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GORMAN-RUPP PUMPS

10 SERIES PUMPS

12B, 12C, 12D, 13A, 13C And 13E Electric Motor Or Engine Driven Pumps

with Self Lubricated or Grease Seal

MANUAL PART 3 of 3

MAINTENANCE AND REPAIR WITH TROUBLESHOOTING

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO
GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA Printed in U.S.A.

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The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

INTRODUCTION

Thank You for purchasing a Gorman-Rupp 10 Series Pump. **Read this manual** carefully to learn how to safely maintain and service your pump. Failure to do so could result in personal injury or damage to the pump.

A set of three manuals accompanies your pump. The Installation/Operation Manual contains essential information on installing and operating the pump. The Parts List Manual provides a performance curve, a pump model cross-section drawing, and parts list for your pump.

This Maintenance and Repair Manual provides troubleshooting and maintenance instructions required to properly diagnose operational problems, and to service the pump components.

As described on the following page, this manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed precautions for every situation that might occur during maintenance of the pump. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that **only** safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed **only** after establishing that neither personal safety nor pump integrity are compromised by such practices. Pumps and related equipment **must** be installed and operated according to all national, local and industry standards.

If there are any questions regarding the pump which are not covered in this manual or in other literature accompanying the unit, please contact your Gorman-Rupp distributor or the Gorman-Rupp Company:

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901--1217
or:
Gorman-Rupp of Canada Limited
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St. Thomas, Ontario N5P 3R7

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RECORDING MODEL AND SERIAL NUMBERS

Please record the pump model, serial number, voltage, and phase in the spaces provided below. Your Gorman-Rupp distributor needs this information when you require parts or service.

Pump Model: _____

Serial Number: _____

Voltage: _____

Phase: _____

WARRANTY INFORMATION

The warranty provided with your pump is part of Gorman-Rupp's support program for customers who operate and maintain their equipment as described in this and the other accompanying literature. Please note that should the equipment be abused or modified to change its performance beyond the original factory specifications, the warranty will become void and any claim will be denied.

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



Immediate hazards which WILL result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure to follow the procedure.



Hazards or unsafe practices which COULD result in severe personal injury or death. These instructions describe the procedure required and the injury which could result from failure to follow the procedure.



Hazards or unsafe practices which COULD result in minor personal injury or product or property damage. These instructions describe the requirements and the possible damage which could result from failure to follow the procedure.

NOTE

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

SAFETY - SECTION A

This information applies to 10 Series electric motor or engine driven pumps. Refer to the manual accompanying the power source before attempting to begin operation.

This manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed instructions and precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that only safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed only after establishing that neither personal safety nor pump integrity are compromised by such practices.

This manual contains essential information on troubleshooting and maintaining the pump. In addition to this manual, see the separate literature covering installation and operation, pump parts, and any optional equipment shipped with the pump.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Disconnect or shut down the power source and take the necessary precautions to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

WARNING!

Do not attempt to pump any liquids the pump has not been designed for, and which may damage the pump or endanger personnel as a result of pump failure. Consult the factory to determine compatibility between the pump and liquid.

WARNING!

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. Suction and discharge hoses and piping must be removed from the pump before lifting.

WARNING!

After the pump has been positioned, make certain that the pump and all piping or hose connections are tight, properly supported and secure before operation.

WARNING!

Do not operate the pump against a closed discharge valve for long periods of time. If operated against a closed discharge valve, pump components will

deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.



Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.



These pumps may be used to handle products which if overheated could produce dangerous fumes. Use extreme caution when venting the pump, or when removing covers, plates, plugs, or fittings.



Never run this pump backwards. Be certain that rotation is correct before fully engaging the pump.



If the pump is used to pump materials which could cause serious illness or injury through direct exposure or emitted fumes, wear protective clothing, such as rubber gloves, face mask, and rubber apron, as necessary before disassembling the pump or piping.



Do not operate the pump without shields and/or guards in place over the drive shafts, belts, and/or couplings, or other rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.



If the pump is powered by an electric motor, do not operate a non-explosion proof motor in an explosive atmosphere. An explosion, which may cause severe personal injury or death, could result. Install, connect and operate the motor in accordance with the National Electric Code and all local codes. If there is a conflict between the instructions in the manual accompanying the unit and the National Electric Code or applicable local code, the National or Local code shall take precedence. All electrical equipment supplied with the pump conforms to applicable federal regulations and national codes in effect on the date of manufacture.



If the pump is electric motor driven, the electrical power used to operate this pump is high enough to cause injury or death. Obtain the services of a qualified electrician to troubleshoot, test and/or service the electrical components of this pump.



If the pump is powered by an internal combustion engine, do not operate in an explosive atmosphere. When operating internal combustion engines in an enclosed area, make certain that exhaust fumes are piped to the outside. These fumes contain carbon 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.



Never tamper with the engine governor to gain more power. The governor establishes safe operating limits that should not be exceeded. The maximum continuous operating speed for the pump is shown on the performance curve (see the Parts List Manual).



Pumps and related equipment must be installed and operated according to all national, local and industry standards.

TROUBLESHOOTING – SECTION B

Review all SAFETY information in Section A.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Disconnect or shut down the power source and take the necessary precautions to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

Table B-1 Troubleshooting Chart

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Not enough liquid in casing.	Add liquid to casing. See **PRIMING**.
	Suction check valve contaminated or damaged.	Clean or replace check valve.
	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See **INSTALLATION**.
	Strainer clogged.	Check strainer and clean if necessary.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Suction intake not submerged at proper level or sump too small.	Check installation and correct submergence as needed.

Table B-1 Troubleshooting Chart (continued)

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont.)	Impeller or other wearing parts worn or damaged.	Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Impeller clogged.	Free impeller of debris.
	Pump speed too slow.	Check driver output; check belts or couplings for slippage.
	Pump running backwards (electric motor driven models).	Check direction of rotation. Correct 3-phase wiring by interchanging any two motor leads at control box. (See **Pump Rotation** in the Installation and Operations Manual.
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See **INSTALLATION** in the Installation and Operations manual.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high.	Check driver output, check that sheaves or couplings are correctly sized.
	Discharge head too low.	Adjust discharge valve.
	Liquid solution too thick.	Dilute if possible.
PUMP CLOGS FREQUENTLY	Discharge flow too slow.	Open discharge valve filly to increase flow rate, and run power source at maximum governed speed.
	Suction check valve or foot valve clogged or binding.	Clean valve.
EXCESSIVE NOISE	Cavitation in pump.	Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.
	Pumping entrained air.	Locate and eliminate source of air bubble.
	Pump or drive not securely mounted.	Secure mounting hardware.
	Impeller clogged or damaged.	Clean out debris; replace damaged parts.

PREVENTIVE MAINTENANCE

Since pump applications are seldom identical, and pump wear is directly affected by such things as the abrasive qualities, pressure and temperature of the liquid being pumped, this section is intended only to provide general recommendations and practices for preventive maintenance. Regardless of the application however, following a routine preventive maintenance schedule will help assure trouble-free performance and long life from your Gorman-Rupp pump. For specific questions concerning your application, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Record keeping is an essential component of a good preventive maintenance program. Changes in suction and discharge gauge readings (if so equipped) between regularly scheduled inspections can indicate problems that can be corrected before system damage or catastrophic failure occurs. The appearance of wearing parts should also be documented at each inspection for comparison as well. Also, if records indicate that a certain part (such as the seal) fails at approximately the same duty cycle, the part can be checked and replaced before failure occurs, reducing unscheduled down time.

For new applications, a first inspection of wearing parts at 250 hours will give insight into the wear rate for your particular application. Subsequent inspections should be performed at the intervals shown on the chart below. Critical applications should be inspected more frequently.

Preventive Maintenance Schedule

Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, Flow)	I				
Bearing Lubrication		I			R
Seal Lubrication (And Packing Adjustment, If So Equipped)		I			R
V-Belts (If So Equipped)			I		
Air Release Valve Plunger Rod (If So Equipped)			I	C	
Front Impeller Clearance (Wear Plate)				I	
Rear Impeller Clearance (Seal Plate)				I	
Check Valve					I
Pressure Relief Valve (If So Equipped)					C
Pump and Driver Alignment					I
Shaft Deflection					I
Bearings					I
Bearing Housing					I
Piping					I
Driver Lubrication – See Mfgr's Literature					

Legend:
I = Inspect, Clean, Adjust, Repair or Replace as Necessary
C = Clean
R = Replace

* Service interval based on an intermittant duty cycle equal to approximately 4000 hours annually. Adjust schedule as required for lower or higher duty cycles or extreme operating conditions.

PUMP MAINTENANCE AND REPAIR – SECTION C

GENERAL INFORMATION

Review all SAFETY information in Section A.

Follow the instructions on all tags, label and decals attached to the pump.

WARNING!

Before attempting to install, operate, or service this pump, familiarize yourself with this manual, and with all other literature shipped with the pump. Unfamiliarity with all aspects of operation or maintenance could lead to destruction of equipment, injury or death to personnel.

WARNING!

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. If slings or chains are used to move the pump or components, make sure that the load is balanced; otherwise serious personal injury or death could result. Suction and discharge hoses and piping must be removed from the pump before lifting.

The maintenance and repair instructions in this manual are keyed to the sectional view, Figure C–1 or C–2 and the corresponding parts identification list. Refer to the separate Parts List Manual for replacement parts.

Select a suitable location, preferably indoors, to perform required maintenance.

This Maintenance and Repair Manual provides troubleshooting and maintenance instructions required to properly diagnose operational problems, and to service the pump components. Maintenance instructions within this manual are limited to the pump hydraulic, priming and drive components only.

Check **TROUBLESHOOTING**, Section B to determine causes and remedies of pump problems. Disassemble the pump only as far as required.

As described in the **SAFETY** Section, this manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that **only** safe, established shop procedures are used, and that any procedures not addressed in this manual are performed **only** after establishing that neither personal safety nor pump integrity are compromised by such practices.

Lifting

Use lifting equipment with a capacity of **at least five times the weight of the pump**, including the weight of any options or customer-installed accessories. Discharge hose or piping **must** be removed before attempting to lift the pump.

For the approximate weight of your pump, refer to the pump specification data sheet or contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

SECTION DRAWING

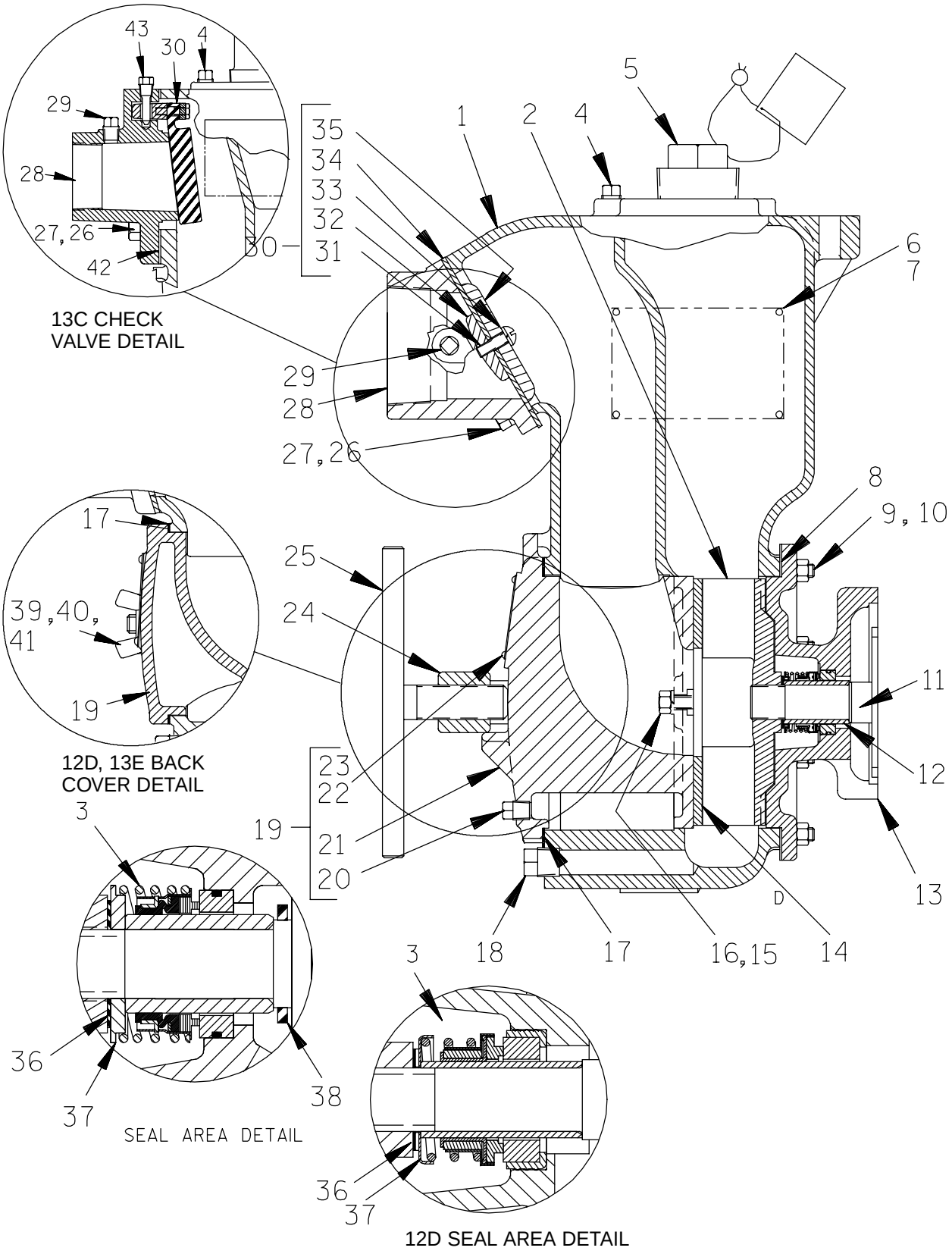


Figure C–1. Typical 12D, 13A, 13C And 13E Pump End Assembly w/Self Lubricated Seal

Typical 12D, 13A, 13C And 13E Pump End Assembly w/Self Lubricated Seal Parts Identification List

Refer to the separate Parts List Manual for serviceable parts, part numbers and quantities.

ITEM NO.	PART NAME	ITEM NO.	PART NAME
1	PUMP CASING	22	–WARNING PLATE
2	IMPELLER	23	–DRIVE SCREW
3	SEAL ASSEMBLY	24	CLAMP BAR
4	PIPE PLUG	25	CLAMP BAR SCREW
5	FILL PLUG ASSEMBLY	26	HEX HEAD CAPSCREW
6	NAME PLATE	27	LOCKWASHER
7	DRIVE SCREW	28	SUCTION FLANGE
8	CASING GASKET SET	29	PIPE PLUG (IF REQUIRED)
9	STUD	30	CHECK VALVE ASSEMBLY
10	HEX NUT	31	–ROUND HEAD MACHINE SCREW
11	SHAFT EXTENSION	32	–SMALL VALVE WEIGHT
12	SHAFT SLEEVE	33	–LOCKWASHER
13	INTERMEDIATE ASSEMBLY	34	–CHECK VALVE GASKET
14	WEAR PLATE ASSEMBLY	35	–LARGE VALVE WEIGHT ASSEMBLY
15	HEX NUT	36	IMPELLER ADJUSTING SHIMS
16	LOCK NUT	37	SPRING CENTERING WASHER OR SPRING RETAINER
17	BACK COVER GASKET		
18	CASING DRAIN PLUG	38	SLINGER RING (IF REQUIRED)
19	BACK COVER PLATE ASSEMBLY	39	FLAT WASHER
20	–PIPE PLUG (IF REQUIRED)	40	WING NUT
21	–BACK COVER	41	STUD

SECTION DRAWING

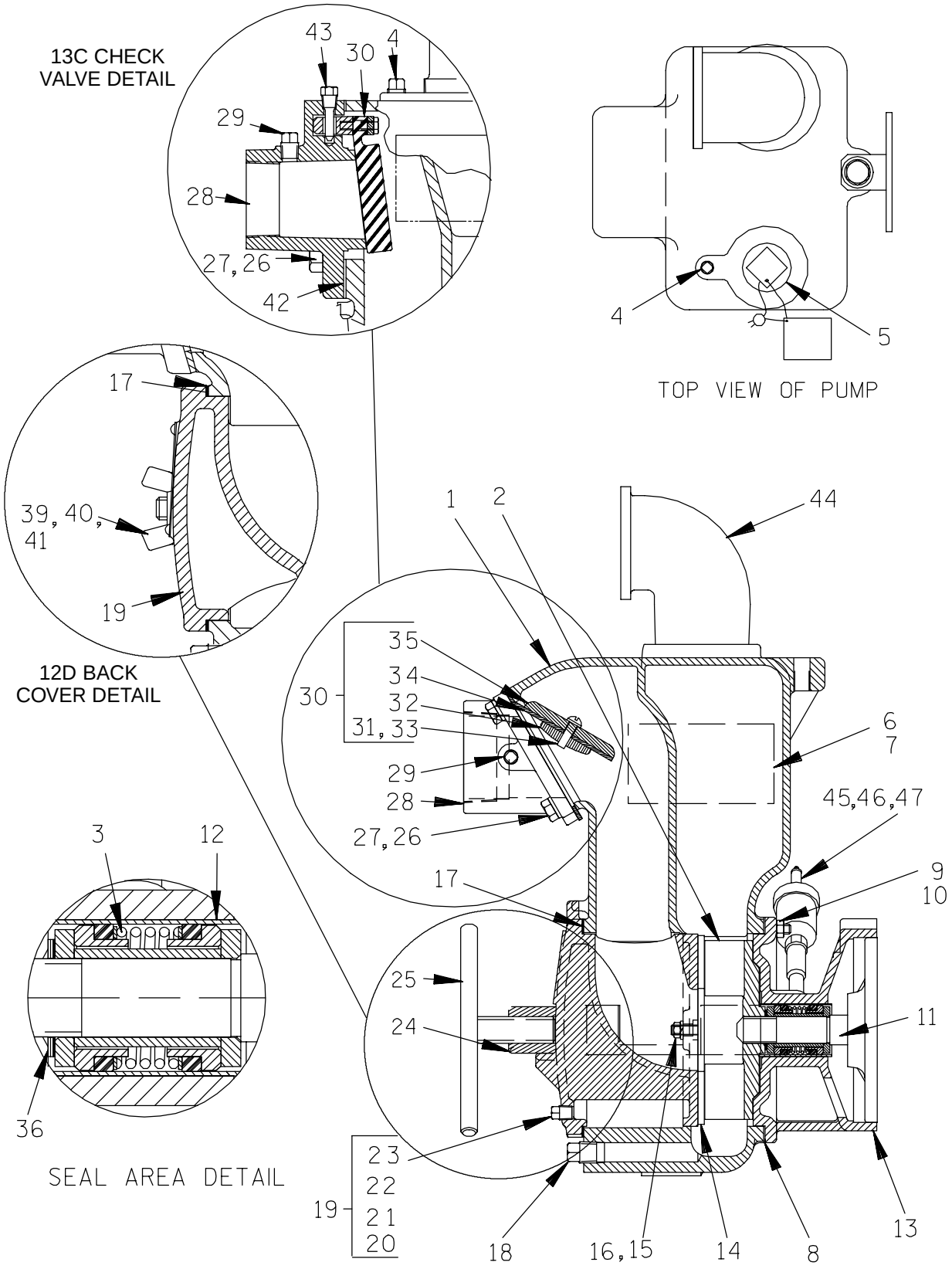


Figure C–2. Typical 12B, 12C, 12D, 13A And 13C Pump End Assembly w/Grease Seal

Typical 12B, 12C, 12D,13A and 13C Pump End Assembly w/Grease Seal Parts Identification List

Refer to the separate Parts List Manual for serviceable parts, part numbers and quantities.

ITEM NO.	PART NAME	ITEM NO.	PART NAME
1	PUMP CASING	25	CLAMP BAR SCREW
2	IMPELLER	26	HEX HEAD CAPSCREW
3	SEAL ASSEMBLY	27	LOCKWASHER
4	PIPE PLUG	28	SUCTION FLANGE
5	FILL PLUG ASSEMBLY	29	PIPE PLUG
6	NAME PLATE	30	CHECK VALVE ASSEMBLY
7	DRIVE SCREW	31	–ROUND HEAD MACHINE SCREW
8	CASING GASKET SET	32	–SMALL VALVE WEIGHT
9	STUD	33	–LOCKWASHER
10	HEX NUT	34	–CHECK VALVE GASKET
11	SHAFT EXTENSION	35	–LARGE VALVE WEIGHT ASSEMBLY
12	SEAL LINER	36	IMPELLER ADJUSTING SHIMS
13	INTERMEDIATE ASSEMBLY	37	NOT REQUIRED
14	WEAR PLATE ASSEMBLY	38	NOT REQUIRED
15	HEX NUT	39	FLAT WASHER
16	LOCK NUT	40	WING NUT OR MACHINE BOLT
17	BACK COVER GASKET	41	STUD
18	CASING DRAIN PLUG	42	SUCT FLANGE GSKT (IF REQUIRED)
19	BACK COVER PLATE ASSEMBLY	43	CHECK VALVE PIN (IF REQUIRED)
20	–PIPE PLUG (IF REQUIRED)	44	DISCHARGE ELBOW (IF REQUIRED)
21	–BACK COVER	45	GREASE CUP
22	–WARNING PLATE	46	PIPE COUPLING
23	–DRIVE SCREW	47	PIPE NIPPLE
24	CLAMP BAR		

PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

Review all SAFETY information in Section A.

Follow the instructions on all tags, label and decals attached to the pump.

This pump requires little service due to its rugged, minimum-maintenance design. However, if it becomes necessary to inspect or replace the wearing parts, follow these instructions which are keyed to the sectional views (see Figure C–1 or C–2) and the accompanying parts list. Unless otherwise specified, the instructions apply to either Figure C–1 or Figure C–2.

Before attempting to service the pump, disconnect or lock out the power source and take the necessary precautions to ensure that the pump will remain inoperative. Close all valves in the suction and discharge lines.

For power source disassembly and repair, consult the literature supplied with the power source, or contact your local source representative.

WARNING!

This manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed instructions and precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that only safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed only after establishing that neither personal safety nor pump integrity are compromised by such practices.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Disconnect or shut down the power source and take the necessary precautions to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

WARNING!

If the pump is designed to pump materials which could cause serious illness or injury through direct exposure or emitted fumes, wear protective clothing, such as rubber gloves, face mask, and rubber apron, as necessary before disassembling the pump or piping.

Suction Check Valve Removal and Disassembly

(Figure C–1 or Figure C–2, Models 12B, 12C, 12D, 13A, And 13E)

Before attempting to service the pump, remove the pump casing drain plug (18) and drain the pump. Clean and reinstall the drain plug.

To service the suction check valve assembly (30), remove the suction piping. Remove the hardware (26 and 27) securing the suction flange (28) and check valve assembly (30) to the pump casing (1). Separate the check valve assembly from the suction flange.

Inspect the check valve parts for wear or damage. If replacement is required, remove the hardware

(31 and 33), and separate the check valve gasket (34) and weights (32 and 35).

Suction Check Valve Removal

(Figure C--2, Model 13C)

If the check valve assembly (30) is to be serviced, remove the hardware (26 and 27) securing the suction flange (28). Remove the check valve pin (43) and pull the complete assembly from the suction flange. Remove the suction flange gasket (42).

NOTE

Further disassembly of the check valve is not required since it must be replaced as a complete unit. Individual parts are not sold separately.

If no further disassembly is required, see **Suction Check Valve Installation**.

Back Cover Removal

(Models 12B, 12C, 13A And 13C)

The wear plate assembly (14) is easily accessible and may be serviced by removing the back cover (19). Loosen the clamp bar screw (25) and remove the clamp bar (24). Pull the back cover and wear plate from the pump casing. Remove the back cover gasket (17). Clean the mating surfaces of the back cover plate and pump casing.

Inspect the wear plate and replace it if badly scored or worn. To remove the wear plate, disengage the hardware (15 and 16) securing it to the back cover.

If no further disassembly is required, see **Back Cover Installation**.

Back Cover Removal

(Models 12D And 13E)

The wear plate (14) can be serviced after the back cover assembly (19) has been removed.

Remove the wing nuts and washers (39 and 40) securing the back cover to the casing. Pull the back cover and wear plate from the pump casing (1).

Inspect the wear plate for excessive wear or scoring. If replacement is required, remove the hardware (15 and 16) securing it to the back cover.

Remove the cover plate gasket (17) and clean the mating surfaces.

If no further disassembly is required, see **Back Cover Installation**.

Pump Casing Removal

To service the impeller or seal assembly, disconnect the discharge piping. Remove the hardware securing the pump casing to the base. Tie and tag any leveling shims used under the pump mounting feet to ease reassembly.

Disengage the hardware securing the pump casing to the hoisting bail. Support the pump casing using a suitable hoist and sling, and remove the nuts (10) securing the pump casing to the intermediate (13). Separate the pump casing and gasket set (8) from the intermediate by pulling the casing straight away. Clean the mating surfaces of the intermediate and pump casing. Tie and tag the gaskets, or measure and record their thickness for ease of reassembly.

Impeller Removal

If the pump is equipped with a grease seal, turn the cross arm on the automatic lubricating grease cup (45, Figure C--2) clockwise until it rest against the cover (see Figure C--5) before attempting to remove the impeller (2). This will prevent the grease in the cup from escaping when the impeller is removed.

To loosen the impeller (2), tap the vanes of the impeller in a counterclockwise direction (when facing the impeller) with a block of wood or a soft-faced mallet. Unscrew the impeller using caution; tension on the seal spring will be released as the impeller is unscrewed.

Inspect the impeller and replace it if cracked or badly worn. Slide the impeller adjusting shims (36) off the impeller shaft. Tie and tag the shims or measure and record their thickness for ease of reassembly.

Self Lubricated Seal Removal And Disassembly

(Figures C--1 and C--3)

Remove the spring centering washer or spring retainer (37) and seal spring. Slide the shaft sleeve (12) and rotating portion of the seal off the shaft as a single unit. Apply oil to the sleeve and work it up under the bellows. Slide the rotating portion of the seal off the shaft. Use a pair of stiff wires with hooked ends to remove the assembled stationary seat from the intermediate (13).

NOTE

An alternate method of removing the seal assembly is to remove the hardware securing the intermediate to the power source and slide the intermediate and seal assembly off the shaft as a single unit. Place the intermediate on a flat surface with the impeller side down. Use a suitable sized dowel to press the seal components from the intermediate.

Remove the slinger ring (38). If required, remove the intermediate as described above.

If no further disassembly is required, see **Self Lubricated Seal Installation.**

Grease Seal Removal and Disassembly

(Figures C--2 and C--4)

To remove the seal assembly (3), remove the grease cup and piping (45, 46 and 47) from the intermediate.

Carefully remove the outer stationary and rotating seal elements, packing ring, stationary washer, seal spring, and spacer sleeve from the intermediate. Using two stiff wires with hooked ends, remove the inboard stationary washer, packing ring and stationary and rotating seal elements.

NOTE

The seal assembly may also be removed by disengaging the hardware securing the intermediate to the power source and sliding the intermediate and seal assembly off the shaft as a single unit. Use a dowel of suitable size to press the seal components from the intermediate.

Inspect the seal liner (12) for wear or grooves which could cause leakage or damage to the seal packing rings. The seal liner is a press fit in the intermediate and does not normally require replacement. If replacement is necessary, separate the intermediate from the power source as described above.

If the seal liner needs replaced, see **Seal Reassembly and Installation**.

If no further disassembly is required, see **Grease Seal Reassembly and Installation**.

Self Lubricated Seal Installation

(Figures C-1 and C--3)

Clean the seal cavity and shaft with a cloth soaked in fresh cleaning solvent.

WARNING!

Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Inspect the shaft (11) for damage. Small scratches or nicks may be removed with a fine file or emery cloth. If excessive wear exists, the shaft will have to be replaced. (Refer to the power source service manual).

The seal is not normally reused because wear patterns on the finished faces cannot be realigned during reassembly. This could result in premature failure. If necessary to reuse an old seal in an emergency, **carefully** wash all metallic parts in **fresh** cleaning solvent and allow to dry thoroughly.

Handle the seal parts with extreme care to prevent damage. Be careful not to contaminate precision finished faces; even fingerprints on the faces can shorten seal life. If necessary, clean the faces with a non-oil based solvent and a clean, lint-free tissue. Wipe **lightly** in a concentric pattern to avoid scratching the faces.

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leak-

age. Clean and polish the shaft sleeve (12), or replace it if there are nicks or cuts on either end. If any components are worn, replace the complete seal; **never mix old and new seal parts**.

If a replacement seal is being used, remove it from the container and inspect the precision finished faces to ensure that they are free of any foreign matter.

To ease installation of the seal, lubricate the assemblied stationary seat and shaft sleeve with water or a very **small** amount of oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure C--3).

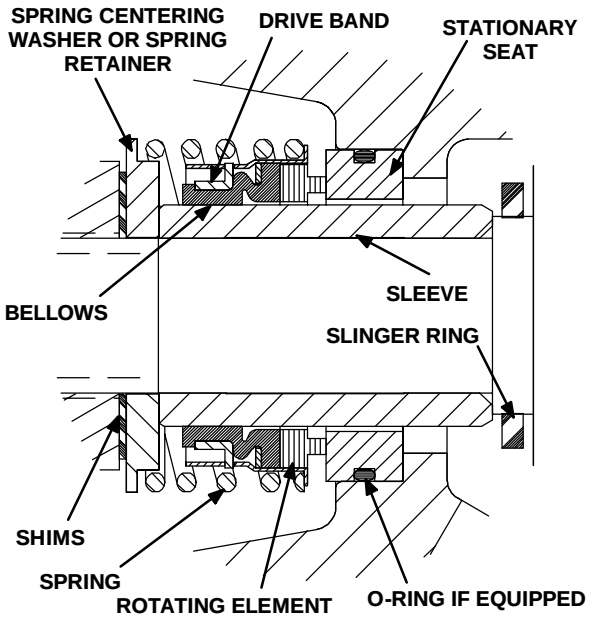


Figure C--3. Self Lubricated Seal Assembly

CAUTION

This seal is not designed for operation at temperatures above 160°F (71°C). Do not use at higher operating temperatures.

If the intermediate (13) was removed, position the intermediate over the shaft and secure it to the power source with the previously removed hardware.

If used, install the slinger ring (38) on the shaft.

Press the assembled stationary seat into the intermediate until the stationary seat bottoms against the intermediate bore. A push tube cut from a length of plastic pipe would aid this installation. The I.D. of the pipe should be approximately the same diameter as the I.D. of the seal spring.

Slide the rotating subassembly (consisting of the rotating element, retainer and bellows) onto the lubricated shaft sleeve until the rotating element is **just flush** with the end of the sleeve with the chamfered I.D. Slide the sleeve and rotating subassembly onto the shaft until the seal faces contact. Continue to push the sleeve through the seal until it bottoms against the shaft shoulder.

Install the seal spring and spring centering washer or spring retainer (37).

Grease Seal Reassembly and Installation

(Figures C--2 and C--4)

Before installing the seal, inspect the bore of the seal liner (12) for wear or grooves which might cause leakage or damage to the seal packing rings. If the seal liner must be replaced, remove the intermediate as described in **Seal Removal And Disassembly**, and position it on the bed of an arbor (or hydraulic) press. Use a new sleeve to force the old one out. After the new liner is properly installed, drill a 1/4-inch diameter hole through the liner to permit the flow of lubricant to the seal assembly. **Be careful** to center the drill in the threaded grease piping hole and not damage the threads. Deburr the hole from the inside of the seal liner after drilling.

Inspect the shaft for damage. Small scratches or nicks may be removed with a fine file or emery cloth. If excessive wear exists, the shaft will have to be replaced. (Refer to the engine or motor service manual).

Position the intermediate (13) against the power source and secure it in place using the previously removed hardware.

Clean the seal cavity and shaft with a cloth soaked in fresh cleaning solvent.

WARNING!

Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat,

sparks, and flame. Read and follow all precautions printed on solvent containers.

The seal is not normally reused because wear patterns on the finished faces cannot be realigned during reassembly. This could result in premature failure. If necessary to reuse an old seal in an emergency, **carefully** wash all metallic parts in **fresh** cleaning solvent and allow to dry thoroughly.

Handle the seal parts with extreme care to prevent damage. Be careful not to contaminate precision finished faces; even fingerprints on the faces can shorten seal life. If necessary, clean the faces with a non-oil based solvent and a clean, lint-free tissue. Wipe **lightly** in a concentric pattern to avoid scratching the faces.

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. Clean and polish the seal liner, or replace it if there are nicks or cuts on either end. If any components are worn, replace the complete seal; **never mix old and new seal parts**.

If a replacement seal is being used, remove it from the container and inspect the precision finished faces to ensure that they are free of any foreign matter.

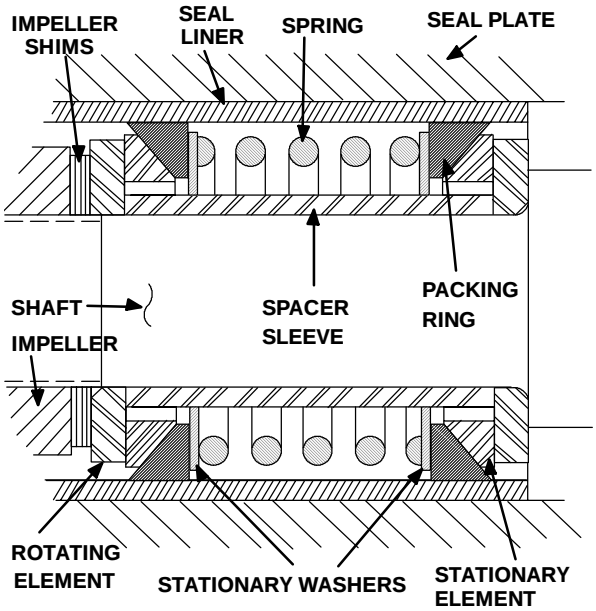


Figure C--4. Grease Seal Assembly

To ease installation of the seal, lubricate the packing rings and seal liner with water or a very **small** amount of oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure C--4).

CAUTION

This seal is not designed for operation at temperatures above 110°F (43°C). Do not use at higher operating temperatures.

The position for the inboard rotating element is determined by the machining of the impeller shaft at the shoulder where the element seats. If there is a radius on the shaft, position the inboard element with the I.D. chamfer **toward** the shaft shoulder. If the shaft is undercut at the shoulder, position the inboard element with the I.D. chamfer **away** from the shoulder.

Subassemble the inboard stationary element, packing ring and seal washer. Press this unit into the lubricated seal liner until the seal faces contact. A push tube cut from a length of plastic pipe would aid this installation. The I.D. of the tube should be approximately the same as the the I.D. of the seal spring.

Install the spacer sleeve and seal spring.

Subassemble the outboard stationary element, packing ring and seal washer. Press this unit into the lubricated seal liner.

Install the outboard rotating element with the chamfered side **toward the impeller end of the shaf**t.

Install the grease cup and the piping (45, 46 and 47) in the intermediate.

After the impeller has been installed, lubricate the seal as indicated in **LUBRICATION** at the end of this section.

NOTE

Some smoking and leakage may occur after installing a new seal assembly. This should stop after the pump has run a while and the lapped seal faces have seated in.

Impeller Installation And Adjustment

Inspect the impeller, and replace it if cracked or badly worn. Install the same thickness of impeller

adjusting shims (36) as previously removed, and screw the impeller onto the shaft until tight.

For maximum pump efficiency, a specific clearance is required between the impeller and the intermediate (see Table C–1). Add or remove impeller shims until this clearance is reached.

NOTE

Be sure the intermediate is tight against the power source while measuring this clearance.

Table C–1. Impeller Clearances

Pump	Clearance	
	Impeller to Intermediate	Impeller to Wear Plate
12B	.020 to .040	.008 to .015
12C	.020 to .040	.008 to .015
12D	.015 to .040	.010 to .020
13A	.020 to .040	.008 to .015
13C	.020 to .040	.010 to .020
13E	.020 to .040	.008 to .015

Pump Casing Installation

Install the same thickness of pump casing gaskets (8) as previously removed, and secure the pump casing (1) to the intermediate (13) with the nuts (10). **Do not** fully tighten the nuts at this time.

NOTE

The back cover assembly must be in place to adjust the impeller face clearance.

For maximum pump efficiency, a specific clearance is required between the wear plate (14) and the impeller (see Table C–1). Install the back cover assembly (19) and set this clearance by adding or removing gaskets in the pump casing gasket set (8).

NOTE

An alternate method of adjusting this clearance is to reach through the discharge port with a feeler gauge and measure the gap. Add or subtract pump casing gaskets accordingly.

After the face clearance has been set, tighten the nuts (10) securing the pump casing to the intermediate.

Back Cover Installation

(Figure C–1 or C–2)

If the wear plate (14) was removed for replacement, center the wear plate against the cover plate (19) and secure it using the attaching hardware (15 and 16). The wear plate **must** be concentric to prevent binding when the back cover is installed.

NOTE

To ease future disassembly, apply a film of grease or 'Never-Seez' on the back cover shoulder, or any surface that contacts the pump casing. This action will reduce rust and scale build-up.

Clean any scale or debris from the contacting surfaces on the pump casing that might prevent a good seal with the back cover. Replace the back cover gasket (41) and slide the back cover assembly (34) into the pump casing. Be sure the wear plate does not bind against the impeller.

(Models 12B, 12C, 13A And 13C)

Secure the back cover assembly by installing the clamp bar (24) and tightening the clamp bar screw (25). **Do not** over-tighten the clamp bar screw; it should be just tight enough to ensure a good seal at the back cover shoulder.

(Models 12D And 13E)

Secure the back cover assembly with the hardware (39 and 40). **Do not** over tighten the wing nuts; they should be just tight enough to ensure a good seal at the back cover shoulder.

Suction Check Valve Installation

(Models 12B, 12C, 12D, 13A And 13E)

Inspect the check valve components and replace as required. Subassemble the check valve weights (32 and 35) and check valve gasket (34) using the attaching hardware (31 and 33).

Position the check valve assembly (30) in the suction port with the large weight toward the inside of the pump casing. Install the suction flange (28) and

secure with the hardware (26 and 27). Check the operation of the check valve to ensure proper seating and free movement.

(Figure C--2, Model 13C)

Inspect the check valve assembly (19), and replace it if badly worn.

NOTE

The check valve assembly must be replaced as a complete unit. Individual parts are not sold separately.

Position the check valve adaptor in the mounting slot of the suction flange (28). Align the adaptor with the flange hole, and secure the assembly with the check valve pin (43). Install the suction flange and suction flange gasket (42), and secure with the hardware (26 and 27). Check the operation of the check valve to ensure proper seating and free movement.

Final Pump Assembly

Secure the pump to the base with the previously removed hardware. Be sure to reinstall any leveling shims used under the pump mounting feet.

Be sure the pump and power source are securely mounted to the base.

Install the suction and discharge lines. Make certain that all piping connections are tight, properly supported and secure. Open all the valves in the suction and discharge lines.

Be sure the pump and power source have been properly lubricated, see **LUBRICATION**.

Remove the fill plug assembly (24) and fill the pump casing with clean liquid. Reinstall the fill plug and tighten it.

Refer to **OPERATION** in the Installation And Operation manual before putting the pump back into service.

LUBRICATION

Self Lubricated Seal Assembly

(Figure C--1)

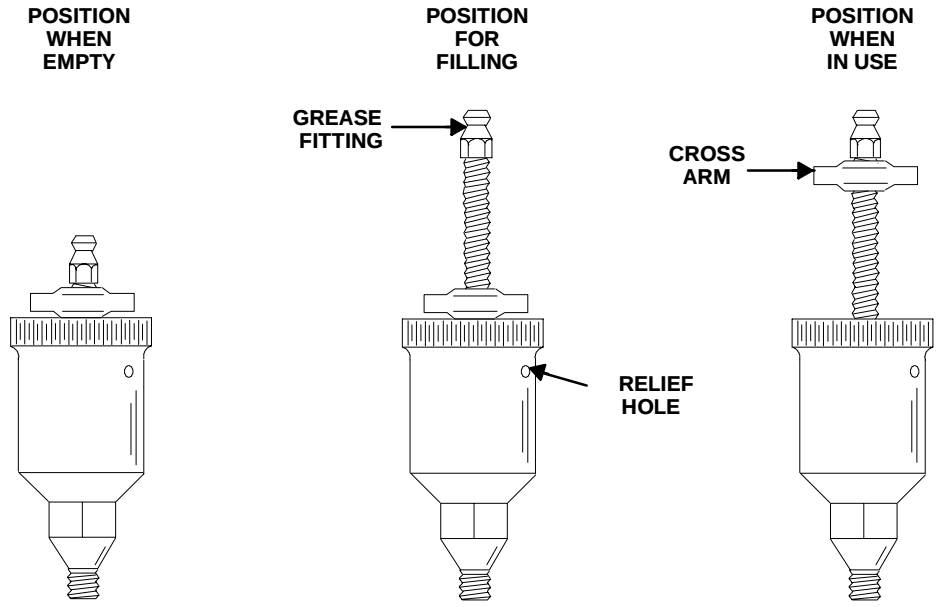
The seal assembly is lubricated by the medium being pumped, or by a flow of fresh liquid from an external source. Flushing liquid may be taken from the pump discharge and supplied through auxiliary piping.

When handling abrasive or tacky liquids, supply fresh lubricating liquid from an external source. Be sure the liquid supplied to the seal is compatible with the liquid being pumped, and that its flow is controlled to prevent dilution. If flushing is required, contact the factory.

Grease Lubricated Seal Assembly

(Figure C--2)

Fill the grease cup (12) through the grease fitting with No. 2 lithium base grease until grease escapes from the relief hole. Turn the grease cup arm counterclockwise until it is at the top of the stem; this will release the spring to apply grease to the seal (see Figure C--5).



NOTE:
When installing a new grease cup, lubricate the cup as indicated on the installation tag furnished with the grease cup.

Figure C--5. Automatic Lubricating Grease Cup

NOTE

Some smoking and leakage may occur after installing a new seal assembly. This should stop after the pump has run a while and the lapped seal faces have seated in.

Power Source

Consult the literature supplied with the power source, or contact your local power source representative.

WARRANTY

Pumping units manufactured by The Gorman-Rupp Company, Mansfield, Ohio are guaranteed to be free from defects in material and workmanship for one year from date of shipment from factory in Mansfield, Ohio. The obligation under this Warranty, statutory or otherwise, is limited to replacement or repair at Mansfield, Ohio factory or at a point designated by Gorman-Rupp, of such part as shall appear to us upon inspection at such point, to have been defective in material or workmanship.

This Warranty does not obligate The Gorman-Rupp Company to bear the cost of labor or transportation charges in connection with replacement or repair of defective parts; nor shall it apply to a pump upon which repairs or alterations have been made unless authorized by Gorman-Rupp.

No warranty is made in respect to engines, motors, or trade accessories, such being subject to warranties of their respective manufacturers.

In Submersible Pumps, pump and motor are integral and Submersibles are warranted as a unit. Since motor is subject to an important degree upon quality and performance of electrical controls, unit warranty is valid only when controls have been specified and provided by Gorman-Rupp.

No express implied or statutory warranty, other than herein set forth is made or authorized to be made by Gorman-Rupp.

In no event shall The Gorman-Rupp Company be liable for consequential damages or contingent liabilities arising out of the failure of any Gorman-Rupp pump or parts thereof to operate properly.

THE GORMAN-RUPP COMPANY

Mansfield, Ohio

NOTE: In Canada, all above references to “The Gorman-Rupp Company, Mansfield, Ohio” is understood to mean “Gorman-Rupp of Canada Limited, St. Thomas, Ontario.”

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

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