIPPLE	T-16	15070	1
14	PIPE COUPLING	AE-16	11990	1
15	BANDING STRAP	33157-007		2
16	STRAP CLAMP	12961-023		2
17	FILL CAP GUARD	42381-008		1
18	WISCONSIN BKND ENGINE	202-B6		1
19	HEX HEAD CAPSCREW	B-0611	15991	REF
20	FLAT WASHER	K-06	15991	REF
21	LOCK WASHER	J-06	15991	REF
22	HEX NUT	D-06	15991	REF
23	HEX HEAD CAPSCREW	B-0509	15991	1
24	SPACER	462	15070	1
25	MUFFLER SHIELD	34453-003		1
26	HEX HEAD CAPSCREW	B-0602	15991	REF
27	DYNA-SEAL WASHER	S-1586		REF
OPTIONAL				
	STATIONARY BASE	8105	24000	1

CANADIAN SERIAL NO. AND UP

SECTIONAL DRAWING

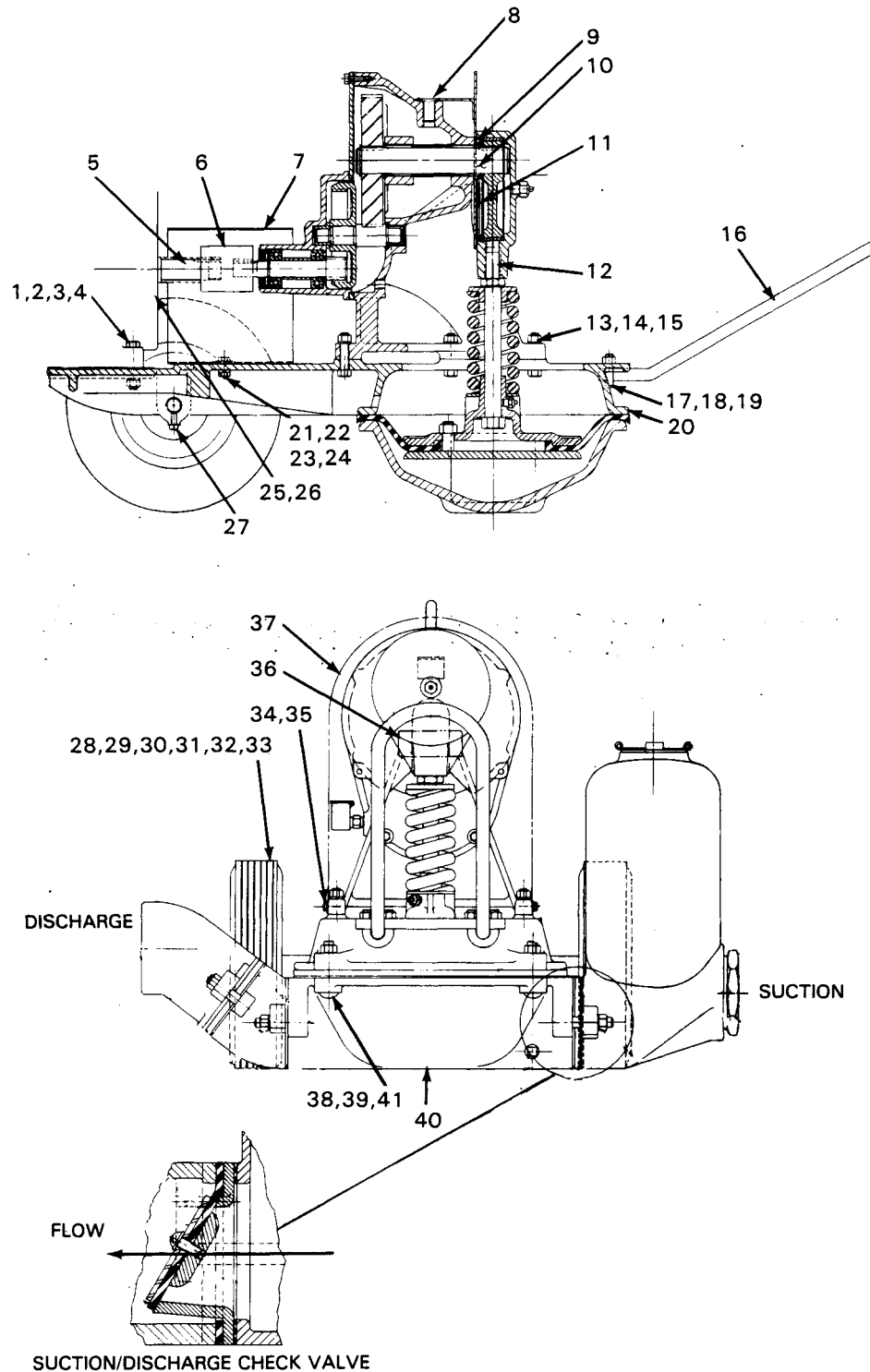


Figure 2. 3D-BKND-X Pump End Assembly



PARTS LIST

3D-BKND-X PUMP END ASSEMBLY

ITEM NO.	PART NAME	PART NUMBER	MATERIAL CODE	QTY
1	HEX HEAD CAPSCREW	B-0611	15991	4
2	LOCK WASHER	J-06	15991	4
3	HEX NUT	D-06	15991	4
4	FLAT WASHER	K-0608	15991	4
5	SPACER SLEEVE	2-R	16000	1
6	★ COUPLING	11730	00000	1
7	COUPLING GUARD	34613-005		1
8	HEX HEAD CAPSCREW	B-1004	15991	REF
9	★ SNAP RING	5385	00000	1
10	GEAR BOX ASSEMBLY (See Fig. 5)	44161-008		1
11	ECCENTRIC CAM WASHER	6531	18040	REF
12	PLUNGER ROD ASSEMBLY (See Fig. 4)	5685-B		1
13	HEX HEAD CAPSCREW	B-0608	15991	5
14	LOCK WASHER	J-06	15991	5
15	HEX NUT	D-06	15991	5
16	DRAW BAR	5438	15990	1
17	U-BOLT	5495	15990	2
18	HEX NUT	D-06	15991	4
19	LOCK WASHER	J-06	15991	4
20	DIAPHRAGM FRAME	7924-B	13010	1
21	HEX HEAD CAPSCREW	B-0404	15991	2
22	FLAT WASHER	K-04	15991	2
23	LOCK WASHER	J-04	15991	2
24	HEX NUT	D-04	15991	2
25	HEX HEAD CAPSCREW	B-0602	15991	4
26	DYNA-SEAL WASHER	S-1586		4
27	SQUARE HEAD SETSCREW	G-0604	15990	1
28	PNEUMATIC TIRE	S-0752		2
29	AXLE	5645	15990	1
30	SPACER WASHER	5382	15990	7
31	COTTER PIN	M-0306	15990	2
32	SQUARE HEAD SETSCREW	G-0604	15990	1
33	PIPE	5657	15070	1
34	HEX HEAD CAPSCREW	B-0402	15991	4
35	LOCK WASHER	J-04	15991	4
36	LUBE DECAL	38816-085		1
37	ECCENTRIC GUARD ASSEMBLY	42381-030		1
38	HEX NUT	D-08	15991	4
39	FLAT WASHER	K-07	15991	4
40	DIAPHRAGM POT ASSY (See Fig. 3)	46475-703		1
41	RIB MACHINE BOLT	BJ-0811	15990	REF
NOT SHOWN				
	NAME PLATE	2613-BP	13990	1
	STRAINER	9026	24000	1

★ Indicates Items Recommended For Stock

SECTIONAL DRAWING

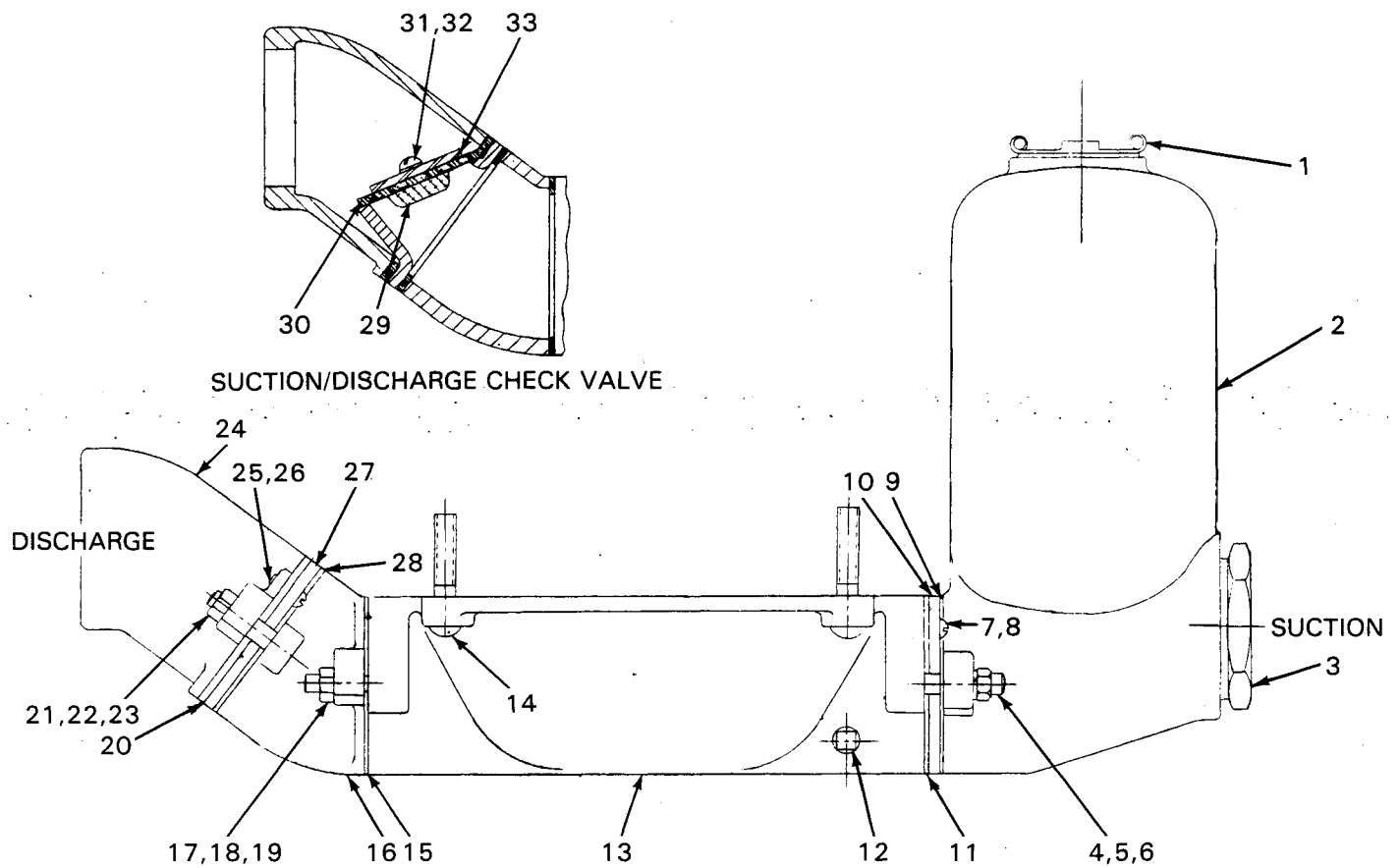


Figure 3. 46475-703 Diaphragm Pot Assembly



PARTS LIST

46475-703 DIAPHRAGM POT ASSEMBLY

ITEM NO.	PART NAME	PART NUMBER	MATERIAL CODE	QTY
1	SUCTION STUB PLUG AND GASKET	S-0591		1
2	SUCTION STUB	5376	13010	1
3	REDUCER PIPE BUSHING	AP-4832	11990	1
4	STUD	C-0810	15991	2
5	HEX NUT	D-08	15991	2
6	FLAT WASHER	K-07	15991	2
7	ROUND HEAD MACHINE SCREW	X-0404	15991	2
8	LOCK WASHER	J-04	15991	2
9	★ SUCTION STUB GASKET	5374-GA	19140	1
10	SUCTION VALVE SEAT	5374	10010	1
11	★ SUCTION FLAP VALVE ASSEMBLY	46413-027		1
12	DIAPHRAGM POT DRAIN PLUG	P-06	11990	1
13	DIAPHRAGM POT	5375	13010	1
14	RIB MACHINE BOLT	BJ-0811	15990	4
15	★ INBOARD DISCHARGE FLANGE GASKET	5374-GA	19140	1
16	INBOARD DISCHARGE FLANGE	5377	13040	1
17	STUD	C-0809	15991	2
18	HEX NUT	D-08	15991	2
19	FLAT WASHER	K-07	15991	2
20	★ DISCHARGE FLAP VALVE ASSEMBLY	46413-027		1
21	STUD	C-0810	15991	2
22	HEX NUT	D-08	15991	2
23	WASHER	11273	15990	2
24	OUTBOARD DISCHARGE FLANGE	5658	13010	1
25	ROUND HEAD MACHINE SCREW	X-0403	15991	2
26	LOCK WASHER	J-04	15991	2
27	★ DISCHARGE FLAP VALVE SEAT	5374	10010	1
28	★ GASKET	5374-GA	19140	1
29	★ VALVE WEIGHT	5426	13010	2
30	★ FLAP VALVE	5427-A	19140	2
31	LOCK WASHER	J-04	17000	4
32	ROUND HEAD MACHINE SCREW	X-0403	17000	4
33	★ VALVE WEIGHT	5428	15990	2

★ Indicates Items Recommended For Stock

SECTIONAL DRAWING

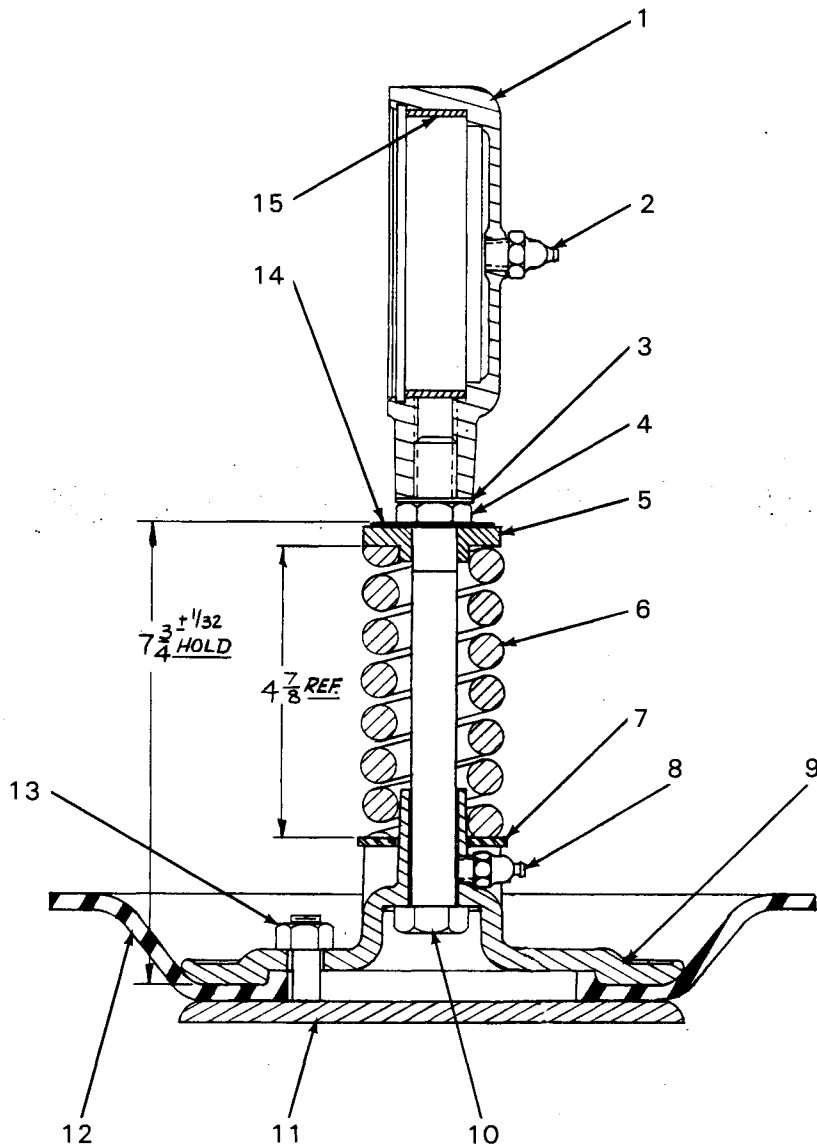


Figure 4. 5685-B Plunger Rod Assembly



PARTS LIST

5685-B PLUNGER ROD ASSEMBLY

ITEM NO.	PART NAME	PART NUMBER	MATERIAL CODE	QTY
1	ECCENTRIC CAP	5373	13010	1
2	LUBE FITTING	S-0191		1
3	T-LOCKWASHER	AK-12	15991	1
4	JAM NUT	AT-12	15990	1
5	SPRING WASHER	5384	15990	1
6	★ SPRING	5398	16080	1
7	FLAT WASHER	K-20	15991	1
8	LUBE FITTING	S-0191		1
9	UPPER DIAPHRAGM PLATE	5381	10010	1
10	★ PLUNGER ROD ASSY	5383	15990	1
11	LOWER DIAPHRAGM PLATE ASSY	5394-A	10030	1
12	★ DIAPHRAGM	S-1042		1
13	HEX NUT	D-08	15991	3
14	★ ADJUSTING SHIM	11840-B	15990	4
15	★ ECCENTRIC BEARING	5610	14000	1

★ Indicates Items Recommended For Stock

SECTIONAL DRAWING

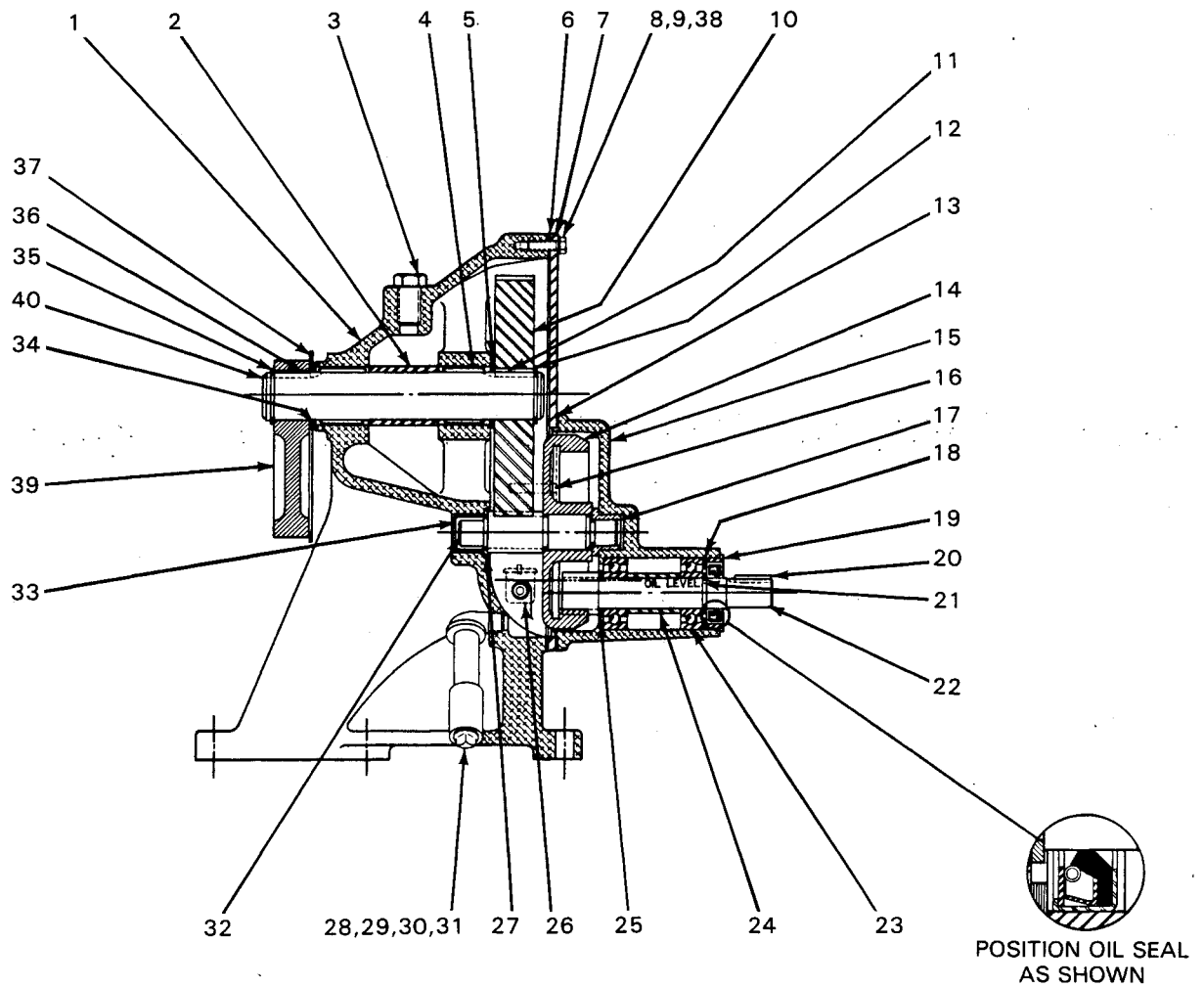


Figure 5. 44161-008 Gear Box Assembly



PARTS LIST

GEAR BOX ASSEMBLY 44161-008

ITEM NO.	PART NAME	PART NUMBER	MATERIAL CODE	QTY
1	GEAR HOUSING	5367	13010	1
2	SPACER SLEEVE	S-0952		1
3	HEX HEAD CAPSCREW	B-1004	15991	1
4	★ CAM SHAFT BEARING	S-0702		2
5	SPACER WASHER	5395	15990	1
6	★ GEAR HOUSING GASKET	5367-G	20050	1
7	COVER PLATE	5396	15990	1
8	HEX HEAD CAPSCREW	B-0403	15991	7
9	LOCK WASHER	J-04	15991	9
10	★ CAM SHAFT GEAR	5334	16060	1
11	★ CAM SHAFT GEAR KEY	31811-040	15990	1
12	★ SNAP RING	S-0700		1
13	★ BEARING HOUSING GASKET	S-0825		1
14	★ PINION GEAR	S-0823		1
15	BEARING HOUSING	5918-A	13010	1
16	DOWEL PIN	AA-0405	15990	2
17	★ PINION SHAFT BUSHING	S-0824		1
18	DRIVE SHAFT WASHER	2-M	15990	3
19	★ OIL SEAL ASSEMBLY	14408		1
20	★ DRIVE SHAFT KEY	N-0304	15990	1
21	SNAP RING	S-0269		1
22	★ DRIVE SHAFT	8211	16070	1
23	★ DRIVE SHAFT BEARING	S-1044		2
24	SPACER SLEEVE	5922	15070	1
25	SNAP RING	S-0269		1
26	OIL CUP	S-0617		1
27	SPACER WASHER	5382	15990	1
28	STREET ELBOW	RS-04	11990	1
29	PIPE NIPPLE	T-0408	15070	1
30	PIPE COUPLING	AE-04	11990	1
31	GEAR BOX DRAIN PLUG	P-04	11990	1
32	★ PINION SHAFT	5333	16020	1
33	★ PINION SHAFT BEARING	S-0703		1
34	★ ECCENTRIC CAM SHIM SET	13103-A	15990	1
35	SNAP RING	S-0700		1
36	★ ECCENTRIC CAM KEY	31811-040		1
37	WASHER	6531	18040	1
38	HEX HEAD CAPSCREW	B-0407	15991	2
39	★ ECCENTRIC CAM	5378-A	10080	1
40	★ ECCENTRIC CAM SHAFT	5397	15020	1

★ Indicates Items Recommended For Stock

PUMP ASSEMBLY DISASSEMBLY AND REASSEMBLY

This pump requires little service due to its rugged, minimum-maintenance design. If it becomes necessary to inspect or replace components, however, follow these instructions, which are keyed to the sectional views (see figures 1 through 5) and the accompanying parts lists.

```

////////////////////////////////////
//
//                               WARNING
//
// The engine used in this pump is not standard. It has
// been modified for spark-arrested operation, and can-
// not be further modified without affecting perfor-
// mance and safety factors. The spark-arresting
// modifications must be inspected and maintained
// regularly while the unit is in use.
//
////////////////////////////////////

```

```

////////////////////////////////////
//
//                               WARNING
//
// Before performing any maintenance or repair, or
// disassembling this pump, disconnect the spark plug
// to ensure that the engine will remain inoperative.
//
////////////////////////////////////

```

ENGINE SEPARATION

NOTE

It is not necessary to remove the engine to disassemble the pump end assembly (1, figure 1) or gear box assembly (10, figure 2) or any of their components.

See figure 1, and disconnect the ground wire assembly (2) from the engine (1).

See figure 2, and remove the hex head capscrews (21), flat washers (22), lock washers (23), and hex nuts (24) securing the coupling guard (7) to the diaphragm frame (20); remove the coupling guard.

Remove the hex head capscrews (1), lock washers (2), and hex nuts (3), and flat washers (4) securing the engine to the diaphragm frame.

Separate the engine from the pump end assembly, retaining the shaft key securing the gear box drive shaft to the coupling (6).

PUMP END DISASSEMBLY (See figure 2)

Close all connecting valves, and drain the pump by removing the drain plug (12, figure 3). Clean and reinstall the drain plug.

Remove the eccentric guard assembly (37) by removing the hex head capscrews (34) and lock washers (35) securing the eccentric guard to the gear box assembly (10).

To remove the diaphragm pot assembly (40), remove the hex nuts (38) and flat washers (39) securing the diaphragm pot to the diaphragm frame (20).

To remove the plunger rod assembly (12), remove the snap ring (9) securing the assembly to the gear box cam shaft.

To remove the gear box assembly, remove the hex head capscrews (13), lock washers (14), and hex nuts (15) securing the gear box to the diaphragm frame. If the engine has not been removed, remove the gear box drive shaft from the engine coupling, retaining the drive shaft key.

Diaphragm Pot Disassembly (See Figure 3)

To remove the suction accumulator (2), remove the hex nuts (5) and flat washers (6) securing the accumulator to the diaphragm pot (13).

To remove the suction check valve assembly (11), remove the round head machine screws (7) and lock washers (8) securing the valve seat (10) and flap valve assembly to the diaphragm pot.

To remove the inboard discharge flange (16), remove the hex nuts (18) and flat washers (19) securing the flange to the diaphragm pot.

To remove the outboard discharge flange (24), remove the hex nuts (22) and washers (23) securing the flange to the inboard discharge flange.

To remove the discharge check valve assembly (20), remove the round head machine screws (25) and lock washers (26) securing the valve seat (27) and check valve assembly to the outboard discharge flange.

The suction and discharge flap valve assemblies are identical parts, and operate in the same direction. For removal and/or replacement of flap valve components, remove the round head machine screws (32) and lock washers (31).

Plunger Rod Disassembly (See Figure 4)

To remove the diaphragm (12), remove the hex nuts (13) securing the lower diaphragm plate assembly (11) to the upper diaphragm plate (9).

To separate the upper diaphragm plate, flat washer (7), spring (6), spring washer (5), adjusting shims (14), jam nut (4), and T-lockwasher (3), unscrew the plunger rod (10) from the eccentric cap (1).

The eccentric bearing (15) is a press fit in the eccentric cap.

Gear Box Disassembly (See Figure 5)

Drain the gear box by removing the gear housing drain plug (31). Clean and reinstall the drain plug.

Remove the two hex head capscrews (38) and lock washers (9) securing the bearing housing (15) and cover plate (7) to the gear housing (1), and the five hex head capscrews (8) and lock washers (9) securing the cover plate to the gear housing.

Disengage the drive shaft (22) from the pinion gear (14), and remove the bearing housing, assembled cover plate, and assembled drive shaft and components.

Remove the two hex head capscrews (8) and lock washers (9) securing the cover plate to the bearing housing.

To disassemble the drive shaft components, remove the oil seal assembly (19) and drive shaft washer (18), and force the drive shaft and assembled components out of the bearing housing. Remove the outboard snap ring (21), and remove the outboard bearing (23) and spacer sleeve (24). Remove the inboard snap ring (25), and remove the inboard bearing.

Remove the pinion shaft bushing (17), disengage the pinion gear from the cam shaft gear (10), and remove the pinion shaft (32) and assembled pinion gear. Remove the spacer washer (27) from the pinion shaft, and remove the pinion gear. Force the pinion shaft bearing (33) out of the gear housing.

Remove the snap ring (35) securing the eccentric cam (39) on the eccentric cam shaft (40), and remove the eccentric cam, retaining the eccentric cam key (36). Remove the washer (37), and the eccentric cam shim set (34). Drive the eccentric cam shaft (40) and the remainder of the assembled components from the pump end of the gear housing out of the drive end.

To disassemble the cam shaft components, remove the snap ring (12), and remove the cam shaft gear, retaining the gear key (11). Remove the spacer washer (5), cam shaft bearings (4), and spacer sleeve (2).

PUMP END REASSEMBLY

Gear Box Reassembly (See Figure 5)

Clean all shafts and gears with a soft cloth soaked in cleaning solvent.

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WARNING

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Most cleaning solvents are toxic and flammable. Use

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them only in a well-ventilated area free from ex-

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cessive heat, sparks, and flame. Read and follow all

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precautions printed on solvent containers.

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Clean shaft sleeves, spacers, and the bores of the gear housing and shaft and bearing housing with a soft cloth soaked in cleaning solvent.

Clean all bearings in cleaning solvent free of grit or metallic particles.

Inspect all shafts, gears, and bearings, replace as necessary.

Install the eccentric cam shaft gear snap ring and the cam shaft gear key. Install the eccentric cam shaft gear, spacer washer, outboard bearing, spacer sleeve, and inboard bearing. Install the eccentric cam shaft and assembled components in the gear housing.

Install the eccentric cam washer and shim set. Install the eccentric cam and eccentric cam snap ring.

Install the pinion shaft bearing in the gear housing. Install the pinion shaft spacer sleeve. Install the pinion shaft in the shaft bearing, making certain that the shaft engages the eccentric cam shaft gear. Install the pinion gear and the pinion gear bushing.

Install the inboard snap ring on the drive shaft, and install the drive shaft inboard bearing.

Install the spacer sleeve on the drive shaft, and install the drive shaft outboard bearing and the outboard snap ring.

Install the drive shaft and assembled bearings in the bearing housing.

Install the drive shaft washer. Inspect the oil seal assembly, and replace as necessary. Install the oil seal assembly with the lip positioned as shown in figure 5.

Replace the bearing housing gasket (13), and install the two capscrews and lock washers securing the cover plate to the bearing housing.

Replace the cover plate gasket (6), position the cover plate and the assembled bearing housing and drive shaft components on the dowel pins (16), and secure the cover plate to the gear housing, making certain that the pinion shaft bushing seats squarely in the bore of the bearing housing and that the drive shaft engages the pinion shaft gear.

Plunger Rod Reassembly (See Figure 4)

Clean the plunger rod, and the bores of the eccentric, spacer, spring centering washer, and upper diaphragm plate with a soft cloth soaked in cleaning solvent.

Inspect the eccentric bearing, and replace as necessary. Install the bearing in the eccentric cap.

Inspect the plunger rod, and replace if bent or warped. Install the plunger rod in the upper diaphragm plate. Install the flat washer and spring on the upper diaphragm plate, and install the spring washer, adjusting shims, and jam nut on the plunger rod.

Refer to figure 4, and tighten the jam nut until the spring is compressed to $4\frac{7}{8}$ inches. With the spring properly compressed, the distance between the bottom of the upper diaphragm plate and the top of the adjusting shims should measure $7\frac{3}{4}$ inches. Measure this distance, and add or remove adjusting shims until it is correct.

Install the T-lockwasher on the plunger rod, and screw the plunger rod into the eccentric cap until the cap and T-lockwasher are flush.

Inspect the diaphragm, and replace it if damaged or worn. Install the diaphragm on the lower diaphragm plate, and secure the lower diaphragm plate to the upper diaphragm plate.

Diaphragm Pot Reassembly (See Figure 3)

Replace the inboard discharge flange gasket (15), and secure the inboard discharge flange to the diaphragm pot.

Inspect the discharge flap valve assembly, and replace as necessary. Position the discharge flap valve assembly in the outboard discharge flange, install the valve seat, and secure the valve seat and discharge flap valve assembly to the outboard discharge flange.

Replace the outboard discharge flange gasket (28), and secure the outboard discharge flange to the inboard discharge flange.

Inspect the suction flap valve assembly, and replace as necessary. Position the suction flap valve assembly in the diaphragm pot, install the valve seat, and secure the valve seat and suction flap valve assembly to the diaphragm pot.

Replace the suction accumulator gasket (9), and secure the accumulator to the diaphragm pot.

Pump End Reinstallation (See Figure 2)

If the engine has not been removed, install the gear box drive shaft key in the shaft keyway, and install the drive shaft and key in the engine coupling. Secure the gear box to the diaphragm ring.

See figure 1, and secure the coupling guard to the base assembly.

Position the eccentric cap of the plunger rod assembly over the eccentric cam of the gear box assembly, and install the snap ring securing the plunger rod assembly.

Secure the diaphragm pot assembly to the diaphragm ring, making certain that the lip of the diaphragm is seated evenly between the diaphragm pot and the diaphragm ring.

Secure the eccentric guard assembly to the gear box assembly.

ENGINE INSTALLATION (See Figure 1)

If the engine has been removed, install the engine coupling over the gear box drive shaft key and drive shaft, and secure the engine to the diaphragm frame.

Connect the ground wire assembly to the engine.

Secure the coupling guard to the diaphragm frame.

LUBRICATION**Plunger Rod Assembly (See figure 3)****CAUTION**

The eccentric bearing (15) should be lubricated thoroughly after each 8 hours of operation. Failure to do so may cause the bearing to overheat and fail.

Lubricate the plunger rod assembly with Citgo #2 or equivalent automotive grease through the lubrication fittings (2 and 8), which are accessible through openings in the eccentric guard.

Apply sufficient grease to the upper lubrication fitting (2), so that grease escapes from the eccentric cap (1). Apply sufficient grease to the lower diaphragm fitting (8) so that grease escapes from the top of the upper diaphragm plate (9).

Gear Box Assembly (See figure 4)

Remove the hex head capscrew (2), lock washer (43), and flat washer (44) at the top of the gear box housing (3), and fill the oil cup (42) with a good grade of SAE 20-30 non-detergent motor oil to the midpoint of the oil cup sight gauge. Reinstall the hex head capscrew, flat washer, and lock washer.

OPERATION

Make certain that all piping connections are secure, and open all connecting valves.

See Section C for operation.

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