Challenger

# Service Manual

## SB34 / SB36
## Small Square Baler

## PICKUP AND FEEDING

**FIG. 8:** Continuous flow, straight through feeding is possible with the wide, low profile pickup assembly (1). Hay from the windrow is picked up by the closely located tines (2) of the pickup assembly and moved by an auger (3) into a charge chamber (4). The in line charge chamber feeds the baling chamber from the bottom.

This baler makes bales that are the same shape and the same condition in light, or heavy, windrows. As the flakes are formed, the stuffer fingers sweep the flakes into the bale chamber with each return stroke of the plunger. With the PTO operating at 540 rpm, the plunger makes 100 strokes per minute to compress the hay in the baling chamber.

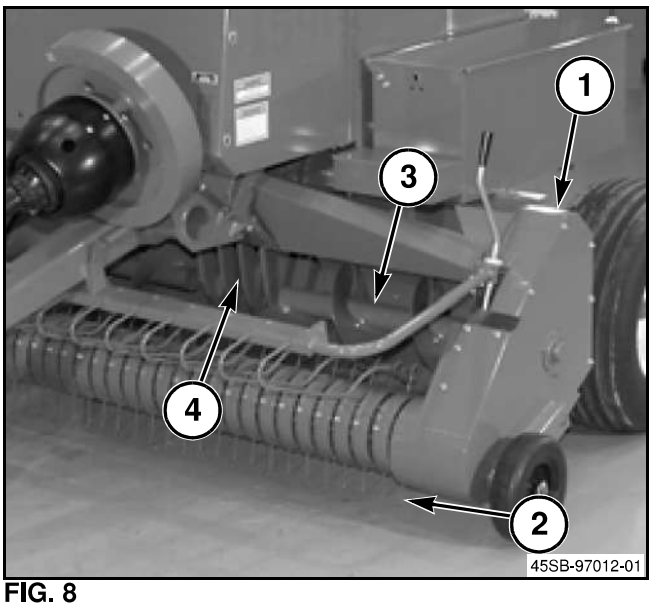

FIG. 8

**FIG. 9:** The pickup height adjustment strap (1) controls the height of the tines above the ground. Set tine height according to instructions in the Adjustments Section.

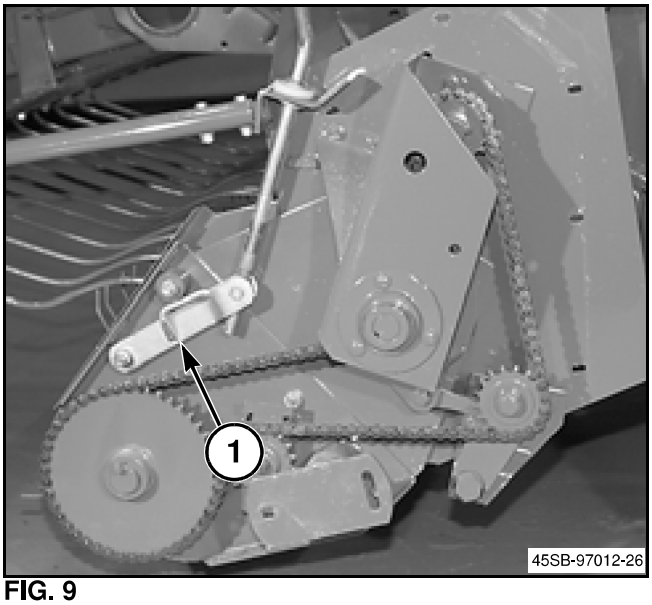

FIG. 9

## Drive Chain Lubricants

Lubrication specifications are met by the use of a good grade of clean engine oil without detergents.

Detergent oils are not required but oils with anti-foam, anti-rust, or film strength additives can be helpful.

The proper lubricant viscosity for many operating temperatures are shown in the chart below.

| **Ambient Operating Temperatures** | | **Recommended Lubricant** |
|---|---|---|
| **degrees F** | **degrees C** | **Viscosity** |
| -20 to 20 | - 29 to - 7 | SAE 10 |
| 20 to 40 | - 7 to 4 | SAE 20 |
| 40 to 100 | 4 to 38 | SAE 30 |
| 100 to 120 | 38 to 49 | SAE 40 |
| 120 to 140 | 49 to 60 | SAE 50 |

*NOTE: Heavy oils and greases are too stiff to enter the chain joints and must not be used.*

With proper lubrication, a separating wedge of lubrication is formed between the pins and bushings in the chain joints much like that formed in journal bearings.

The viscosity of the lubricant changes the lubricants film strength, and capacity to keep the moving parts separate. The highest viscosity oil which will flow between the chain link plates and fill the pin bushing areas will provide the best wear life. This is needed to reduce metal to metal contact. If the lubricant is supplied with enough volume, the lubricant also cools and cushions shock loads.

## Good Drive Chain Lubrication

Connector link pins, on removal from a properly lubricated drive chain, will have a high luster polish and will not be changed in color.

Drive chains which are operated without proper lubrication will have a reddish brown oxide in the joints. On removal, the connector link pins will be changed in color, rough, with grooves, or damaged.

When operating in dust containing excessive amounts of damaging particles (sandy field conditions), the chain must not be lubricated on the outside. The oil will pick up damaging particles that form a grinding compound with lubricant (similar to valve lapping compound) which causes early wear of both the sprockets and the drive chain.

Under severe conditions, the chain must be removed every 50 hours of operation cleaned and lubricated, following the procedure shown below:

1. Remove the chain from the sprockets.
2. Wash the chain in cleaning solvent. If the chain is gummed, soak the chain for several hours in the cleaning solvent, and then wash the chain in clean fluid.
3. Using clean and dry compressed air, blow the chain dry or wipe the chain dry with a clean towel or cloth.
4. Inspect the chain for wear and corrosion.
5. Soak the chain in engine oil to lubricate the pins, bushings, and rollers.
6. Position the chain in a vertical position and permit the extra lubricant to drain off.
7. Wipe the chain dry with a clean shop towel or cloth.
8. While the chain is off the sprockets, clean the sprockets with cleaning solvent, and inspect the chain for wear and corrosion.
9. Check the driver, driven, and idler sprocket alignment and make corrections if found necessary.
10. Install the drive chain and properly adjust the chain tension.

## CHAIN SPEED CALCULATION FORMULAS

To calculate or find chain speed in ft/min, use the formulas below: = Belt Speed (ft/min)

Driver Sheave Diameter (inches) X 3.1416/12 X Driver Sheave Speed (rpm) = Chain Speed (ft/min)

Driver Sheave Diameter (inches) X 0.2618 X Driver Sheave Speed (rpm) = Chain Speed (ft/min)

| Inches | | mm | Inches | | mm |
|---|---|---|---|---|---|
| Fraction | Decimal | | Fraction | Decimal | |
| - | 8.6614 | 220.0 | 19 | 19.0 | 482.601 |
| 9 | 9.0 | 228.6 | - | 19.6850 | 500.0 |
| - | 9.0551 | 230.0 | 20 | 20.0 | 508.001 |
| - | 9.4488 | 240.0 | 25 | 25.0 | 635.0 |
| 9-1/2 | 9.5 | 241.3 | 30 | 30.0 | 762.0 |

## DECIMAL EQUIVALENTS OF 8THS, 16THS, 32NDS, AND 64THS

| 8ths | 16ths | 32nds | 64ths | |
|---|---|---|---|---|
| 1/8 = 0.125 | 1/16 = 0.625 | 1/32 = 0.03125 | 1/64 = 0.015625 | 33/64 = 0.515625 |
| 1/4 = 0.25 | 3/16 = 0.1875 | 3/32 = 0.09375 | 3/64 = 0.046875 | 35/64 = 0.546875 |
| 3/8 = 0.375 | 5/16 = 0.3125 | 5/32 = 0.15625 | 5/64 = 0.078125 | 37/64 = 0.578125 |
| 1/2 = 0.5 | 7/16 = 0.4375 | 7/32 = 0.21875 | 7/64 = 0.19375 | 39/64 = 0.609375 |
| 5/8 = 0.625 | 9/16 = 0.5625 | 9/32 = 0.28125 | 9/64 = 0.140625 | 41/64 = 0.640625 |
| 3/4 = 0.75 | 11/16 = 0.6875 | 11/32 = 0.34375 | 11/64 = 0.171875 | 43/64 = 0.671875 |
| 7/8 = 0.875 | 13/16 = 0.8125 | 13/32 = 0.40625 | 13/64 = 0.203125 | 45/64 = 0.703125 |
| | 15/16 = 0.9375 | 15/32 = 0.46875 | 15/64 = 0.234375 | 47/64 = 0.734375 |
| | | 17/32 = 0.53125 | 17/64 = 0.265625 | 49/64 = 0.765625 |
| | | 19/32 = 0.59375 | 19/64 = 0.296875 | 51/64 = 0.796875 |
| | | 21/32 = 0.65625 | 21/64 = 0.328125 | 53/64 = 0.828125 |
| | | 23/32 = 0.71875 | 23/64 = 0.359375 | 55/64 = 0.859375 |
| | | 25/32 = 0.78125 | 25/64 = 0.390625 | 57/64 = 0.890625 |
| | | 27/32 = 0.84375 | 27/64 = 0.421875 | 59/64 = 0.921875 |
| | | 29/32 = 0.90625 | 29/64 = 0.453125 | 61/64 = 0.953125 |
| | | 31/32 = 0.96875 | 31/64 = 0.484375 | 63/64 = 0.984375 |

## DECIMAL EQUIVALENTS OF LETTER SIZE DRILLS

| Letter | Size of Drill in Inches | Size of Drill in mm |
|---|---|---|
| A | 0.234 | 5.953 |
| B | 0.238 | 6.0452 |
| C | 0.242 | 6.1468 |
| D | 0.246 | 6.2484 |
| E | 0.25 | 6.35 |
| F | 0.257 | 6.5278 |

## IDL (Implement Driveline)

**FIG. 31:** Neapco IDL grease fittings (1) (12 hours)

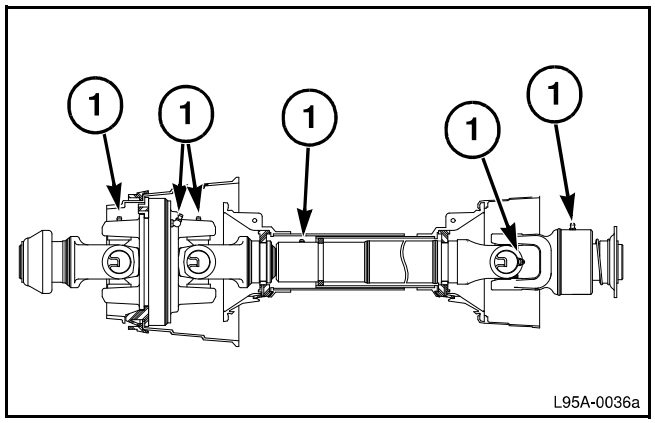


**FIG. 31**

**FIG. 32:** Weasler IDL grease fittings (1) (12 hours)

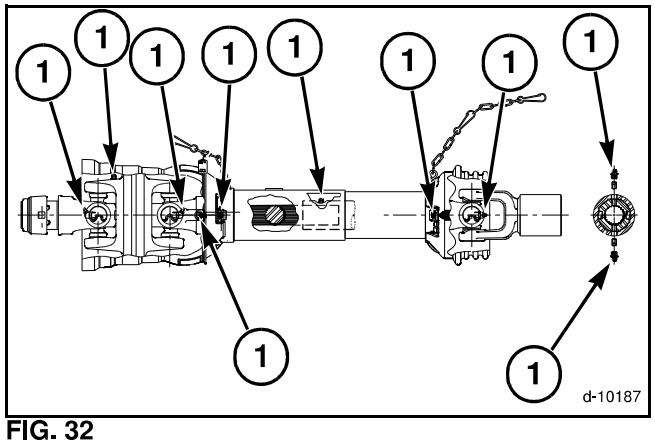


**FIG. 32**

## CHAIN AND BELT TENSION

### Pickup and Auger Drive Chains

Adjust the pickup and auger drive chains to 6.35 mm of deflection with 13.6 kg of force with the chain tensioner sprocket. Measure the deflection at the points shown.

**Belt Driven Pickups**

**FIG. 4:** Left-hand side

(1) Chain tensioner sprocket

(2) Measure deflection here

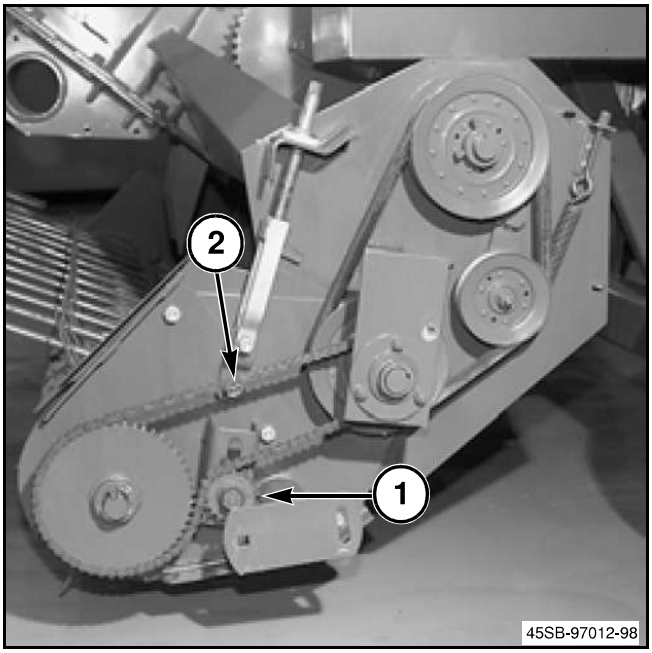


**FIG. 4**

**FIG. 5:** Right-hand side

(1) Chain tensioner sprocket

(2) Measure deflection here

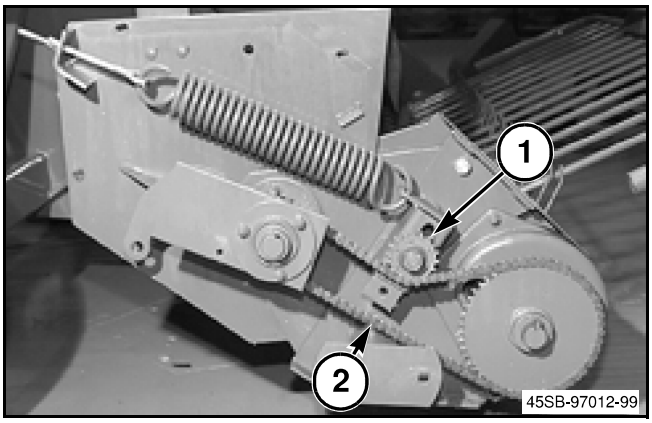


**FIG. 5**

6. Loosen the stuffer drive chain on the left-hand side of the baler with the chain tensioner sprocket (8). Rotate the sprocket forward on the drive chain one tooth at a time. Tighten the chain. Rotate the flywheel to align the grease fitting in the lubrication hole in the baler left-hand side panel. The lower strand of the chain must be tight with the plunger crank arm aligned with the front edge of the plunger safety stop as shown.

*NOTE: Rotating the sprocket forward permits the flake to enter the bale chamber more quickly so the hay is not "loading" on the bottom of the plunger.*

7. Rotate the flywheel to check the gap again between the stuffer fingers and plunger knives at the nearest point. The gap must not be less than 6.5 mm. If this gap is not correct, repeat step 6. Tighten the tensioner sprocket, and check the gap again until the correct gap is reached.

*NOTE: Changing the stuffer timing will change the needle timing. After timing the stuffer, check the needle timing. See Needle Timing in this section.*

## Removal

**FIG. 2:** Remove the hardware (1) that secures the shields (2) to the slip clutch.

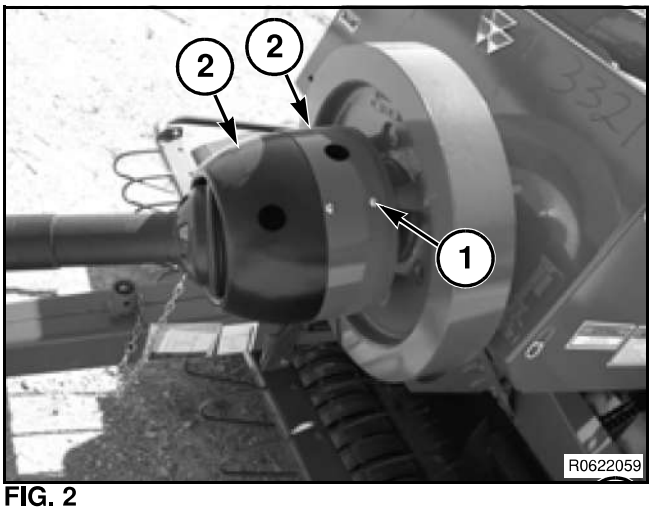


**FIG. 2**

**FIG. 3:** Disconnect the quick release overrunning clutch (1).

Remove the driveline from the machine.

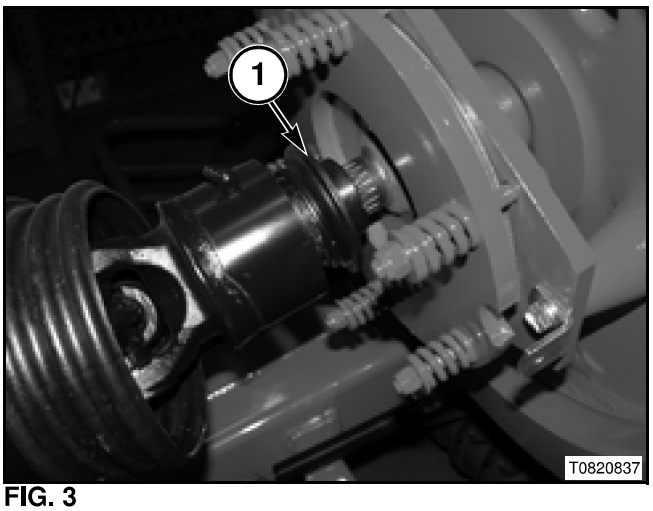


**FIG. 3**

### Shields With Lock Clips

**FIG. 4:** To remove the shield (1) on the implement and baler drive line (2), remove and keep the lock clip (3) from the shield.

*NOTE: This clip is also the grease fitting for the shield bushing.*

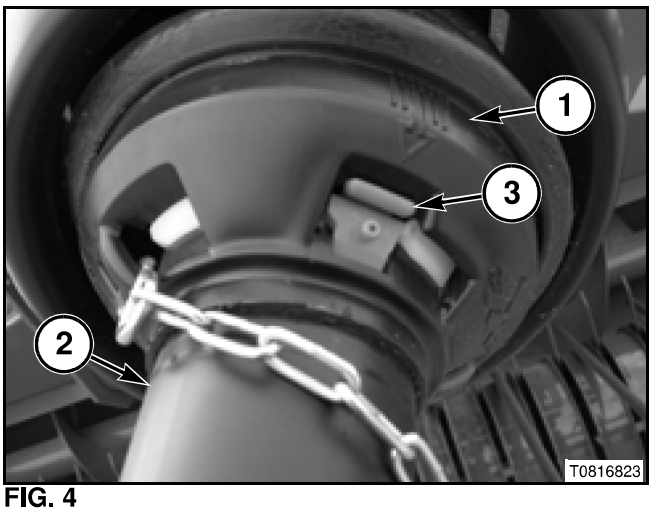


**FIG. 4**

**FIG. 35:** Set the shaft yoke on the vise so the ears of the shaft yoke are supported by the jaws of the vise. Carefully hit the clamp yoke with the hammer to seat the bearing cap against the snap ring.

*NOTE: When hitting a yoke NEVER hit the area around the hole for the bearing cap. Distortion of the hole will make removal of the bearing cap difficult.*

Turn the shaft yoke over in the vise. Carefully hit the clamp yoke with the hammer to seat the other bearing cap against the snap ring.

If equipped, install the grease fittings in the bearing caps.

Apply grease to the grease fitting in the cross.

Before assembling the two halves of the shaft, clean the shaft. Apply grease to the shaft and the slip tube.

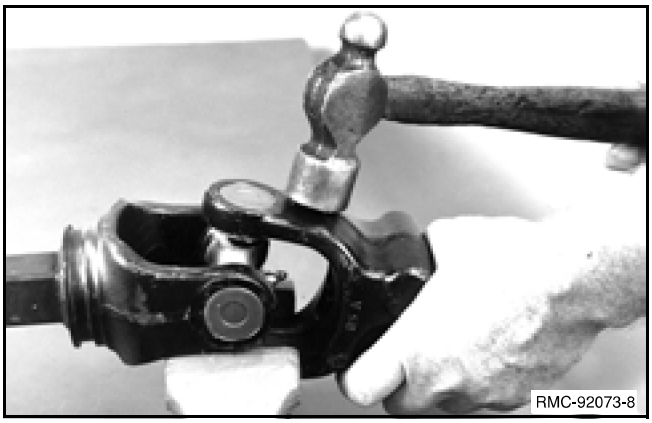


**FIG. 35**

## Installation

### Shields With Lock Clips

**FIG. 36:** Clean the bearing groove in the drive line. Apply grease to the bearing groove.

Install the nylon bearing (1).

Install the guard (2) onto the drive line.

Align the tabs on the nylon bearing with the slots in the guard.

Turn the nylon bearing to lock the guard into position.

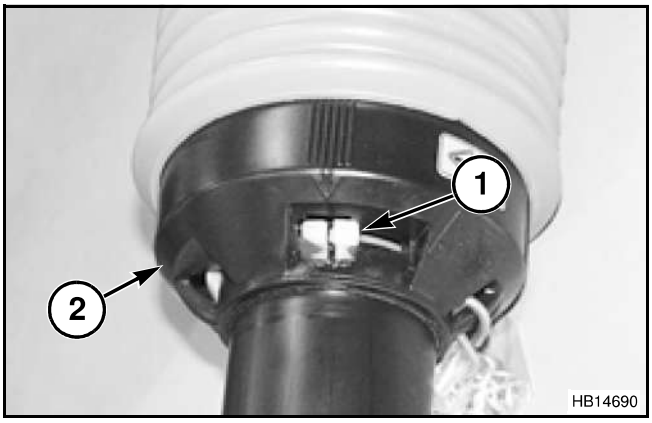


**FIG. 36**

**FIG. 37:** Install the lock clip (1).

*NOTE: This clip is also the grease fitting for the shield bushing.*

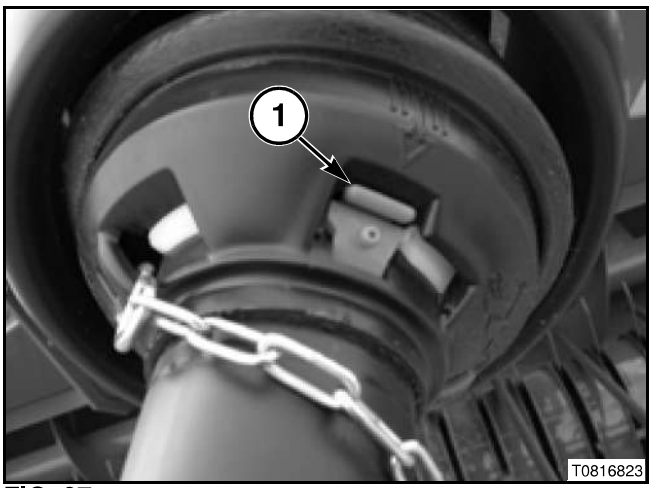


**FIG. 37**

**FIG. 53:** Align the machine driveline U-joints.

Slide both halves of the machine driveline into each other (1).

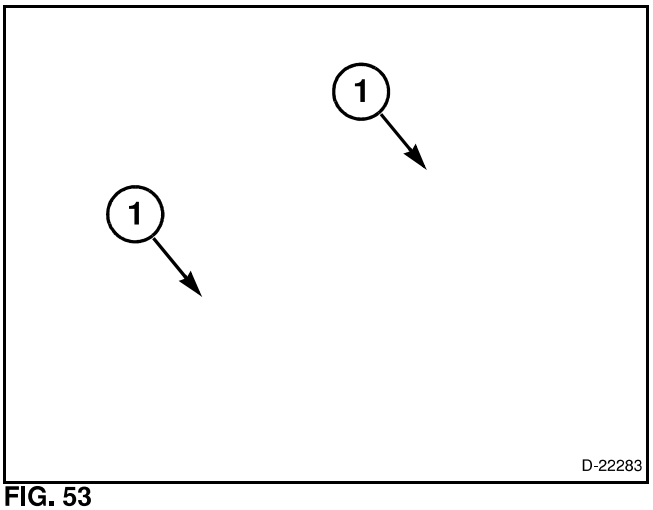


**FIG. 53**

**FIG. 54:** Install the implement driveline (1) onto the clutch shaft (2).

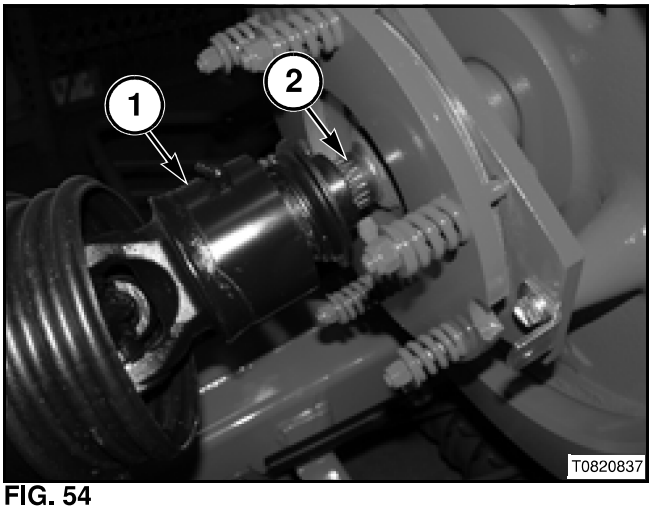


**FIG. 54**

**FIG. 55:** Install the shields (1) onto the clutch housing.

Install and tighten the hardware (2) that secures the shield to the clutch.

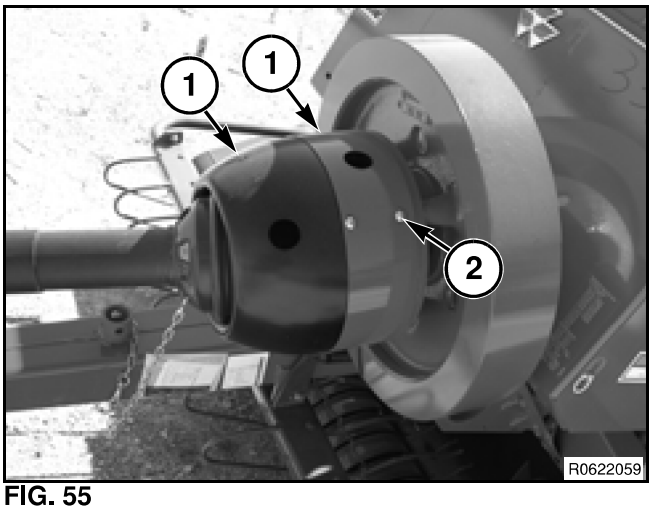


**FIG. 55**

**Shear Hub**

**FIG. 79:** Remove the hardware (1) that secures the shields (2) to the slip clutch.

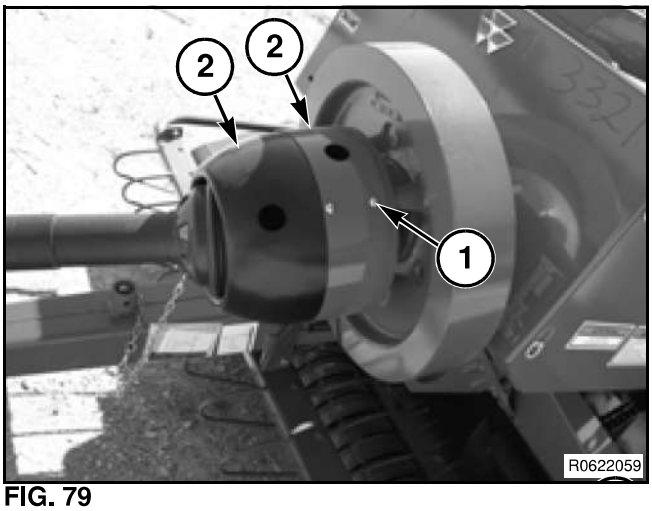


**FIG. 79**

**FIG. 80:** Disconnect the quick release overrunning clutch (1).

Remove the driveline from the machine.

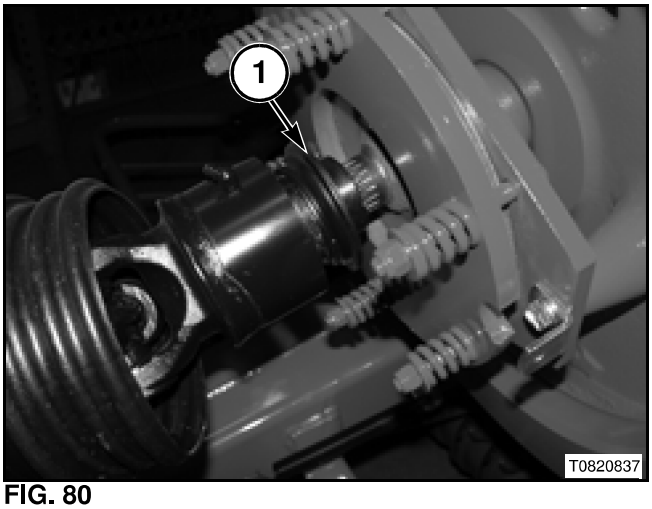


**FIG. 80**

**FIG. 81:** Remove the three bolts, washers, and support clips (1) from the flywheel (2).

Remove the slip clutch (3).

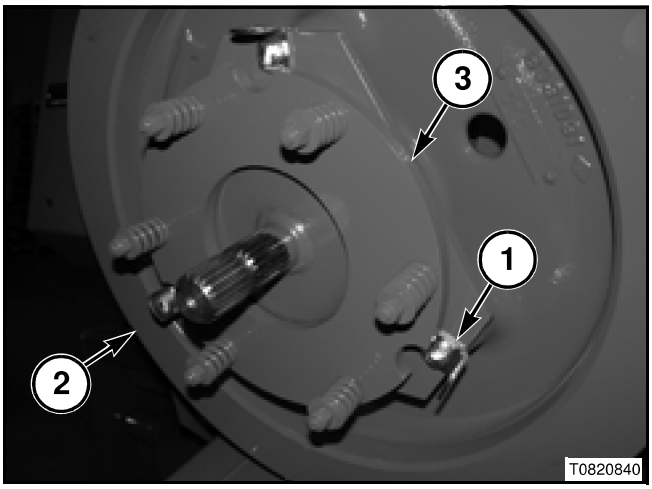


**FIG. 81**

**FIG. 99:** Rotate the housing (1) over.

*NOTE: If the original pinion shaft and original housing are being used, go ahead to the inner bearing cup installation section.*

If a new pinion shaft or a new housing is being used, use the following instructions.

Install the bearing cup (2).

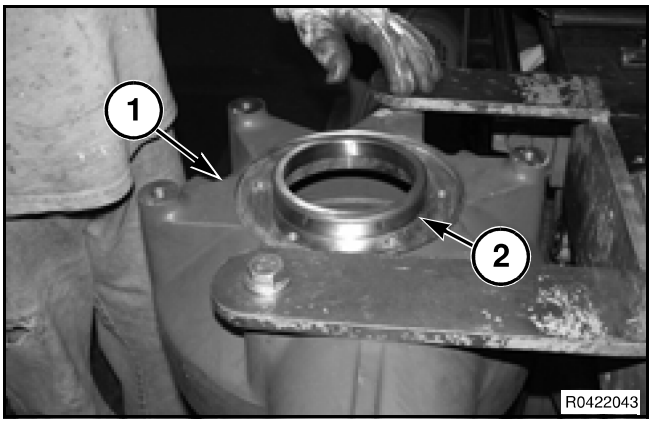


**FIG. 99**

**FIG. 100:** Put one each of a 0.254, 0.305, 0.381 mm (0.010, 0.012, and 0.015 in) shim and the retainer in position on the housing.


**FIG. 100**

**FIG. 101:** DO NOT put sealant on the retainer at this time.

Install the cap screws.

Tighten the cap screws to 59 Nm (44 lbf ft).

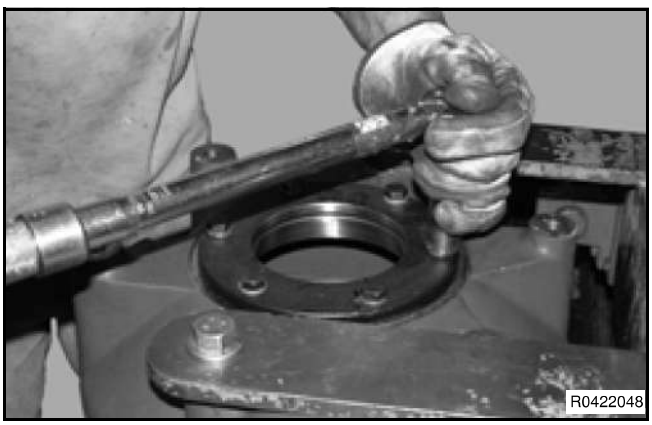


**FIG. 101**

**FIG. 136:** Apply Loctite® 515 sealant or equivalent to the machined surface of the cover plate (1), bearing retainer, and threads of the cap screws (2). Do not put sealant between the shims.

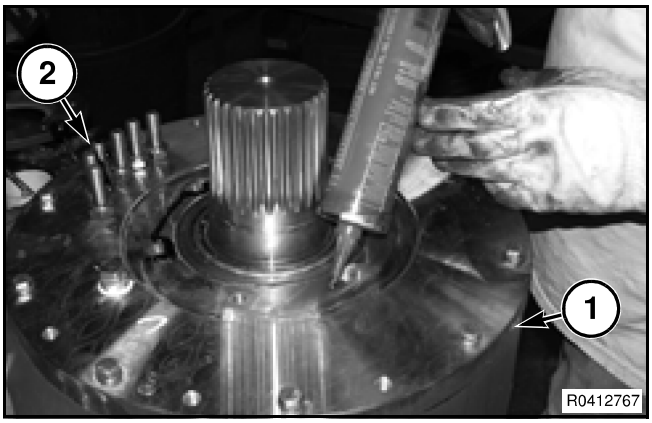


**FIG. 136**

**FIG. 137:** Put the shims (1) and bearing retainer (2) into position on the cover plate (3).

Do not damage the seal (4).

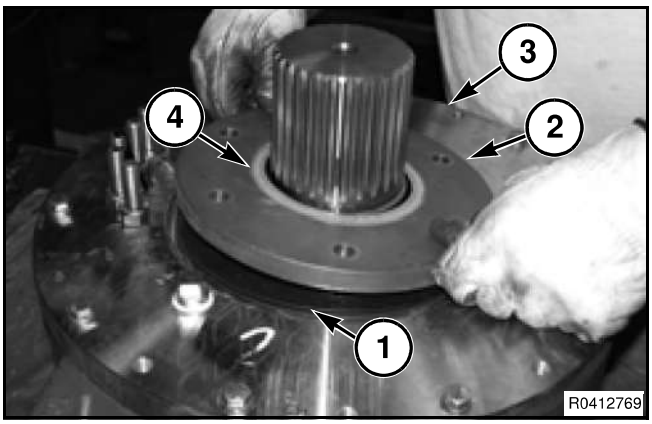


**FIG. 137**

**FIG. 138:** Install the cap screws.

Tighten the cap screws to 95 Nm (70 lbf ft).


**FIG. 138**

## AUGER AND BEARING REPLACEMENT

### General Information

#### Locking Collar - Self - Eccentric

**FIG. 7:** The bearing (1) is held in position on the shaft by a locking collar (2). The locking collar has an eccentric counterbore that engages the eccentric end of the bearing inner race (3) when the locking collar is rotated.

The locking collar is rotated by hitting a drift punch inserted in the drift pin hole (4). The assembly grips the shaft tightly with a positive locking action that increases with use.

A set screw (5) in the locking collar engages the shaft when tightened and applies additional locking pressure.

- Loosen the set screw in the locking collar.
- Loosen the locking collar with a drift punch. Rotate the locking collar opposite the direction of normal shaft rotation until free from the bearing.
- Remove the locking collar from the bearing and shaft.
- Support the shaft and remove the bolts fastening the bearing flanges to the structure.
- Slide the bearing and the bearing flanges from the shaft.

*NOTE: Removing paint and corrosion from the shaft will make removal easier.*

- Put the new bearing and bearing flanges on the shaft. Make sure the bearing inner race is facing the correct direction.
- Install the bolts that fasten the bearing flanges to the structure. Make sure the bearing is straight within the bearing flanges.
- Tighten the bolts evenly.

*NOTE: Always tighten the locking collar in the direction of normal shaft rotation.*

- Put the locking collar on the shaft and push the locking collar against the bearing inner race.
- Rotate the locking collar in the direction of normal shaft rotation until tightly engaged.
- Tighten the locking collar with a drift punch.

*IMPORTANT: Always tighten the locking collar in the direction of normal shaft rotation.*

- Tighten the set screw in the locking collar.

| Set Screw Size | Nm | lbf in |
|---|---|---|
| 1/4-20 | 4.8 | 78 |
| 5/16-18 | 18 | 156 |
| 3/8-16 | 31 | 273 |
| 7/16-14 | 49 | 428 |

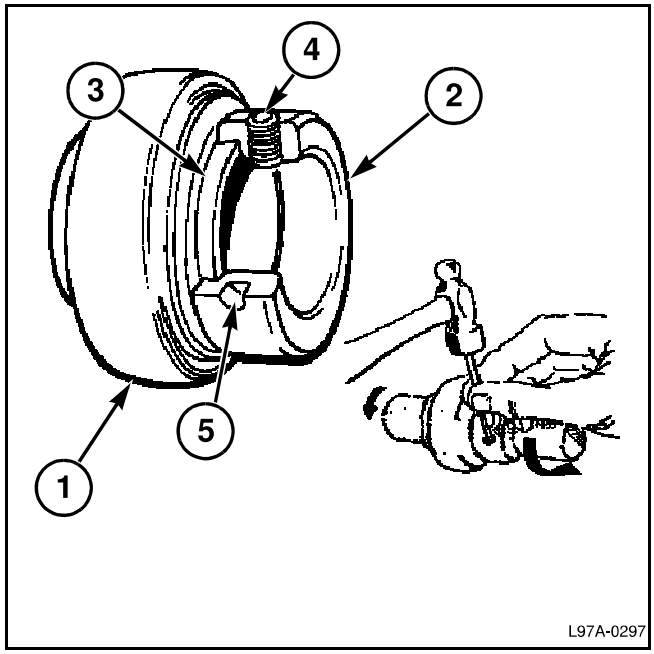


**FIG. 7**

**FIG. 34:** Remove the gib key (1).

Remove the dual sprocket assembly (2).

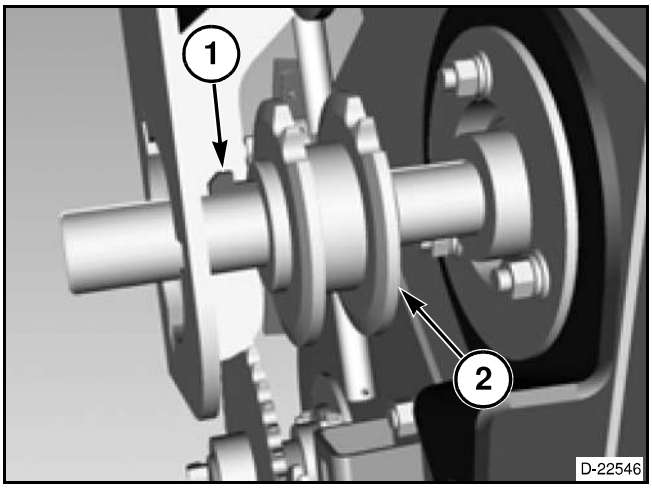


**FIG. 34**

**FIG. 35:** Loosen the inside locking collar (1).

Remove the hardware (2) securing the inside bearing assembly (3) to the pickup.

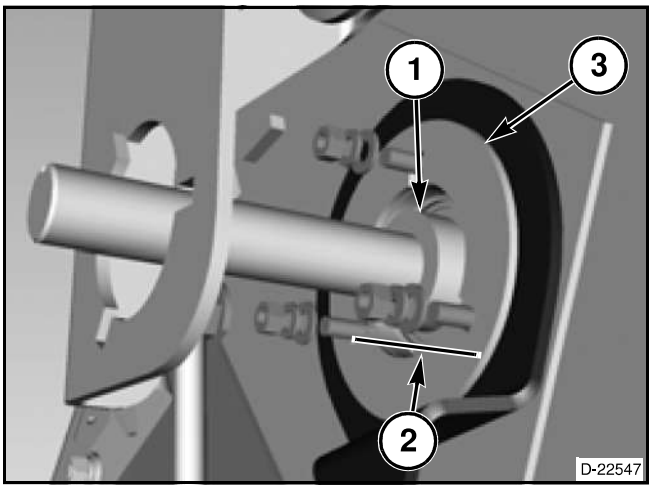


**FIG. 35**

**FIG. 36:** Remove the flange (1) and the spacer (2).

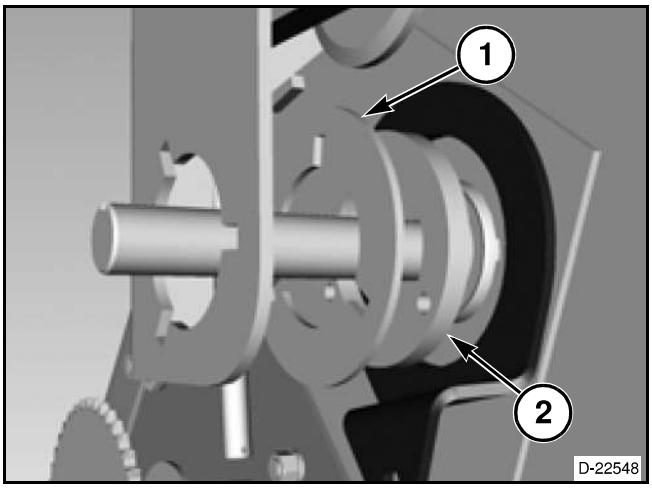


**FIG. 36**

**FIG. 57:** Install the sprocket (1) onto the right-hand auger shaft (2).

Align the sprocket with the corresponding sprockets.

Install the gib key (3) into the sprocket to attach the sprocket to the auger shaft.

*NOTE: Check the alignment of the sprockets once they are installed.*

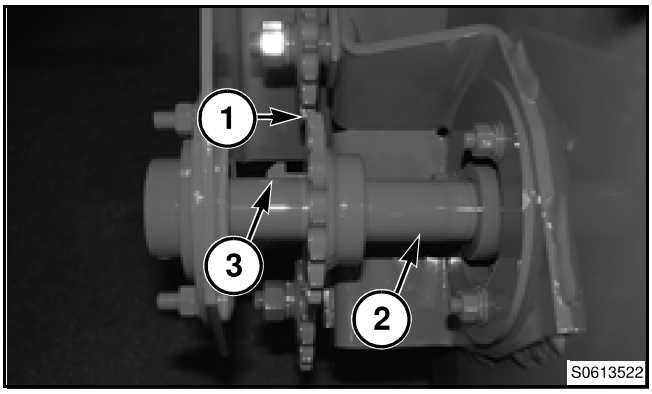


**FIG. 57**

**FIG. 58:** Install the outside bearing, flanges (1), hardware (2), and locking collar (3).

Tighten the inside locking collar (4).

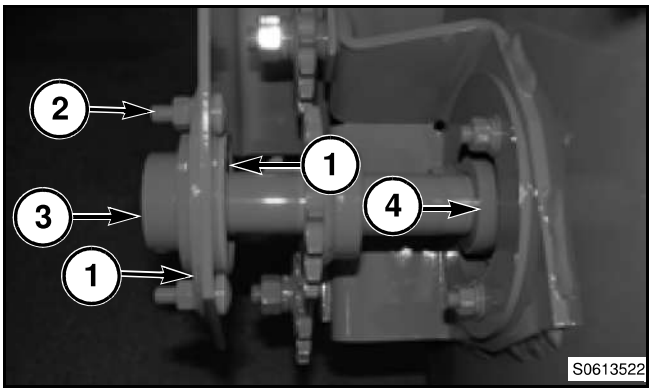


**FIG. 58**

**FIG. 59:** Support the right-hand auger.

Install the chain (1) onto the sprockets.

*NOTE: Do not tighten the chains at this point or damage will occur.*

Tighten the outside locking collar (2).

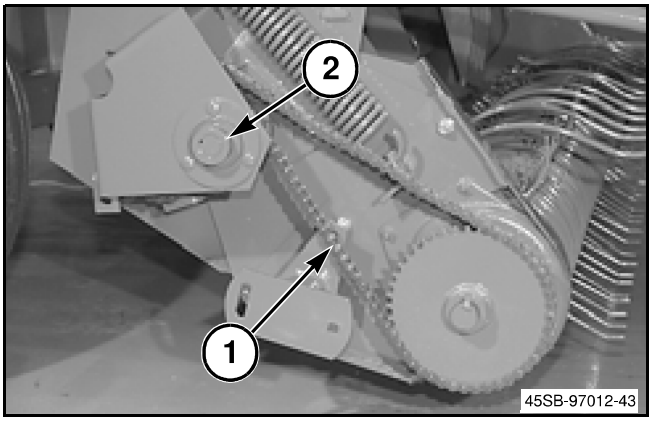


**FIG. 59**

**FIG. 60:** Adjust the pickup and auger drive chains to 6.35 mm (1/4 inch) of deflection with 13.6 (30 lb) of force with the chain tensioner sprocket. Measure the deflection at the points shown.

(1) Chain tensioner sprocket

(2) Measure deflection here

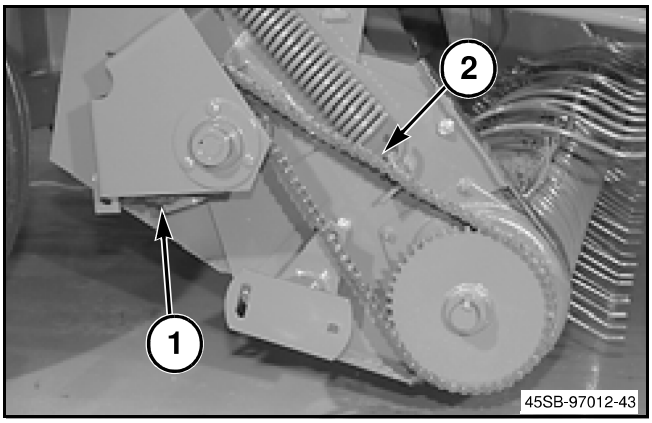


**FIG. 60**

**FIG. 79:** Install the outside bearing, flanges (1), and locking collar (2).

Tighten the inside locking collar.

Support the right-side auger.

Install the chain (3) on the sprockets.

*NOTE: Do not tighten the chains at this point or damage will occur.*

Install the hardware that hold the outside bearing and flanges to the pickup.

Tighten the outside locking collar.

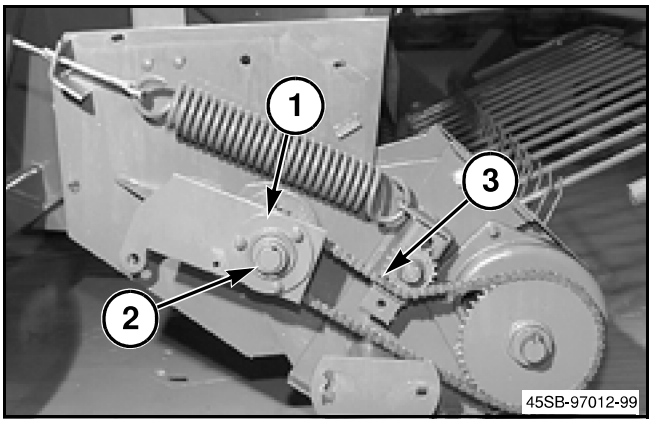


**FIG. 79**

**FIG. 80:** Adjust the pickup and auger drive chains to 6.35 mm (1/4 inch) of deflection with 13.6 (30 lb) of force with the chain tensioner sprocket. Measure the deflection at the points shown.

(1) Chain tensioner sprocket

(2) Measure deflection here

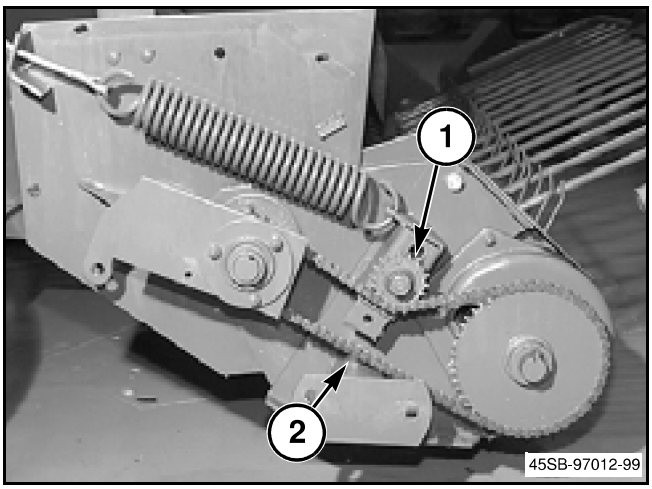


**FIG. 80**

**FIG. 81:** Install the right-hand side shields (1).

Install the gauge wheel strut (2), gauge wheel (2), and then the cotter pin (4).

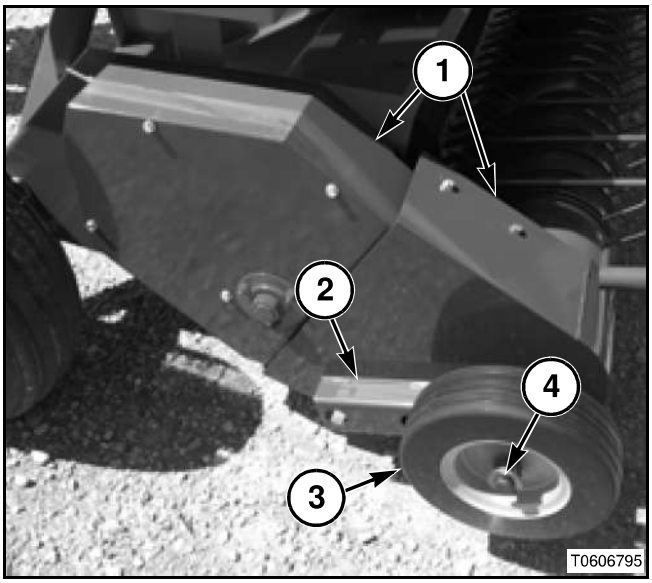


**FIG. 81**

**FIG. 95:** Punch the gib key (1) out then remove the sprocket (2).

Remove the hardware securing the bearing assembly (3) to the pickup.

Loosen and remove the locking collar (4).

Remove the bearing assembly from the shaft (5).

*NOTE: Use a bearing puller as needed.*

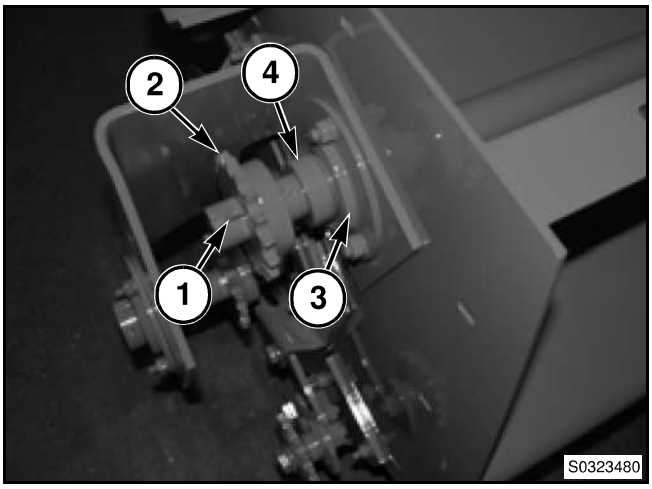


**FIG. 95**

**FIG. 96:** Loosen the chain tensioner sprocket (1) for the slip clutch drive.

Remove the chain (2) from the slip clutch sprocket.

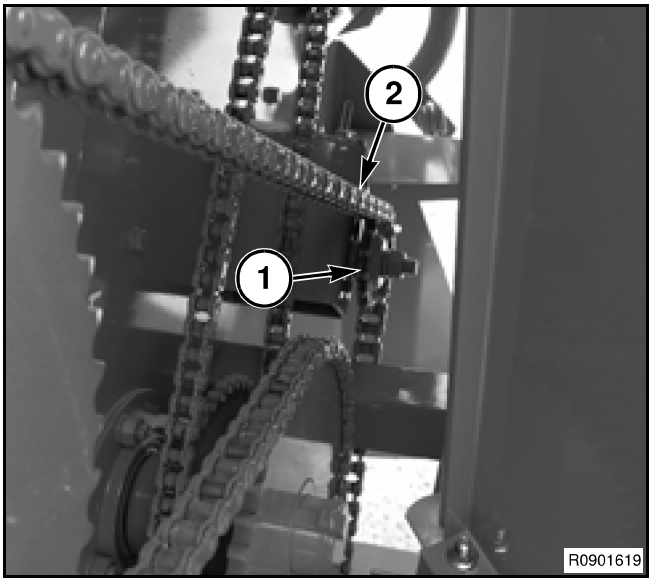


**FIG. 96**

**FIG. 97:** Loosen the locking collar (1).

Remove the drive shaft and clutch assembly (2) from the pickup.

Remove the hardware securing the bearing assembly (3), then remove the bearing assembly.

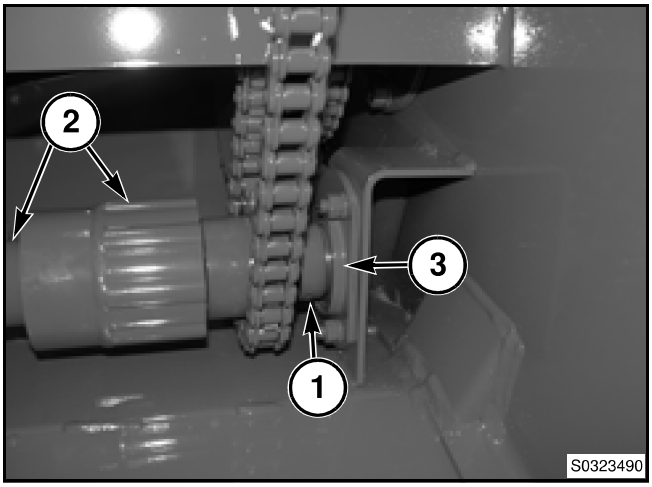


**FIG. 97**

**FIG. 122:** Loosen the chain tensioner sprocket (1).

Remove the chain (2) for the slip clutch drive shaft.

Remove the slip clutch drive sprocket (3).

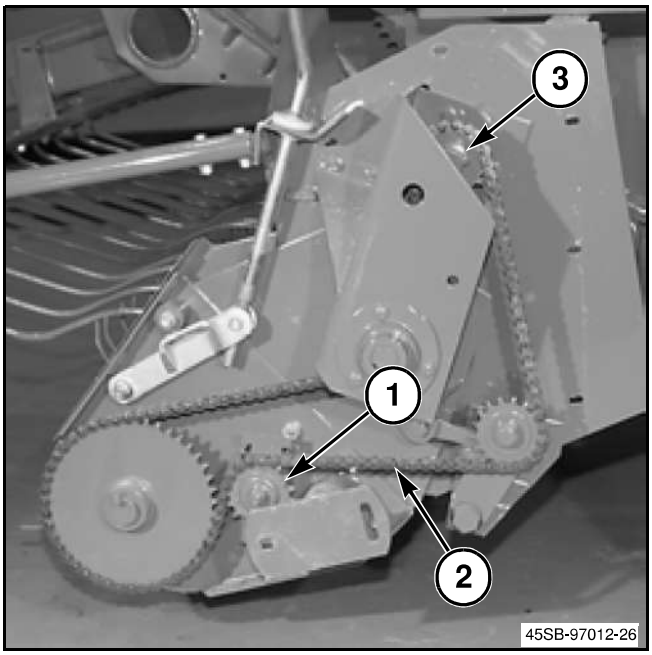


**FIG. 122**

**FIG. 123:** Punch the gib key (1) out then remove the sprocket (2).

Remove the hardware securing the bearing assembly (3) to the pickup.

Loosen and remove the locking collar (4).

Remove the bearing assembly from the shaft.

*NOTE: Use a bearing puller as needed.*

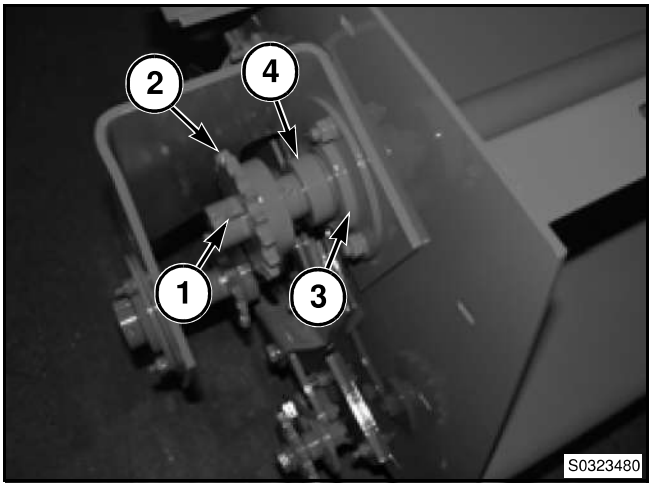


**FIG. 123**

**FIG. 124:** Loosen the chain tensioner sprocket (1) for the slip clutch drive.

Remove the chain (2) from the slip clutch sprocket.

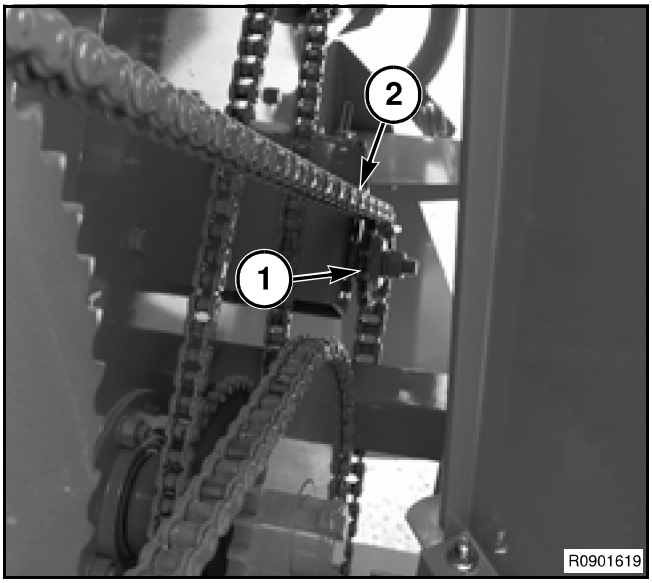


**FIG. 124**

## ROTOR ASSEMBLY

### General Information

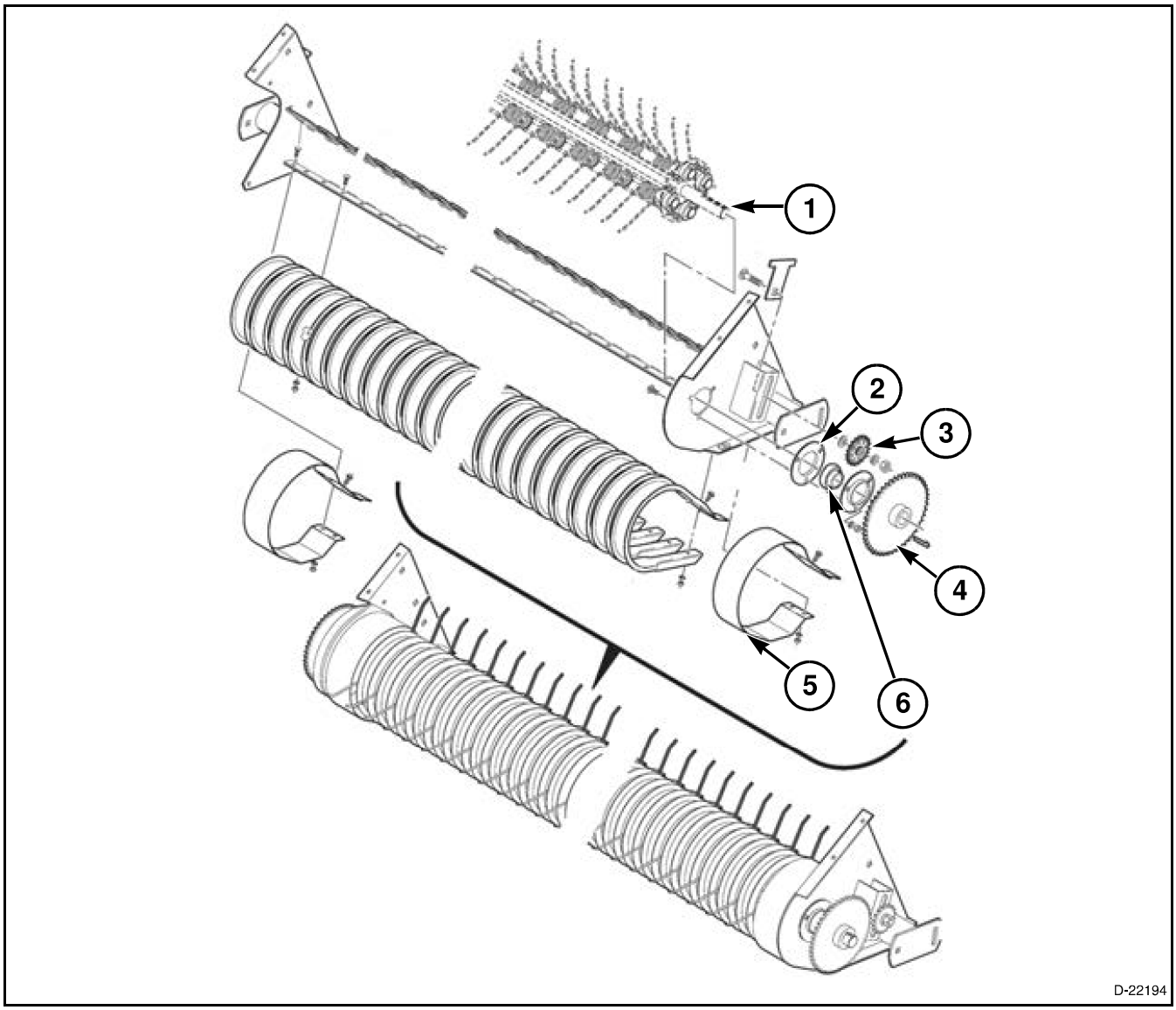


**FIG. 145**

**FIG. 145:** Components

(1) Rotor Assembly

(2) Bearing Flange

(3) Idler Sprocket

(4) Sprocket

(5) Tine Wrapper

(6) Bearing and Locking Collar

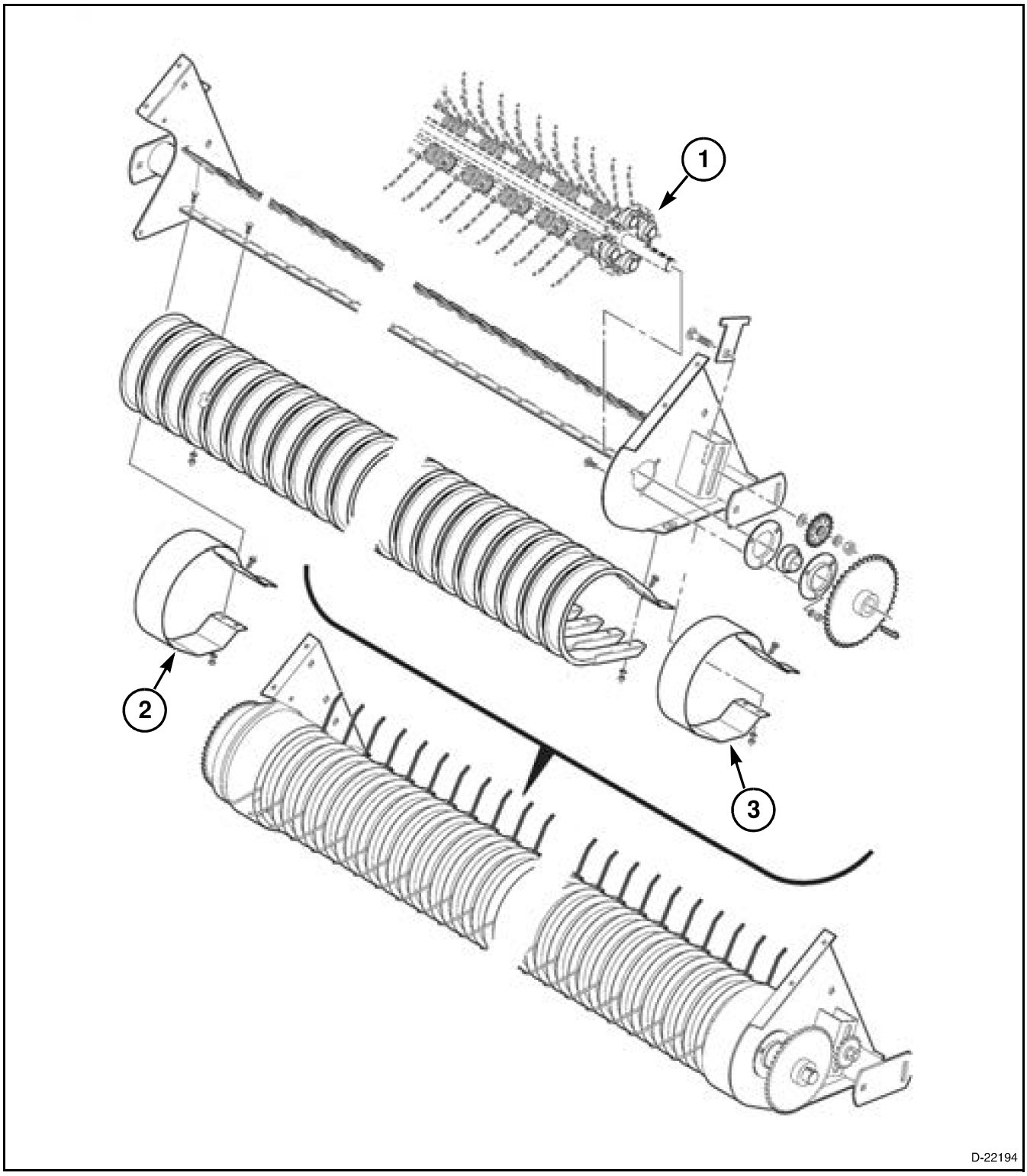


**FIG. 163**

**FIG. 163:** Support the rotor assembly (1).

Install the right-hand wrapper (2).

Install the left-hand wrapper (3).

**FIG. 183:** Install the left-hand side chain.

Adjust the pickup and auger drive chains to 6.35 mm (1/4 inch) of deflection with 13.6 (30 lb) of force with the chain tensioner sprocket. Measure the deflection at the points shown.

(1) Chain tensioner sprocket

(2) Measure deflection here

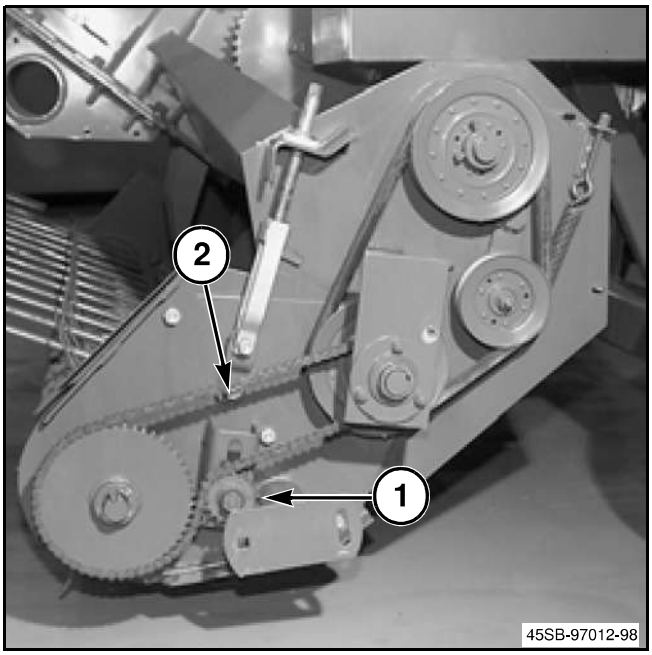


**FIG. 183**

**FIG. 184:** Install the left-side shields (1).

Install the gauge wheel assembly (2) and the windguard.

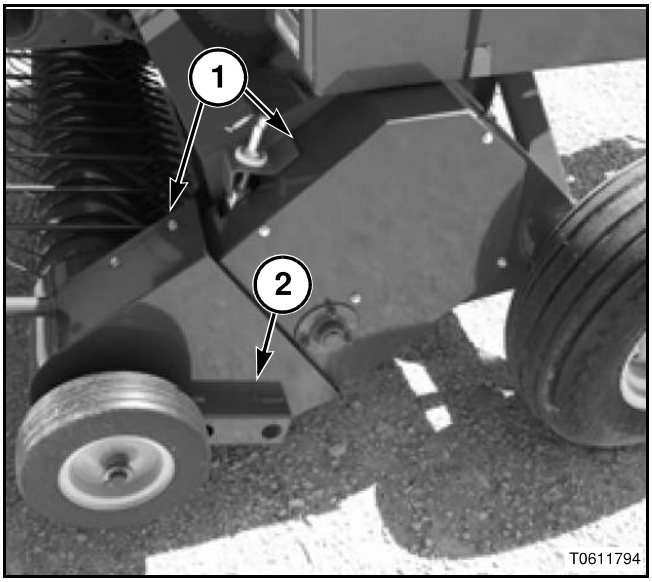


**FIG. 184**

**FIG. 185:** Install the right-hand side chain.

Adjust the pickup and auger drive chains to 6.35 mm (1/4 inch) of deflection with 13.6 (30 lb) of force with the chain tensioner sprocket. Measure the deflection at the points shown.

(1) Chain tensioner sprocket

(2) Measure deflection here

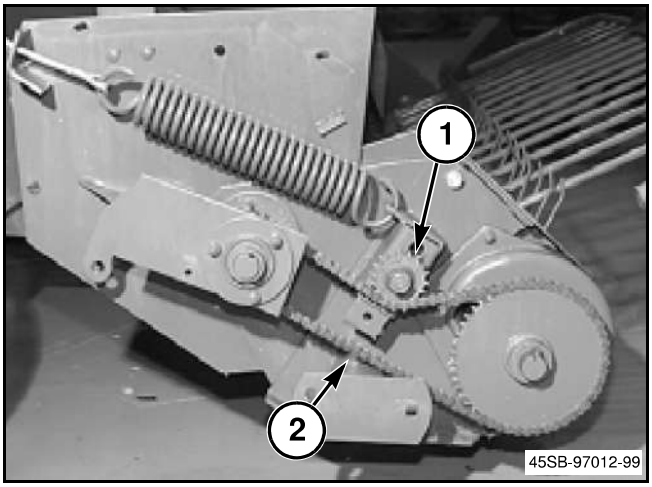


**FIG. 185**

(1) Square Key
(2) Woodruff Key
(3) Drive Shaft
(4) * Retaining Ring
(5) * Shaft Seal
(6) Spacer
(7) Ball Bearing
(8) Retaining Clip (two)
(9) Stator Housing
(10) * Gasket
(11) Small Dowel Pin (two)
(12) Idler Gear
(13) Slip Fit Gear
(14) Needle Bearings
(15) Gear Housing
(16) Large Dowel Pin (two)
(17) Short Bolt (four)
(18) * O-Ring (two)
(19) Housing
(20) Long Bolt (four)
(21) * Big O-Ring
(22) Little O-Ring (two)
(23) Adjustment Knob
(24) Reservoir
(25) Screw and Lock Washer
(26) Filter Assembly
(27) Micron Filter
(28) Gasket
(29) Reservoir Cap

**FIG. 30:** Use a sleeve (1) or clear tape to cover the drive shaft.

Slide the shaft seal (2) over the drive shaft with the part number on the shaft seal facing away from the stator (3).

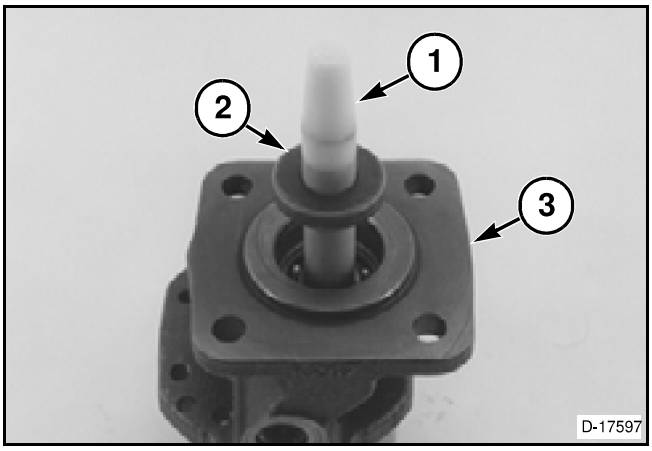


**FIG. 30**

**FIG. 31:** Place a collar or deep socket over the shaft and the shaft seal.

Press the shaft seal until the shaft seal is just below the snap ring groove.

*IMPORTANT: Do not damage the drive shaft, ball bearing, seal, or the stator.*


**FIG. 31**

**FIG. 32:** Install the retaining ring (1) into the groove on the stator (2).

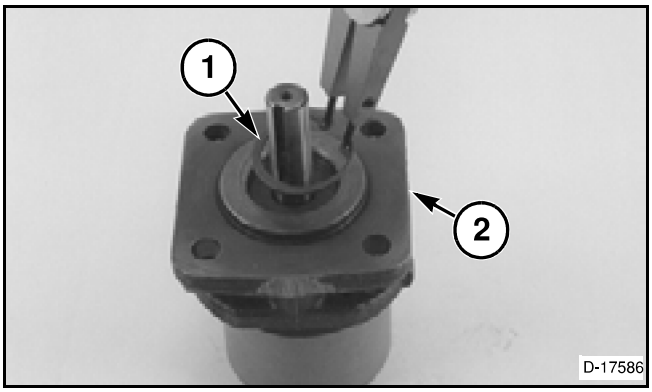


**FIG. 32**

## PUMP AND RESERVOIR S.N. HS65101 THROUGH HT65592

### Components

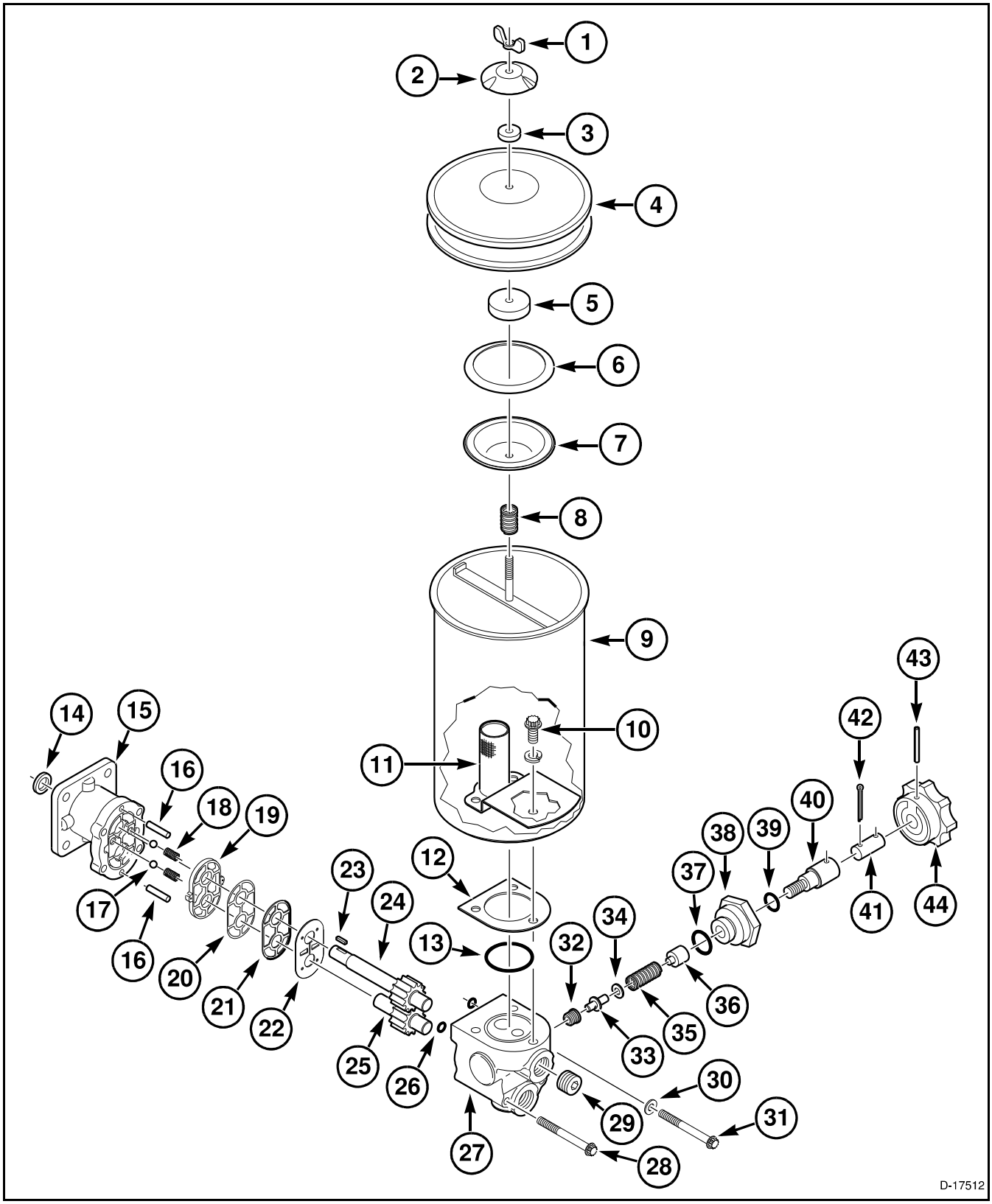


FIG. 49

# Challenger®

## SB34 / SB36
## Small Square Baler

# SERVICE MANUAL
## 79035890 A Rev.

# 06 - Knotter

### Contents

## Knotter Head - Disassembly

### Components

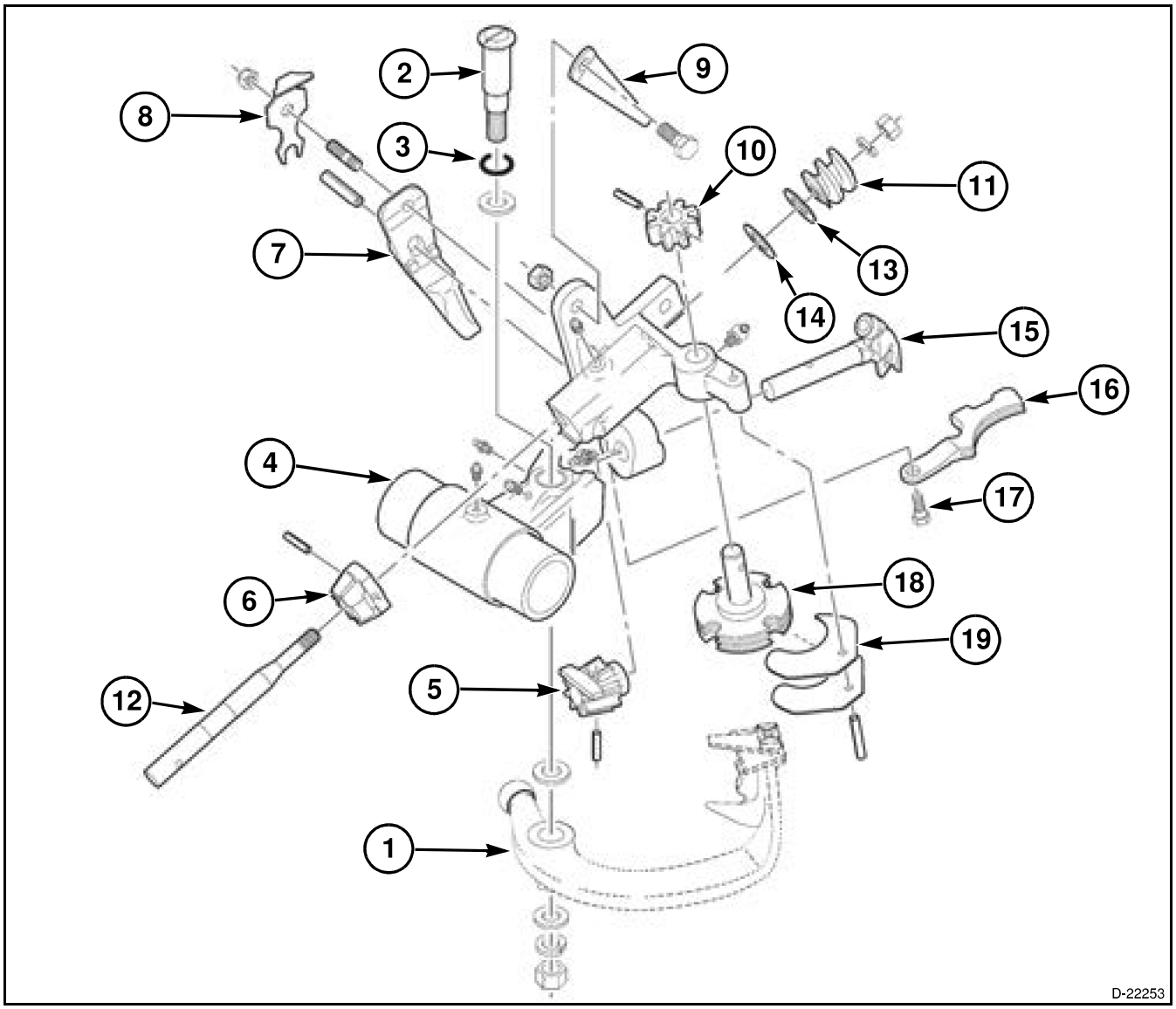


**FIG. 15**

**FIG. 15:** Knotter shaft assembly

(1) Stripper Arm
(2) Stripper Arm Shaft
(3) O-ring
(4) Knotter Head Frame
(5) Billhook Pinion Gear
(6) Worm Pinion Gear
(7) Billhook Cam
(8) Billhook Cam Spring
(9) Tension Lever
(10) Twine Disc Gear
(11) Worm Gear
(12) Worm Gear Shaft
(13) Machinery Bushing - 0.89 mm (0.13 in)
(14) Shim - 0.18 mm (0.007 in)
(15) Billhook
(16) Twine Holder
(17) Shoulder Bolt
(18) Twine Disc
(19) Twine Disc Cleaner

**FIG. 33:** The pinion clearance must be 0.20 to 0.45 mm (0.008 to 0.018 in). Remove or install shims between the knotter head frame and the pinion gear to correct the pinion clearance.

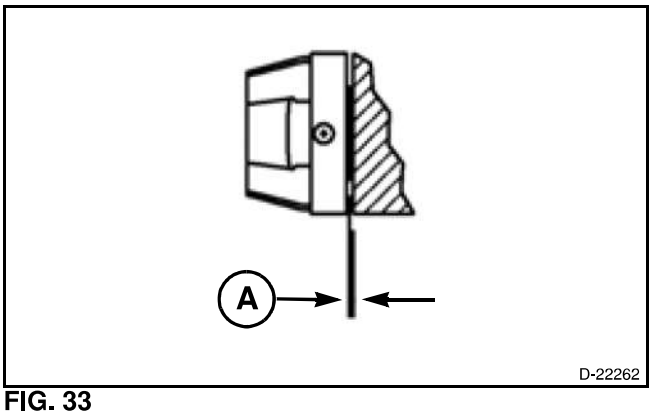


**FIG. 33**

# Challenger®

## SB34 / SB36
## Small Square Baler

# SERVICE MANUAL
## 79035890 A Rev.

# 07 - Mainframe

### Contents

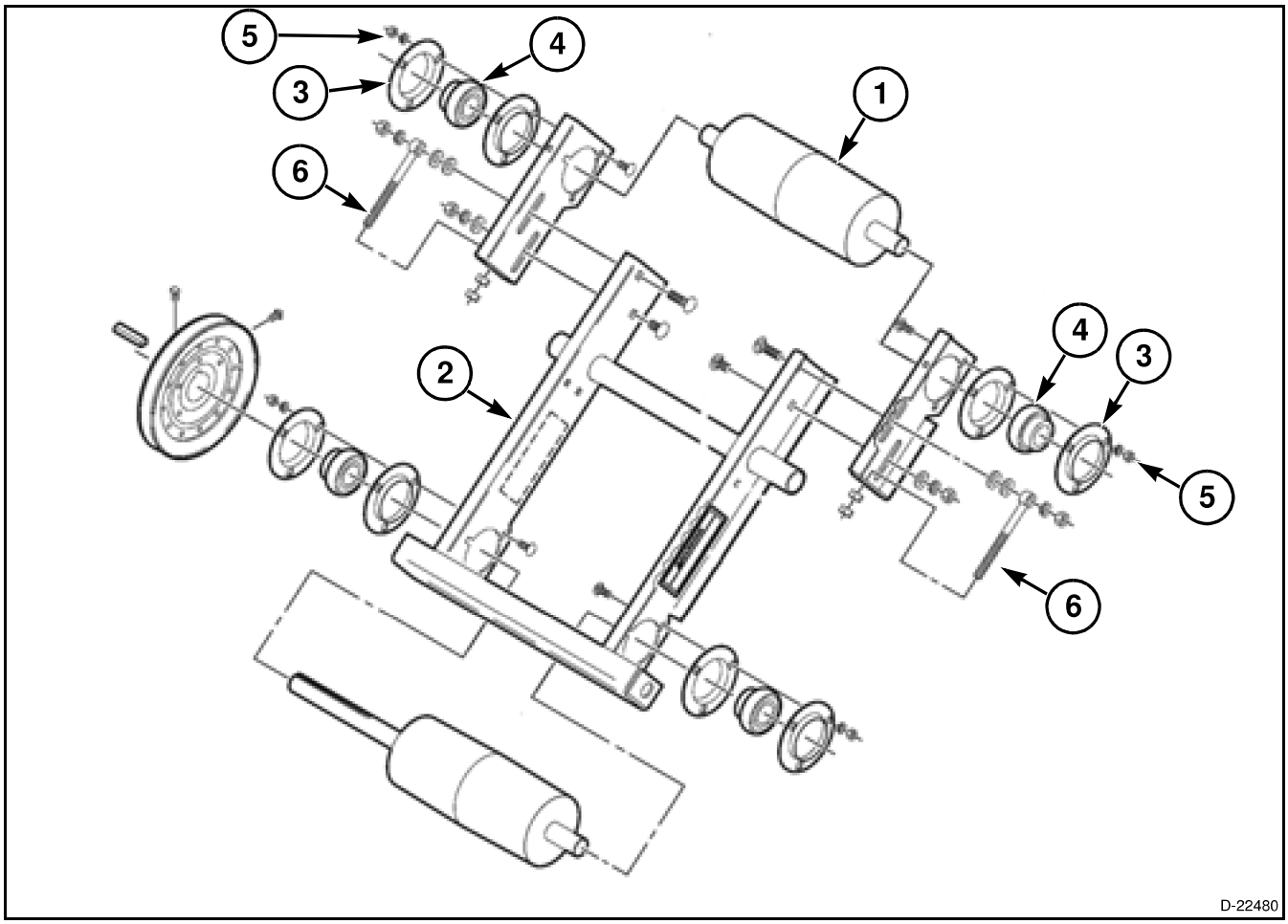


**FIG. 11**

**FIG. 11:** Center the roller (1) between the inner sides of the frame (2).

Install the bearing flanges (3), bearings (4), and lock collars.

Install the lock collars toward the outside of the frame. Do not tighten the flange hardware (5) or lock collars at this time.

Adjust the drawbolts (6) to equal length.

Tighten the bracket bolts (7).

Tighten the bearing flange hardware.

Tighten the lock collars.

## WIRE TIE (CONT'D)

| Problem | Possible Cause | Correction |
|---|---|---|
| Three wires, or more, in the twist | Wire not put next to the wire cutter holder arm, or the twister hook is holding the wire | Adjust the needle nearest to the wire cutter holder arm guide.<br><br>Increase the needle penetration.<br><br>Adjust the timing of the twister hook. |

## BALES SHAPE AND SIZE PROBLEMS

| Problem | Possible Cause | Correction |
|---|---|---|
| Poor bale shape | Windrow not even, or rate of feed not even | Adjust the ground speed to feed the windrow evenly. |
| | Dull plunger knife and ledger knives | Sharpen the plunger and ledger knives. |
| | Clearance between the plunger knife and ledger knives is not correct | Adjust the ledger knives to the plunger knives. |
| | Auger strippers need to be removed, or installed | Remove, or install, the auger strippers. |
| | Stuffer and plunger timing is not correct | Adjust the stuffer and plunger timing. |
| Bales are very rough | Feed rate too high | Reduce the ground speed. |
| Bale lengths are not the same each time | Clutch dog pivot will not move | Clean and lubricate the clutch dog pivot. |
| | Metering wheel spool not moving freely, or worn smooth | Install a new metering wheel spool. Check the alignment of the knotter trip arm. |
| | Knotter trip arm spring not connected, or damaged | Check the knotter trip arm spring. |