

INSTRUCTIONS-PARTS LIST



307-714

Rev B

Supersedes A

This manual contains IMPORTANT
WARNINGS AND INSTRUCTIONS
READ AND RETAIN FOR REFERENCE

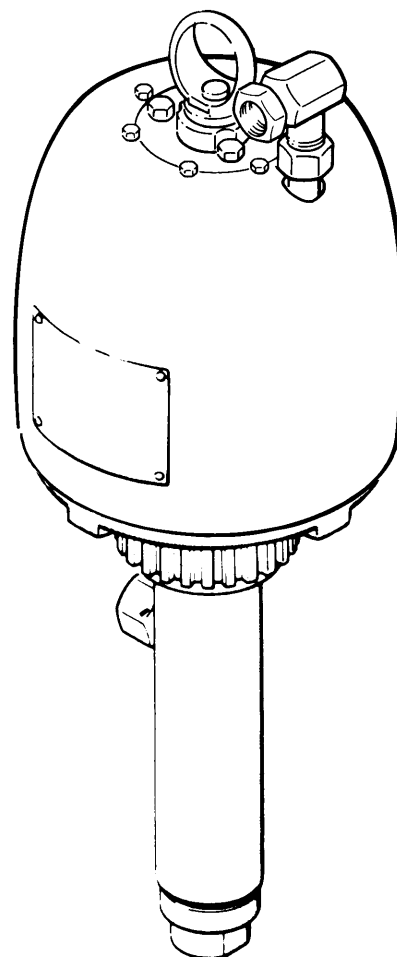
43:1 RATIO

BULLDOG HYDRAULIC SUPPLY PUMP

4300 psi (301 bar) MAXIMUM WORKING PRESSURE

Model 218-334, Series A

This pump is designed to supply hydraulic oil to the accumulators in an oil rig blow-out prevention system.



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WARNING

HIGH PRESSURE SPRAY CAN CAUSE SERIOUS INJURY.

FOR PROFESSIONAL USE ONLY. OBSERVE ALL WARNINGS.

Read and understand all instruction manuals before operating equipment.

FLUID **INJECTION** HAZARD

General Safety

This equipment generates very high fluid pressure. Spray from leaks or ruptured components can inject fluid through your skin and into your body and cause extremely serious bodily injury, including the need for amputation. Also, fluid splashed into the eyes or onto the skin can cause serious damage.

ALWAYS follow the Pressure Relief Procedure, at right, before cleaning, removing or servicing any system equipment.

NEVER try to stop or deflect leaks with your hand or body.

Keep your hands away from the end of any drain valve in the system when opening it.

Be sure equipment safety devices are operating properly before each use.

Medical Alert-Airless Spray Wounds

If any fluid appears to penetrate your skin, get **EMERGENCY MEDICAL CARE AT ONCE. DO NOT TREAT AS A SIMPLE CUT.** Tell the doctor exactly what fluid was injected.

Note to Physician: Injection in the skin is a traumatic injury. It is important to treat the injury surgically as soon as possible. Do not delay treatment to research toxicity. Toxicity is a concern with some exotic coatings injected directly into the blood stream. Consultation with a plastic surgeon or reconstructive hand surgeon may be advisable.

Pressure Relief Procedure

To reduce the risk of serious bodily injury, including injection, splashing in the eyes or on the skin, or injury from moving parts, always follow this procedure whenever you shut off the pump, when checking or servicing any part of the system, when installing, cleaning, or changing parts, and whenever you stop using the pump.

1. Shut off the air to the pump.
2. Close the bleed-type master air valve (required in your system).
3. Open any drain valves used in your system, having a container ready to catch the drainage. Keep your hands away from the end of any drain valve when opening it.
4. Leave the drain valve(s) open until you are ready to pump again.

If you suspect that the hose or plumbing line is completely clogged, or that pressure has not been fully relieved after following the steps above, VERY SLOWLY loosen the hose or plumbing line end coupling and relieve pressure gradually, then loosen completely. Now clear the hose or plumbing line.

EQUIPMENT MISUSE HAZARD

General Safety

Any misuse of the equipment or system components, such as overpressurizing, modifying parts, using incompatible chemicals and fluids, or using worn or damaged parts, can cause them to rupture and result in fluid injection or other serious bodily injury, fire, explosion or property damage.

NEVER alter or modify any part of this equipment; doing so could cause it to malfunction.

CHECK all equipment regularly and repair or replace worn or damaged parts immediately.

Read and follow the fluid and solvent manufacturer's literature regarding the use of protective clothing and equipment.

System Pressure

The 43:1 Bulldog pump develops **4300 psi (301 bar) MAXIMUM WORKING PRESSURE** at 100 psi (7 bar) MAXIMUM INCOMING AIR PRESSURE. NEVER exceed 100 psi (7 bar) air supply to the pump. Be sure that all equipment and accessories are rated to withstand the maximum working pressure of this pump. DO NOT exceed the maximum working pressure of any component used in the system.

Fluid Compatibility

BE SURE that all fluids and solvents used are chemically compatible with the wetted parts shown in the Technical Data on the back cover. Always read the manufacturer's literature before using fluid or solvent in the pump.

FIRE OR EXPLOSION HAZARD

Static electricity is created by the high velocity flow of fluid through the pump and hose or plumbing line. If every part of the system is not properly grounded, sparking may occur, and the system may become hazardous. Sparking may also occur when plugging in or unplugging a power supply cord. Sparks can ignite fumes from solvents and the fluid, dust particles and other flammable substances, whether you are indoors or outdoors, and can cause a fire or explosion and serious bodily injury and property damage.

If you experience any static sparking or even a slight shock while using this equipment, **SHUT OFF THE PUMP IMMEDIATELY**. Check the entire system for positive grounding. Do not use the system again until the problem has been identified and corrected.

Grounding

To reduce the risk of static sparking, ground the pump and all other components used or located in the area. **CHECK** your local electrical code for detailed grounding instructions for your area and type of equipment and be sure to ground all of these components:

1. **Pump:** use a ground wire and clamp as shown in Fig 1.
2. **Air and fluid hoses or plumbing lines:** use only grounded hoses and plumbing lines with a maximum of 500 feet (150 m) combined length to ensure grounding continuity. Refer to **Hose and Plumbing Line Grounding Continuity**, below.
3. **Air compressor:** follow the air compressor manufacturer's recommendations.
4. **All solvent pails** used when flushing, according to local code. Use only **metal pails**, which are conductive. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts the grounding continuity.

HOSE AND PLUMBING LINE SAFETY

High pressure fluid in the hoses or plumbing lines can be very dangerous. If the hose or plumbing line develops a leak, split or rupture due to any kind of wear, damage or misuse, the high pressure spray emitted from it can cause an injection injury or other serious bodily injury or property damage.

ALL FLUID HOSES MUST HAVE SPRING GUARDS! The spring guards help protect the hose from kinks or bends at or close to the coupling which can result in hose rupture.

TIGHTEN all fluid connections securely before each use. High pressure fluid can dislodge a loose coupling or allow high pressure spray to be emitted from the coupling.

NEVER use a damaged hose or plumbing component. Before each use, check the entire hose or plumbing line for cuts, leaks, abrasion, bulging cover, or damage or movement of the couplings. If any of these conditions exist, replace the hose or defective components immediately. **DO NOT** try to recouple high pressure hose or mend it with tape or any other device. A repaired hose cannot contain the high pressure fluid.

MOVING PARTS HAZARD

Moving parts can pinch or amputate your fingers or other body parts. **NEVER** operate the pump with the air motor shield removed. **KEEP CLEAR** of moving parts when starting or operating the pump. Before checking or servicing the pump, follow the **Pressure Relief Procedure** on page 2 to prevent the pump from starting accidentally.

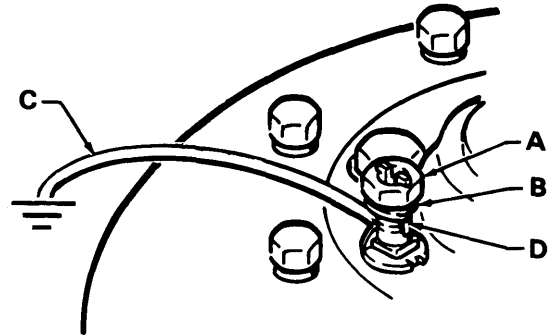


Fig 1

To ground the pump, loosen the grounding lug locknut (A) and washer (B). Insert one end of a 12 ga (1.5 mm²) minimum ground wire (C) into the slot in lug (D) and tighten the locknut securely. See Fig 1. Connect the other end of the wire to a true earth ground such as a steel building column or water pipe. Always check your local code. See **ACCESSORIES** for available ground wire and clamp.

Flushing Safety

Before flushing, be sure the entire system and flushing pails are properly grounded. Refer to **Grounding**, above. Follow the **Pressure Relief Procedure** on page 2. Always use the lowest possible fluid pressure.

HANDLE AND ROUTE HOSES CAREFULLY. Do not pull on hoses to move equipment. Do not use fluids or solvents which are not compatible with the inner tube and cover of the hose, or with the plumbing lines and components. **DO NOT** expose Graco hose to temperatures above 180°F (82°C) or below -40°F (-40°C).

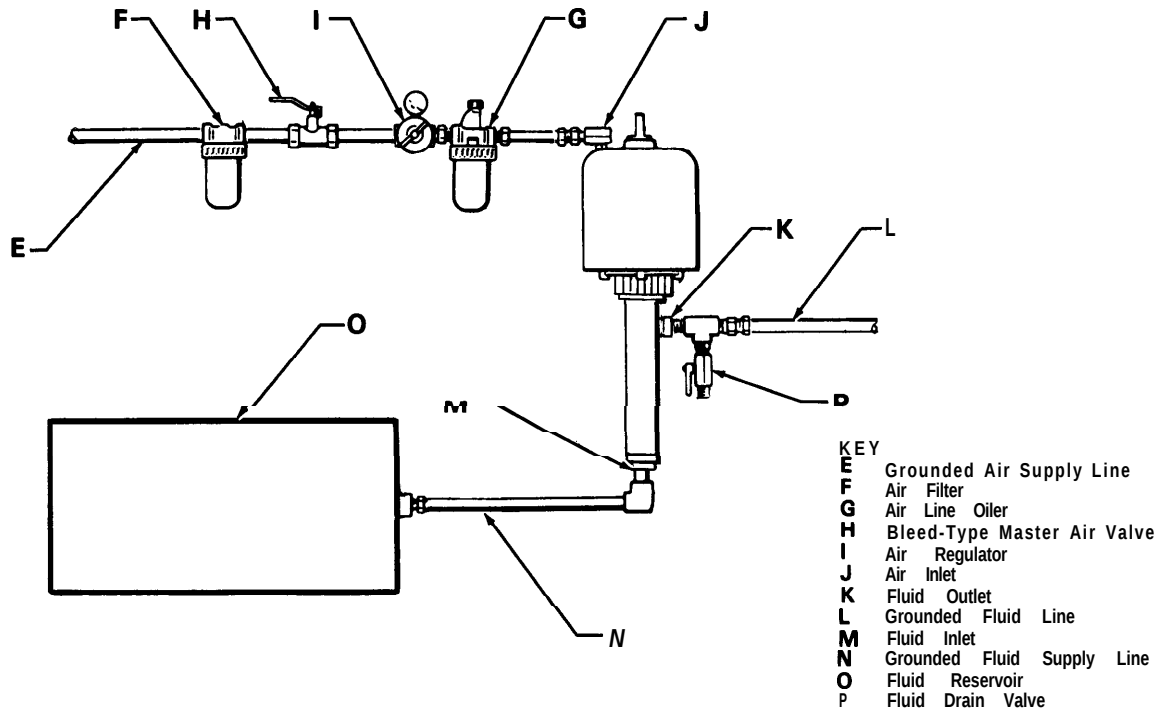
Hose and Plumbing Line Grounding Continuity

Proper hose and plumbing line grounding continuity is essential to maintaining a grounded system. Check the electrical resistance of your air and fluid hoses or plumbing line at least once a week. If your hose does not have a tag on it which specifies the maximum electrical resistance, contact the hose supplier or manufacturer for the maximum resistance limits. Use a resistance meter in the appropriate range for your hose to check the resistance. If the resistance exceeds the recommended limits, replace it immediately. An ungrounded or poorly grounded hose or plumbing line can make your system hazardous. Also read **FIRE OR EXPLOSION HAZARD**, above.

IMPORTANT

United States Government safety standards have been adopted under the Occupational Safety and Health Act. These standards—particularly the General Standards, Part 1910, and the Construction Standards, Part 1926—**should** be consulted.

TYPICAL INSTALLATION



INSTALLATION

This pump is designed to supply hydraulic oil to the accumulators in an oil rig blow-out prevention system.

The Typical Installation above is only a guide. Contact your Graco representative for assistance in designing a system to meet your needs.

Mount the pump to suit your type of installation. The Dimensional Drawing on the back page gives measurements needed for installing the pump.

Reference numbers and letters in the text refer to the callouts on the drawings.

Grounding the Pump

WARNING

Proper grounding is essential. Read the Grounding instructions under FIRE AND EXPLOSION HAZARD on page 30 and refer to your local electrical code for more information on grounding.

System Accessories

Refer to the Typical Installation above, and install the system accessories in the approximate order shown. Accessories are shown on page 14.

NOTE: To ensure maximum pump performance, be sure that any accessory used is properly sized to meet your system requirements.

WARNING

Two accessories, the bleed-type master air valve (H) and the fluid drain valve (P), are required for your system to reduce the risk of serious bodily injury from moving parts, injection, or splashing in the eyes or on the skin when shutting off the pump.

The bleed-type master air valve relieves air trapped between the valve and pump, after the pump is shut off. Trapped air can cause the pump to cycle unexpectedly and result in serious bodily injury, including amputation, if you are adjusting or repairing the pump. The master air valve should be located within easy reach of the pump.

The fluid drain valve helps relieve pressure in the displacement pump and line when shutting off the pump.

On the air line (E), install an air regulator (I) near the pump air inlet (J) to control pump speed and pressure, and an air line oiler (G) downstream from the regulator to provide automatic lubrication to the air motor. Upstream from the oiler, install an air filter (F) to remove harmful dirt and moisture from the compressed air supply.

Connect the Lines

In this system, fluid and air lines may be either hoses or hard plumbed. All lines must be grounded. Connect the air supply (E) to the 3/4 npsm(f) air inlet (J). Connect the fluid supply line (N) to the 1 in. npt(f) fluid intake (M) and the fluid line (L) to the 3/4 npt(f) fluid outlet (K).

OPERATION

WARNING

Pressure Relief Procedure

To reduce the risk of serious bodily injury, including injection, splashing in the eyes, or injury from moving parts, always follow this procedure whenever you shut off the pump, when checking or servicing any part of the system, when installing, cleaning, or changing parts, and whenever you stop using the pump.

1. Shut off the air to the pump.
2. Close the bleed-type master air valve (required in your system).
3. Open any drain valves used in your system, having a container ready to catch the drainage. Keep your hands away from the end of any drain valve when opening it.
4. Leave the drain valves open until you are ready to pump again.

If you suspect that the hose or plumbing line is completely clogged, or that pressure has not been fully relieved after following the steps above, VERY SLOWLY loosen the hose or line end coupling and relieve pressure gradually, then loosen completely. Now clear the hose or line.

Starting and Adjusting Pump

Open the fluid supply shut off valve and the system drain valve. Open the bleed-type master air valve and slowly open the air regulator until the pump starts to cycle (about 40 psi (2.8 bar)). Allow pump to cycle slowly until all air is purged from lines. The lines are purged when the fluid emitted from the drain valve is flowing in a steady stream. With the lines purged, close the system drain valve. The pump will stall against pressure.

With pump and lines primed, and with adequate air pressure and volume supplied, the pump will start and stop as supply demands or until the bleed-type master air valve is shut off.

Use an adequately sized air regulator to control pump speed and fluid pressure. Always use the lowest air pressure necessary to give you the results you want. Higher pressure causes premature pump wear.

WARNING

NEVER exceed 100 psi (7 bar) air input pressure to the pump, to avoid damage to the pump and to reduce the risk of component rupture which can cause serious bodily injury, including injection or splashing of fluids in the eyes or on the skin.

Flush Pump Before Using

Pumps are tested with lightweight oil which is left in to protect pump parts. To prevent contamination of fluid, flush the pump with a compatible solvent before using it.

MAINTENANCE

Check tightness of throat packing nut weekly. The packing nut should be tight enough to prevent leakage -no tighter. ALWAYS follow the Pressure Relief Procedure above, before adjusting the packing nut to reduce the risk of serious bodily injury.

NEVER allow the pump to run dry of fluid being pumped. A dry pump will quickly accelerate to a high speed, possibly damaging itself. If your pump accelerates quickly, or is running too fast, stop it immediately and check the fluid supply. If the supply container is empty and air has been pumped into the lines, prime pump and lines with fluid or flush and leave filled

with compatible solvent. Be sure to eliminate all air from fluid system to prevent corrosion.

Corrosion Protection

CAUTION

Water, or even moist air, can cause pump corrosion. To prevent corrosion, NEVER leave the pump filled with water or air. After normal flushing, flush the pump again with mineral spirits or oil-based solvent, relieve pressure, and leave the mineral spirits in the pump. Be sure to follow all steps of the Pressure Relief Procedure, above.

WARNING

Pressure Relief Procedure

To reduce the risk of serious bodily injury, including injection, splashing in the eyes or on the skin, or injury from moving parts, always follow this procedure whenever you shut off the pump, when checking or servicing any part of the system, when installing, cleaning, or changing parts, and whenever you stop using the pump.

1. Shut off the air to the pump.
2. Close the bleed-type master air valve (required in your system).
3. Open any drain valves used in your system, having a container ready to catch the drainage. Keep your hands away from the end of any drain valve when opening it.
4. Leave the drain valves open until you are ready to pump again.

If you suspect that the hose or plumbing line is completely clogged, or that pressure has not been fully relieved after following the steps above, **VERY SLOWLY** loosen the hose or line end coupling and relieve pressure gradually, then loosen completely. Now clear the hose or line.

WARNING

NEVER operate the pump with the air motor shield removed. The shield encloses the air valve housing, which moves during operation and can pinch or amputate your fingers.

Locating Air Leaks

Air leaks can generally be detected by listening when the pump is not running. To locate where the air is leaking:

1. Shut off the air supply and disconnect the air hose.
2. Screw the inlet union (117) out of the air manifold (87).
3. Remove the air motor shield (73) and screw the inlet union (117) back into the manifold (87). See Fig 2.
4. Connect the air hose and turn the air on. **DO NOT** exceed 40 psi inbound air pressure.

5. Use the checking methods listed in the Check Chart on page 7 to find where the air is leaking. Replace parts as necessary.

Fluid Leaks

If the pump continues to operate when the hydraulic outlet valve is closed, the packings are worn or the ball checks are leaking.

If anything more than a light film of fluid is detected at the weep hole, the base bearings gasket (100) or both the gasket and base bearing (98) need to be replaced. See Fig 2.

Stalled Air Motor

A stalled air motor may be caused by icing due to unusual environmental conditions such as: (1) operating at a high cycle rate under hot, high humidity conditions or (2) long operation under cold arctic conditions.

If motor stalling is not caused by environmental conditions, try filling the air lubricator with non-detergent, SAE #10 oil to prevent stalling.

To restart a stalled motor, either turn off the air and allow the ice to melt (if stalling was due to icing) or follow this procedure:

1. Turn off the air supply.
2. Remove the lift ring (74).
3. Push down the air valve housing (102) with a screwdriver. **DO NOT** use your fingers! See Fig 2.

WARNING

DO NOT use your fingers to disengage the air valve housing. Moving parts in the air motor can pinch or amputate your fingers.

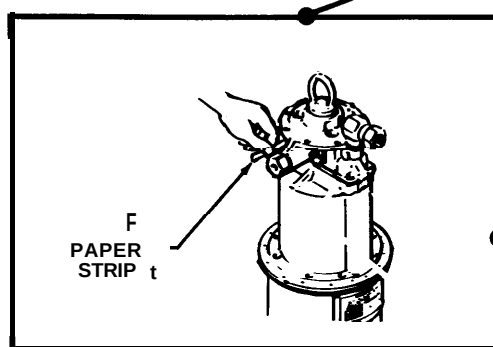
4. Screw the lift ring (74) back on.
5. Turn on the air supply.

AIR LEAK CHECK CHART

With Stroke Position	Fig. Ref. Check Points	Checking Method	Cause
DOWN	A (air manifold)	By feel	Blown air manifold gaskets (91).
	B (between cylinder & base)	By feel	Blown air cylinder gasket (103).
	C (weep hole)	By feel	Blown base bearings, upper o-ring, or cup seal.
UP	D (trip rod)	Squirt oil around bearing (98)	Worn trip rod packing (71) or bearing (98).
	E (air director valves)	Squirt oil around air valves (92)	Worn air valves (92) or their packings (93).
BOTH	F (exhaust holes)	Hold paper strip over exhaust holes; see Detail in Fig 2.	Worn air piston o-ring (69).

WARNING

Keep fingers out of exhaust openings. Moving parts in the air motor may pinch or amputate fingers.



PUSH VALVE HOUSING DOWN TO RESTART STALLED MOTOR.

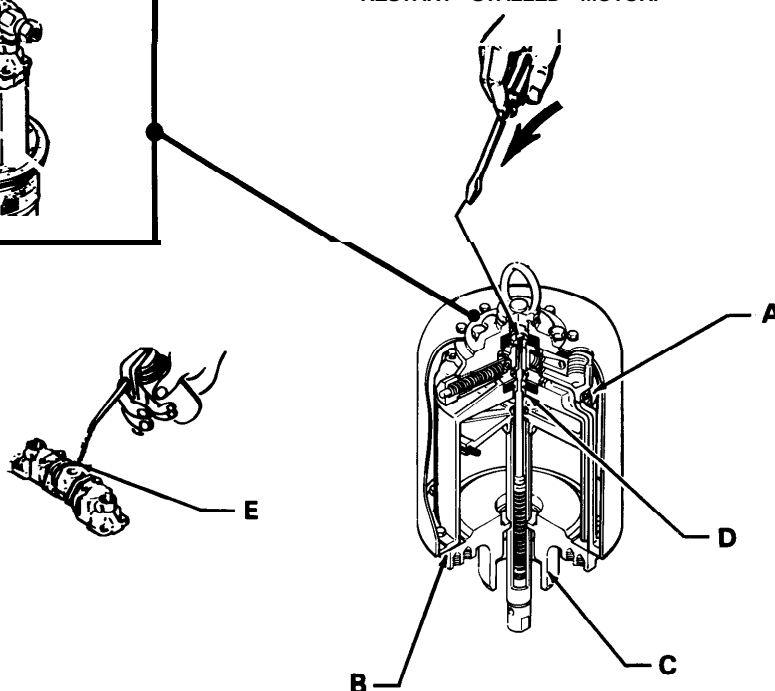


Fig 2

WARNING

To reduce the risk of serious bodily injury, ALWAYS follow the **Pressure Relief Procedure** on page 6 and relieve system pressures before servicing, cleaning, or removing any parts.

Disassembly

1. Disconnect all hoses, tubes, controls etc. from the air motor to provide ease in servicing.
3. Remove the lift ring (74).
3. Remove the swivel adapter (117). Remove the eight capscrews (75) and lockwashers (76), then lift the air motor shield (73) off the motor.
4. Remove the air inlet spring cap (107) and the detent spring retainers (77). Take out the compression springs (78), spring guides (79), and the plungers (80). See Fig 3. Inspect the parts for wear or damage and replace them as necessary.

CAUTION

HANDLE SPRINGS CAREFULLY. Scratches or nicks will cause early spring failure.

5. Remove the four screws (82) and lockwashers (83) holding the detent housing (81). Lift the housing up off the air manifolds (87) while holding the detent rollers (89) in the housing. See Fig 3.
6. Remove the detent rollers (89), axles (90), thrust washer (96), and dampening pad (97) from the detent housing (81). Inspect the parts for wear and damage. If either the roller or axle is worn or damaged, replace both; they are a matched set.
7. Remove the capscrews (85) and lockwashers (86). Carefully remove both air manifolds, as the air director valves (92) are spring compressed between the air valve housing (102) and the manifold valve plates (101). Check the air director valves (92), o-rings (93) and springs (94) for wear or damage. Replace if necessary.
8. Remove the four screws (88) in each manifold plate (101). Check the manifold plates and seals (42) for wear or damage. Also remove the air manifold gaskets (91). Replace any worn parts.
9. Remove the trip rod nut (106) and the lockwasher (86) from the trip rod (43a). Pull the air valve housing (102) up off the trip rod. See Fig 3.
10. Pull the trip rod and piston assembly (43) up as far as possible. Grip the trip rod (43a) below the bushing (95) with padded pliers, and screw the bushing off the trip rod.

CAUTION

Take special care to avoid damaging the plated surface of the trip rod. Padded pliers 207-579 are available. See ACCESSORIES, page 14.

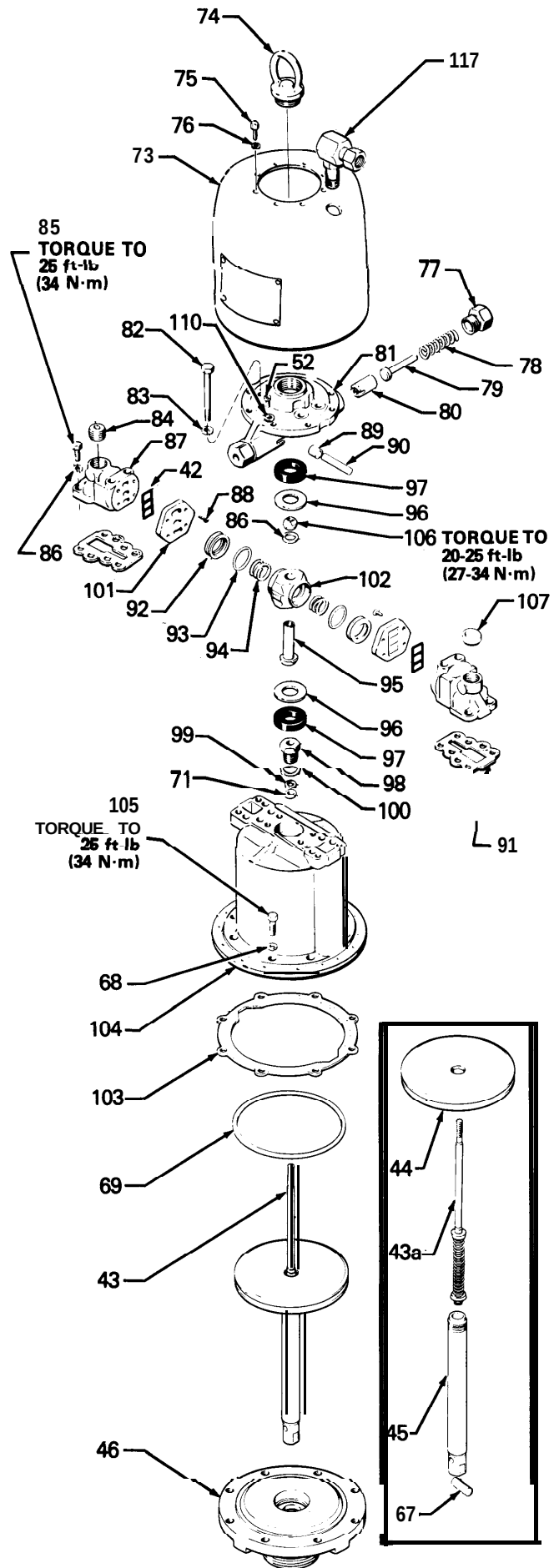


Fig 3

11. Remove the thrust washer (96) and dampening pad (97) from the air motor cylinder (104).
12. Remove the eight screws (105) and lockwashers (68) holding the air motor cylinder to the base (46).
13. Carefully pull the air motor cylinder (104) straight up off the air motor base (46) and the trip rod and piston assembly (43a). Be careful not to tilt the cylinder as this could damage the smooth inner surface. Check the piston o-ring (69) for wear or damage and replace if necessary. The diameter of the o-ring is larger than that of the piston. Inspect the cylinder gasket (103) and replace as necessary.

Assembly

1. Install the piston o-ring (69) on the piston (44) using heavy petroleum grease. Be sure the slots in the gasket (103) align with the air passages in the air motor cylinder (104). Since the diameter of the o-ring is greater than that of the piston, gather the excess o-ring to one side of the piston and tuck it into one of the two indented areas of the air motor cylinder.
2. Secure the cylinder (104) with the eight screws (105) and washers (68). Torque to 25 ft-lb (34 N·m).
3. Be sure the back-up washer (99) and v-packing (71) are in place on the trip rod bearing (98).
4. Place the copper gasket (100) over the trip rod (43a) and attach trip rod bearing (98) to trip rod.
5. Reinstall the dampening pad (97) and thrust washer (96).
6. Place the valve plate seals (42) between the air manifolds (87) and the valve plates (101), with the rounded side of the valve plates out. Screw four manifold plate screws (88) into both air manifolds.
7. Before installing the air manifolds (87), pull the trip rod and piston assembly up as far as possible. Line up the air manifolds with the gaskets (91) and loosely screw the two rear manifold screws (85) with lockwashers (86) into both air manifolds.
8. Position the alignment tool (see ACCESSORIES, page 14) between the two air manifolds. Hold the two air manifolds against the alignment tool and torque the screw (85) in each manifold to 25 ft-lb (34 N·m). Screw another screw into each manifold. Remove the alignment tool.

NOTE: If the alignment tool is not available, complete steps 9 and 10 which follow, then measure and set the space at 1.8 in. (45.7 mm) between the two air manifolds and the air valve housing (102).

9. Screw the trip rod bushing (95) onto the trip rod (43a). Hold the trip rod with padded pliers 207-579. See ACCESSORIES, page 14.

10. Place the air valve housing (102) over the trip rod bushing (95).
11. Secure the air valve housing (102) with the trip rod nut (106) and lockwasher (86). Torque the nut to 20-25 ft-lb (27-34 N·m) until .031 in. (about the thickness of a dime) of the trip rod (43a) extends above the nut.
12. Place the o-rings (93) around each director valve (92).
13. Place the two compression springs (94) in each side of the air valve housing (102).
14. With the air valve housing (102) pushed all the way down against the air motor cylinder (104), place the air director valves (92) against the springs (94) and compress them into the air valve housing (102).
15. Install the dampening pad (97) and thrust washer (96) in the detent housing (81). Use a heavy petroleum base grease to hold them in position.
16. Coat the plungers (80), spring guides (79), and compression springs (78) with heavy petroleum grease and install them in the detent housing.
17. Engage the threads of the detent spring retainers (77) one turn into the detent housing (81).
18. Place the detent axle (90) and roller (89) into the detent housing (81), using heavy petroleum grease.
19. Place the detent housing (81) on the air manifolds (87) while holding the detent axles (90) and rollers (89) in position with your fingers from the top of the housing.
20. Before installing the four detent housing screws (82) and lockwashers (83), be sure the detent axles (90) and rollers (89) align correctly with the valve housing (102). Tighten the detent spring retainers (77) as required to properly align the rollers (89).
21. Screw the four detent housing screws (82) with lockwashers (83) into the housing (81).
22. Position the spring cap (107) on the air manifold.
23. Place the air motor shield (73) over the air motor and secure it with the eight shield retaining screws (75) and lockwashers (76).
24. Reinstall the swivel adapter (117). Screw in the lift ring (74).

DISPLACEMENT PUMP SERVICE

WARNING

To reduce the risk of serious bodily injury, including injection, or splashing in the eyes or on the skin, ALWAYS follow the Pressure Relief Procedure on page 6 and relieve system pressures before servicing, cleaning, or removing any parts.

Disassembly

1. Disconnect all hoses, tubes, controls etc. from the pump to provide ease in servicing.
2. Loosen but do not remove the intake valve housing (62) while the displacement pump is still assembled to the air motor base (46). See Fig 4.
3. Remove the outlet adapter (56). Inspect the o-ring (72) and replace it if necessary.
4. Remove the cylinder coupling nut (57).
5. Insert a 3/4 npt pipe nipple or extension into the outlet of the cylinder (55). Use this as a handle to turn and remove the cylinder.
6. Remove the intake housing (62) from the cylinder (55). Inspect the ball stop pin (58), guide (59), ball (60), and o-ring (61) for wear or damage, and replace as necessary.
7. Unscrew the piston and valve seat housing (54) from the trip rod and piston assembly (43). Remove the ball (48) from its seat, then remove the washer (49), spring (50), male gland (51), v-packings (111, 112), and female gland (53). Inspect the parts for wear or damage and replace as necessary.
8. Remove the packing housing (47) from the air motor base (46). Take out the parts and clean all except the seals with a compatible solvent. Clean the seals with a soft cloth. Check the packing housing for wear or damage and replace if necessary. As a preventive maintenance procedure, replace all the seals every five years, or earlier if necessary.
9. Inspect the piston shaft (45) for scoring or wear. The piston shaft is a part of the trip rod and piston assembly (43), which must be replaced as one piece. DO NOT break loose the epoxy fitting. Replacing this assembly requires disassembly of the air motor, as described in the preceding section. Scoring or irregular surfaces on the piston shaft or polished inner wall of the cylinder (55) causes premature packing wear and leaking. Check these parts by rubbing a finger over the surface or holding the part up to the light at an angle. Replace worn or damaged parts.

Assembly

1. Carefully slide the packing housing (47) onto the piston shaft (45).
2. Insert the packing housing (47) into the air motor base (46) by tapping lightly on the housing.
3. Insert the packings into the packing housing (47) from the bottom and push them up toward the air motor. Be sure the lips of the v-packings are facing down against the fluid pressure. The packings should be inserted in the following order: female gland, white v-packing, black v-packing, white v-packing, black v-packing, male gland, compression spring, washer, and retaining ring.
4. Place the piston packings onto the piston and valve seat housing (54) in the following order, with the lips of the v-packings facing up against fluid pressure: female gland (53), white v-packing (112), black v-packing (111), white v-packing (112), black v-packing (111), male gland (51), spring (50), and washer (49).
5. Apply Loctite® 27 sealant or equivalent to the housing (54) threads.
6. Place the check ball (48) onto the seat of the piston and valve seat housing (54) and screw the housing into the piston shaft (45). Torque the housing to 137-143 ft-lb (186-194 N·m).
7. Slide the pump cylinder (55) into the air motor base (46).
8. Screw the cylinder coupling nut (57) onto the air motor base (46), securing the pump cylinder (55).
9. With the o-ring (72) in place, screw the outlet adapter (56) into the pump cylinder.
10. Place the ball stop pin (58) into the upper set of holes of the ball guide (59).
11. Place the check ball (60) into the intake valve housing (62). Insert the ball guide (59) containing the stop pin into the intake valve housing.
12. Put the o-ring (61) in place and screw the intake valve housing (62) into the base of the pump cylinder (55). Tighten securely.
13. Reconnect all hoses, plumbing etc. to restore the pump to operation. Reconnect the ground wire if it was disconnected.

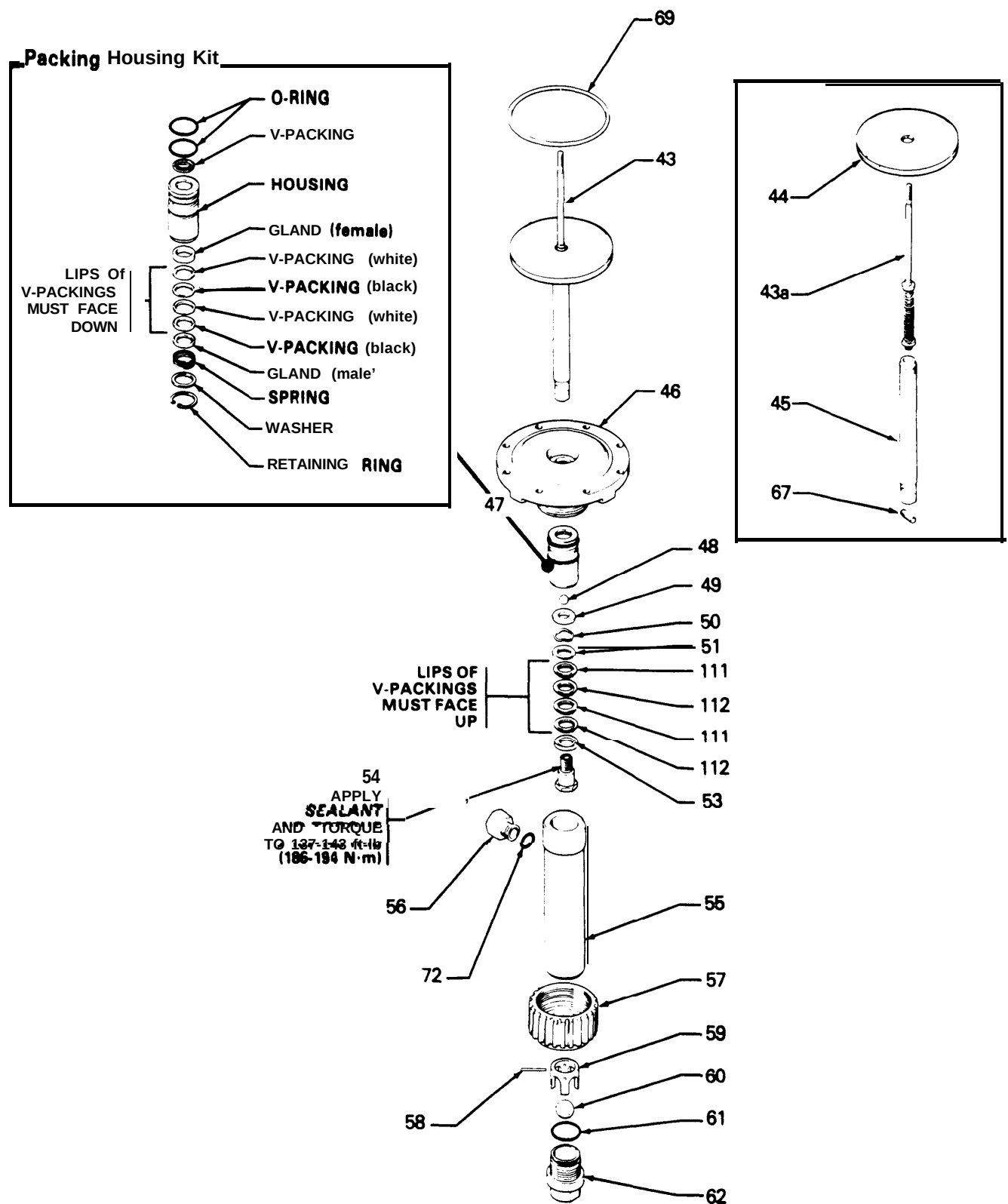
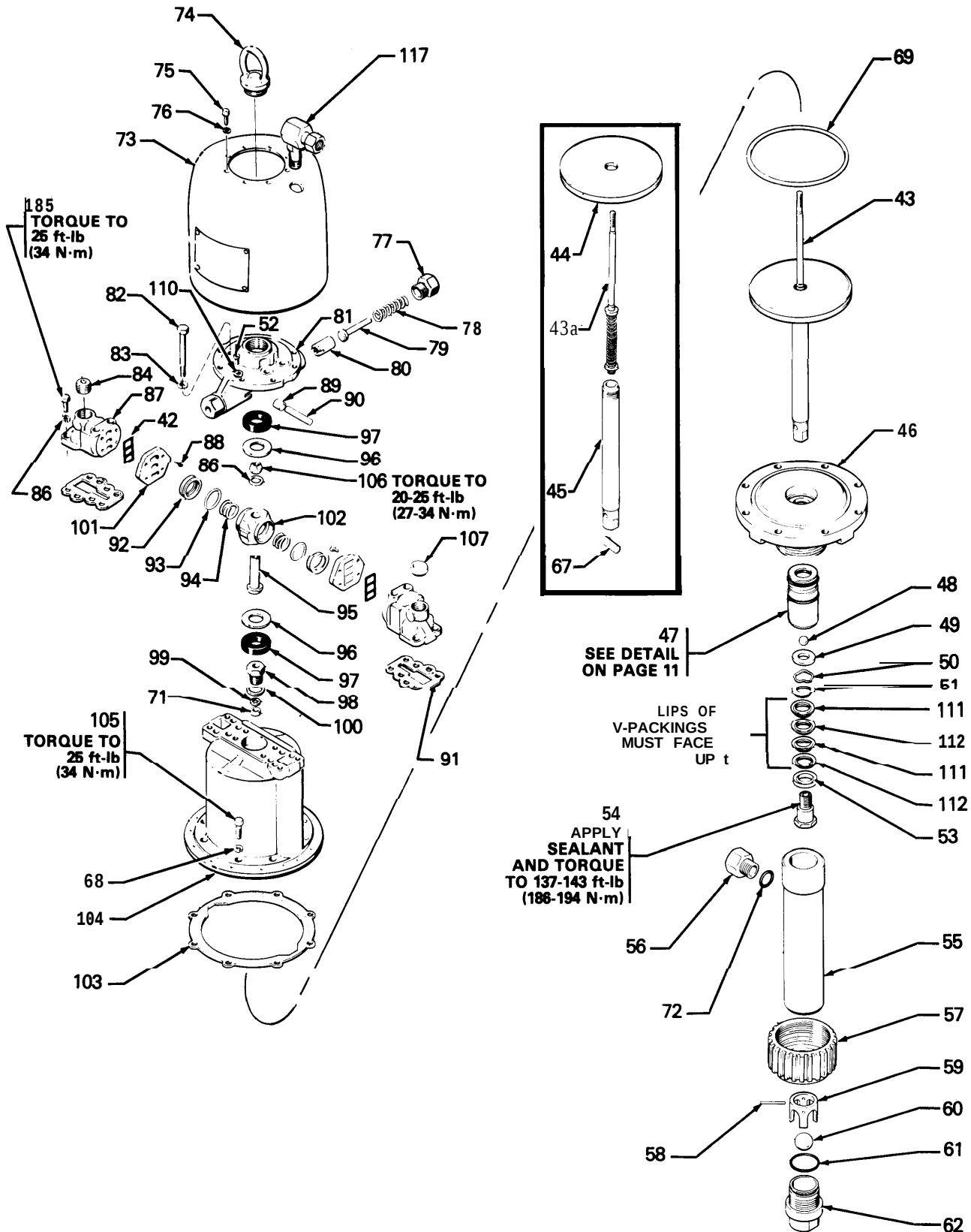


Fig 4

PARTS DRAWING

Model 218-334, Series A



PARTS LIST

REF NO.	PART NO.	DESCRIPTION	QTY
42	168-184	SEAL, valve plate	2
43	218-596	TRIP ROD AND PISTON ASSEMBLY	1
43a	218-598	.ROD, trip	1
44	177-080	PISTON, air motor	1
45	215-916	SHAFT, piston	1
46	177-084	BASE, air motor	1
47	215-674	HOUSING, packing	1
48	101822	BALL, stainless steel; 5/8"	1
49	177-067	WASHER, back-up	1
50	105-757	SPRING, wave	1
51	177-073	GLAND, male; brass	1
52	104-029	CLAMP, grounding	1
53	178-065	GLAND, female; brass	1
54	178-188	HOUSING, piston and valve seat	1
55	177-083	CYLINDER, pump	1
56	177-065	ADAPTER, outlet; 3/4 npt(f) x 1-1/16-12 un	1
57	177-071	NUT, coupling	1
58	172-399	PIN, ball stop	1
59	176-532	GUIDE, ball	1
60	102-973	BALL, stainless steel; 2"	1
61	105-756	O-RING; Buna-N	1
62	215-673	HOUSING, intake; 1" npt(f)	1
67	166-701	PIN, ball stop	1
68	100-018	LOCKWASHER, spring; 1 /2"	8
69	161-578	O-RING, piston; Buna-N	1
71	176-546	V-PACKING; polyurethane	1
72	105-765	O-RING; Buna-N	1
73	169-588	SHIELD, air motor	1
74	180-952	LIFT RING	1
75	100333	CAPSCREW, hex-head; 1/4-20 x 1/2"	8
76	100-016	LOCKWASHER, spring; 1/4"	8
77	161587	RETAINER, detent spring	2
78	161-589	SPRING, compression	2
79	161588	GUIDE, spring	2
80	169-583	PLUNGER, detent	2
81	177-664	HOUSING, detent	1
82	101-713	CAPSCREW, hex-head; 7/16-14x 3"	4
83	100-052	LOCKWASHER, spring; 7/16"	4
84	102-726	PLUG, pipe, socket-head; 3/4 npt	1
85	100-101	CAPSCREW, hex-head; 3/8-16x 1"	4
86	100-133	LOCKWASHER, spring; 3/8"	5
87	168-187	MANIFOLD, air	2
88	101-716	SCREW, flat-head machine; No. 10-24 x 1/2"	8
89	169-585	ROLLER, detent	2
90	169-586	AXLE, detent	2

REF NO.	PART NO.	DESCRIPTION	QTY
91	168-183	GASKET, air manifold; Buna-N	2
92	168-182	VALVE, air director	2
93	156-698	O-RING; Buna-N	2
94	161-575	SPRING, compression	2
95	177-134	BUSHING, trip rod	1
96	161-576	WASHER, thrust	2
97	161-577	PAD, dampening	1
98	215-933	BEARING	1
99	161-559	WASHER, back-up; leather	1
100	150-647	GASKET; brass	1
101	169-584	PLATE, valve	2
102	161-585	HOUSING, air valve	1
103	161-556	GASKET	1
104	177-486	CYLINDER, air motor	1
105	100-424	CAPSCREW, hex-head; 1/2-13 x 1"	8
106	177-135	NUT, trip rod	1
107	168-135	CAP, spring	1
110	104-582	WASHER, tab	1
111	178-066	V-PACKING; rubber	2
112	178-067	V-PACKING; UHMWPE	2
117	207-648	UNION, adapter; 90° swivel; 3/4 npsm(f)	1

HOW TO ORDER REPLACEMENT PARTS

1. To be sure you receive the correct replacement parts, kit or accessories, always give all of the information requested in the chart below.
- 2 Check the parts list to identify the correct part number; do not use the ref. no. when ordering.
- 3 Order all parts from your nearest Graco distributor.

6 digit PART NUMBER	QTY	PART DESCRIPTION

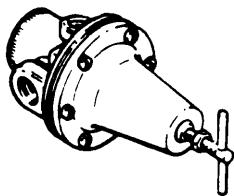
ACCESSORIES (Must be purchased separately)

AIR PRESSURE REGULATOR

300 psi (21 bar) MAXIMUM WORKING PRESSURE

206-197 1/2 npt inlet & outlet

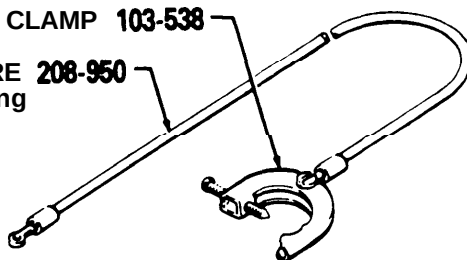
207-755 3/4 npt inlet & outlet



GROUNDING CLAMP 103-538

GROUND WIRE 208-950

25 ft (7.6 m) long

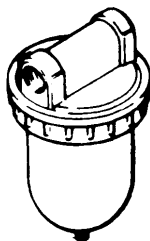


AIR LINE FILTER

250 psi (17.5 bar) MAXIMUM WORKING PRESSURE

106-149 1/2 npt inlet & outlet

106-150 3/4 npt inlet & outlet

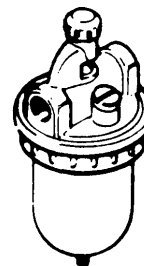


AIR LINE LUBRICATOR

250 psi (17.5 bar) MAXIMUM WORKING PRESSURE

214-848 1/2 npt inlet & outlet

214-849 3/4 npt inlet & outlet

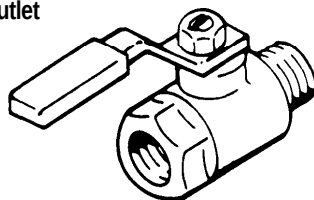


BLEED-TYPE MASTER AIR VALVE 107442

300 psi (21 bar) MAXIMUM WORKING PRESSURE

Relieves air trapped in the air line between the pump air inlet and this valve when closed.

1/2 npt(m x f) inlet and outlet

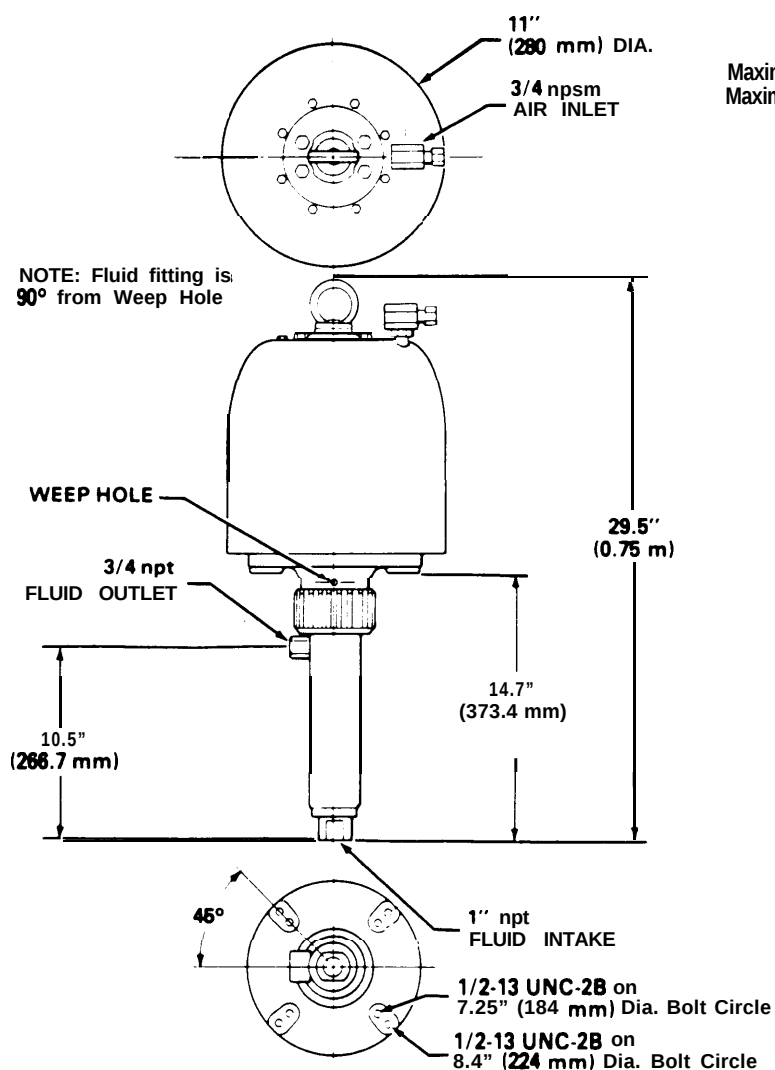


SPECIAL TOOLS

207-579 Padded Pliers

168-513 Alignment Tool

DIMENSIONAL DRAWING



TECHNICAL DATA

Maximum working pressure : 4300 psi (301 bar)

Maximum air input pressure : 100 psi (7 bar)

Air inlet : 3/4 npsm(f)

Fluid inlet : 1" npt(f)

Fluid outlet : 3/4 npt(f)

Wetted parts : Carbon Steel; Stainless Steel,
Chrome Plating, Zinc Plating,
Nickel Plating, Brass, Buna-N

SERVICE INFORMATION

Order of v-packings in Packing Housing Kit illustration (inset of Fig 4) corrected.

THE GRACO WARRANTY AND DISCLAIMERS

WARRANTY

Graco warrants all equipment manufactured by it and bearing its name to be free from defects in material and workmanship on the date of sale by an authorized Graco distributor to the original purchaser for use. As purchaser's sole remedy for breach of this warranty, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment proven defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for, any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility with Graco equipment of structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claim. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor and transportation.

DISCLAIMERS AND LIMITATIONS

THE TERMS OF THIS WARRANTY CONSTITUTE PURCHASER'S SOLE AND EXCLUSIVE REMEDY AND ARE IN LIEU OF ANY OTHER WARRANTIES (EXPRESS OR IMPLIED), INCLUDING WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY NON-CONTRACTUAL LIABILITIES, INCLUDING PRODUCT LIABILITIES, BASED ON NEGLIGENCE OR STRICT LIABILITY. EVERY FORM OF LIABILITY FOR DIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OR LOSS IS EXPRESSLY EXCLUDED AND DENIED. IN NO CASE SHALL GRACO'S LIABILITY EXCEED THE AMOUNT OF THE PURCHASE PRICE. ANY ACTION FOR BREACH OF WARRANTY MUST BE BROUGHT WITHIN TWO (2) YEARS OF THE DATE OF SALE.

EQUIPMENT NOT COVERED BY GRACO WARRANTY

GRACO MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO ACCESSORIES, EQUIPMENT, MATERIALS, OR COMPONENTS SOLD BUT NOT MANUFACTURED BY GRACO. These items sold, but not manufactured by Graco (such as electric motor, switches, hose, etc.) are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

Factory Branches: Atlanta, Chicago, Dallas, Detroit, Los Angeles, West Caldwell (N.J.)
Subsidiary and Affiliate Companies: Canada; England; Switzerland; France; Germany; Hong Kong; Japan

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