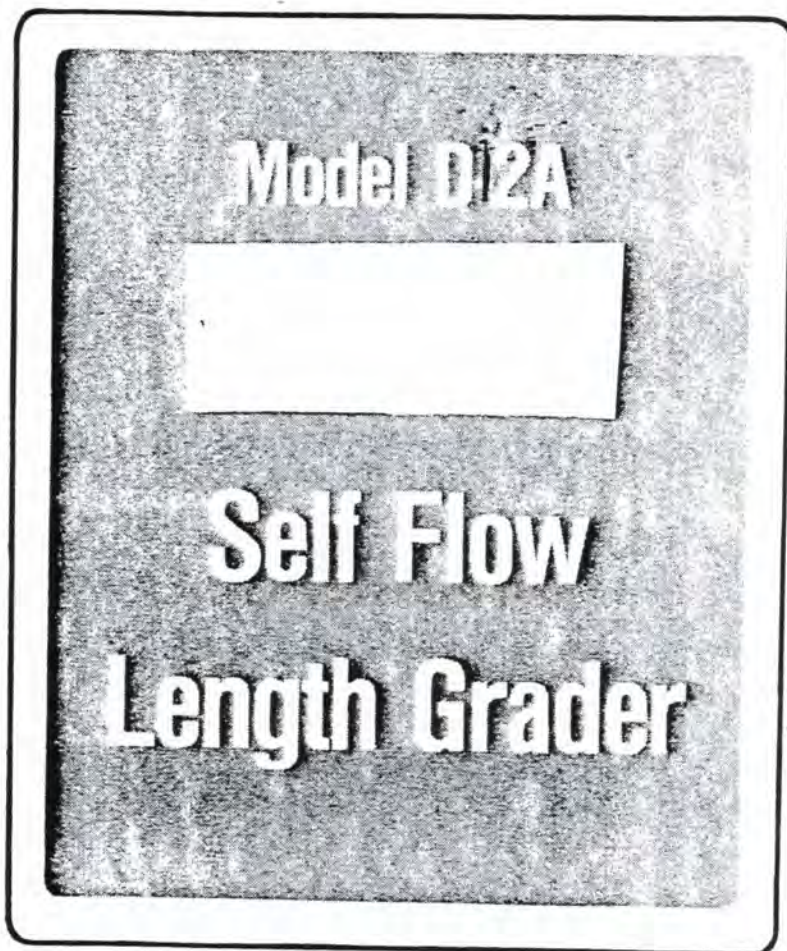


OPERATION AND REPAIR PARTS MANUAL



IDEAL GRAIN AND SEED CLEANER COMPANY

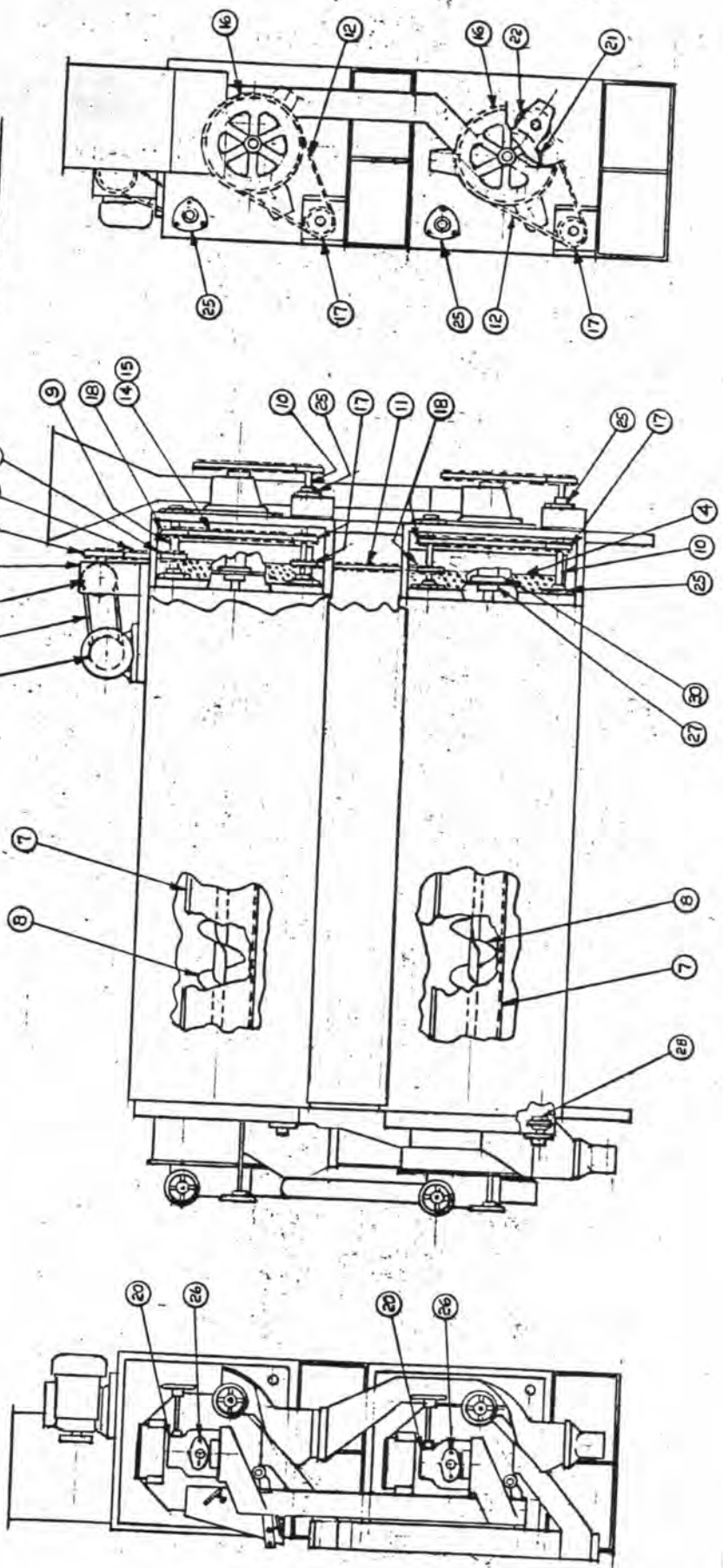
85 Second Avenue S.E. • New Brighton, MN. 55112

MANUFACTURING AND REPAIRING OF GRAIN CLEANING MACHINES

D-2A/786

ITEM	PART NO.	DESCRIPTION	QTY.	ITEM	PART NO.	DESCRIPTION	QTY.	ITEM	PART NO.	DESCRIPTION	QTY.
1	B35	DRIVE BELT	1	11	A7010-63	ROLLER CHAIN 3/4 P	1	21	C2	TRUNNION TRACK	2
2	IVP44 x 7/8	MOTOR SHEAVE	1	12	A7010-81	ROLLER CHAIN 3/4 P	2	22	A369	TRUNNION ROLLERS	4
3	BK60-5/8	DRIVE SHEAVE	1	13	A7010-46	ROLLER CHAIN 3/4 P	1	23	* A320	RETARDER- OUTER CYL.	2
4	A203	OUTER CYLINDER	2	14	A7010-96	ROLLER CHAIN 3/4 P	2	24	* A319	RETARDER- INNER CYL.	2
5	* A204	INNER CYLINDER	2	15	C3	RING SPROCKET 69T	2	25	A506	BEARING 1 3/16 B	10
6	* 3W569	TROUGH - INSIDE	2	16	C51-52	SPROCKET 60T	2	26	A335	OILITE BEARING	2
7	A208	SEED TROUGH	2	17	7002-10	SPROCKET 15T	6	27	A113	WOOD BEARING	4
8	3W548	CONVEYOR	2	18	7002-5	SPROCKET 16T	3	28	A332	RUBBER ROLLER	8
9	725	MAIN DRIVE SHAFT	2	19	60B15 x 7/8	SPROCKET, REDUCER	1	29	A308	SPEED REDUCER	1
10	726	DRIVE SHAFT	2	20	A941	DISCHARGE CASTING	2	30	C12	BEARING HOLDER	4

* NOT SHOWN



INTRODUCTION

This manual is intended to cover Models D-2A, D-12A and D-22A. In almost all cases, references to the Model D-2A instructions, illustrations and parts lists will apply to the other machines as well. An additional parts list will be furnished with this manual, listing part differences if your machine is not a model D-2A.

The Model D-2A Self Flow Length Grader is a two-cylinder machine which is designed to clean grain and seed and make separations by length. The exclusive tapered indent cylinders allow product to flow continuously through the machine for constant operation. Availability of a variety of indent cylinder sizes, combined with control flexibility,

allows the processing of many different types of product.

Consult the sales literature, this manual or contact your local sales representative to assist you with any cleaning, grading, or separating problems. Our Seed Laboratory offers a testing service for grain and seed samples at no cost or obligation. Send samples or written inquiries to:

Ideal Grain and Seed Cleaner Company
85 Second Avenue Southeast
New Brighton, MN 55112
or call (612) 636-7323

USE OF MANUAL

This manual has been especially prepared to familiarize owners and operators with the operation and maintenance of the Ideal Model D-2A Self Flow Length Grader. In some instances, information contained in this manual is generalized, since specific operation can be determined only during operation. For thorough understanding, optimum operation, and proper maintenance, please give all information in this manual your careful

consideration.

Left, right, front, and rear designations of the machine are determined by viewing the machine from the discharge end. As further orientation aids, drawings in this manual have direction arrows indicating the front of the machine and caption designations describing positions.

MECHANICAL SPECIFICATIONS

Model D-2A	
Length, overall	118"
Highth, overall	46"
Width, overall	31-½"
Minimum power requirement	One H.P.
Weight, empty	1,050 Lbs.

For specific information on: Models other than D-2A, mounting hole locations and intake hopper and spouting dimensions, see your installation drawing (furnished separately).

INSTALLATION

The machine should be placed on a level foundation which is as free as possible of vibration. Adequate access clearance for service and maintenance must be provided. Ideally, one end of the machine should have clearance equal to the machine length to allow cylinder replacement.

Provide a suitable connection to the feed hopper opening. The machine operates most efficiently if the product is choke-fed to assure a constant infeed volume and flow.

If a motor is supplied with the machine, refer to the packing list or motor name plate to identify power connection and wiring requirements. Electrical connections should be made only by a qualified electrician, strictly following or exceeding applicable safety codes and regulations. A lockable power switch is recommended to reduce the possibility of accidental starting during service or maintenance.

OPERATION

OPERATION SEQUENCE

This machine is constructed of iron and steel, and is very durable. It is a relatively simple machine employing few moving parts. Major components are the outer cylinder, the stationary trough and its control wing, the inner cylinder, and the inner trough. The machine is equipped with an exclusive double cylinder (one cylinder within another). This configuration permits separations for three different sizes (short, medium, and long) of product in one pass through the machine. For the following operation sequence, refer to figure 1.

A mixture of product is choke-fed into the feed intake (A) at the rear of the machine, and flows into the large outer cylinder. Leveltrol blades attached at an angle to the stationary trough cause the mixture to move forward. The outer cylinder picks up the medium and short product and leaves the long product which exits the machine through a discharge chute (B). This is the first separation. Medium and short product are transferred to the outer trough (C). A spiral blade attached to the outside of the

CAUTION

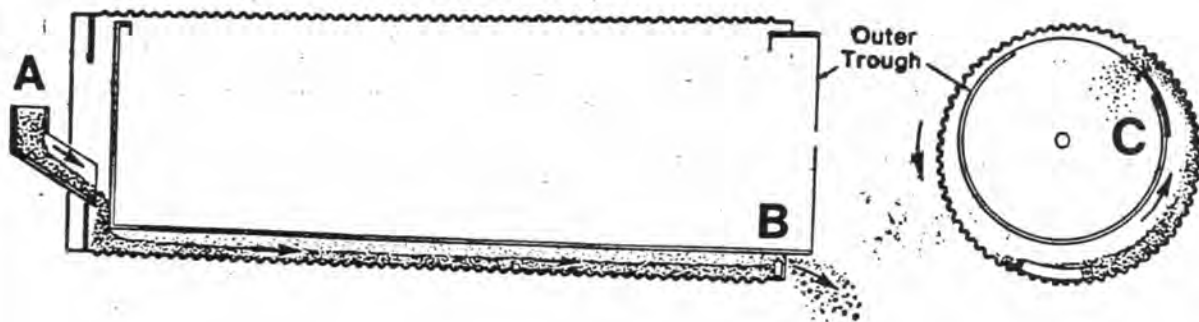
Check the rotation of the motor after making the electrical connections. Inspect rotation of the motor from the drive shaft end--it should rotate clockwise. If not, reverse the electrical connections.

The machine is completely prelubricated prior to shipment from the factory. Refer to the section on maintenance for operational lubrication. If the machine is shipped by ocean vessel, complete cleaning and lubrication must be done prior to operation to remove possible salt contaminants.

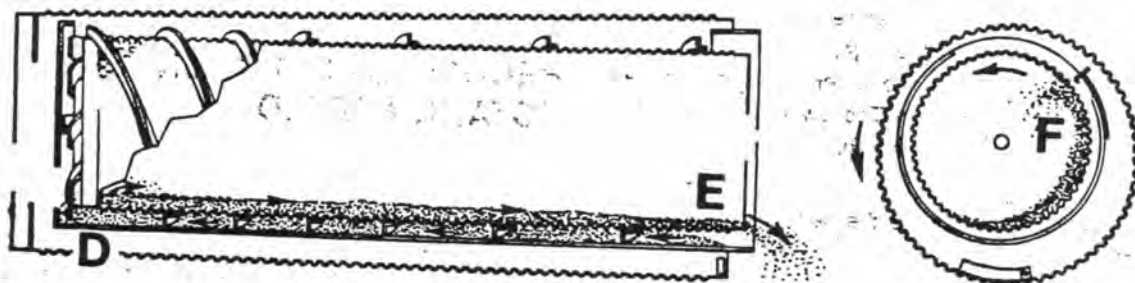
inner cylinder moves the medium and short product to the rear of the machine (D), where a pickup wheel transfers the mixture into the inner cylinder (E). Here, Leveltrol blades attached at an angle to the inner trough cause the mixture to move forward toward the second discharge chute. The inner cylinder lifts the short product (F) into the inner trough (G). Short product in the inner trough is moved toward the third discharge (H) by a spiral blade on a shaft. Discharge of the three separations are all at the same end of the machine, thus simplifying installation and collection of product.

Percentages of separation are controlled by the wing on the outer trough (C), and by the tilt angle of the inner trough (G). Raising the outer trough wing reduces the amount of product transferred into the outer trough and inner cylinder. Tilting the inner trough more to the left (as viewed from the front of the machine) reduces the amount of product transferred into the inner trough.

FIRST SEPARATION



SECOND SEPARATION



THIRD SEPARATION

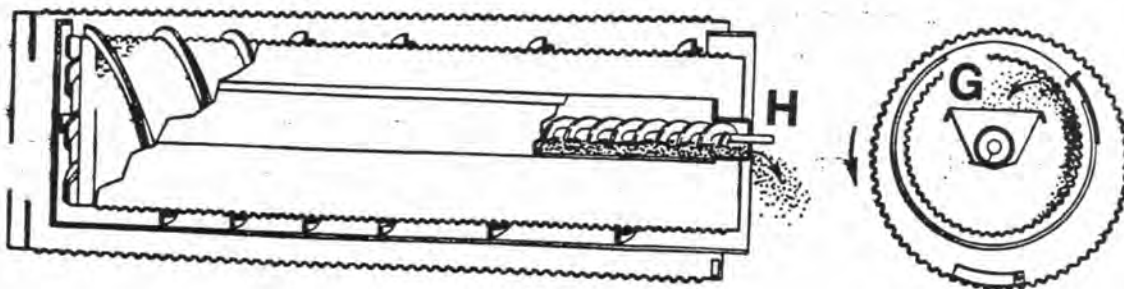


FIGURE 1 — Sequence of Operation

OPERATING CONTROLS

For the following descriptions, refer to figure 2.

NOTE

When a control setting is changed, wait at least three minutes to observe the effects of the change. Change control settings one at a time.

Outer Cylinder Retarder Adjustment (A): Retarder restricts long product discharge, permitting time for sorting and lifting of medium and short product. Setting of this control must be determined during operation. If the retarder is set too high, long product will transfer into the outer trough with the medium and short product. If it is set too low, short and medium product will discharge with the long product.

Outer Cylinder Retarder Lock (B): Secures setting of Outer Cylinder Retarder.

Outer Trough Handwheel (C): Rotating this handwheel in a clockwise direction lowers the grading edge of the wing. Setting for this control must be determined during operation. If the wing is set too high, medium and short product will drop back into the outer cylinder and be discharged with the long product. Too low a setting permits long product to enter the outer trough.

Wing Lock Clamp (D): Secures the setting of the Outer Trough Wing.

Inner Cylinder Retarder Weight (E): Retarder restricts medium product discharge, permitting time for sorting and lifting of short product. Setting of this control must be determined during machine operation. If the weight is set out on the lever arm too far, medium length product will transfer into the inner trough with the short product. Setting the weight too far out on the lever arm allows short product to exit through the medium product discharge chute.

Inner Cylinder Retarder Weight Hook (F): Secures the position of the Inner Cylinder Retarder Weight in the open position as shown.

Inner Trough Handwheel (G): Handwheel adjusts the position of the inner trough grading edge. Turning the wheel clockwise lowers the grading edge. The scale on the front

of the machine is calibrated to show the position of the inner trough. Setting of this control can be determined only during operation. If the inner trough grading edge is set too high, short product will fall back into the inner cylinder and be discharged with the medium product. Setting the grading edge too low causes medium length product to transfer into the inner trough with the short product.

Inner Trough Handwheel Lock (H): Secures the setting of the Inner Trough position.

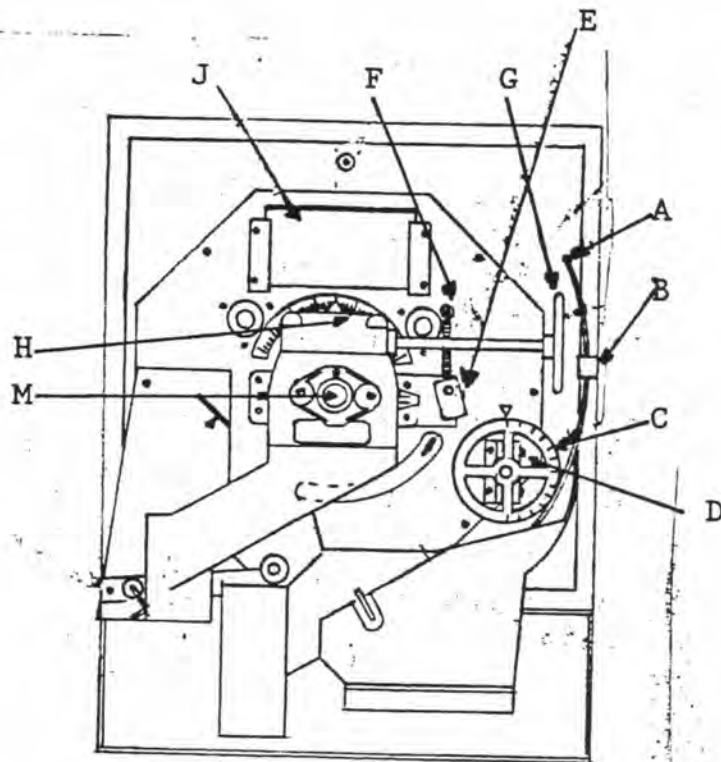
Inspection Door (J): Open to observe operation and position of inner cylinder and inner trough. Close for routine operation and cleanout procedures.

Feed Intake Hopper Slide (K): Mixed product input into the machine can be regulated or shut off using the slide in the feed intake at the rear of the machine.

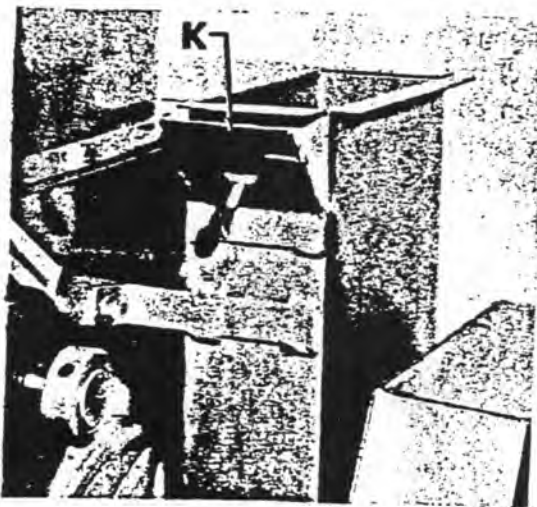
RECOMMENDED CYLINDER ROTATION SPEED

Whenever the machine is shipped with a motor, the inner cylinder speed has been adjusted at the factory to the proper rotation speed of approximately 56 RPM. If the motor is supplied by the customer, this speed must be set. Check or set speed by placing your finger on the center shaft set collar (M, figure 2) and count rotation while machine is running.

To adjust the speed of the cylinder, remove the guard from the drive belt between the motor and the right-angle gear reducer. Loosen the motor mounting screws. Adjust the effective diameter of the adjustable pulley on the motor as needed. Increasing the effective diameter of the pulley by reducing the distance between the sides increases the outer cylinder speed. Adjust the setting of the motor on its mounting base to provide proper tension on the belt. Replace the guard over the drive belt. The speed of the inner cylinder is 5 to 6 RPM faster than the outer cylinder. This relationship is not adjustable.



FRONT VIEW



Rear View

FIGURE 2 — Operating Controls

INITIAL START-UP

This procedure describes the general start-up sequence applicable to all grain products. Final control settings can be determined only during operation. It is recommended that the operator(s) keep a record of control settings for various products as an aid for future operations.

When the machine is shipped from the factory, the separating cylinders are coated with a rust inhibitor. After the machine has been in operation for four to five hours, the inner surfaces of the cylinders become polished. This changes the operating characteristics of the machine. Therefore it will be necessary to change the control settings to obtain optimum results.

NOTE

When changing control settings with the machine running, wait at least three minutes after each control setting change before observing results. Change only one control setting at a time.

1. Loosen the lock on the inner trough handwheel. Turn the handwheel until the top of the trough is in the horizontal position (scale setting of 3- $\frac{1}{2}$ to 4). Verify the position by raising the inspection door (refer to figure 2, item J) and observing position through the inspection port. Adjust as required and note the pointer setting. Close the inspection door and lock the handwheel.
2. Loosen the lock on the outer trough handwheel. Turn the handwheel fully counterclockwise to set the wing to its highest level. Tighten the lock.
3. Loosen the lock on the outer cylinder retarder. Adjust the retarder upward until approximately three inches of discharge opening remains. Tighten the lock.

4. Unlatch the outer trough cleanout weight (refer to figure 2, item L) and gently let it down to its lowest position.
5. Lower inner cylinder retarder weight (refer to figure 2, item E).
6. Close the slide on the feed intake.
7. Supply an adequate quantity of product to the feed intake to ensure continuous choke-feeding.

WARNING

Starting the machine when filled with product can cause damage to drive parts. Therefore, once loaded, the machine must not be stopped until it is empty. In the event of power failure or other stoppage while loaded, turn off the electrical power and lock it off. Then clean out by hand as much product as possible before attempting to restart the machine.

8. Start the machine. When the cylinders are rotating at the recommended speeds, open the feed intake slide to the desired position.
9. Allow the machine to run until product is distributed along the bottom of the outer cylinder and overflows the retarder.
10. Loosen the lock on the outer trough handwheel. Turn the handwheel clockwise until a satisfactory mix of short and medium product begins to discharge. Lock the handwheel.

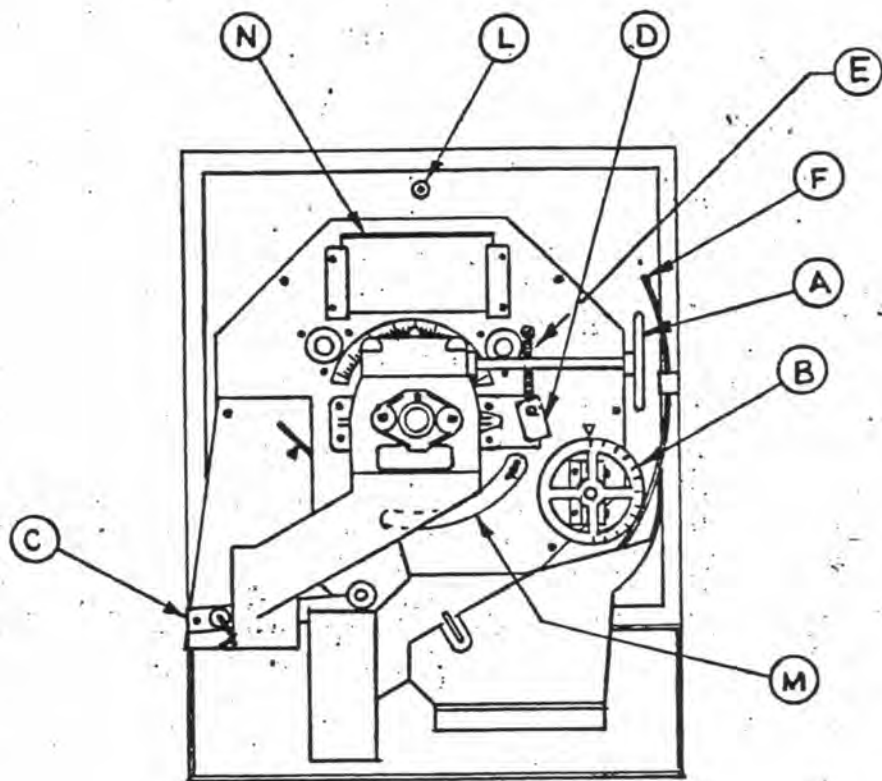


FIGURE 3 - CLEANOUT PROCEDURES
FRONT VIEW

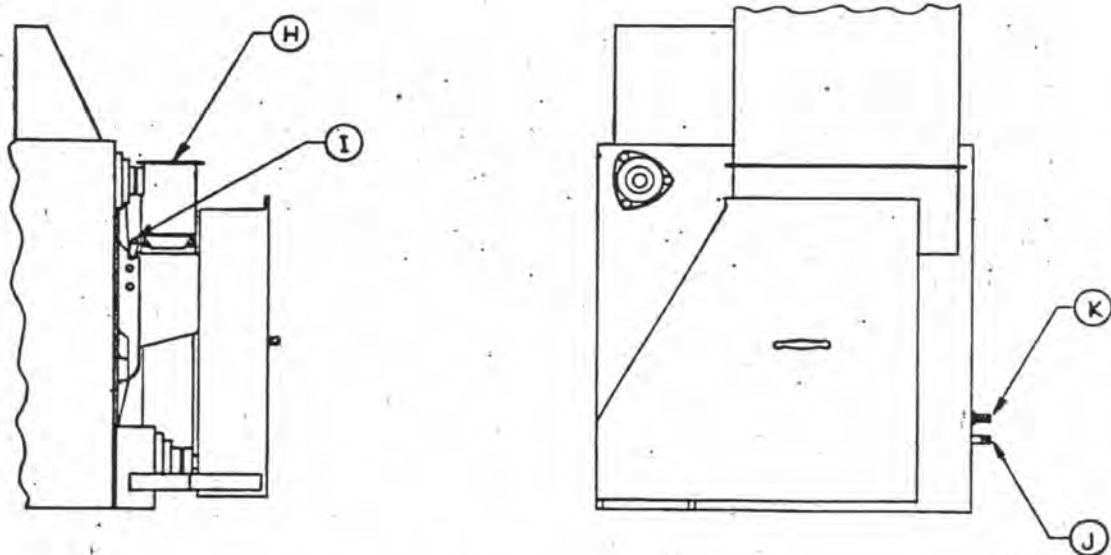


FIGURE 4 - CLEANOUT PROCEDURES
REAR VIEW

STOPPING AND CLEANOUT

This machine incorporates new features which permit more efficient cleanout of product from the machine. This section contains the recommended cleanout procedure. Refer to figures 3 and 4 when performing the following procedure.

1. At the end of the product run, let the machine continue to run until most of the product is clear.

WARNING

Personal injury can occur when performing the following steps. Wear and use appropriate safety equipment, and exercise extreme caution while performing cleanout procedures with the machine running.

2. Set the following controls on the front of the machine to the cleanout position:

Inner trough handwheel (A): Set inner trough to the dump position (pointer at the left side of the dial).

Outer trough handwheel (B): Rotate handwheel fully clockwise to completely lower wing.

Outer trough cleanout (C):
See Page 17A

Inner cylinder retarder weight (D): Raise to its upper position and latch the spring onto the hook (E).

Outer cylinder retarder (F): Move the retarder down to allow the maximum opening.

NOTE

In the following steps, the best results are obtained using a tapered nozzle to direct the air flow.

3. At the rear of the machine, direct air into the top of the feed intake (at H) if possible.

MAINTENANCE

To assure continued satisfactory operation of your machine, perform the periodic maintenance which follows. The recommended service interval is 40 hours or weekly, whichever is shorter.

WARNING

Personal injury can result from attempts to service the machine while it is running. Empty and purge the machine (refer to the instructions in the cleanout section). Turn off the electrical power to the machine and lock the electrical switch before attempting machine service.

Break-in Maintenance:

After the first 40 hours of use, check the entire machine for tightness of fasteners. Check the setscrews on all bearings, sprockets and pulleys. Tighten any loose fasteners

4. Briefly direct compressed air into the end area cleanout fitting (I). Then, for a longer time, direct compressed air into the inner cylinder cleanout (J). Next, direct air into the outer cylinder cleanout (K). More air injected into J and K will shorten cleanout time.
5. After a few minutes, raise the outer trough wing to its highest position by rotating the handwheel fully counterclockwise. Set the inner trough position to 5 on the scale. Remove the plug from the upper front air hole (at L) and direct compressed air into the hole. Replace the plug. Remove the plug from the lower front air hole (M, behind inner trough discharge spout) and direct compressed air into the hole. Replace the plug. Direct compressed air into the outer cylinder retarder area.
6. Slide the front inspection door (N) upward and remove it. Purge the area inside with compressed air. Replace the inspection door.
7. Run the machine until it sounds nearly empty and/or shows no signs of product after inspection.

NOTE

In the following step, failure to thoroughly clean the retarder area can cause undue wear to the outer cylinder or outer cylinder retarder.

8. Turn off electrical power to the machine, and lock the electrical switch. Remove the eyebolt guide, retarder control rod and outer cylinder retarder from the machine. Clean out by hand any material that is held or imbedded in the retarder area. Reinstall the retarder, retarder control rod, and the eyebolt guide.

RESUMING OPERATION

Use the initial startup procedure to resume operation.

as required.

Speed Reducer Maintenance:

Refer to the manufacturer's data sheet at the end of this manual.

8-Hour Maintenance:

Using compressed air and a soft, clean, dry cloth, clean grain and dust accumulations from the area and machine. Clean dirt accumulations from shafts, bearings, and controls. Clear out all pieces of metal, glass, and other refuse from behind the outer cylinder retarder.

NOTE

For moderate temperature operation, use medium pressure bearing grease. When operating in sub-zero (F) temperatures, use light pressure grease.

40-Hour Maintenance:

1. Lubricate the bronze center shaft bearing on the front of the machine and the friction rollers which have needle-type bearings. Use bearing grease.
2. Liberally lubricate the roller chains using commercial grade chain lubricant or SAE 10W oil. The chains can be accessed by removing the access door at the right rear of the machine and by removing the rear drive guard. Also apply the same lubricant to all control pivot points.

200-Hour Maintenance:

Lubricate the Sealmaster® bearings with 4 to 5 shots of grease according to the manufacturer's instructions. If the machine is running in extremely dirty conditions or high temperatures, lubricate these bearings more frequently.

SERVICE

The local Ideal distributor is trained to service your machine, and to assist with any service, operation, or adjustment questions which may arise. Additional information can be obtained from Ideal at the address listed in the introduction.

REPLACEMENT PARTS

The following pages illustrate and list the repair parts for the Ideal Model D-2A Self Flow Length Grader. Common hardware items (nuts, bolts, washers, etc.) are not listed. Obtain these items from local hardware sources. Parts for the D-12A and D-22A machines will be listed in a separate parts list included with this manual.

Ordering Repair Parts: Order repair parts from the local Ideal distributor, or from the Ideal factory at the address listed in the introduction. Please furnish the following information:

1. Model and serial number as shown on the machine serial plate on the front of the machine.
2. Part number, description, and desired quantity for each part as shown in the following parts lists. Do not give the item number.
3. Any special shipping instructions.
4. If ordering cylinders, specify the indent size in addition to the part number.

NOTE

It is recommended that a new cylinder be purchased complete with ring and end, because these parts are difficult to install correctly in the field. The intake cone assembly or ring sprocket should be ordered separately, if required.

CYLINDER ASSEMBLY, REAR See Figure 5

Item	Part No.	Description	Qty.
1	1	1
2	1	1
3		HOPPER	1
4	C51-52	SPROCKET, 60T, 3/4"P	1
5	465	SET COLLAR, 1-5/16"	6
6	337	SEAL, Wool Band	1
7	A506	BEARING	4
8	7002-5	SPROCKET, 16T, 3/4"P	1
9	7002-10	SPROCKET, 15T, 3/4"	2
10	725	SHAFT, Upper Drive	1
11	C50	TROUGH EXTENSION	1
12	3W567	OUTER TROUGH ASSEMBLY (See Fig. 8)	1
13	A113	WOOD BEARING ASSEMBLY	1
14	C12	BEARING HOLDER	1
15	A203	CYLINDER ASSEMBLY	1
16	C2	TRUNNION TRACK	1
17	C3	SPROCKET, 69T, 3/4"P	1
18	691	END PLATE, Rear	1
19	A369	TRUNNION ROLLER ASSEMBLY	4
20	C49	SPIDER CASTING	1
21	692	BEARING BRACKET	1
22	726	SHAFT, Lower Drive	1
23	A356	HUB ASSEMBLY	1
24	609	SPACER, Hub Assembly	1
25	A204	CYLINDER ASSEMBLY	1
26	A208	SEED TROUGH ASSEMBLY	1
27	3W548	CONVEYOR, Seed Trough	1

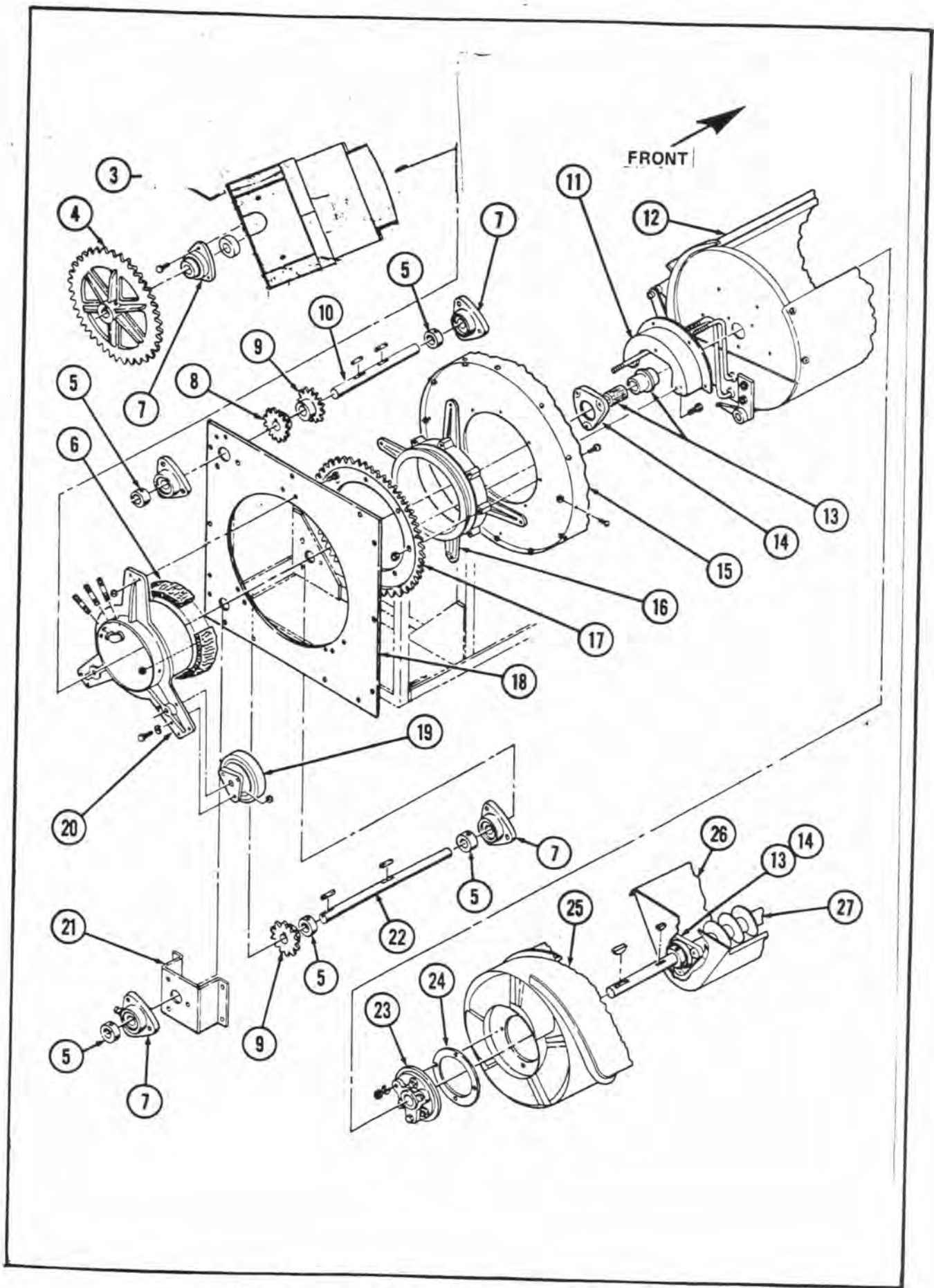


FIGURE 5 — Cylinder and Rear End Parts

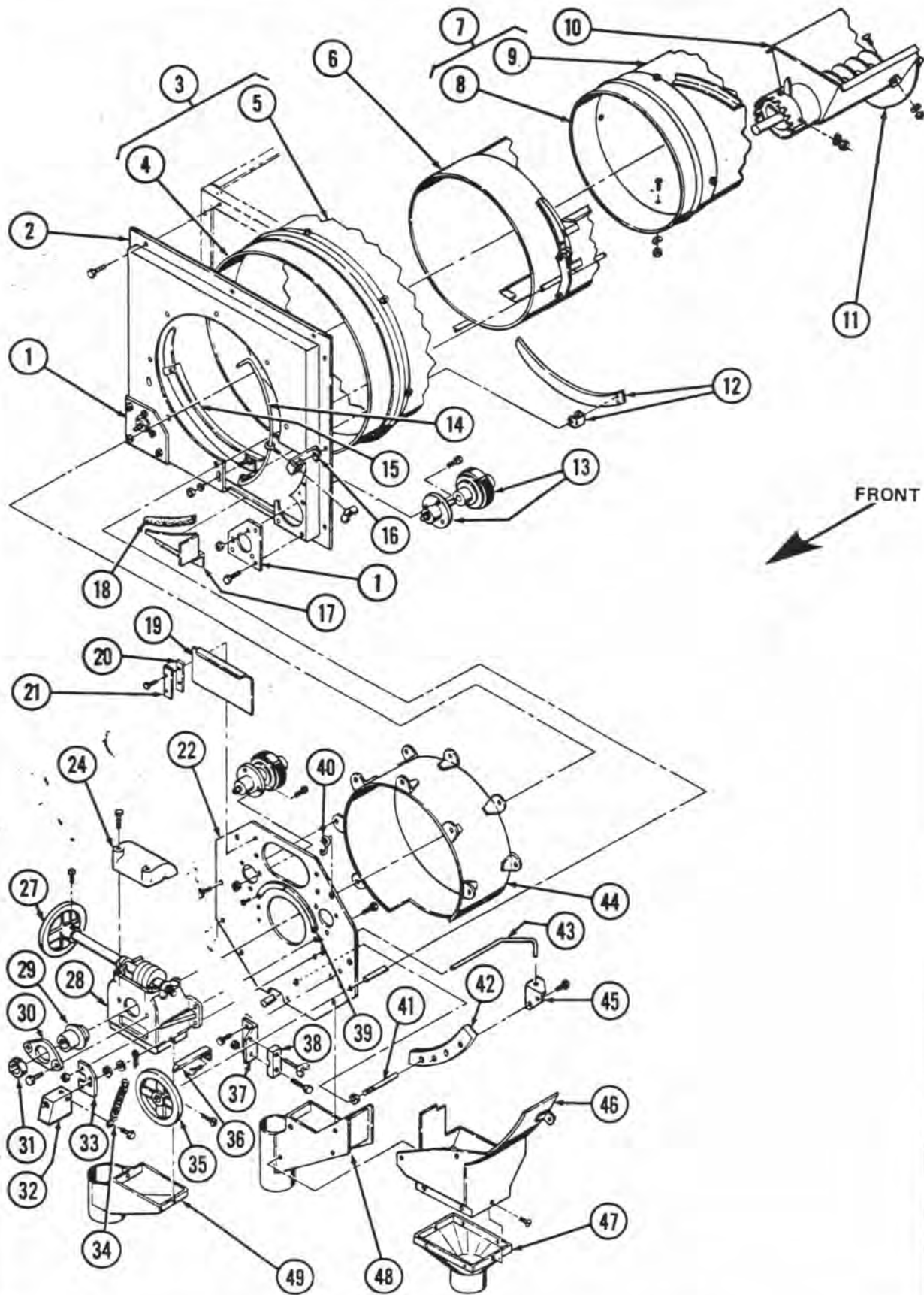


FIGURE 6 — Cylinder and Front End Parts

PARTS LIST

CYLINDER ASSEMBLY, FRONT — See Figure 6

Item	Part No.	Description	Qty.
1	497	MOUNTING PLATE, Friction Roller	2
2	351	END PLATE, Front	1
3	A203	CYLINDER ASSEMBLY, Outer, (Incl. Items 4 & 5)	1
4	C1	CYLINDER RING, Outer Cylinder	1
5	W5001-0	CYLINDER, Outer	1
6	3W567	OUTER TROUGH	1
7	A204	SEED CYLINDER ASSEMBLY (Incl. Items 8 & 9)	1
8	C6	CYLINDER RING, Seed Cylinder	1
9	W5002-0	CYLINDER, Only (Please Specify)	1
10	A208	SEED TROUGH ASSEMBLY	1
11	C34	BLADE, Seed Trough	12
12	A320	RETARDER ASSEMBLY	1
13	A332	FRICTION ROLLER ASSEMBLY	1
14	406	CONTROL ROD, Retarder	1
15	3W378	GUIDE, Retarder	1
16		SUPPORT, Retarder Control Rod	1
17		SEAL HOLDER	1
18		SEAL, Wool Band	1
19		INSPECTION DOOR	1
20		SPACER, Inspection Door	2
21		GUIDE, Inspection Door	2
22	357	EXTENSION HEAD PLATE	1
24	C59	COVER, Discharge Head	1
27	C94	HANDWHEEL, Discharge Head	1
28	A341	DISCHARGE HEAD	1
29	A355	BEARING	1
30	C62	BEARING HOLDER	1
31	465	SET COLLAR	1
32	C47	WEIGHT, Seed Retarder	1
33	494	GUIDE, Weight Arm	1
34		SPRING, Seed Retarder Weight	1
35	C94-1	HANDWHEEL, Outer Trough	1
36	493	POINTER, Outer Trough Handwheel	1
37	492	BRACKET, Wing Rod	1
38	491	CLAMP, Wing Rod	1
39	C70	DIAL	1
40		HOOK, Retarder Weight	1
41	790	STUD, Retarder	1
42	A319	RETARDER	1
43	489	ARM, Retarder	1
44	3W566	EXTENSION RING	1
45		BRACKET, Retarder	1
46		SPOUT, Thru's	1
47		SPOUT, Thru's Adapter	1
48		SPOUT, Grain	1
49		SPOUT, Screenings	1

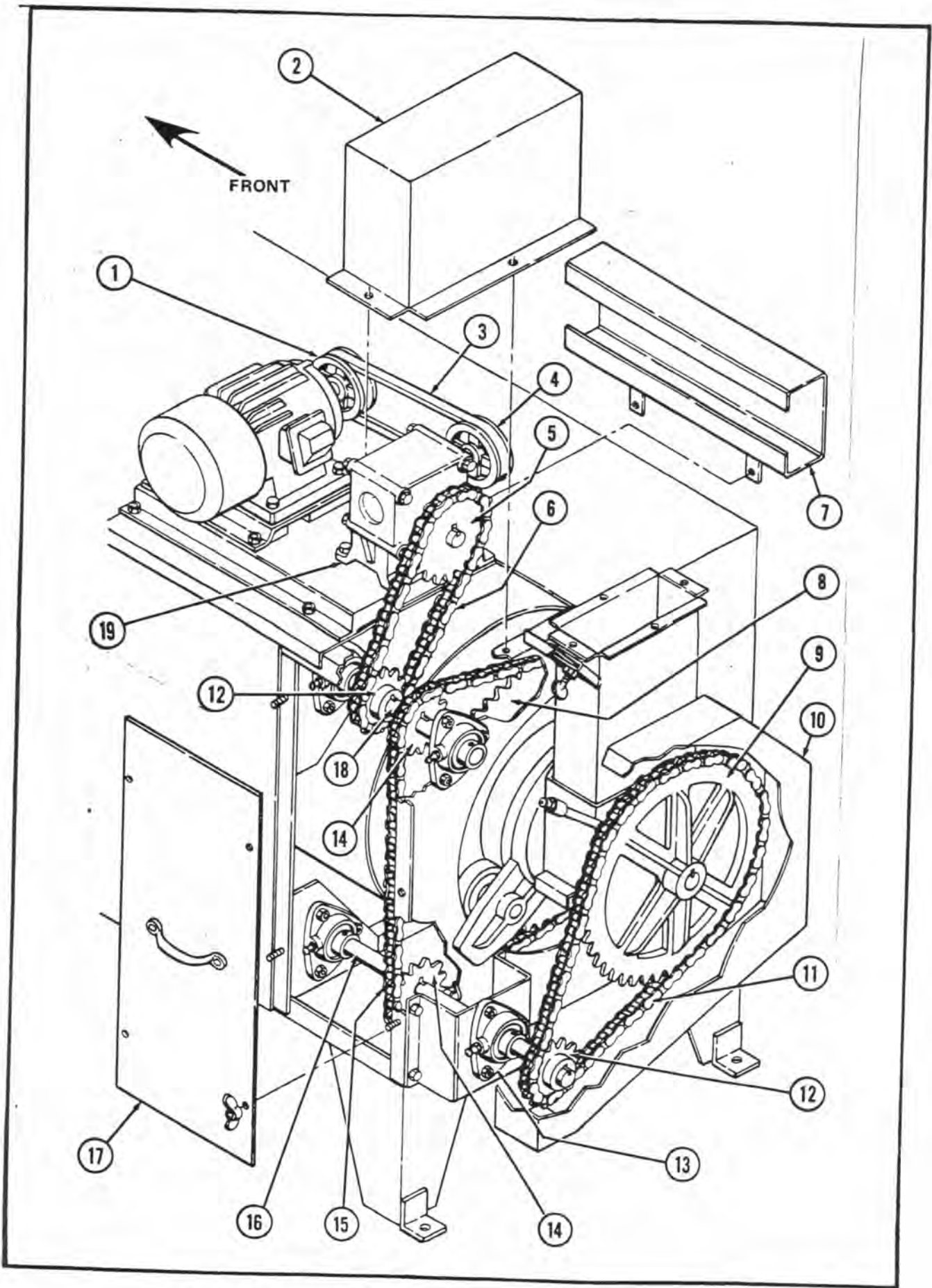


FIGURE 7 — Drive and Guard Parts, Rear End .

PARTS LIST

DRIVE SYSTEM — See Figure 7

Item	Part No.	Description	Qty.
1	IVP40	SHEAVE $\frac{7}{8}$	1
2	3W595	CHAIN GUARD, Reducer	1
3	B32	BELT.....	1
4	BK52	SHEAVE, $\frac{5}{8}$ " Bore.....	1
5			
6	A7010-46	CHAIN, $\frac{5}{8}$ " — Pitches	1
7	3W594	BELT GUARD, Motor	1
8	C3	RING SPROCKET	1
9	C51-52	SPROCKET, 60T, $\frac{3}{4}$ "P.....	1
10		GUARD, Conveyor Drive	1
11	A7010-81	CHAIN, $\frac{3}{4}$ " — 81 Pitches	1
12	7002-10	SPROCKET, 15T, $\frac{3}{4}$ "P.....	5
13	A506	BEARING	4
14			
15	A7010-96	CHAIN, $\frac{3}{4}$ " — 96 Pitches	1
16	726	SHAFT.....	1
17		ACCESS DOOR	1
18	725	SHAFT.....	1
19	A308	REDUCER	1

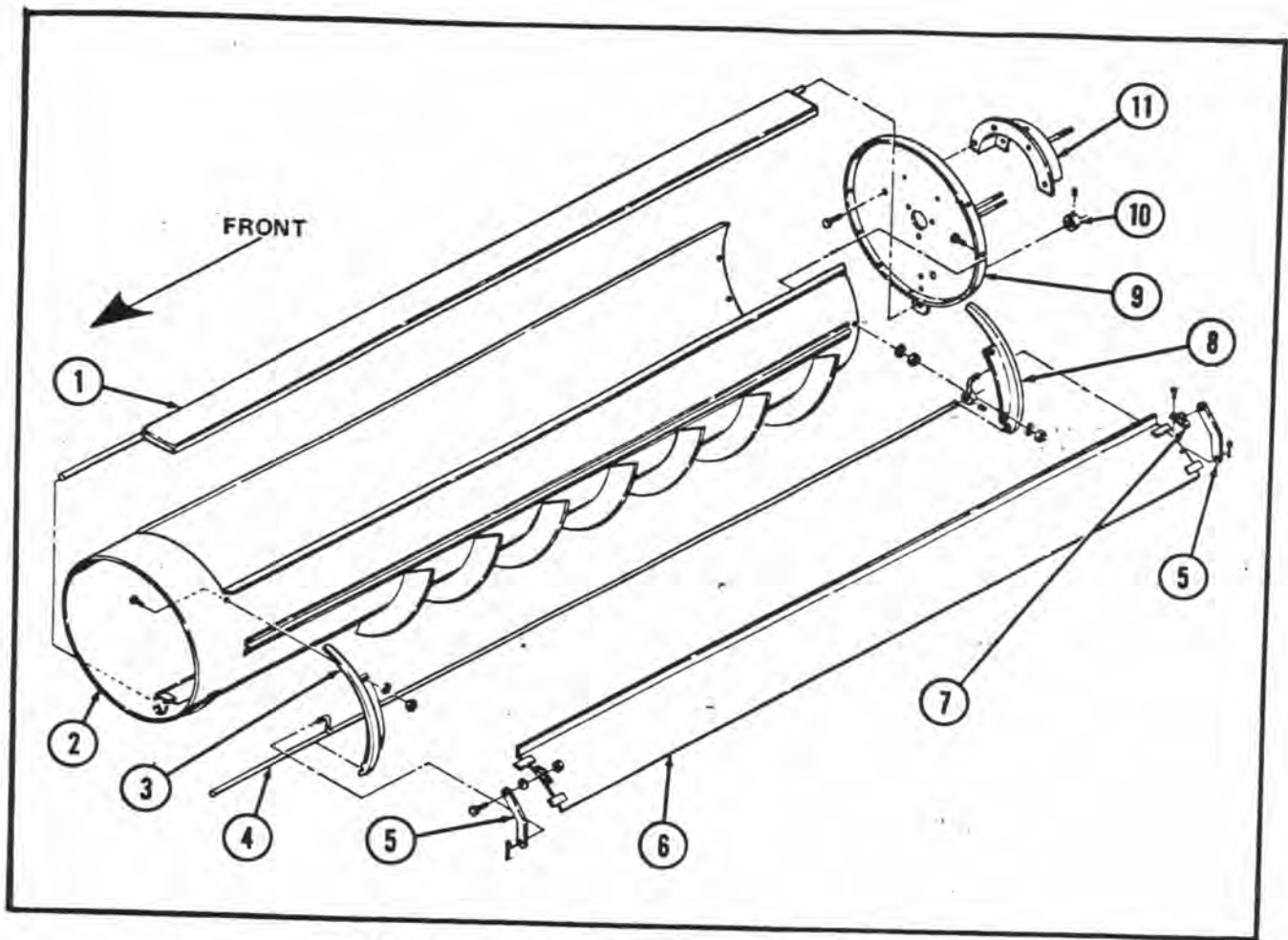


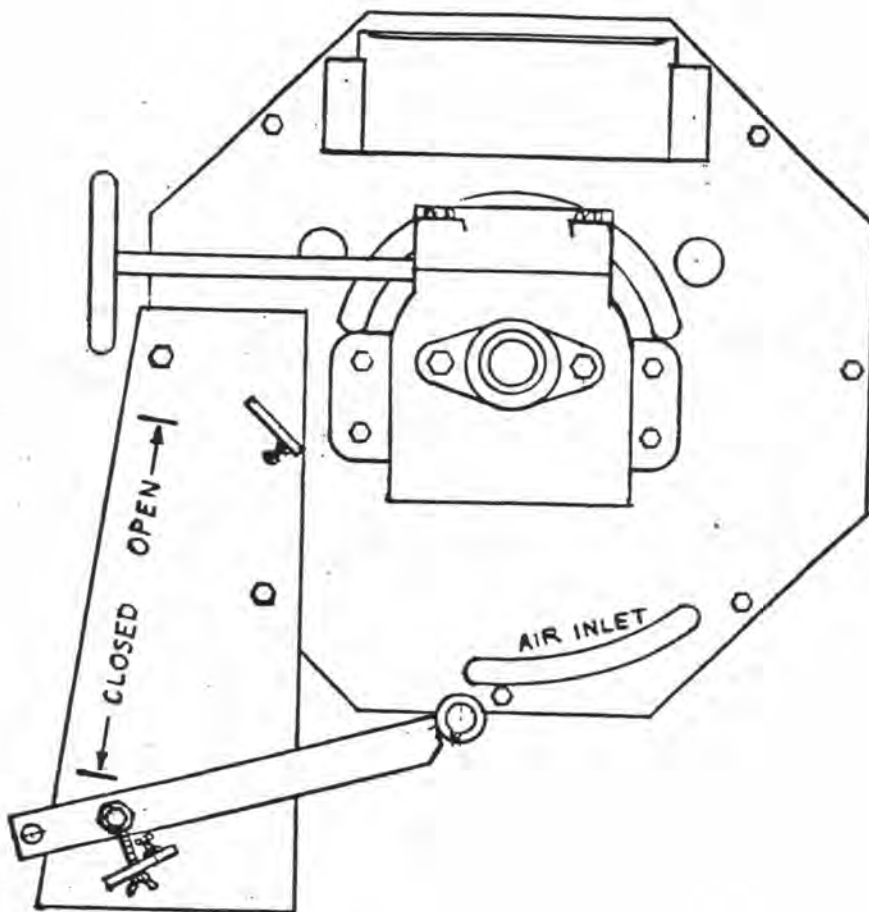
FIGURE 8 — Outer Trough Assembly

Item	Part No.	Description	Qty.
1	3W569	GATE WELD, Outer Trough	1
2	3W567	OUTER TROUGH	1
3	C98	GUIDE, Wing, Left	1
4	3W106	WING ROD	1
5	400	ARM, Wing	2
6	A210	WING ASSEMBLY	1
7	C97	BRACKET, Wing Arm	2
8	C99	GUIDE, Wing, Right	1
9		END, Outer Trough	1
10	468	SET COLLAR	1
11	C50	TROUGH EXTENSION	1

INSTRUCTIONS FOR REMOVING AND REPLACING CYLINDERS IN D2A, D12A, D22A

1. Remove guard, chain sprocket and bearing (Figure 7, item 10, 11, and 9) also bearing behind item 9 and intake hopper.
2. Remove secondary hopper (Figure 5, item 2). Remove hose clamps O, J and K shown in Figure 4.
3. Remove all spouting on discharge end of machine (Figure 6). Remove item 28 and worm rack attached to trough neck. Also, open and close bracket and arm (see page 17A). Remove item 22 from item 44, inner cylinder (item 7) and inner trough (item 10) can now be removed as one assembly.
4. Remove item 11 (Figure 5) from item 20.
5. Remove (12) bolts holding end plate to frame (Figure 6, item 2). End plate and outer trough (item 6) can now be removed as one assembly.
6. Remove chain (Figure 7, item 15). Outer cylinder (Figure 6, item 3) can now be removed.

NOTE: If screw conveyor is removed from inner cylinder be sure to mark shaft so that the shaft will extend the correct distance from end of cylinder.

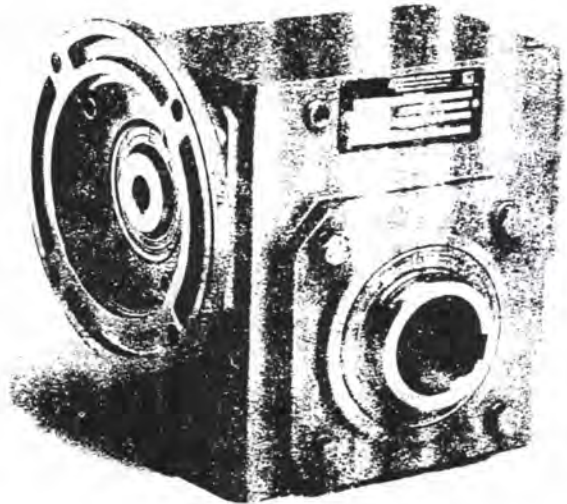
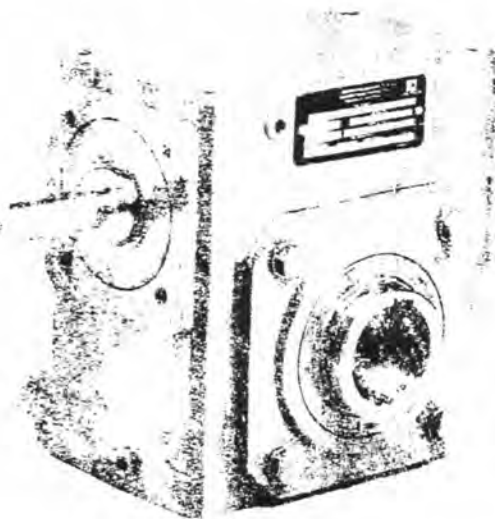
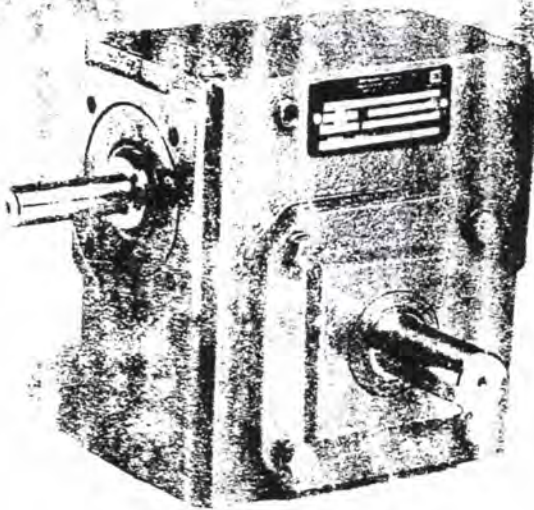


This machine incorporates new features which makes better cleanout of machine possible, to achieve this, the following steps are recommended:

- (1) Shut off feed to machine.
- (2) Attach spring on retarder weight for inner cylinder to hook, also remove retarders from all cylinders.
- (3) After 3 or 4 minutes rotate all troughs to dump position then return to #4½ to 5.
- (4) Rotate outer trough handwheel clockwise until stopped.
- (5) In the illustration above the arm is in closed position, during cleanout the arm should be in open position and returned to close position when cleanout is completed.
- (6) Apply several blast of air into areas designated as air inlet. This section of machine has air inlets on both ends.

All of the above steps should be done while machine is running, but extreme caution must be exercised while performing cleanout procedure to prevent injury.

EPT



WORM GEAR SPEED REDUCERS MAINTENANCE INSTRUCTIONS

CENTER DISTANCES 1.33, 1.54, 1.75, 2.06, 2.37, 2.67, 3.00, 3.25, 3.75, 4.50, 5.16 AND 6.00



EMERSON POWER TRANSMISSION CORP
30 SOUTH AURORA
ROCKAWAY, N.Y. 14850
(716) 697-7200

INTRODUCTION

The following instructions apply to Worm Gear Speed Reducers. When ordering parts or requesting information specify all information stamped on the reducer nameplate.

EQUIPMENT REQUIRED

In addition to standard mechanic's tools, the following equipment is required: arbor press, wheel puller, torque wrench, dial indicator, seal driver, bluing, adhesive sealant, snap ring pliers for internal and external rings.

GENERAL INSTRUCTIONS

Housings - Clean external surfaces of reducer before removing seal cages and end covers to prevent dirt from falling into the unit. Record mounting dimensions of accessories for reference when reassembling. If it is necessary to remove the reducer from its operating area, disconnect all connected equipment and lift reducer from its foundation.

Seals - Replacement of all seals is recommended when a unit is disassembled. However, if seals are not to be replaced, protect seal by wrapping shaft with thin, strong paper coated with oil or grease before removing or replacing seal case assembly. Clean the shaft but do not use any abrasive material on the shaft surface polished by the seal.

CAUTION

If the reducer is painted, extreme care should be taken to mask the shaft extensions and rubber surface of the seals. Paint on the shaft adjacent to the seal or on the seal lip will cause oil leakage.

TO CHANGE OUTPUT SHAFT DIRECTION

To change the hand of a unit from left hand to right hand, or vice versa, the following instructions apply:

1. Remove drain plug and drain oil from unit.
2. Remove end cover and seal cage capscrews; then while supporting output shaft remove end cover and shims from the unit.
3. Remove output shaft and seal cage together from extension side.
NOTE: Keep shims with their respective seal cage and end cover.
4. Reassemble unit per instructions on Page 5, Item 3.

CAPSCREW TIGHTENING TORQUE

Table 1

Capscrew Diameter	1/4-20 UNC	5/16-18 UNC	3/8-16 UNC	1/2-13 UNC
Torque (in. lbs.) Dry	96	204	360	900

UNIT DISASSEMBLY

1. Remove drain plug and drain oil from unit.
2. Low speed shaft (gear shaft) removal:
 - A. Remove end cover and seal cage capscrews.
 - B. With a firm hold on the output extension remove end cover and shims.
 - C. Carefully slide output shaft assembly and seal cage out extension side.
 - D. Slide seal cage off low speed shaft using caution to prevent damage to seal lips.
 - E. Wire or tie the shims to their mating end cover and seal cages. They will be available for reference when assembling the unit.
3. High speed shaft (worm shaft) removal:
 - a. For C-Flange units 1.33 C.D. through 3.25 C.D.:
 - Use a small chisel to make a groove in the stamped steel cover opposite the motor flange. Pry cover off. Remove internal snap ring from housing bore. Remove motor flange. Using a plastic hammer, gently tap on the motor end of the shaft to feed worm shaft assembly through housing and out.

- For C-Flange units 3.75 C.D. through 6.00 C.D.:
 - Remove motor flange. Remove seal cage opposite motor face. Keep shims with seal cage for reassembly. Remove bearing nut and washers from end opposite motor. Using a plastic hammer, gently tap the shaft on the motor end. Push shaft assembly through housing until rear bearing outer race is free. Slide bearing inner-races off of shaft and remove worm through front of housing. If a press is available, pressing the shaft out is preferable.
- For Basic units 1.33 C.D. through 3.25 C.D.:
 - Use a small chisel to make a groove in the stamped steel cover opposite the extension. Pry cover off. Remove internal snap ring from housing bore. Using a plastic hammer, gently tap on the extension end of shaft to feed assembly through housing and out. On units with C.D. of 1.33, 1.54, 2.63, and 3.00, front bearing will remain in housing bore. Use soft tool and plastic hammer to tap bearing out extension end of housing from rear. Be sure to tap on outer-race of bearing. If a press is available, pressing this bearing out is preferable.
- For Basic units 3.75 C.D through 6.00 C.D.:
 - Remove front and rear seal cages. Keep shims with seal cages for reassembly. Remove bearing nut and washers from end opposite extension. Using a plastic hammer, gently tap the shaft on extension end. Push shaft assembly through housing until rear bearing outer-race is free. Slide rear bearing inner-race off of shaft. Reverse direction and push shaft assembly through front end of housing and out. If a press is available, pressing the shaft out is preferable.

PARTS SERVICE

1. Housing – Clean inside of housing with kerosene or solvent and then dry.
2. Seal cages and end cover – Remove dirt from joint faces, wipe clean and dry.
3. Air vent – Wash in kerosene, blow clean and dry.
4. Seals – To replace seals without dismantling reducer refer to steps C through F below. To replace seals when the entire reducer is dismantled and coupling hubs, sprockets, pulleys, pinions, keys, etc. have been removed the following instructions apply:

NOTE: Replacement of all seals is recommended when a unit is disassembled.

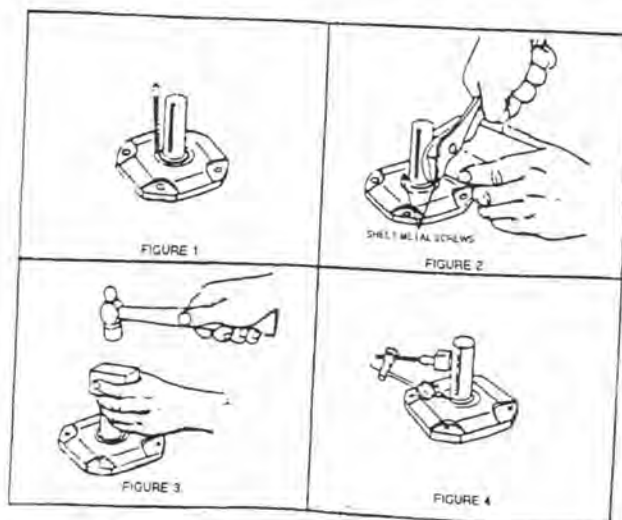
Caution

New seals will leak if the seal lips or if seal's rubbing surface on the shaft has been altered. Protect seal lips at all times. Clean the shaft but do not use any abrasive material on the shaft surface polished by the seal.

- A. Block up seal cages and press or drive out seal.
- B. Remove old sealing compound from seal seat in cage if it is present. If a seal with rubber coating on the outside diameter is used, no sealant is necessary. If no rubber coating is on seal outside diameter, coat seal cage bore with adhesive sealant immediately before assembly.

To prevent possible damage to seal lips, do not reassemble seals until high speed and low speed shafts have been reassembled to the housing. Then see steps E and F below.

- C. See Figures 1 through 4 – To replace seals without dismantling reducer, proceed as follows:



Caution

Do not damage shaft; new seals will leak if seal contacting surface is marred. Use punch and place two or more holes in steel casing of seal, Figure 1. (The steel casing may be rubber coated) Insert sheet metal screws, leaving the heads sufficiently exposed so they can be pried up or grasped with pliers, Figure 2. Do not drill holes because chips may get into the unit.

- D. Work seal loose. Be careful to keep all metal or dirt particles from entering unit. Remove old sealing compound from seal seat if it is present. Also remove burrs and sharp edges from shaft. Clean with rag moistened with solvent. Do not use abrasive material on shaft seal contacting surface.

Caution

Protect seal lips when handling; seal leakage will result if these are damaged. If a seal with rubber coating on the outside diameter (O.D.) is used, no sealant is necessary. If no rubber coating is on seal O.D., coat seal cage bore with adhesive sealant. Coat seal lips with oil and carefully work seal into position. Before sliding seal into position, protect seal lips from shaft keyway edges by wrapping shaft with thin, strong paper coated with oil. Position garter spring toward the inside of the unit. Place a square face pipe or tube against the seal O.D. and drive or press seal until fully seated as shown in Figure 3. Do not strike seal directly.

- F. For best performance, seat the seal square with shaft within .005" at 180°. Check with dial indicator as shown in Figure 4, Page 3, or with a straight edge and feelers, or square and feelers. To straighten a cocked seal, place tubing over the seal and tap the tube lightly at a point diametrically opposite the low point on the seal. DO NOT strike seal directly.
5. Bearings –
 - A. Wash all bearings in clean kerosene and then dry.
 - B. Inspect bearings carefully and replace those that are worn or questionable.
NOTE: Replacement of all bearings is recommended.
 - C. Use a wheel puller or press to remove worm shaft bearings. Apply force to inner race only – not to cage or outer race.
 - D. Use a wheel puller or press to remove tapered bearing inner races.
 - E. To replace tapered bearing inner races and all ball bearings, heat bearings in an oil bath or oven to maximum of 290° F (143° C). Slide high speed shaft bearings onto the oiled shaft until seated against the shoulder or snap ring of the shaft. Slide low speed shaft bearing onto the oiled shaft against the gear spacer.
 - F. Thoroughly coat all bearings with lubrication oil.
 6. Worm, gear and shaft –
 - A. Worm and high speed shaft – since all worms are integral with the high speed shaft, any wear or damage to the worm will necessitate replacing both.
 - B. Press shaft out of bronze worm gear. To reassemble gear and low speed shaft, freeze shaft or heat gear. Do not exceed 200° F (93° C). Insert key into the shaft keyway and press shaft into oiled gear bore.
NOTE: It is advisable to replace both the worm and worm gear should either of the assemblies require replacement.

UNIT REASSEMBLY

1. Preliminary
 - A. Check to see that all worn parts have been replaced, gear and bearings coated with oil and all parts cleaned. Remove all foreign matter from unit feet. The feet must be flat and square with each other.
 - B. Before starting to reassemble reducer, add old shims or replace with new shims of equal thickness.
2. High Speed Shaft (Worm Shaft) Assembly
 - For C-Flange units 1.33 C.D. through 3.25 C.D.:
 - Lubricate bearing bores of housing. Press bearing onto end of worm shaft flush to shoulder (or snap ring). Lock bearing onto shaft with external snap ring. Insert shaft assembly from opposite motor end into housing until seated against shoulder in bore. Lock shaft assembly into housing bore with internal snap ring. Coat outside diameter of stamped steel end cover with adhesive sealant and press into input bore opposite motor flange until flush with housing. If endcover is rubber coated, do not use sealant.
 - For C-Flange units 3.75 C.D. through 6.00 C.D.:
 - Apply adhesive sealant to both housing input faces. Subassemble the two bearing inner-races onto rear of worm shaft and secure with locknut and washers. Insert shaft assembly into rear bore of housing along with the first bearing outer-race. With plastic hammer gently tap end of shaft until bearing outer-race is seated against shoulder in housing bore. If a press is available, pressing the assembly in is preferable. Press the final bearing outer-race in and install the rear seal cage. Adjust endplay per instructions on Page 5, Item 3. Install motor flange.

- For Basic units with C.D of 1.75, 2.06, 2.37, and 3.25:
 - Lubricate bearing bores of housing. Subassemble bearings onto worm shaft. Lock rear bearing onto shaft with external snap ring. Insert shaft assembly from opposite extension end into housing until bearing is seated against shoulder in bore. Lock shaft assembly in housing bore with internal snap ring. Coat outside diameter of stamped steel endcover with adhesive sealant and press into input bore opposite extension until flush with housing. If endcover is rubber coated, **DO NOT** use sealant.
- For Basic units with C.D. of 1.33, 1.54, 2.62, and 3.00:
 - Follow above procedure with the following exception:

Subassemble only the rear bearing onto worm shaft. After subassembly is installed into housing, press front bearing into extension side of housing until seated against shoulder or snap ring on worm.

Basic units with C.D. of 3.75 through 6.00:

– Apply adhesive sealant to both housing input faces. Press extension side bearing inner-race onto worm. Insert worm shaft into extension side bore of housing. Hold worm shaft in place and slip rear bearing inner-race onto shaft until seated against shoulder. Press rear bearing outer-race into housing bore opposite extension until seal cage can be installed. Install rear seal cage. Press extension side bearing outer-race into housing until extension side seal cage can be installed. Install seal cage. Adjust endplay per instructions on Page 5, Item 3.

3. Low Speed Shaft (Gear Shaft) Assembly

- A. Determine output shaft direction.
- B. Assemble low speed shaft assembly, seal cage, and end cover with shims on both seal cage and end cover. Torque capscrews to torques listed in Table 1. Rotate the input shaft to seat output bearings.
- C. Moving the shaft back and forth by hand, check axial float with dial indicator as shown in Figure 5. Axial float must be .0005-.003" with .0005 being the absolute minimum. Do not preload bearings. If the axial float is not as specified, add or subtract required shims under end cover.

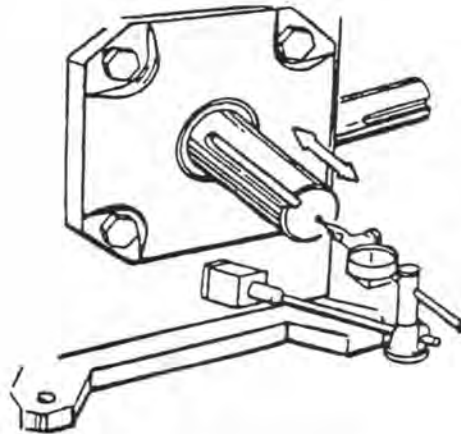
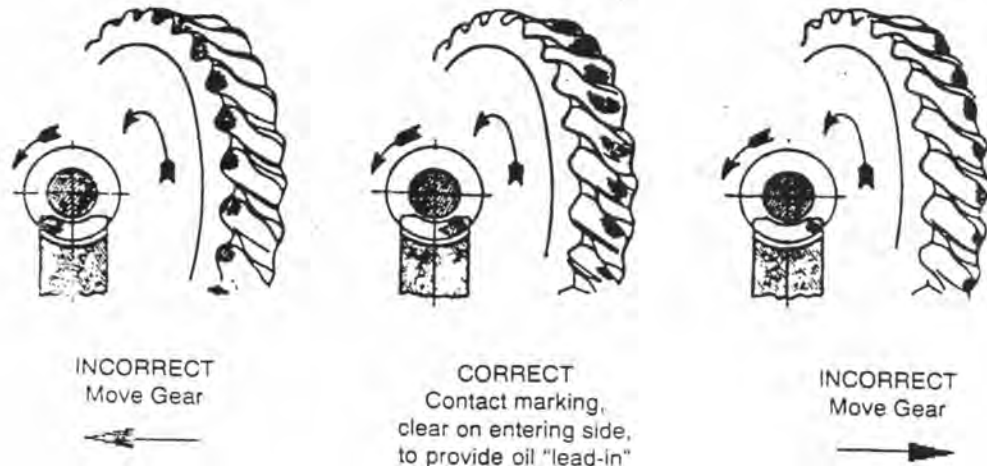


Figure 5 Checking Axial Float

- D. Remove output shaft with seal cage and apply bluing to several teeth on the gear. Worm thread and gear teeth must be clean of oil. Reassemble output shaft and seal cage with output key facing up.
- E. Use a rag to apply hand pressure to the output shaft and rotate the high speed shaft both direction until the gear teeth with bluing have gone through gear mesh several times. Return output shaft to original position. Remove output shaft and seal cage to inspect contact. Compare with Figure 6. If contact is not correct, move assembly in the direction shown in Figure 6 by adding shims to the side to which the arrow points after removing them from the opposite side. Repeat Steps D and E until contact pattern is correct.
- F. Recheck axial float with dial indicator.
- G. When contact pattern is correct, tighten seal cage and end cover capscrews to torques listed in Table 1.

Figure 6 Gear Contact Pattern



4. Seals - To reassemble seals to unit, see Parts Service Steps 4E and 4F, Page 4.

5. Motorized Coupling Adapter

When mounting dimensions should be adhered to when removing motor and coupling assembly for service. When ordering replacement coupling halves (metal gear), specify correct bore diameter. See Table 2 for mounting dimensions.

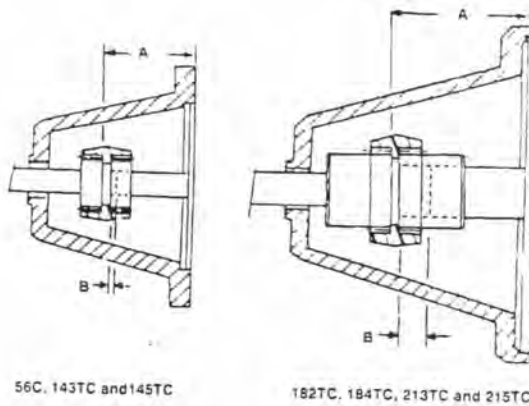


Figure 7 Motorized Coupling Adapter
C.D. 1.33 through 5.25

COUPLING ADAPTER DATA

Table 2

Center Distance	56C		140TC		180TC		210TC	
	A	B	A	B	A	B	A	B
1.33	2.25	.06	2.31	.12	-	-	-	-
1.54	2.31	.12	2.38	.19	-	-	-	-
1.75	2.25	.06	2.31	.12	-	-	-	-
2.06	2.25	.06	2.31	.12	-	-	-	-
2.37	2.25	.06	2.31	.12	-	-	-	-
2.62	2.25	.06	2.31	.12	3.12	.12	-	-
3.00	2.25	.06	2.31	.12	3.12	.12	-	-
3.25	2.25	.06	2.31	.12	3.12	.12	-	-
3.75	-	-	2.69	.42	3.66	.66	3.91	.41
4.50	-	-	2.41	.15	3.40	.40	3.65	.15
5.16	-	-	-	-	3.25	.25	3.50	0

6. Final Inspection

- A. Turn gear train over by hand as a final check.
- B. Re-install reducer and accessories.

Caution

Discard motor key. Use only special key provided with reducer. Failure to use special key will make assembly impossible.

- C. Fill reducer with the recommended oil to proper level. See Figure 8 for standard oil levels.
- D. Spin test for three minutes and check for noise, leakage and rapid temperature rise.

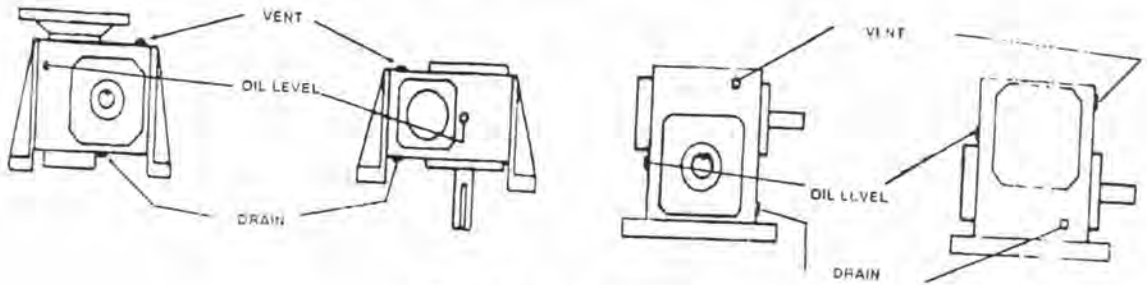


Figure 8 Standard Oil Levels

PREVENTATIVE MAINTENANCE

1. After first week, check all external capscrews and plugs for tightness.
2. Periodically, check oil level when gears are at rest. Add oil if needed. Do not fill above mark indicated by level because leakage and overheating may occur.

STORED AND INACTIVE UNITS

1. All units are shipped with oil that will protect parts against rust for a period of four (4) months in an outdoor shelter or twelve (12) months in a dry building after shipment from the factory. Indoor dry storage is recommended.
2. If a unit is to be stored or is to be inactive after installation beyond the above periods, fill the unit completely with oil.

Caution

Before starting a stored unit or re-starting an inactive unit, the oil level should be returned to the proper value as indicated by the oil level.

LUBRICATION

Normal operating temperature of a worm gear reducer is less than 200°F but during initial break-in the temperature may exceed 200°F. After break-in is completed the temperature will fall below 200°F. If temperature exceeds 200°F for greater than 100 hours consult the factory.

1. Change initial oil fill after 500 hours service or 5 weeks.
2. Change oil every 2500 hours service or 6 months. If severe operating conditions exist, change the oil every 1 to 3 months.
3. **90 WEIGHT OIL AND EP OIL ARE NOT RECOMMENDED.**
4. For ambient temperatures -40° F to 15° F use Mobil SHC634.
5. Units running at slow speeds (less than 100 RPM input) should carry high oil level and in ambient temperatures of 15° to 125° F use an AGMA #8C lubricant.
6. See Table 3 for list of recommended lubrication manufacturers.

Lubrication Manufacturers

The companies and oil shown are typical. Any other make of oil meeting American Gear Manufacturers Association (AGMA) standards #7C and #8C will be satisfactory.

Table 3

Ambient Temperature	15 to 60° F	50 to 125° F
Viscosity Range MM/S at 40°C	414 - 506	612 - 748
ISO Grade	460	680
SAE Gear Lubricant (approx.)	#140	#250
Oil Company Name	AGMA #7C	AGMA #8C
Amoco Oil Co.	Amoco Worm Gear Oil	Amoco Cyl. Oil 680
Atlantic Richfield (ARCO)		Modoc 175
Chevron Oil Co.	Cylinder Oil 460X	Cylinder Oil 680X
Conoco Oil Co.	Inca Oil	
Exxon Oil Co.	Cylastic TK460	Cylastic TK680
Fiske Brothers	SPO 277	SPO288
Gulf Oil Co.	Senate 460	Senate 680
Gulf-Canada	Senate 460	Senate 680
Keygear	Keygear K-600	
Mobile Oil Corp.	Mobil 600W Cyl. Oil	Mobil 30W Super Cyl. Oil
Pennzoil	Cyl. Oil #8	Cyl. Oil No. 6
Phillips Petroleum Co.	Hector 460S	Hector 630S
Shell Oil Co.	Valvata Oil J460	Valvata Oil J680
Schio	Energol DC-600C	Energol DC-600C
Texaco Inc.	Vanguard 460	Honor 680
Union Oil Co. of CA	Steaval B110	Steaval B165

Table 4

Oil Capacity (oz.)

Center Distance	Worm Top	Worm Bottom	Worm Vertical	Output Vertical
1.33	4	8	8	4
1.54	6	18	18	14
1.75	8	20	20	12
2.06	12	22	28	18
2.37	16	30	36	26
2.62	20	46	60	40
3.00	45	78	82	72
3.25	56	65	101	66
3.75	78	115	140	100
4.50	120	180	182	157
5.16	174	216	240	198
6.00	274	366	400	274