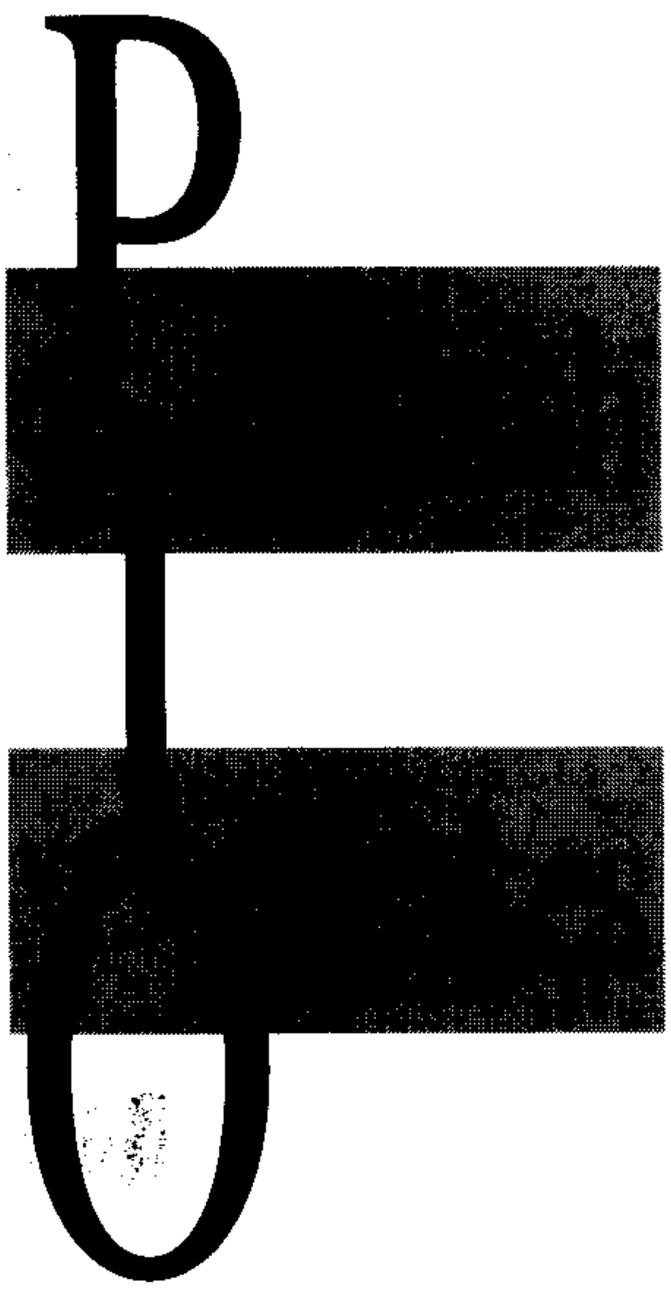
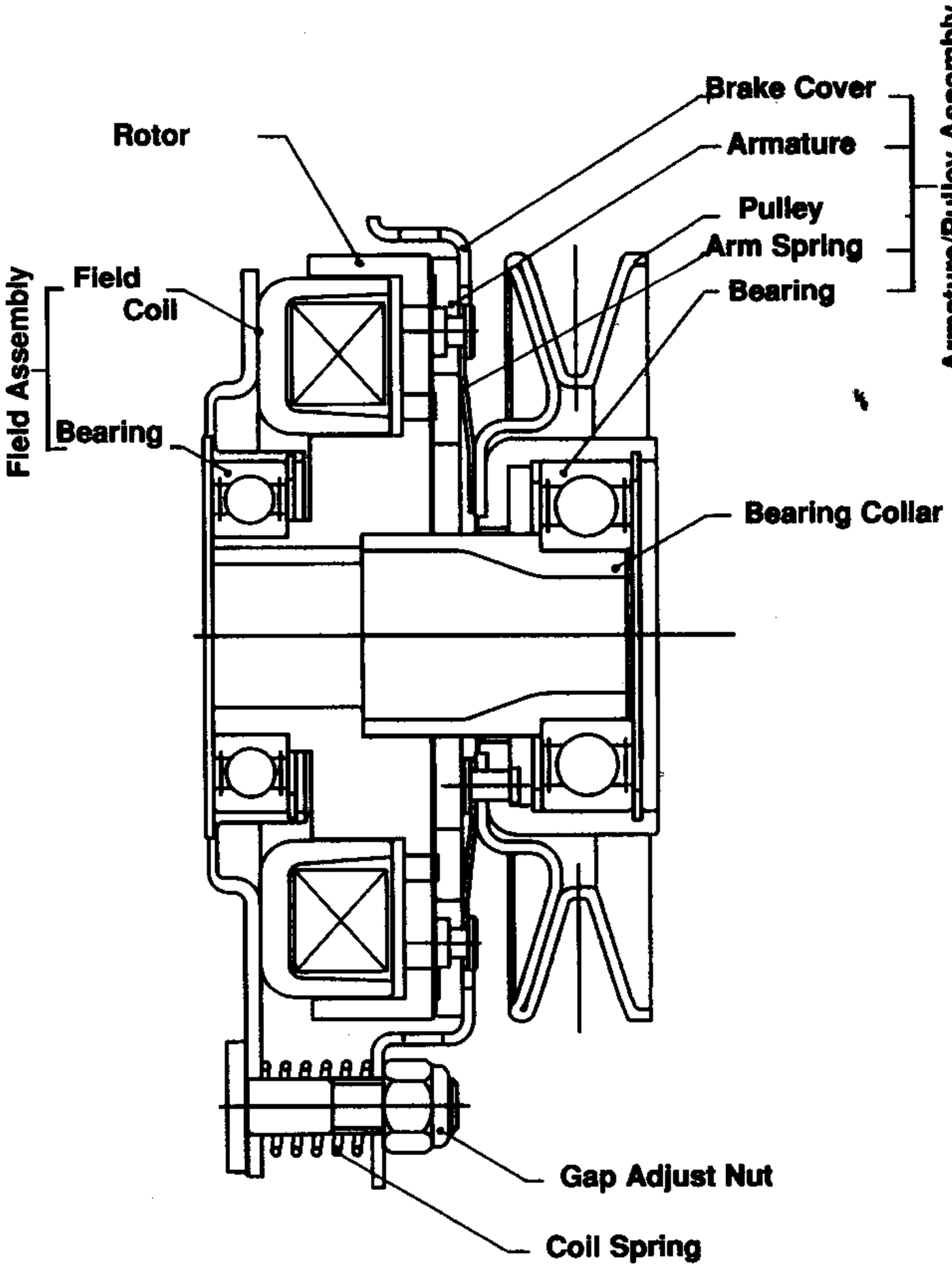
Trouble-Shooting Electric





With the growing use of the electric PTO clutch/brake in both consumer and commercial applications, the potential failure due to misapplication or inappropriate maintenance also increases.

By following the steps listed below, you should arrive at the solution to the four most common customer complaints about electric clutches.

Complaint 1:
PTO Clutch Will Not Engage

1. Check the fuse first to make sure it is not blown. A quick visual check of the clutch and the electrical system should be done first. If the circuit is equipped with a fuse and it has blown, replace it and check the clutch.

2. Check the pulley/armature connection. If the rivets or springs are broken, causing the connection between the pulley and the armature to be severed, the clutch will not transmit rotation and must be replaced.

3. If the air gap is too large, the electromagnetic field will not pull the armature toward the rotor. There should be an air gap between the armature and the rotor. This air gap can be checked through the inspection slots in the side of the

brake cover. Adjustment should be made on the nuts to bring the air gap within the manufacturer-recommended allowances.

In general, the air gap between the armature and the rotor should be run about .010 to .020. Because some clutches do not have adjustable air gaps, when the air gap is too large, the clutch is worn out.

4. Make sure the clutch is receiving voltage from the battery. All PTO clutches operate on 12 volts and almost all coils operate on four amps or less.

Disconnect the terminal from the clutch to the power cable, and make sure that the proper voltage signal is being received. If the battery is not producing enough volts, the PTO clutch may not be able to pull in because the magnetic field will not be strong enough.

5. Inspect both the power cable going into the clutch and the clutch cable itself to make sure there are no cuts in the wire. If the wire has been damaged, this may prevent the clutch from receiving power from the battery or may cause the system to ground out.

6. Check the ohm rating of the coil. If the wires and all connections look in good shape and if the coil is open or is grounded out, the field coil has failed and needs to be replaced.

7. Make sure that no physical contact occurred from the field to the rotor. If the coil is open, a physical check should be made to the clutch assembly to make sure that no physical contact occurred from the field to the rotor. If the rotor has rubbed on the field, the physical evidence would be discoloration. This frictional heat could have caused the unit's failure, so care should be taken to ensure that when installing a replacement clutch the same failure does not repeat itself.

For flange-mounted units, sometimes the field could shift against the rotor. In this case, the mounting bolts should be checked. In a bearing-mounted clutch assembly, the rotor could sustain damage from outside the contact, which could bend the rotor, causing it to make field contact. Both should be checked to confirm if these were reasons for the clutch field failure.

8. The main power wire system fuse and seat switch should be double-checked to make sure they are not faulty. If the clutch field checks out and there does not appear to be any breaks in the lead wire going into the clutch assembly, the fault must be in the electrical system of the tractor.

Complaint 2:
PTO Clutch Will Not Disengage

1. The most common reason that an electric PTO clutch will not disengage is because the surface of the armature and the rotor have galled (locked together). Galling typically occurs in a new clutch that is not burnished properly. It is a condition where a piece of metal, such as a burr, has been deformed between the pressure of the armature and the rotor plate. Due to pressure and heat upon engagement, this small piece of metal can actually weld the armature and the rotor surfaces together, locking up the clutch and preventing disengagement.

Even though this has occurred, the clutch many times can still be salvaged. A trick is to insert the head of a screw driver between the armature and rotor,

and then tap until the surfaces spring apart. If they do not come apart initially, you may have to attempt this insertion in more than one location.

After the surfaces are separated, reburnish the clutch. Burnishing is the wearing in of the armature and rotor surfaces, and is accomplished by cycling the clutch anywhere from 30 to 100 times. (The blade should not be cutting grass when the clutch is being burnished.)

2. Another reason for the clutch not disengaging is if the brake-plate-adjustment bolts have been tightened to the point that there is no air gap between the clutch armature and rotor. If there is no air gap, the clutch will not separate when power is released from the coil. This condition should be easy to spot because the brake plate would be discolored from being in constant contact with the armature when the engine is running.

Complaint 3:
Clutch Slips

A slipping clutch is one of the worst problems you can come across because it is often difficult to diagnose the initial reason for the slipped clutch. Since a slipping clutch will eventually sustain a total failure, that failure sometimes will obliterate the evidence of why the clutch started slipping in the first place. The following areas should be checked to see if they contribute to slippage:

1. Contamination. If oil or grease has contaminated the clutch surfaces, the ability to transfer torque is substantially reduced. Oil or grease contamination would be noticed by having visible oil or grease on the outside of the clutch, or by sometimes showing a black residue if the clutch temperature has burned off most of the oil. In all cases, the customer should be advised that no oil or grease should be allowed to get on the clutch friction surfaces. If there is a potential in the installation for oil to leak on the clutch, create a deflector shield.

2. Low or inconsistent voltage. The battery should be checked to make sure the clutch is operating at its full 12-volt capacity. Also, lead wires should be checked to make sure there are not cuts in the wires. When a cut wire moves, this may open and close the clutch circuit, which could simulate slippage.

Also, if the battery is not producing enough voltage, the clutch will not operate at its maximum torque capability and slippage would occur, especially if the clutch becomes loaded down.

3. An overloaded clutch. If the torque required in the application is too much for the clutch to handle, slippage can occur, especially in a heavy-duty requirement. In most cases, the clutch is designed to stall the engine, but, occasionally a smaller clutch is used on a high-horsepower engine. In this case, the clutch would not have the ability to stall the engine and may be more prone to slippage. If you feel this is the case, you should go back to the manufacturer so a higher-torque clutch can be installed.

4. Severe galling. If a clutch surface has galled, the torque-transmitting capability can be reduced by 50%. If you feel that the galling is due to either a momentary overload or from improper initial burnishing, the clutch can be burnished. However, a severely galled clutch will take at least 100 cycles of burnishing before it can come back to full torque capability. (Reburnishing should occur when the grass is not being cut.)

5. Broken leaf springs or rivets. If the clutch has broken its connection between the pulley and the armature because of broken leaf springs or rivets, it is no longer functional. This means the clutch must be replaced and cannot be repaired.

Complaint 4:
Clutch Is Noisy

First, ask about the noise. Sometimes, a noise is from a belt, not the clutch. To help this problem, the belt needs to be adjusted. (Also verify that the right belt is being used.)

1. Check flange-mounting bolts. (If you have a bearing-mounted clutch go to step #2.) If the unit is flange-mounted, make sure that the field-mounting-plate bolts are properly tightened. Loose bolts may mean occasional field and rotor contact.

2. Check anti-rotation pin. (If you have a flange-mounted clutch, go to step #3.) There is normally an anti-rotation pin projected through the back-plate of the clutch assembly. If this slot has been elongated due to vibration, additional movement will be created, resulting in additional noise on the back-plate area. If this happens, try to reduce the overall area of movement; however, try not to restrict movement totally. (Clutch back-plate should have approximately ⅛-in. total movement available in axial and radial directions.)

3. Check air gap. If an occasional pinging or scraping noise is noticed when the clutch is disengaged, there is a possibility that the air gap between the armature and rotor are set too close. In this case, the brake cover should be backed off to the manufacturer's suggested range. (Make sure to check air gap in all three locations.)

If noise is noticed when the clutch is engaged, it means there is contact with the brake cover. If the air gap is set too close, it should be opened up to the manufacturer's suggested range.

4. Listen for bearing noise. If a bearing noise is noticed when the clutch is disengaged, there could be a problem in either the pulley side bearing or the field side bearing. If the noise disappears when the clutch is engaged, then the problem is in the pulley side bearing. If possible, the bearing should be replaced.

Prior to replacing the bearing, the failure should be verified and the seal should be checked on the bearing to confirm that the bearing has failed due to seal damage, high-temperature damage or water contamination.

Occasionally, field bearing failures can cause other problems, like ripping off torque tabs or lead wires. As with slipping, it is sometimes difficult to determine which happened first. ❑

Editor's Note: *This article is from Frank Flemming, Sales Manager, Ogura Clutches and Brakes, marketed in the United States by Kanematsu USA, Inc., Somerset, NJ. It is reprinted with permission from the June, 1995 issue of* OUTDOOR POWER EQUIPMENT *Magazine.*