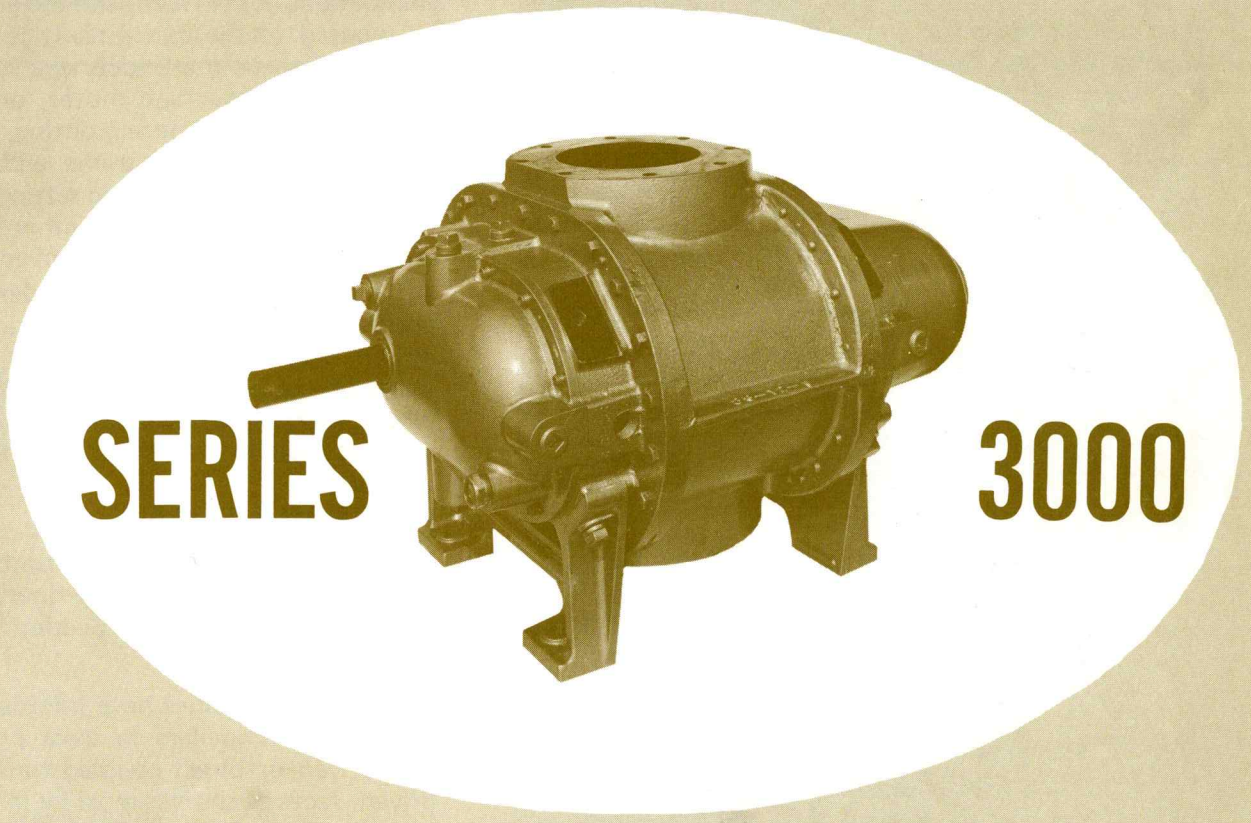
SUTORBILT

BULLETIN RMJ-4

installation
repair
maintenance

MANUAL



SERIES 3000

YOUR KEY TO TROUBLE-FREE SERVICE

Although Sutorbilt blowers are sturdy, precision-engineered machines, there are several relatively simple, but basic installation and maintenance procedures that must be observed to assure optimum performance. As there is no guesswork in the manufacture of these highly advanced units, there must be none in preparing them to get the job done in the field. It is the purpose of this manual to help you properly install, maintain and service your Sutorbilt blower. Follow the instructions carefully and you will be rewarded with years of trouble-free operation.

Some principles of correct installation and maintenance are identical or similar for all series of Sutorbilt blowers. In such cases, instructions for all models are treated compositely in various sub-sections. Much of the data is peculiar only to the specific series described on the cover of this manual. Hence, it is important — **imperative** — that no section be overlooked when preparing to install your blower.

The manual is prepared in four sections: Installation — Trouble Shooting — Maintenance — and Repair and Replacement. Observance of the instructions in the first three sections will minimize reference to Section IV, Repair and Replacement.

TABLE OF CONTENTS

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SECTION I

INST

EQUIPMENT CHECK

Before uncrating, check the packing slip carefully to be sure all parts have been received. Small, important accessories — relief valves, for instance — can easily be lost. Note that all accessories are listed as separate items on the packing slip. After every item on the packing slip has been checked off, uncrate carefully. **Register claim with carrier for lost or damaged equipment.**

LOCATION

If possible, install the blower in a light, clean dry place with plenty of room for inspection and maintenance.

FOUNDATIONS

For permanent installation we recommend concrete foundations be provided, and the equipment should be grouted to the concrete. It is necessary that a suitable base be used, such as a steel combination base under blower and motor, or a separate sole plate under each. Before grouting, equipment must be leveled, free of all strains, and anchored so no movement will occur during setting of grout.

When Jack-Screws, Wedges, or other supports are used under base, they must be removed after grout sets.

After grout has completely hardened, a recheck is necessary to compensate for shrinkage, etc. If required, add shims under blower feet after final tightening of foundation anchor bolts.

Where a concrete foundation is not feasible, care must be taken to insure anchoring to firm structural members.

LUBRICATION

IMPORTANT: Do not start up blower until you are positive that it has been properly and fully lubricated. (See "Lubrication" Section.)

ALIGNMENT

Series 3000 machines have internal thrust bearings to maintain impellers in axial positions whether belt driven or direct coupled to driver. When belt driven, faces of sheaves must be in line after proper belt tension has been achieved. On direct connect units, alignment and lubrication of couplings to specifications of coupling manufacturer is important. When mounted drives are supplied from the factory, proper alignment has been established before shipment. However, during shipping, handling and installation it is likely that the alignment has been disturbed and final adjustment **must be made** before startup.

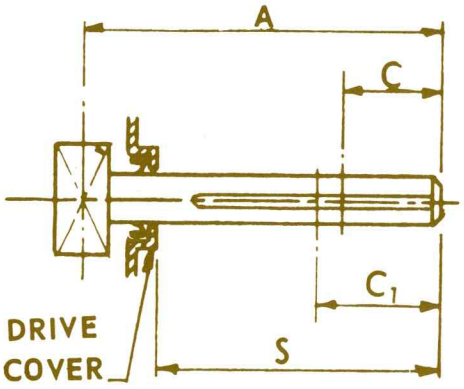
ALLATION

V-BELT DRIVE

For V-belt driven units the belts should be tensioned so that the manufacturer's limits are not exceeded and the blower overhung load limits shown in Table are not exceeded. Sheave should always be positioned within 1/2" of drive cover.

OVERHUNG LOAD TABLE

SERIES	SIZE (GD)	DIMENSIONS, INCHES			MAX. LOAD LBS.
		C	A	S	
3000	8"	2.63	10.50	7.0	890.



$$\text{Load} = \frac{2 \times HP \times 63025}{N \times r}$$; where N = rpm, r = sheave radius, HP = F.L. motor rating

If drive sheave center is located at other than 'C' inches from drive shaft end, the revised maximum load can be calculated as follows:

$$\text{REVISED LOAD} = \text{Max. Load} \times \frac{A - C}{A - C_1}$$

This formula applies with C_1 greater or less than C.

ROTATION

Rotation of the motor must be checked before installing the blower drive. Blowers are built for reversible operation unless a rotational arrow is located above the drive shaft. If an arrow appears, the unit is timed for rotation indicated and cannot be reversed unless the unit is retimed. (See retiming instructions, Section III, Maintenance.)

REMOVING PROTECTIVE MATERIALS

The shaft extension is protected with black paint which can be removed with any standard solvent. Blower inlets and outlets are temporarily capped to keep out dirt and other contaminants during shipping. These covers must be removed before startup. The internal surfaces of all Sutorbilt units are mist sprayed with a rust preventive to protect the machine during the shipping and installation period. Remove this film upon initial startup, using any commerical safety solvent. Pour the solvent slowly into the inlet side of the machine while running until the unit is visibly clean. (See Safety Precaution below.)

SAFETY PRECAUTION

All rotating parts should be protected by guards to eliminate hazards to operating personnel. All inlet openings should be protected by screens to prevent the entrance of foreign objects. Wherever possible, interlock systems should be employed to prevent start up when a hazardous condition exists.

Relief valves should be installed in the system to prevent excessive load from being applied on the unit during operation. Initial and periodic checks should be made to insure that the relief valves are properly set so that the maximum pressure rating of the unit cannot be exceeded. See chart, page 4 for speed and pressure ratings for standard units.

Where reverse rotation is possible a check valve is recommended. When operating a unit with an open or exposed inlet or discharge, care should be exercised to avoid inlet suction and discharge air blast.

SEAL VENTS

Four tapped seal vents are provided in each head plate shown at location C, Fig. A on Page 4. On lip seal units the top openings only should be plugged. On mechanical seal units (MS), all vents may be plugged if desirable.

PIPING

Inlet and discharge connections on all blowers are large enough to handle maximum volume with minimum friction loss.

Excessive weight of piping and fittings will cause internal misalignment and premature wear. Never allow the blower to carry the weight of the pipe. If possible, a spool or sleeve-type expansion joint should be installed between the unit and the piping. Where a flexible connection is not practical, weight of rigid connection must be separately supported.

LUBRICATION

WARNING: Units are shipped without lubricating oil. Do not operate before lubricating.

Timing gears and bearings are kept constantly lubricated by a simple but highly effective splash system. At the drive end, oil is distributed by heavy-duty oil slingers (A) on each shaft. At the gear end, gear teeth are lubricated by being partially submerged. The gear teeth serve as oil slingers for the gear-end bearings.

FILLING PROCEDURE — Remove square-head fill plugs (B) from **top** of gear case and **top** of drive cover. Do not remove any other plugs from gear case or drive cover. Do not mistake tapped vent holes (C) in head plates for fill holes. (Note that fill plugs are drilled with a small hole to vent gear case and drive cover to atmosphere.)

Using any locally available lubricant listed in the accompanying table, fill each end until oil reaches mid-point in the sight glasses (D). Replace fill plugs. Always maintain oil level within sight in the glasses.

Oil should be changed every 1,500 hours under normal service and more frequently if necessary. To drain, remove drain plugs (E) at bottom.

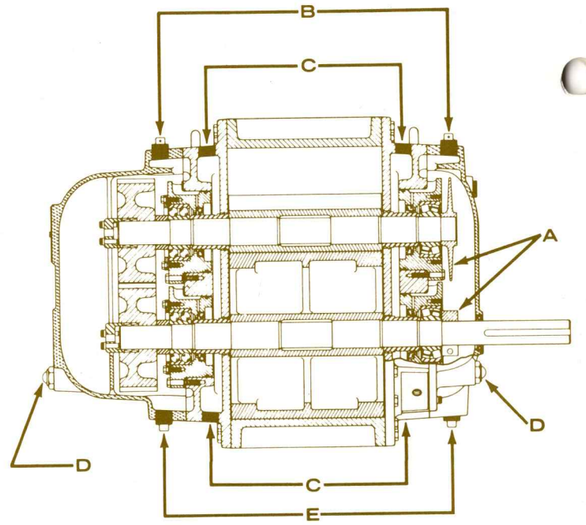


FIGURE A

LUBRICATION INSTRUCTIONS FOR OIL LUBRICATED GEARS AND BEARINGS

Add fresh oil as required to maintain proper level. Drain and refill every 1500 hours of operation under normal service, more frequently when required. Use a good quality oil.

BLOWER DISCHARGE TEMPERATURE	GRADE OIL*
−40° to +32°F.	SAE 10W
+32° to +100°F.	SAE 20
+100° to +275°F	SAE 40

*In applications with exteme variations in ambient temperature a 20W-50W multiple visocsity oil is recommended.

PERFORMANCE AND TECHNICAL DATA

SIZE	INLET & DISCH. DIA. (INCHES)	DISCH. CFR	MAX. RATED PRESS. (P.S.I.)	MAX. RPM	APPROX. NET WEIGHT
812	8	1.04	12	1575	1025
816	8	1.39	10	1575	1175
820	10	1.74	8	1575	1350
824	10	2.09	6	1575	1600

SECTION II TROUBLE SHOOTING

No matter how well equipment is designed and manufactured, there may be times when servicing will be required due to normal wear, the need for readjustment, or various external causes. Whenever equipment needs attention, the operator or repairman should be able to locate the cause and correct the trouble quickly. The following Trouble Shooting Chart will assist the mechanic in those respects.

PROBLEM	POSSIBLE CAUSES	SOLUTION
Knocking	Unit out of time	Retime. See Page 7.
	Distortion due to improper mounting or pipe strains	Check mounting alignment and relieve pipe strains.
	Excessive pressure differential	Reduce to manufacturer's recommended pressure. Examine relief valve, re-set if necessary.
	Worn gears	Replace timing gears. See Page 8.
	Worn bearings	New bearings. See Page 9.
	Worn bearing cartridges	Replace cartridges. See Page 9.
Excessive blower temperature	Too much oil in gear case or drive cover	Reduce oil level. See Page 4.
	Too low operating speed	Increase actual blower speed.
	Clogged filter or muffler	Remove cause of obstruction.
	Excessive pressure differential	Reduce pressure differential across the blower.
	Worn impeller clearances	Restore clearances.
Impeller end or tip drag	Insufficient assembled clearances	Correct clearances.
	Case or frame distortion	Check mounting and pipe strain.
	Excessive operating pressure	Remove cause.
	Excessive operating temperature	Remove cause.
Lack of volume	Slipping belts	Tighten belts.
	Worn clearances	Re-establish proper clearances.
Excessive bearing or gear wear	Improper lubrication	Correct oil level. Replace dirty oil. See Page 4.
Loss of oil	Headplate, gear case or drive cover vents plugged	Clean vents.
	Worn seal	Replace seals. See Page 9.

SECTION III

MAINTENANCE

GEAR INSPECTION

Timing gears, Fig. 2, may be inspected simply by removing the gear case after draining oil. Refer to Fig. No. 1. The gear case (A) is secured to the headplate (B) with cap screws (C).

For visual inspection of gear-end bearings see Section IV, Repair & Replacement (Pages 8-9). On completion of maintenance work, be sure that gear case is restored to original position. Use a paste-type gasket compound on the cleaned mating surfaces. Always relubricate before starting.

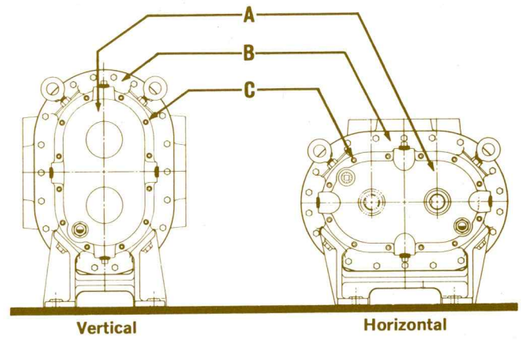


FIGURE NO. 1

IMPELLER INSPECTION

Series 3000 impellers can be inspected through intake and discharge ports. This will reveal such conditions as out of time, excessive or insufficient clearances, abrasion of parts from passing foreign materials, etc.

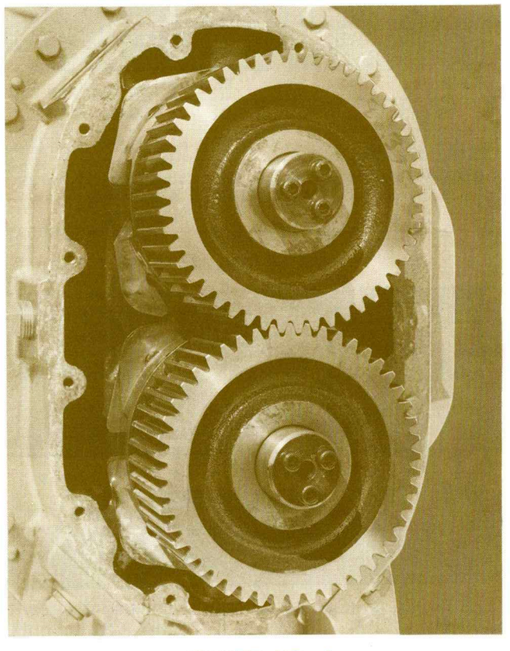


FIGURE NO. 2

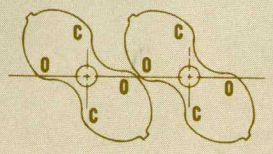
DETERMINING PROPER IMPELLER CLEARANCES

Refer to Fig. No. 3. Impellers are shown viewed from the drive end of the blower. Always face the drive shaft end when determining clearances. Select the illustration which represents your unit.

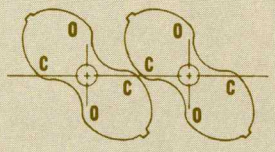
Clearances between impellers are measured at points o-o and c-c when the impellers are positioned at 45° angles as shown. This is done by measuring with a feeler gauge between o-o, then rotating the impellers a quarter turn and gauging between c-c. Adding the measurements obtained will give the total clearance.

Units timed for rotation in one direction only are marked with a rotational arrow above the drive shaft. In these units, o-o should have 2/3rds of the total clearance and c-c should have 1/3.

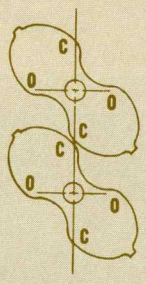
If no rotational arrow appears, the unit is "center timed" for rotation in either direction. In these units, clearances at o-o and c-c should be equal.



Drive Shaft at right, discharge at top; or Drive Shaft at left, discharge at bottom.

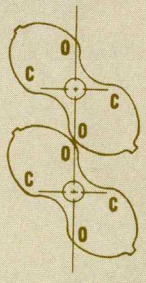


Drive Shaft at right, discharge at bottom; or Drive Shaft at left, discharge at top.



Drive Shaft at bottom, discharge at right.

FIGURE NO. 3



Drive Shaft at bottom, discharge at left.

RESETTING IMPELLER CLEARANCES

Impellers are held in time by the timing gears, which are secured in position on the impeller shafts by grip rings inside the gear hubs. To reset impeller clearances (timing) it is necessary to release the grip rings in one of the gears. (See Fig. No. 4 on next page.)

Grip rings are paired telescoping rings with conical mating surfaces. These rings are telescoped under clamping pressure so that the outer ring expands against the bore of the gear while the inner ring contracts on the shaft, locking them together.

To release the grip rings in one of the gears, first remove the gear locking clamp which is held to the end of the impeller shaft by three cap screws. Use a gear puller to withdraw the gear about 1 8 inch, then lightly tap the side of the gear with a mallet. This will release the grip rings inside the gear hub so that the impeller will be free to adjust. Do not remove the gear.

Wedge the two impellers together against the exact amount of shims required to establish proper clearance as determined previously. Push gear firmly against gear spacer (Fig. 6) on the shaft. Replace the gear locking clamp and cap screws. Partially tighten the cap screws with the shim stock still wedged between impellers. Proceed to tighten the cap screws progressively, finishing with a torque wrench to obtain a torque of 65 ft. lb. Shock-load the gear locking clamp and then re-torque to 65 ft. lb. Remove shim stock and turn the impeller a couple of turns, then recheck the clearances.

END CLEARANCE: It is always good policy to check end clearance between the impeller and gear-end headplate BEFORE AND AFTER DISTURBING TIMING GEARS OR GEAR-END BEARINGS. If end clearance is not within tolerance, see Bearing and Seal Replacement instructions on Pages 9 & 10 for making correction by re-shimming the bearing cartridge.

After completion of work replace gear case and relubricate.

SECTION IV

REPAIR &

With proper maintenance and lubrication you can expect normal life of bearings, gears and seals. To maintain the efficiency of your unit, however, these parts must be repaired or replaced when required.

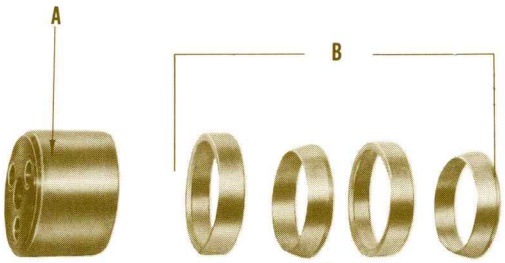
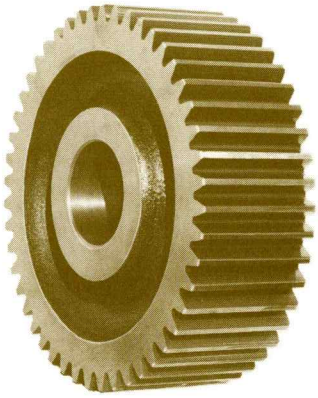


FIGURE NO. 4



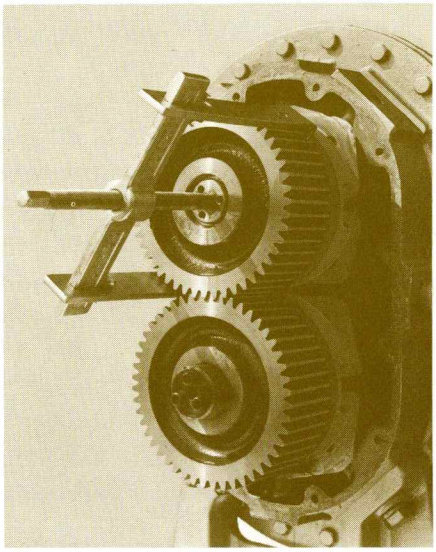


FIGURE NO. 5

TIMING GEAR REMOVAL

Remove the gear case (see Gear Inspection, Page 6). Match mark the shafts and gears to assure proper repositioning on completion of work.

See Fig. No. 4. Remove the cap screws and gear locking clamps (A) from both shafts. Inside the hub of each gear are two pairs of telescoping grip rings (B) which secure the gear to the shaft. These grip rings must be released to remove the gear.

This is done by withdrawing the gear (Fig. No. 5) about 1/8 inch with a gear puller, then lightly tapping the side of the gear. This releases the rings and allows the gear to be removed by hand.

Note carefully the placement of the grip rings before removal, so that you can replace them properly paired and faced in the correct direction.

TO REASSEMBLE, locate each gear firmly against the gear spacer on its shaft. Thoroughly clean and dry all components — the grip rings, shafts and gear bores: coat the grip rings with a light oil then slide the grip rings all the way into the gear bores. Be sure the rings are paired and faced identically as originally installed, as shown in Fig. No. 4. (Note: do not reuse grip rings which have been disassembled, since they lose concentricity and locking characteristics.)

Replace the gear locking clamps and cap screws. Establish a position for one gear, and progressively tighten the cap screws on that gear only. Using a torque wrench, finish at 65 ft. lbs. Shock-load the gear locking clamp and then re-torque to 65 ft. lb. Then follow "Resetting Impeller Clearances" on Page 7 before tightening the second gear in the same manner.

Note end clearance between the impeller and gear head plate and correct if necessary according to instructions on next page. Replace the gear case and relubricate.

REPLACEMENT

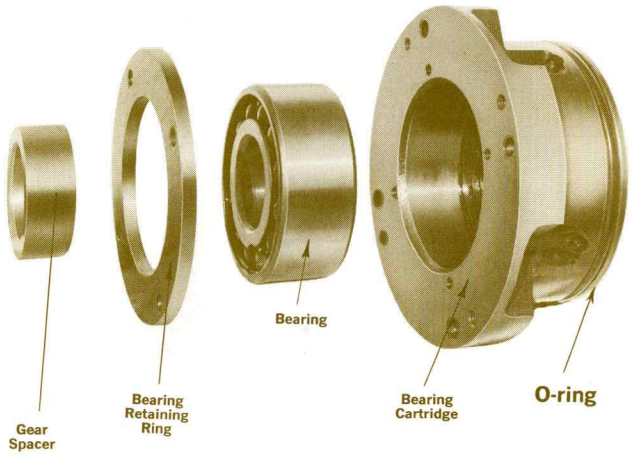
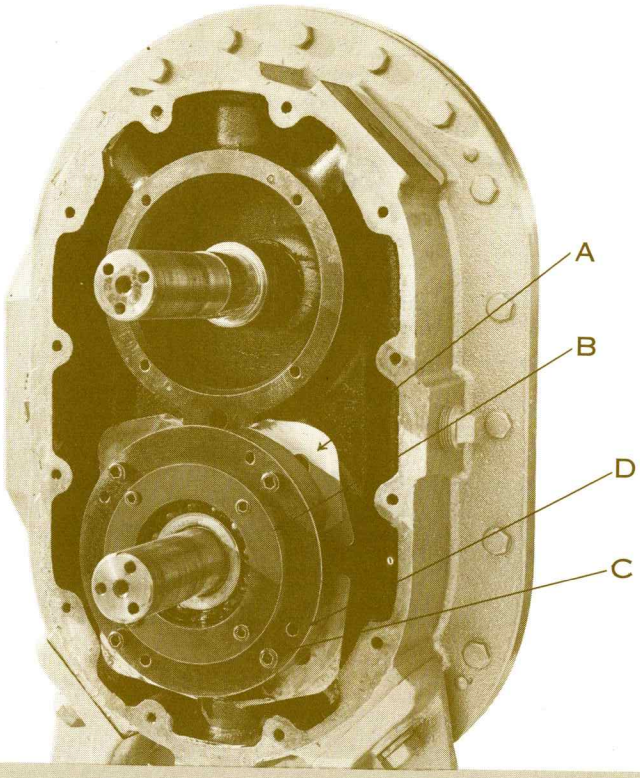


FIGURE NO. 6



BEARING AND SEAL REPLACEMENT

GEAR END

Remove gear case (see Gear Inspection, Page 6). Note end clearance between impeller and gear headplate. Remove timing gears as instructed on opposite page.

Refer to Fig. No. 6. Shims (A) installed during manufacture will now be exposed behind the bearing cartridge (B). These shims set the end clearance between the impeller and headplate; hence it is important that they be returned to their exact positions on reassembly. (NOTE: the number of shims fastened behind each bearing cartridge bolt may vary; be sure each set of shims is identified by position during withdrawal.) To remove the shims, loosen (but do not remove) the bearing cartridge bolts (C). Insert jack screws in tapped holes (D) provided in the cartridge and back out the cartridge until the shims are loose. Remove one attachment bolt at a time, taking out the shims and marking them for accurate repositioning. On removal of all bolts continue using the jack screws to complete the cartridge removal. Remove the bearing retainer from the face of the cartridge.

Blowers have a lip type oil seal behind each bearing; pumps have a mechanical seal.

LIP TYPE OIL SEAL

Whenever a cartridge is removed for repair purposes, always install a new seal and O-ring before reassembly. Install the seal with lip facing the bearing, using a driving instrument having approximately the same outside diameter as the seal. Use precaution not to damage the sealing elements, particularly when they are moved over the shafts.

MECHANICAL SEAL

Refer to Figure 7. To replace a mechanical seal, remove the old seal components and clean shaft thoroughly, especially under the friction ring (Item 4).

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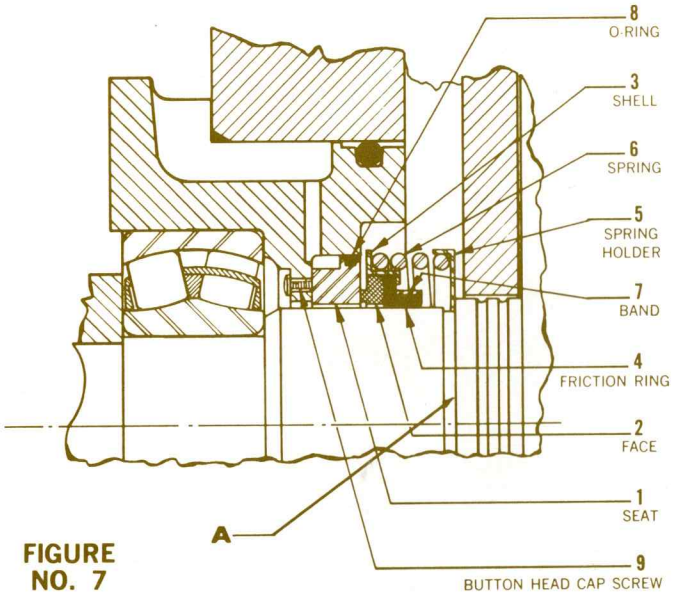


FIGURE NO. 7

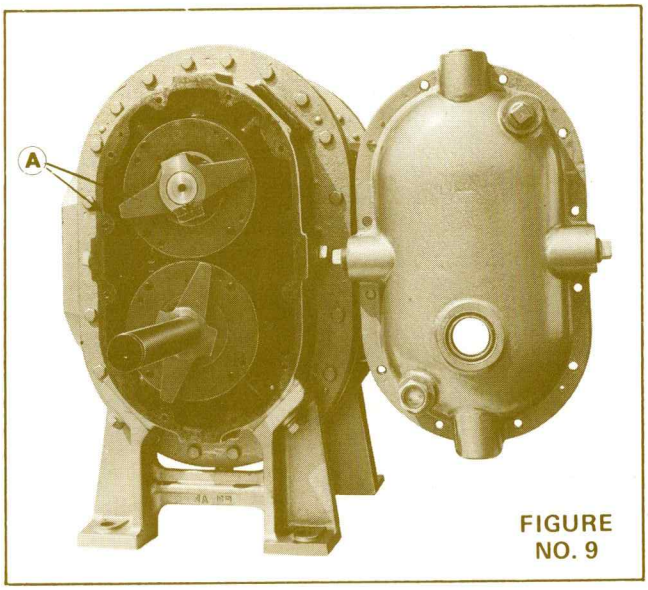


FIGURE NO. 9

Coat shaft with light oil. Install the seal assembly consisting of Items 2 through 7. Be sure that the spring holder (Item 5) is pushed against the large diameter shoulder of the shaft (A). When installing

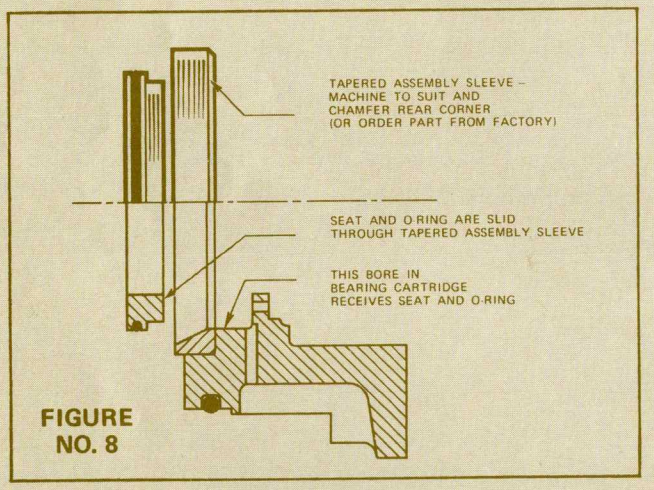


FIGURE NO. 8

the seat (Item 1) and the O-ring (Item 8) in the bearing cartridge, it is necessary to use a tapered assembly sleeve (see Figure 8) to prevent damage to the O-ring. Secure seat (Item 1) with three button-head cap screws (Item 9).

On completion of seal repair or replacement, install a new O-ring on the bearing cartridge. Return the cartridges to their respective shafts and restore the shims to their original positions. Replace bearings in cartridges and secure with bearing retainers. Be sure inner races are against shaft shoulders.

END CLEARANCE — To check the gear-end impeller clearance, install gear spacer (Figure 6) on shaft. Follow with a sleeve made for this purpose from tubing with an I.D. that fits easily on shaft, with squared ends, and with a length of 2-7/8 inches. With gear locking clamp bearing against this sleeve, tighten the three cap screws to 40 ft. lbs. Check clearance between impeller ends and gear headplate. Add or remove shims behind bearing cartridge as needed to establish proper clearance of .005″ to .006″. After this has been established, remove positioning sleeve and install gears, grip rings and gear locking clamps following procedure outlined on Page 8.

DRIVE END

See Figure No. 9. Remove drive cover using jacking screws in tapped holes provided. Unbolt and remove oil slingers from each shaft noting their relative position for later replacement. The bearing cartridges can now be removed following the procedure described for the gear end, with the exception that no shims or bearing retainers will be found.

Re-install bearing cartridges with new seals and O-rings as described on Page 9.

Replace bearings and slingers. Rotate shafts a couple of turns to be sure there will be no interference of the oil slingers. Remove old drive seal and install drive cover. Use a paste-type gasket compound between cleaned mating surfaces. Replace drive seal. Take extreme care to avoid damaging the seal when moving it over the shaft keyway. When reassembly is completed, lubricate.

TYPICAL PARTS DESCRIPTION

DET.	REQD.	DETAIL PART DESCRIPTION
□ 1	2	Main Bearing – Drive End
□ 2	2	Main Bearing – Gear End
□ 3	4	Main Seal
□ 4	1	Drive Seal
□ 5	4 PR.	Grip Rings
□ 6	1 PR.	Timing Gears
● 7	1	Long Shaft Assembly
● 8	1	Short Shaft Assembly
9	1 SET	(Comprises Item 7 & Item 8)
10	4	Sleeves
11	2	Headplate
12	1	Impeller Case
13	1	Gear Case
14	1	Drive Cover
15	4	Bearing Cartridge
16	2	Bearing Retainer
17	A/R	Thrust Shim

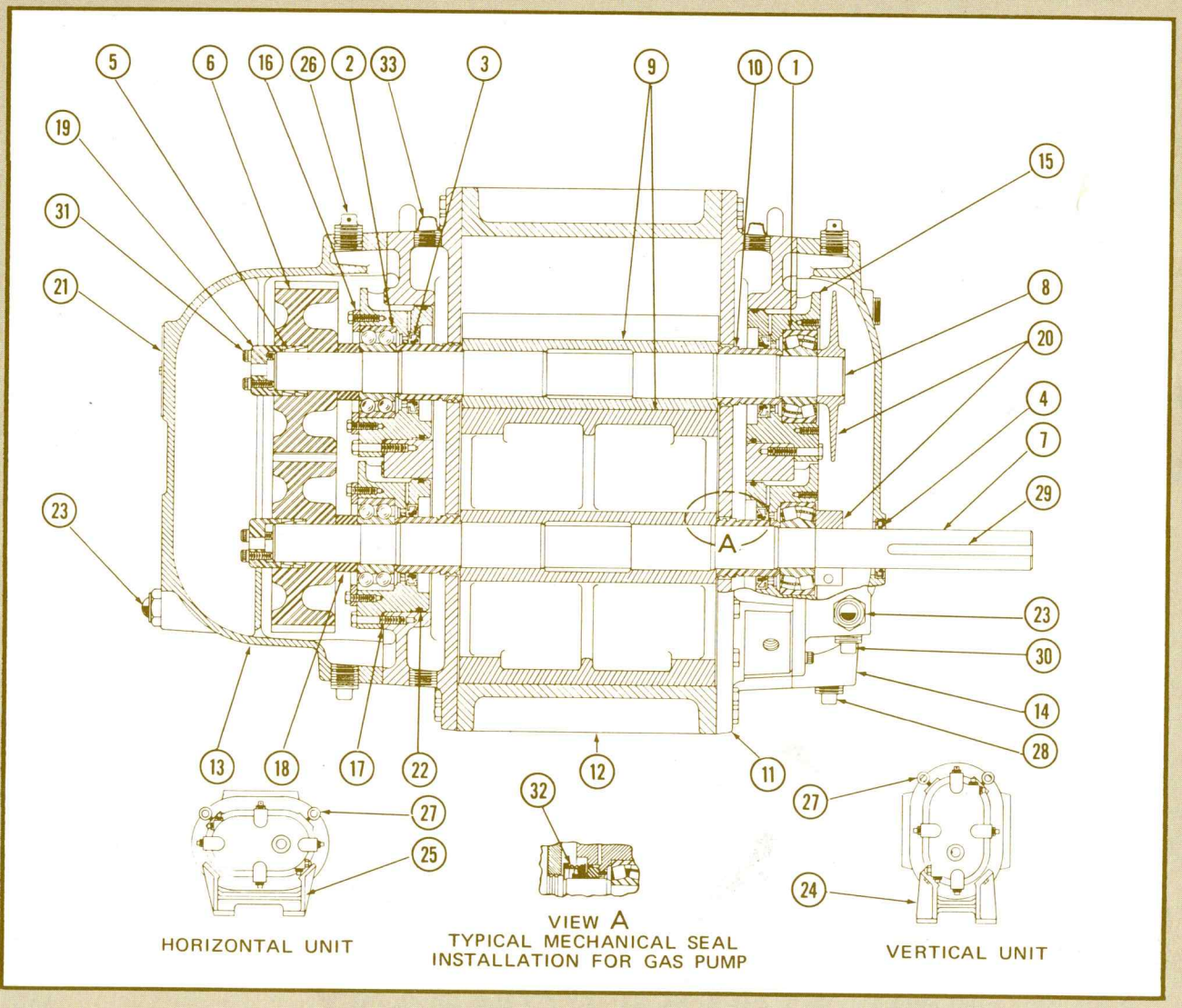
DET.	REQD.	DETAIL PART DESCRIPTION
18	2	Gear Spacer
19	2	Gear Locking Clamp
20	2	Oil Slinger
21	1	Nameplate
□ 22	4	O-Ring (Bearing Cartridge)
23	2	Oil Level Sight Glass
24	2	Vertical Foot
25	2	Horizontal Foot
26	2	Vented Oil Fill Plug
27	4	Eye Bolt (Lifting)
28	2	Drain Plug
29	1	Drive Key
30	8	Pipe Plug
31	6	Soc. Hd. Cap Screw
32	4	Mechanical Seal
33	2	Plug Top Seal Vents

GENERAL NOTES:

1-When ordering spare or replacement parts specify the following: Size of unit, series, serial no. part name, and detail no.

□ 2-Items marked thus are factory recommended spare parts.

● 3-Shaft assembly marked thus consists of one shaft with mounted impeller and shaft sleeves, items 7 & 8 furnished only in matched pair (item 9).



HORIZONTAL UNIT

VIEW A
TYPICAL MECHANICAL SEAL
INSTALLATION FOR GAS PUMP

VERTICAL UNIT