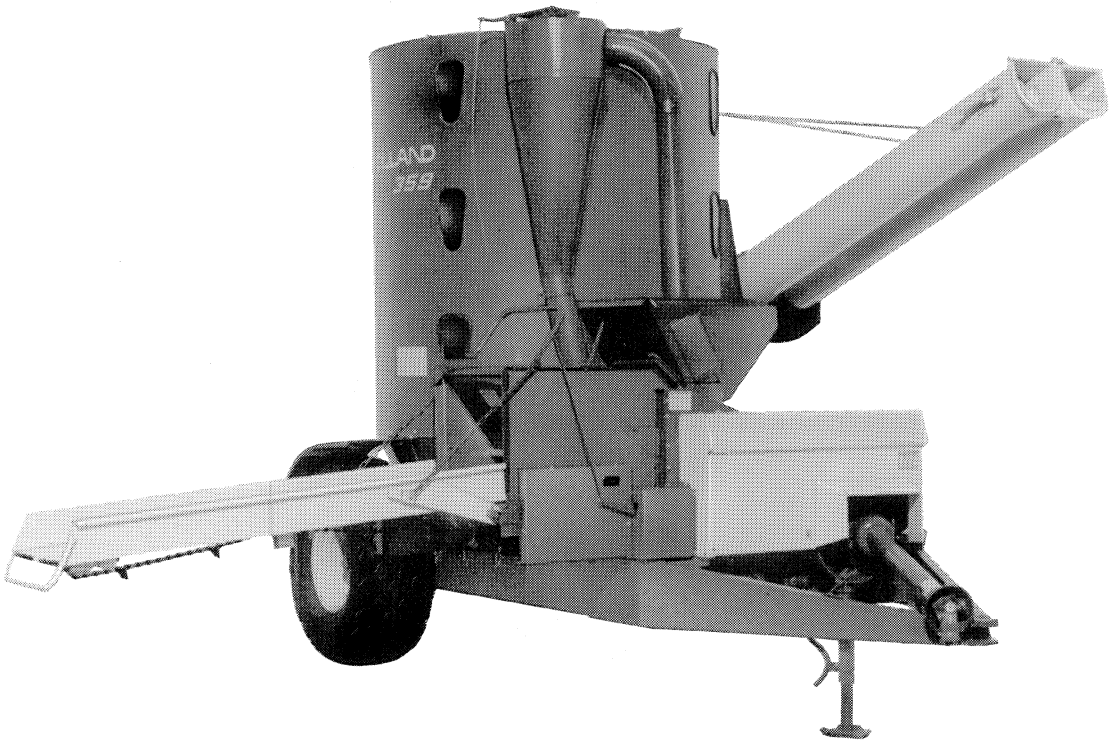
NEW HOLLAND

Service Manual

NEW HOLLAND

Grinder-Mixers

Issue 1-92
(Replaces All Previous Issues)



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SECTION I
GEARBOXES
MODELS 340 and 350

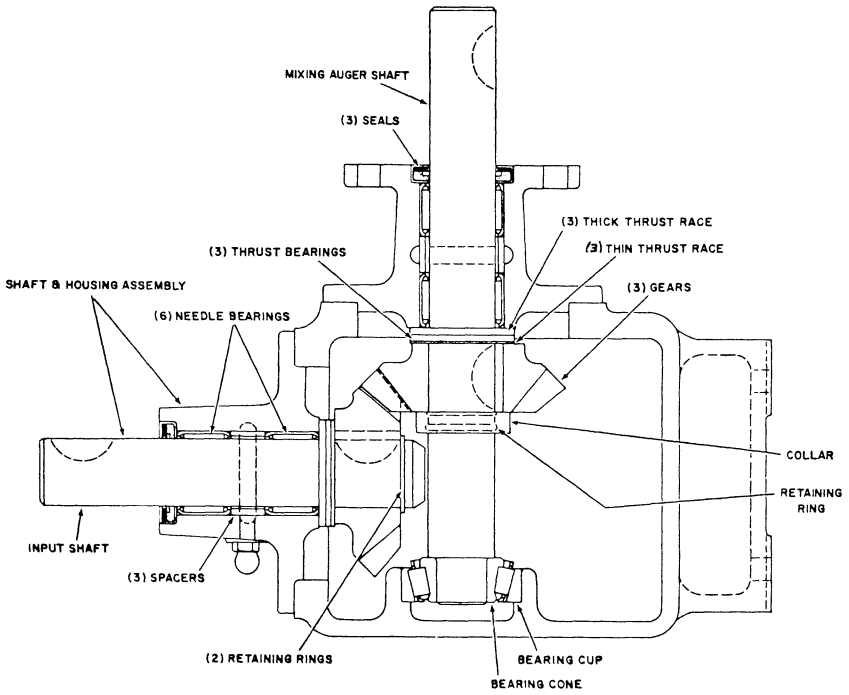


FIGURE 1-1

DISASSEMBLY

1. Normally, to service the gearbox assembly, it is desirable to remove the assembly from the grinder-mixer. This is done by disconnecting the input shaft, mixing auger, and unloading auger drive shaft. Then remove the four cap screws that secure the box to the frame.

Figure 1-1

2. Each of the shaft and housing assemblies are removable as a unit from the gearbox by removing the four cap screws holding each subassembly.
3. The shaft can be disassembled from the housing by removing the retaining ring, the gear, and the woodruff key. Then slip the shaft through the needle bearings.

ASSEMBLY

1. Flush out the gearbox and clean all parts.
2. Use the drawing as a guide for correct assembly.
3. Install the retaining ring and collar on the mixing auger shaft. Make sure the collar is firmly and squarely seated against the retaining ring.
4. Insert the woodruff keys.
5. Install the bearing cup in the gearbox housing.
6. Press the bearing cone against the shoulder on the mixing auger shaft.
7. Slip the gears into place and install the retaining rings on the input shaft and unloading auger shaft.

8. Place one thin thrust race against each gear, backed up by a thrust bearing and a thick thrust race at each location.
9. Press two needle bearings and a spacer into each housing.

   NOTE: Always press the needle bearings into the housing so that the bearing trade name is to the outside.

10. Insert the shafts and gears into the housings.
11. Install the seals with the lip to the inside.
12. Adjust the backlash as recommended in the "Adjustment" section.

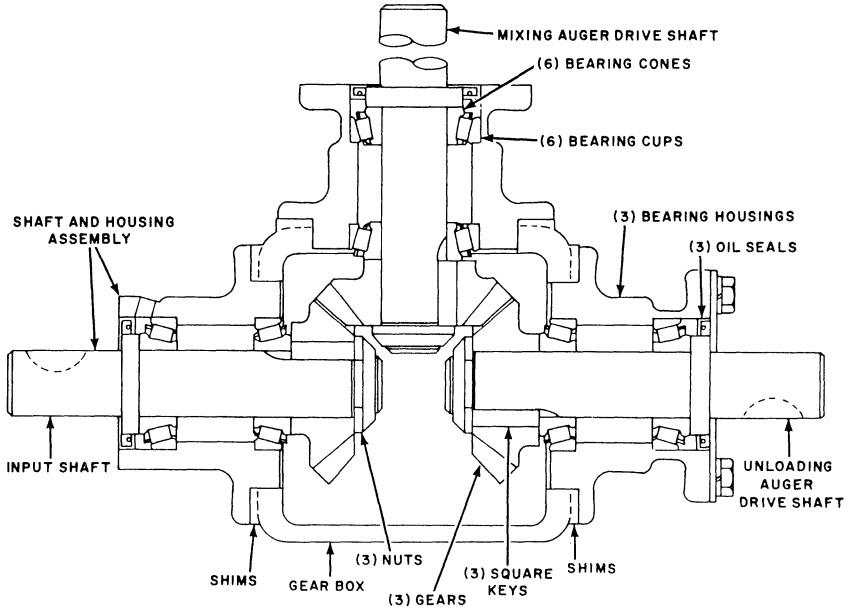
    When installing the shaft and housing assemblies in the gearbox, coat the threads of the cap screws, as well as all joints, with #2 Permatex®.

13. Fill the gearbox to the level of the plug with #90 gear oil.
14. Reinstall the gearbox assembly in the grinder-mixer frame. Make sure all hardware is securely tightened and all drive shafts are correctly aligned.

ADJUSTMENT

Backlash between any two of the mating gears should be 0.007"-0.037". If it exceeds 0.037", add thin thrust races as required at the locations shown on the drawing. Refer to the Service Parts Catalog for the thin thrust race part number. Remove a thin thrust race if binding occurs between any of the gears, but always install at least one.

MODELS 351, 352, 353 (below serial number 400864) and 354



351, 352, 353 BELOW SERIAL NUMBER 400864, AND 354 GEAR BOX

FIGURE 1-2

DISASSEMBLY

1. Normally, to service the gearbox assembly, it is desirable to remove the assembly from the grinder-mixer. This is done by disconnecting the input shaft, mixing auger, and unloading auger drive shaft. Then remove the four cap screws that secure the box to the frame.

Figure 1-2

2. Each of the shaft and housing assemblies are removable as a unit from the gearbox by removing the four cap screws holding each subassembly.
3. The shaft can be disassembled from the housing by removing the nut, the gear, and the square key. Then press the shaft through the bearing cones.

ASSEMBLY

1. Flush out the gearbox and clean all parts.
2. Use the drawing as a guide for correct assembly.
3. Install the bearing cups in the housings.
4. Press the outside bearing cone against the collar.

   NOTE: When installing new bearing cones, they may be heated in oil to 250° F (121° C) to ease assembly).
5. Insert the shaft and bearing into the housing and then press the inside bearing in place.
6. Install the square key, the gear, and then the nut.
7. Adjust the bearings and backlash as recommended in the "Adjustment" section. Be sure to stake the nut to prevent the bearings from losing their adjustment.
8. Fill the gearbox to the level of the plug with #90 gear oil.
9. Reinstall the gearbox assembly in the grinder-mixer frame. Make sure all hardware is securely tightened and all drive shafts are correctly aligned.

ADJUSTMENT

1. Adjust the tapered roller bearings so that it requires 2 in. lbs.-6 in. lbs. (0.226 N·m-0.678 N·m) of torque to rotate the shafts. This adjustment should be made and checked before installing the seals.

   The adjustment is made with the nuts inside the gearbox. After the adjustment is made, stake the nut in the keyway to prevent its turning.

2. The backlash between any two of the mating gears should be 0.002"-0.015". If it exceeds 0.015", remove shims as required at the locations shown on the drawing. Refer to the Service Parts Catalog for the shim part numbers and thicknesses. Add shims if binding occurs between any of the gears.

MODELS 353 (above serial number 400864) and 355

REMOVAL

1. Unbolt the bearing support from the tank top and raise the mixing auger free of the gearbox shaft.
2. From inside the mixing tank, remove the 5/16" cap screws that go through the seal, tank floor, and into the top of the gearbox. Remove the formed seal.
3. Loosen the two locking collars on the gearbox drive shaft. Disconnect the chains and slide the drive shaft forward until the coupler can be slid off the gearbox input shaft.
4. Disconnect and remove the grease lines. Take care that they do not become kinked.
5. Remove the two 5/16" bolts that secure the gearbox to the rear frame cross channel.
6. Remove the two 5/16" bolts that secure the gearbox to the front gearbox support. Watch for and keep any washers or shims from between the gearbox and the support.
7. Remove the four 5/16" bolts securing the front support to the frame channel. Remove the support. Watch for spacers between the bottom of the support and the frame channel.
8. Move the front of the gearbox through the front channel until the clutch is free of the unloading auger drive shaft. Rotate the gearbox until it can be slid down out of the frame.

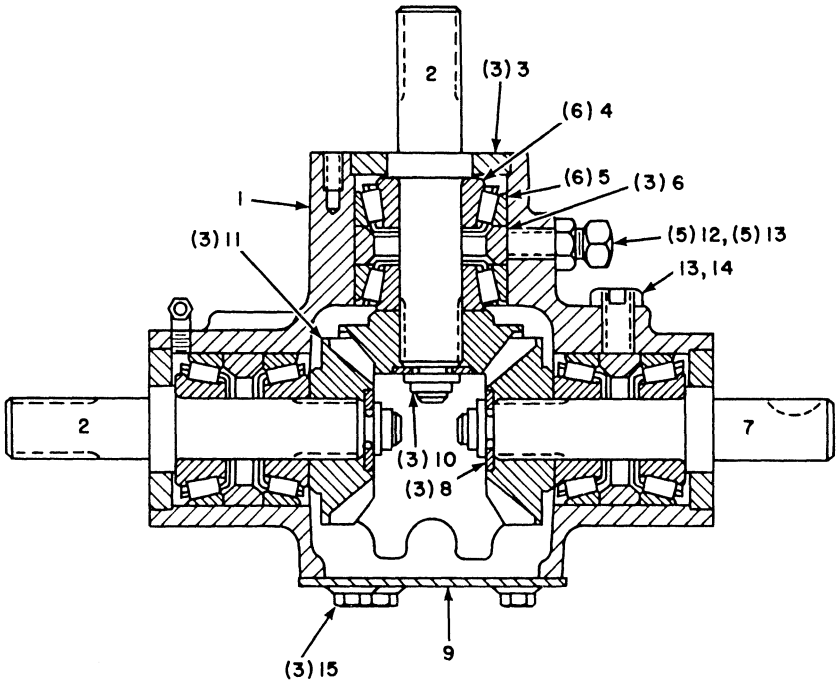


FIGURE 1-3

DISASSEMBLY

Figure 1-3

1. Remove the cover (9) from the bottom of the gearbox. Drain the oil.
2. Remove the nuts (10). Loosen the jam nuts (13) and remove the setscrews (12) and (14). Using a soft punch, drive the shafts out of the gears (11) and bearings (4) and (5).
3. Remove the oil seals (3), bearings (4) and (5), and spacers (6).

ASSEMBLY

1. Thoroughly clean the inside of the gearbox and all parts.
2. Assemble a bearing cone (4), cup (5), spacer (6), cup (5), and cone (4) onto the output shaft (2). Insert this assembly into the top of the gearbox. As the shaft (2) enters the inside of the gearbox, install a gear (11), washer (8), and nut (10). Use new nuts so there will not be any unnecessary drag from the old stakes. Tighten the nut so there is 2 in. lbs.-6 in. lbs. (0.226 N·m-0.678 N·m) bearing drag. Stake the nut into the shaft.
3. Assemble the gearbox input shaft (2) in the same manner. Tighten the nut to remove bearing end play. Stake the nut. Rotate the shaft by hand to make sure there is no binding.
4. With the gearbox input shaft and mixing auger drive shaft and gears in the gearbox, move the assemblies in the housing until the back faces of the gears are aligned. Install a setscrew (12) and jam nut (13) to hold the mixing auger shaft in place.
5. Adjust the backlash between the gears by moving the input shaft and bearing assembly so there is 0.002"-0.015" maximum backlash around the entire circumference of the gears. Install a setscrew (12) and jam nut (13) to hold the shaft and bearing assembly in place.
6. Install the unloading auger drive shaft (7) in a similar manner. Install the gear, washer, and nut. Tighten the nut (10) to remove bearing end play. Stake the nut to the shaft. Adjust the backlash and install a setscrew (14) to hold the shaft and bearing assembly in place.
7. Torque the setscrew (14) to 35 ft. lbs.-40 ft. lbs. (47 N·m-54 N·m). Install the jam nut (13). Install the remaining setscrews (12). Torque all square-head setscrews to 50 ft. lbs.-55 ft. lbs. (67 N·m-74 N·m). Lock the jam nuts.
8. Recheck gear backlash after torquing setscrews. Adjust if necessary.
9. Coat the edge of the gearbox opening with #2 Permatex. Install the gearbox cover (9) and secure it with three 5/16" x 1/2" flange-head bolts (15).

10. Fill the gearbox to the level of the check plug with #90 multipurpose gear lube.
11. Reinstall the gearbox in the grinder-mixer.

PARTS LIST - MODELS 353, 355 GEARBOX

(1) Gearbox assembly
(2) Shaft - two
(3) Oil seal - three
(4) Cone - six
(5) Cup - six
(6) Spacer - three
(7) Shaft
(8) Washer - three
(9) Cover
(10) Nut - three
(11) Bevel gear, 15 T - three
(12) Square-head setscrew - five
(13) Jam nut - six
(14) Socket-head setscrew
(15) Flange-head bolt - three

MODEL 357

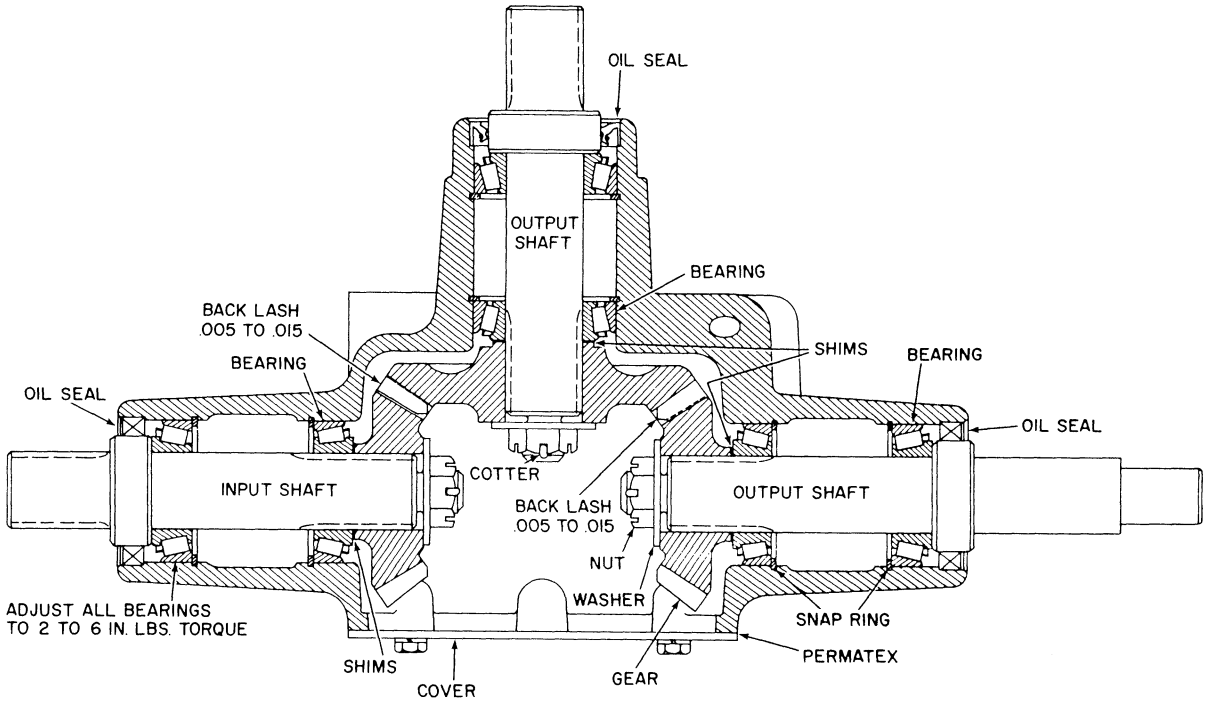


FIGURE 1-4

DISASSEMBLY

1. Remove the gearbox from the grinder-mixer and drain the oil by removing the cover.

Figure 1-4

2. To remove the shaft or gears, remove the castellated nut on the shaft. The shaft can then be tapped out using a soft punch. Be careful not to damage the threads on the shaft.
3. To remove the large gear, remove one of the smaller gears first.
4. When removing gears, make sure all shims are retained for replacement at reassembly.
5. Shims are used between the bearing and gear to set backlash. The backlash between the gears should be 0.005"-0.015".

REASSEMBLY

When the gearbox is completely disassembled, install the large ring gear in the gearbox first. Lubricate all bearings with a good grade of grease before assembly.

1. Install the bearings and output shaft for the large ring gear.
2. Position two 0.005" shims on the shaft between the ring gear and bearing.
3. Install the large ring gear, washer, and castellated nut. Preload the bearing to 2 in. lbs.-6 in. lbs. (0.226 N·m-0.678 N·m) and secure the nut with a cotter pin.
4. Install the input shaft and bearings using a heavy grease to hold the shims on the gear. Position the input gear and slide the input shaft into the gear. Add shims between the gear and bearing as required for 0.005"-0.015" backlash between the input and ring gear. Install a washer and castellated nut. Tighten the nut finger tight to remove bearing end play. Continue tightening the nut to the nearest castellation. Install a cotter pin. Rotate the shafts by hand to make sure there is no binding.
5. The same procedure is used to install the output shaft and ring gear.
6. Install oil seals in the gearbox.
7. Permatex the gearbox lid and secure with cap screws.
8. Fill the gearbox to the level of the check plug with #90 multipurpose gear lube.
9. Reinstall the gearbox in the grinder-mixer.

MODEL 358

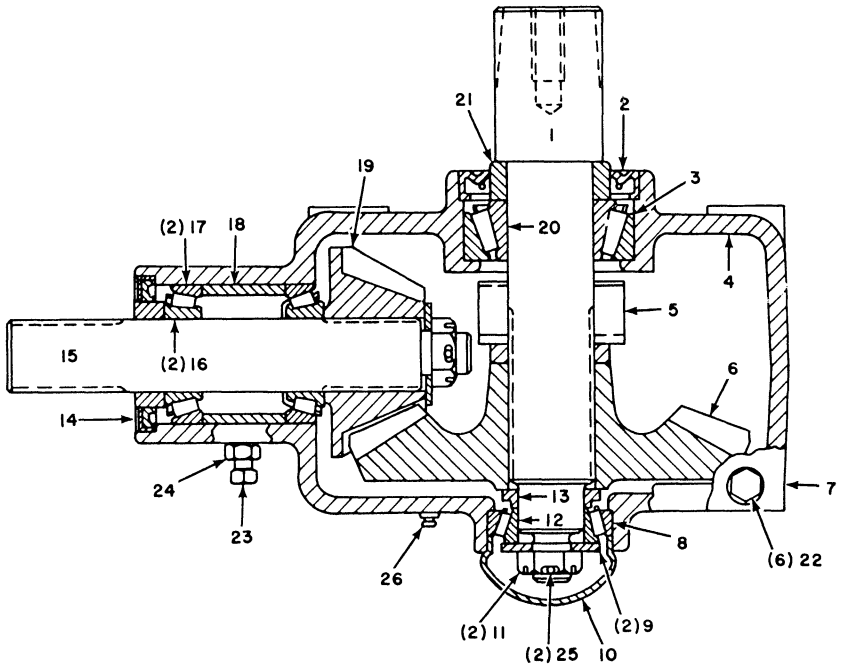


FIGURE 1-5

REMOVAL

1. Drain the oil from the gearbox.
2. Remove the tank access cover at the rear of the mixing tank. Working through this opening, block up the mixing auger by putting wood blocks under the mixing auger scraper supports.
3. Remove the coupler shield and lube line in front of the gearbox. Loosen two setscrews and slide the gearbox drive coupler forward on the gearbox drive shaft spline.
4. Place a floor jack under the gearbox. Remove the four nuts attaching the gearbox to the tank floor. Lower the gearbox until the gearbox mounting tabs are clear of the bolts. Turn the gearbox housing until the input shaft clears the vertical support in front of the gearbox. If the end of the drive shaft is too close to the gearbox shaft to allow it to turn, remove the drive shaft intermediate support bolts allowing the shaft to misalign. Turn the gearbox and lower it to the floor.

DISASSEMBLY

Figure 1-5

1. Remove the cover (7). Remove the hub cap (10). Remove the cotter pin, nut and washer from the end of the output shaft. Using a soft punch, drive the output shaft (1) through the gear and out of the gearbox housing.
2. Remove the spacer (13), gear (6), and collar (5) from the gearbox housing.
3. Remove the cotter pin, nut, and washer from the end of the gearbox input shaft (15). Loosen the jam nut (24) and remove the setscrew (25). Using a soft punch, drive the input shaft (15) out until the pinion (19) can be removed. Remove the pinion. Continue driving the input shaft out of the gearbox.

   NOTE: The bearings and spacer (18) may come out with the input shaft.
4. Remove all seals, bearings, and bearing races. Clean the gearbox housing thoroughly.
5. Inspect all parts for wear or damage.

ASSEMBLY

1. Install bearing cups (3) and (8).
2. Install a bearing cone (16) against the spacer on the gearbox input shaft (15). Place a bearing cup (17) over the cone. Install the spacer (18) and the other bearing cup (17) and bearing cone (16).
3. Start the input shaft and bearing assembly into the neck of the gearbox housing. When the threaded end of the shaft enters the gearbox, start the pinion (19) on the shaft. Continue pushing the shaft through the gear until the washer (9) and nut (11) can be installed
4. Tighten the nut until it takes 2 in. lbs.-6 in. lbs. (0.226 N·m-0.678 N·m) to rotate the shaft in the bearings. If the bearing cups and spacer rotate, install the setscrew (23) and tighten it against the spacer enough to stop rotation. Once the bearing drag or preload has been set, install the cotter pin (25).

   NOTE: Do not bend the legs of the cotter pin over the end of the shaft. Loosen setscrew (23), if installed, and push the input shaft assembly outward until the pinion is against the gearbox.
5. Install the bearing cone (20) on the gearbox output shaft (1). Start the output shaft through the gearbox, installing the collar weld assembly (5), gear (6), and spacer (13) as you proceed. When the upper bearing cone (20) is seated against the cup, install a bearing cone (12), washer (9), and nut (11) on the lower end of the shaft.
6. Torque the nut on the end of the output shaft to 20 ft. lbs. (27 N·m). Back the nut off to the nearest castellation and install a cotter pin (25).

   NOTE: Do not bend the legs of the cotter pin over the end of the shaft.
7. Adjust the backlash to 0.006"-0.010" at the closest point of mesh by moving the pinion gear and input shaft assembly in the neck of the gearbox. When the correct backlash has been obtained, coat the threads of the setscrew (23) with #2 Permatex. Install the setscrew. Torque it to 70 ft. lbs.-75 ft. lbs (94 N·m-101 N·m) and lock the jam nut (24).
8. Clean the edge of the hub cap (10) and the bore of the gearbox where it seats. Coat the edge of the hub cap with Loctite® RC 601-41. Install the hub cap, then seal the joint between the hub cap and gearbox with Permatex.
9. Apply a non-corrosive silicone sealant (Dow Corning Silastic 732 or equivalent) to the edge of the gearbox. Install the gearbox cover. If the elbow was removed from the cover, coat the threads with Permatex before reinstalling it. Coat the threads of the drain plug (26) with Permatex and reinstall it .
10. Reinstall the gearbox in the grinder-mixer. Secure the gearbox with ½" lock washers and nuts. Torque to 66 ft. lbs. (89 N·m). Fill the gearbox with E.P. #90 gear lube to the level of the check plug. Coat the threads of the check plug with Permatex before installing it.
11. Apply grease to the splines of the gearbox output shaft and to the base of the square drive hub. Install the hub, heavy washer, and a ⅝" x 1¾" Grade 5 cap screw. Torque the cap screw to 150 ft. lbs. (203 N·m). Hammer seat the hub on the splines and retorque the cap screw to 150 lbs. (203 N·m).
12. Remove the wood blocks from under the mixing auger. Replace the access cover. Reconnect the gearbox drive coupler. Install the chain. Adjust the idler so there is ⅛"- ½" (3 mm-12 mm) natural sag in the chain mid-span at the tightest point.
13. Reinstall the coupler shield and lube line.
14. Connect the PTO to the tractor. Disconnect the hammer mill drive. Operate the unit slowly and listen for any binding or unusual noises.

PARTS LIST - MODEL 358 GEARBOX

(1) Shaft
(2) Oil Seal
(3) Bearing cup
(4) Gearbox
(5) Collar
(6) Gear
(7) Cover
(8) Bearing cup
(9) Washer - two
(10) Hub cap
(11) Nut - two
(12) Bearing cone
(13) Spacer
(14) Seal
(15) Input shaft
(16) Bearing cone - two
(17) Bearing cup - two
(18) Spacer
(19) Pinion
(20) Bearing cone
(21) Spacer
(22) Flange-head bolt - six
(23) Square-head setscrew
(24) Jam nut
(25) Cotter pin
(26) Plug

MODEL 359

REMOVAL

1. Drain the oil from the gearbox.
2. While the oil is draining, unbolt the bearing support at the top of the mixing auger from the tank top. Raise the mixing auger and cone free of the gearbox shaft. A 4" block of wood under the edge of the cone should be adequate to hold it off the square drive block on the gearbox shaft. Install the block through the tank access door located at the right rear of the grinder-mixer.
3. Remove the fill pipe and lube lines from the gearbox.
4. Position a floor jack or suitable blocking beneath the gearbox.

⚠ WARNING: CAUTION MUST BE EXERCISED IN LOWERING THE GEARBOX TO THE FLOOR BECAUSE IT IS VERY HEAVY.

5. Remove the angle and bolts from the front of the gearbox. Remove the bolts from the side of the gearbox securing it to the frame. Tilting the rear end of the gearbox down may accelerate the disassembly of the U-joint from the splined gearbox drive shaft.
6. Should it be necessary to move the gearbox drive shaft forward to free the U-joint, disconnect and remove all roller chains from the shaft, loosen the shaft bearing support bolts and move the shaft forward.
7. Remove the 5/8" cap screw, securing the square drive block to the gearbox output shaft. Use a gear puller to remove the square drive block. Remove the seal and ring.
8. Remove the U-joint from the end of the gearbox pinion shaft.

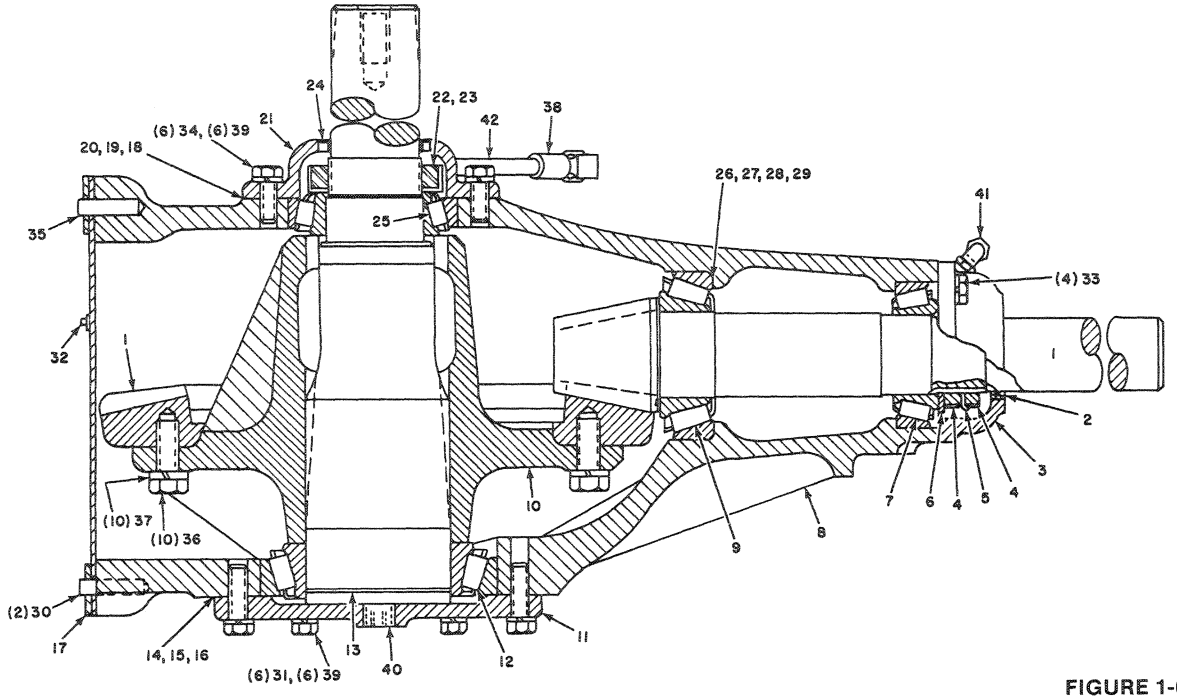


FIGURE 1-6

DISASSEMBLY

Figure 1-6

1. Remove the gearbox cover assembly (17) by removing twelve 5/16" x 3/4" hex-head cap screws.
2. Remove bearing retainer (21) by removing four 3/8" x 1" hex-head cap screws.

   IMPORTANT: When removing the bearing retainer, use care to prevent damaging the oil seal.
3. Remove the shims which were installed between the bearing retainer and the gearbox. Save these shims for later reassembly of the gearbox.
4. Release locknut (22) by bending the ear of lock washer (23) which is holding it secure.
5. Remove the locknut, lock washer, and bearing (25) if it is free at this time.
6. Remove the bearing retainer on the opposite side of the gearbox by removing six 3/8" x 1¼" hex-head cap screws.
7. Remove shims and save them for the reassembly of the gearbox. Remove the bearing (12) at this time if it is free.
8. Install the 5/8" x 1¾" cap screw and flat washer in the end of the output shaft as shown at A, Figure 1-7. This is the same cap screw and washer originally installed in the end of the output shaft.
9. Support the inner race of the opposite bearing on a section of 3½" (88 mm) pipe approximately 12" (30 cm) long.

   MPORTANT: The outside diameter (OD) of this pipe must be turned down slightly on the end so the outside diameter does not interfere with the outer race of the bearing and result in damage. A section of pipe which has been threaded as shown in Figure 1-7, is correct in size. If a threaded section of pipe is not readily available, the OD of standard 3½" (88 mm) pipe may be turned down 5/32" (3.9 mm).
10. Press the output shaft out of the ring gear hub as shown in Figure 1-7. It will require 25 tons-30 tons of force (222,400 N-266,800 N) to separate the shaft and ring gear hub.

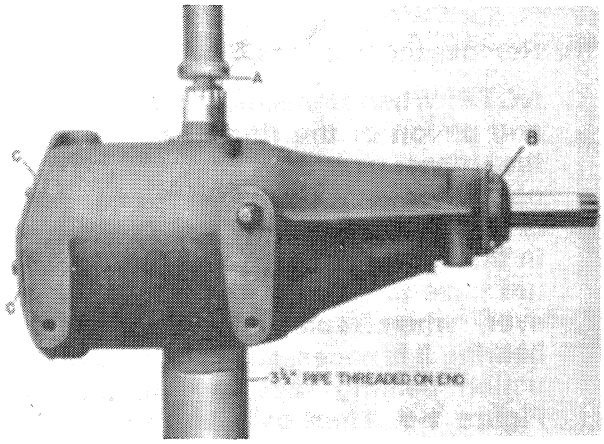


FIGURE 1-7

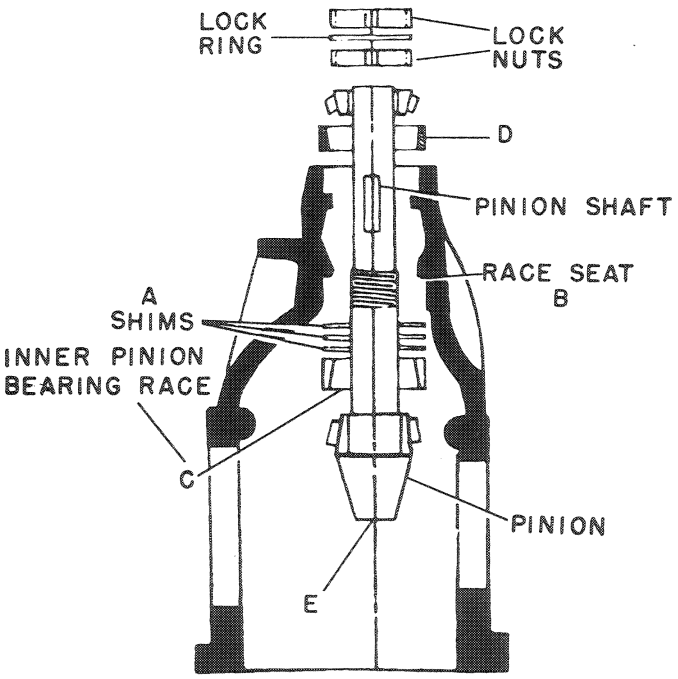


FIGURE 1-8

11. Remove the shaft, ring gear, ring gear hub, and the bearings from the gearbox.
12. Remove the end cap indicated at B, Figure 1-7, by removing the four 5/16" x 3/4" hex-head cap screws.
13. Unlock locknuts by removing lugs of lock washer (5) which hold the locknuts.
14. Remove the locknuts (4). These parts are identified in Figure 1-6.
15. Install the original cap screw in the end of the pinion shaft (1), Figure 1-6, turn medium tight, support the gearbox firmly on end, C, Figure 1-7, and remove the pinion shaft by pressing down through the gearbox.
16. Remove the bearings from the pinion shaft.

NOTE: When replacing only the ring gear and pinion or the ring gear hub, but not the inner pinion bearing (9), it is not necessary to remove the inner pinion bearing race as shown at C, Figure 1-8. In this case the shims at A, Figure 1-8, do not have to be removed or altered. However, when replacing the inner pinion bearing it is necessary to remove the inner pinion bearing race as indicated at C, Figure 1-8. Then calculate the thickness of shims needed at A, Figure 1-8, and proceed with the installation as follows.

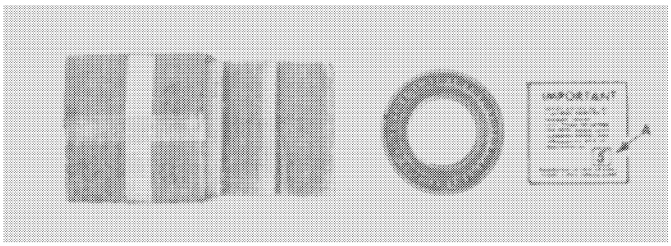


FIGURE 1-9

ASSEMBLY OF THE HYPOID GEARBOX ASSEMBLY

Examine the gear case closely for cracks or any other damage. Use a new gearbox if any damage or questionable quality is apparent. Wash all parts thoroughly. Inspect all parts for wear or damage, especially the ring gear and pinion. Replace any questionable parts.

IMPORTANT: If either the ring gear or the pinion must be replaced, replace both of these parts as they are supplied only in matched sets and must be used as matched sets. Be sure to check the numbers etched on the ring gear and end of the pinion. The numbers must be the same. Replace any worn or damaged bearings. Replace any oil seals which do not appear to be in good condition.

When bearing (9) is being replaced, determine the correct number of shims and install them at A, Figure 1-8. This is necessary so the pinion is properly located with respect to the center of the ring gear. Proper location insures long life of the ring gear and pinion set. A number, usually between 5 and 15, is stamped on the machined surface of the top of the gearbox as indicated at A, Figure 1-10.

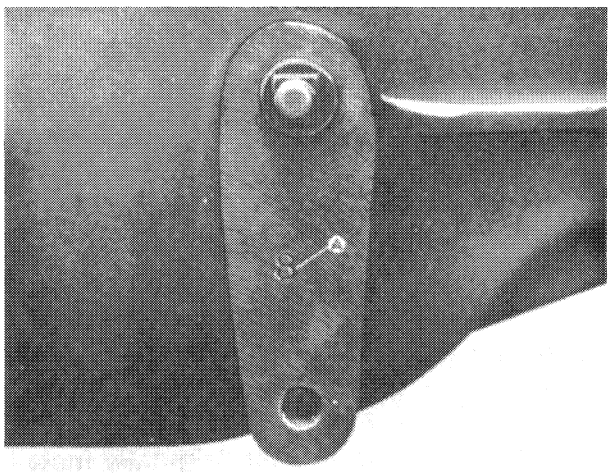


FIGURE 1-10

The bearing is packed with an important note indicating the shim factor of that particular bearing. This shim factor is indicated by a number written on the enclosed slip, see A, Figure 1-9. This number will usually be within a range of 0-8. To determine the correct thickness of shims to be installed at A, Figure 1-8, add these two figures--the one on the gearbox at A, Figure 1-10, and the one marked on the bearing tag at A, Figure 1-9.

For example, the number or shim factor written on the enclosed slip with the bearing at A, Figure 1-9, is 5. The number stamped on the gearbox shown at A, Figure 1-10, is 8. Add 5 and 8 and the total is 13. Therefore, 0.013" thickness of shims then should be installed at A, Figure 1-8, under the inner pinion bearing race, C, Figure 1-8.

Assemble the parts in the following manner:

1. After calculating the correct thickness of shims, install them at A, Figure 1-8, and install the inner pinion bearing race, C, Figure 1-8, using a brass punch. Be sure the bearing race is properly seated.
2. Press the inner pinion bearing on the pinion shaft with a pipe placed against the inner race of the bearing, or install the bearing on the shaft by driving against the inner bearing race with a soft brass punch.

   IMPORTANT: Be certain the bearing is seated properly against the shoulder of the shaft all the way around.
3. Install the outer pinion bearing race, D, Figure 1-8. Be sure it is properly seated all the way around. Install it using a brass punch. Be careful not to damage the race.
4. Position the pinion shaft with the inner pinion bearing installed on it into the gearbox.
5. Turn the gearbox into the position shown in Figure 1-8, and support pinion, E, with a hard wooden block. Be sure the wooden block is high enough to support the weight of the pinion, pinion shaft, and gearbox so the bottom of the gearbox is not resting against the floor or workbench.
6. Install the outer pinion bearing on the pinion shaft using a pipe or a brass punch.
7. Install the inner locknut (4). Tighten this locknut until the pinion bearings are moderately preloaded. If a torque wrench is available, install the original cap screw in the end of the pinion shaft and tighten the locknut until a preload of 15 in. lbs.-25 in. lbs. (1.69 N·m-2.82 N·m) is obtained.

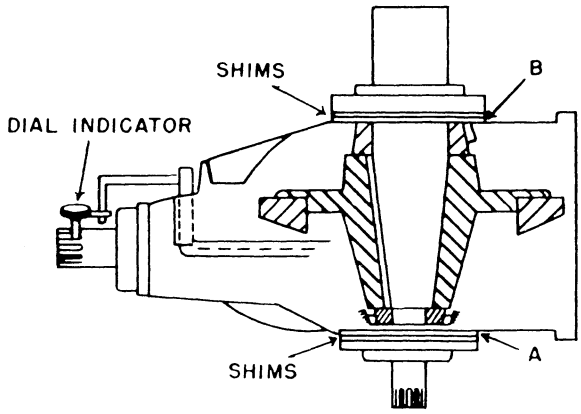


FIGURE 1-11

8. Install lock washer (5).
9. Install the outer locknut. Tighten and recheck the pinion bearing preload to be sure it has not changed. Bend one segment of the lock washer to hold it firmly in position.
10. Apply a thin coat of Permatex to the mating surface of the bearing retainer (3) and install it on the gearbox. Check oil seal (2) to be sure it is in good condition. If it is questionable, replace it.

    Check the ring gear to make certain it is correctly matched with the pinion. The identifying number etched on the outer circumference of the ring gear should correspond with the number etched on the pinion face. If the numbers on the pinion and ring gear are not the same, the gears are not matched and must not be used together.
11. Place the ring gear hub in a vise and bolt the ring gear to the ring gear hub with ten cap screws. Tighten the cap screws uniformly with 85 ft. lbs.-90 ft. lbs. (115 N·m-122 N·m) torque.
12. Position the ring gear hub in the gearbox and insert the shaft into the hub. Tap the shaft endways until the ring gear hub fits tight against the taper of the shaft. Support the smaller end of the ring gear hub on a 2½" (64 mm) pipe and press the shaft into the ring gear hub with approximately 20 tons (177,920 N) pressure.
13. Install bearing (25) on the crankshaft. Be sure it is seated tight against the ring gear hub all the way around. See Figure 1-11.
14. Install lock washer (23) and locknut (22). Tighten the locknut securely and bend one segment of the lock washer into a notch of the locknut to hold it securely in position.

15. Install the same number of shims removed from the gearbox, and install the bearing retainer (21). If a new gearbox or a new ring gear hub is being used, install one 0.003", one 0.005", and one 0.007" shim at this time.

16. Turn the gearbox over on the left side and install bearing (12). Be sure it is seated tight against the ring gear hub all around. See Figure 1-11.

17. Install the bearing race and bearing retainer (11). If the original bearing is being used, install the same shims as were originally used. However, if a new bearing or a new gearbox is being used, install one 0.003", one 0.005", and one 0.007" shim at B, Figure 1-11, at this time.

18. Apply a light coat of Permatex to cover assembly (17) and install it on the gearbox.

    At this stage of assembly, the crankshaft should have no end play and the crankshaft bearing should be moderately preloaded. If any end play is present, remove an equal thickness of shims from under the bearing retainer on each side of the gearbox until all the end play is eliminated from the crankshaft, and the crankshaft bearings are moderately preloaded. If the crankshaft bearings bind when the bearing retainers are tightened, add an equal thickness of shims at A and B, Figure 1-11, until the bearings are moderately preloaded.

19. Adjusting backlash

    a. With the crankshaft bearings moderately preloaded, check the backlash between the ring gear and pinion in the following manner.

    b. Mount a dial indicator on the gearbox so the plunger of the indicator contacts the edge of one of the splines on the pinion shaft. See Figure 1-11.

    c. Rotate the pinion shaft and check the backlash every third turn to obtain at least eight consecutive backlash readings. The backlash reading in each case should be no more than 0.012" and no less than 0.005". A backlash reading of 0.007"-0.009" is considered ideal.

    d. Adjust to obtain proper backlash by increasing the thickness of shims under one bearing cap and decreasing the thickness of shims under the opposite bearing cap. When making this adjustment, an equal thickness of shims should be removed from one side and added to the other so the moderate preload already determined is not affected.

    Removing shims from the left bearing cap at A, Figure 1-11, and adding an equal thickness of shims under the right bearing cap, B, increases the backlash between the ring gear and the pinion. Removing shims from the right side at B, Figure 1-11, and adding an equal number of shims on the left side at A, will decrease backlash. Manipulate the shims until the proper backlash is obtained.

20. Check the output shaft bearing preload in the following manner:

    a. If a torque wrench is available, a reading may be taken from the pinion shaft as was originally done to adjust the pinion bearing preload. However, at this time the preload will be higher, including that of the pinion shaft plus that of the output shaft bearings. This total bearing preload should be from 30 in. lbs.-35 in. lbs.(3.3 N·m-3.9 N·m).

    IMPORTANT: The rear cover should always be in place before adjusting bearing preload.

    b. If the output shaft bearings do not have sufficient preload, remove an equal thickness of shims from under both right and left bearing caps, A and B, Figure 1-11, until the correct preload is obtained.

    c. If the bearing preload is too great, add an equal thickness of shims under the bearing caps on each side. This will decrease the preload on the bearings.

    d. After the proper preload has been obtained, recheck the backlash to be certain it is still correct (occasionally, the backlash may be affected when bearing preload is being adjusted.)

    If all the shims have been removed from under either bearing cap and the correct backlash or bearing preload cannot be obtained, remove crankshaft bearing (12 or 25) and install approximately 0.010" thickness of shim stock between the bearing and the ring gear hub. This will allow additional shims to be placed under the bearing cap and provide a means for further backlash and preloading adjustment.

21. Coat the gearbox output shaft splines with grease. Reinstall the square drive hub on the gearbox output shaft. Install the heavy washer and the 5/8" x 1¾" cap screw. Torque the 5/8" cap screw to 140 ft. lbs.-155 ft. lbs. (189 N·m-210 N·m). Hammer seat the hub and retorque.
22. Reinstall the gearbox in the grinder-mixer. Don't forget the spring and seal. Tighten the mounting bolts to 120 ft. lbs. (162 N·m) torque.
23. Reinstall the mixing auger and cone on the square hub. Center and secure the channel that holds the upper end of the mixing auger.
24. Fill the gearbox to the oil check level plug with E.P. #90 Hypoid gear lubricant. Check the breather cap to be sure it is not plugged.
25. Connect the PTO to the tractor. Disconnect the hammer mill drive. Operate the unit slowly and listen for any binding or unusual noises.

PARTS LIST - MODEL 359 GEARBOX

(1) Hypoid gear set
(2) Oil seal
(3) End cap
(4) Locknut - two
(5) Bearing lock washer
(6) Keyed washer
(7) Tapered roller bearing
(8) Gearbox
(9) Tapered roller bearing
(10) Ring gear hub
(11) Cap
(12) Tapered roller bearing
(13) Shaft
(14) Shim, 0.005" (1±)
(15) Shim, 0.003" (1±)
(16) Shim, 0.007" (1±)
(17) Cover
(18) Shim, 0.007" (1±)
(19) Shim, 0.005" (1±)
(20) Shim, 0.003" (1±)
(21) Bearing retainer
(22) Locknut
(23) Lock washer
(24) Oil seal
(25) Tapered roller bearing
(26) Shim, 0.002" (1±)
(27) Shim, 0.005" (1±)
(28) Shim, 0.007" (1±)
(29) Shim, 0.010" (1±)
(30) Dowel pin, 3/8" x 1½" - two
(31) Cap screw, 3/8" x 1¼" - six
(32) Check plug, 1/8"
(33) Cap screw, 5/16" x 3/4" - sixteen
(34) Cap screw, 3/8" x 1" - six
(35) Dowel pin, ½" x 1½"
(36) Cap screw, ½" x 1¼" - ten
(37) Lock washer, ½" - ten
(38) Coupling, 1/8"
(39) Lock washer, 3/8" - ten
(40) Pipe plug
(41) Fitting - two
(42) Nipple, 1/8" x 4"

SECTION 2
DRIVE SHAFT ASSEMBLIES
MODELS 340, 350, 351, 352, 353, 354, 355, 357, AND 358

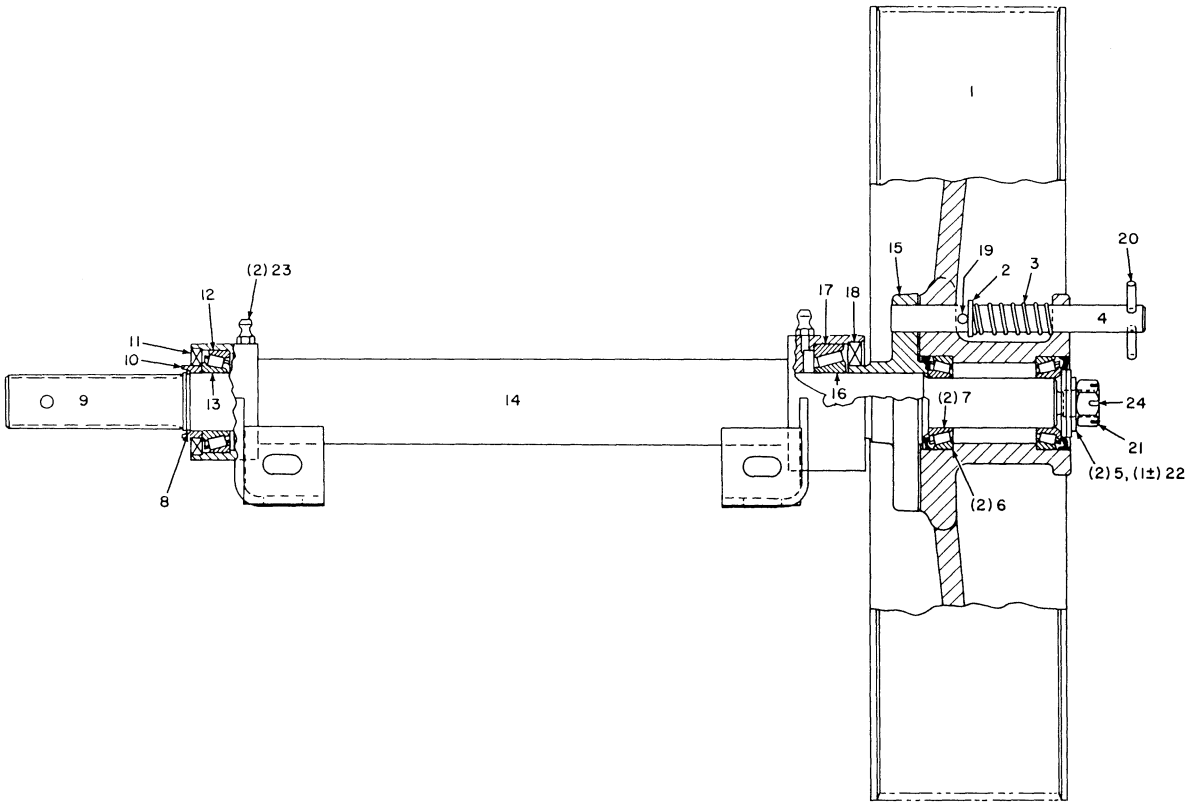


FIGURE 2-1

1. Clean all parts and inspect for wear before assembly.
2. Heat bearing cones (13) and (16) in oil to 300°F (149°C). Heat bearing cones (7) to 250°F (121°C).
3. Install the bearing cups (12) and (17) in the housing (14). Set this aside to use later.
4. Install the retaining ring (8) and keeper (10) on the shaft. Slide the keeper over the ring.
5. Install the preheated cone (13) on the shaft with the back of the cone tight against the keeper (10).
6. Install the housing (14) and preheated cone (16).
7. Install seal (18), clutch plate (15), and preheated bearing cone (7). Press or tap the bearing cone (7) into position so the housing (14) has 0.002"-0.006" end play.
8. Install the bearing cups (6) into the sheave (1).
9. Install the sheave (1). Use care to make sure the seal on the bearing cone (7) is not displaced. Fill the cavity between the bearing cups with wheel bearing grease.
10. Install the outer preheated bearing cone (7), two washers (5), one washer (22), and the nut (21). Tighten the nut so the sheave (1) and the housing (14) each have 0.002"-0.006" end play.
11. Install the cotter pin (24). If the cotter pin does not engage the castellations of the nut, a second washer (22) may be installed. If the nut does not go on far enough to allow the cotter pin to be installed, the washer (22) can be removed.

12. If spring (3) is replaced, the pin (19) must extend 13/16" ± 1/16" (2.0 mm ± 1.5 mm) from shaft (4).
13. Install oil seal (11).
14. Replace the drive shaft assembly on the grinder-mixer.
15. Align the drive and driven sheaves within 1/32" (.78 mm). Refer to the grinder-mixer operator's manual for belt tension requirements.

PARTS LIST - MODELS 340, 350, 351, 352, 353, 354, 355, 357, AND 358 DRIVE SHAFT ASSEMBLY

(1) Sheave
(2) Spacer
(3) Spring
(4) Shaft
(5) Washer - two
(6) Bearing cup - two
(7) Bearing cone and seal - two
(8) Retaining ring
(9) Shaft
(10) Keeper
(11) Seal
(12) Bearing cup
(13) Bearing cone
(14) Housing assembly
(15) Clutch plate
(16) Bearing cone
(17) Bearing cup
(18) Oil seal
(19) Groove pin, 3/16" x 1¾"
(20) Split pin, ¼" x 3"
(21) Slotted nut, ¾"
(22) Washer, ¾" (1±)
(23) Lube fitting - two
(24) Cotter pin, ⅛" x 1¼"

MODEL 359

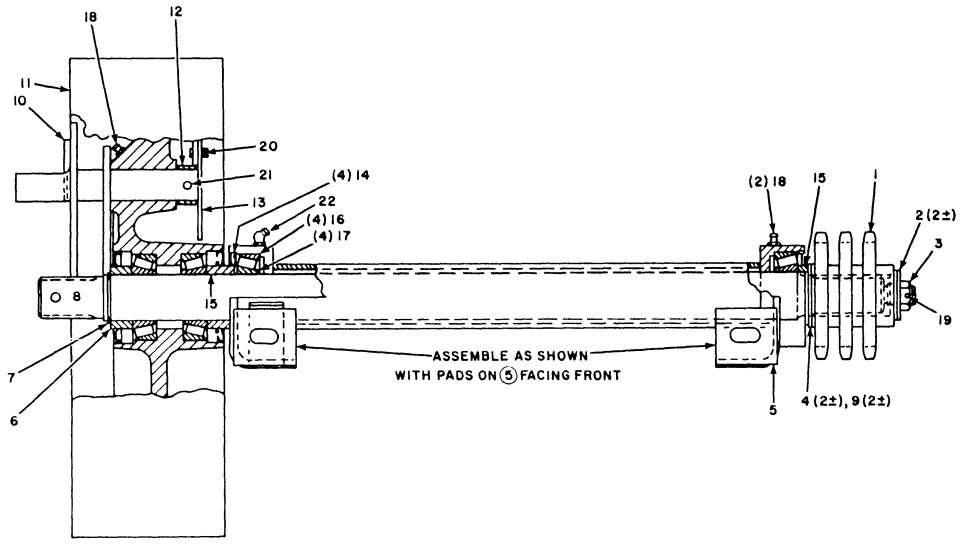


FIGURE 2-2

1. Clean all parts and inspect for wear before assembly.
2. Heat bearing cones (17) in oil to 250°F (121°C).
3. Install the bearing cups (16) into the bearing housing (5) and pulley (11).
4. Lay the drive shaft (8) in front of you with the threaded end to your right. Start at the left end of the shaft (8) and install a preheated bearing cone (17), with the taper to the right, to the right end of the largest diameter of the shaft or approximately 8⅝" (21.9 cm) from the left end.
5. Install two oil seals (14) on a spacer (15) with the lips of the seals pointed to keep grease in the housing (5) and pulley (11). Install the spacer and seals next to the bearing cone.
6. Install a preheated bearing cone (17) with the taper to the left. Install the pulley (11) and press the oil seal (14) into the right end. Install a preheated bearing cone (17) into the left side of the pulley followed by the keeper (6) and retaining ring (7).
7. Tap the bearing cone (17) at the right side of this assembly to the left until the pulley (11) has 0.002"-0.006" end play. Install an oil seal (14) in the left side of the pulley.
8. Install the bearing housing (5), pressing the oil seal (14) into place in the left end of the housing during assembly.
9. Install a preheated bearing cone (17) in the right end of the bearing housing followed by a spacer (15) and oil seal (14). Press the oil seal into the bearing housing.
10. Install the washers (4) and (9), sprocket (1), and washers (2). Install the castellated nut (3) and adjust it so the bearing housing (5) has 0.002"-0.006" end play. Secure the nut with a cotter pin (19).
11. Replace the drive shaft assembly on the grinder-mixer.
12. Align the drive and driven sheaves within 1/32" (0.78 mm). Refer to the grinder-mixer operator's manual for belt tension requirements.
13. Adjust the spring eyebolt to 2¼" (57 mm) from the bracket to the inside of the eye.