

39MT DELCO-REMY STARTER

A rebuilder's friend or foe?



BY BOB THOMAS

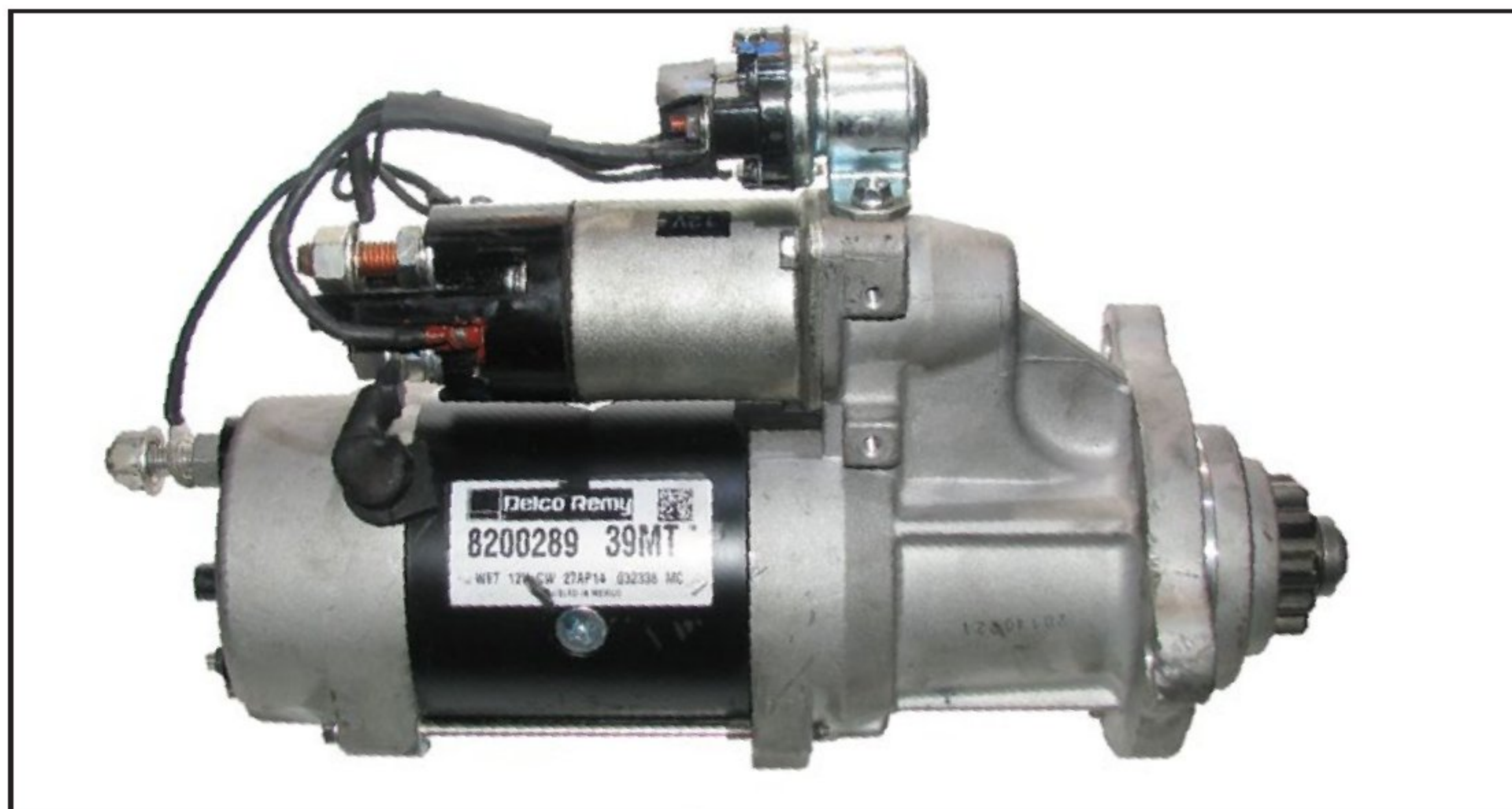


Figure 1—The 39MT, Delco-Remy's primary heavy duty starter, has been in use for 15 years.

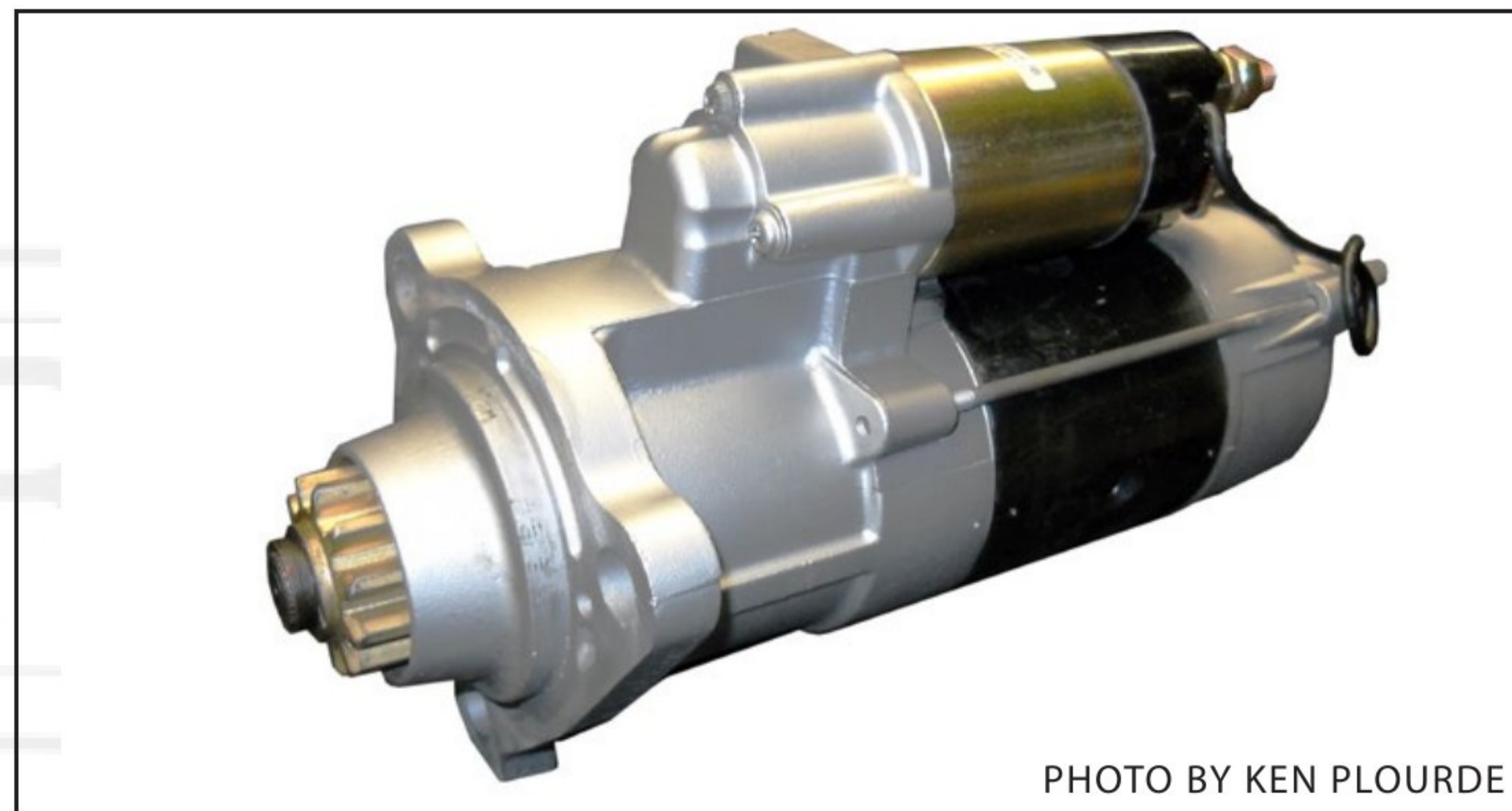


PHOTO BY KEN PLOURDE

Figure 2—The first generation 39MT looks very similar to a Mitsubishi heavy duty starter. Note solenoid mounting screws.

The Delco-Remy 39MT has been around since the beginning of the new millennium, but some rebuilders still admit to feeling uncomfortable working on it. Delco-Remy has made a number of changes to this starter since it first appeared, and these changes have caused much of the confusion and problems that have been associated with the 39MT (see Figure 1).

This planetary gear starter was designed to replace the straight drive 42MT. It provides better torque and cranking speeds than a 42MT along with a considerable reduction in size and weight. The 39MT and 42MT share nothing in common, other than the fact that the complete unit can be interchanged on many applications. Delco-Remy has made a continuing series of modifications and improvements to the 39MT since it was introduced. Consequently, 39MT service parts do not interchange like they did with the 42MT. It is of the utmost importance to know exactly which 39MT you are working on, whether you are rebuilding one or a batch of these starters.

Having the OE starter part number before you do anything is highly recommended. Identification without it can be a problem with all the changes that have been made. There have been many aftermarket replacement units, too, and they may or may not be exact copies. Delco-Remy identifies their 39MT starters as being from a particular generation. Up to now there have been four generations.

GENERATION I—The first 39MT starters were made in Japan and shared many similarities with Mitsubishi heavy duty planetary gear starters (see Figure 2). The easiest way to identify this starter is the three solenoid mounting bolts that go in through the drive end (DE) housing to the solenoid. All later generations use a different solenoid with two mounting bolts pointing in the opposite direction. No parts from a Generation I will fit any of the later starters. These units were all made in Japan. Some service parts are still available for them, but they are limited.

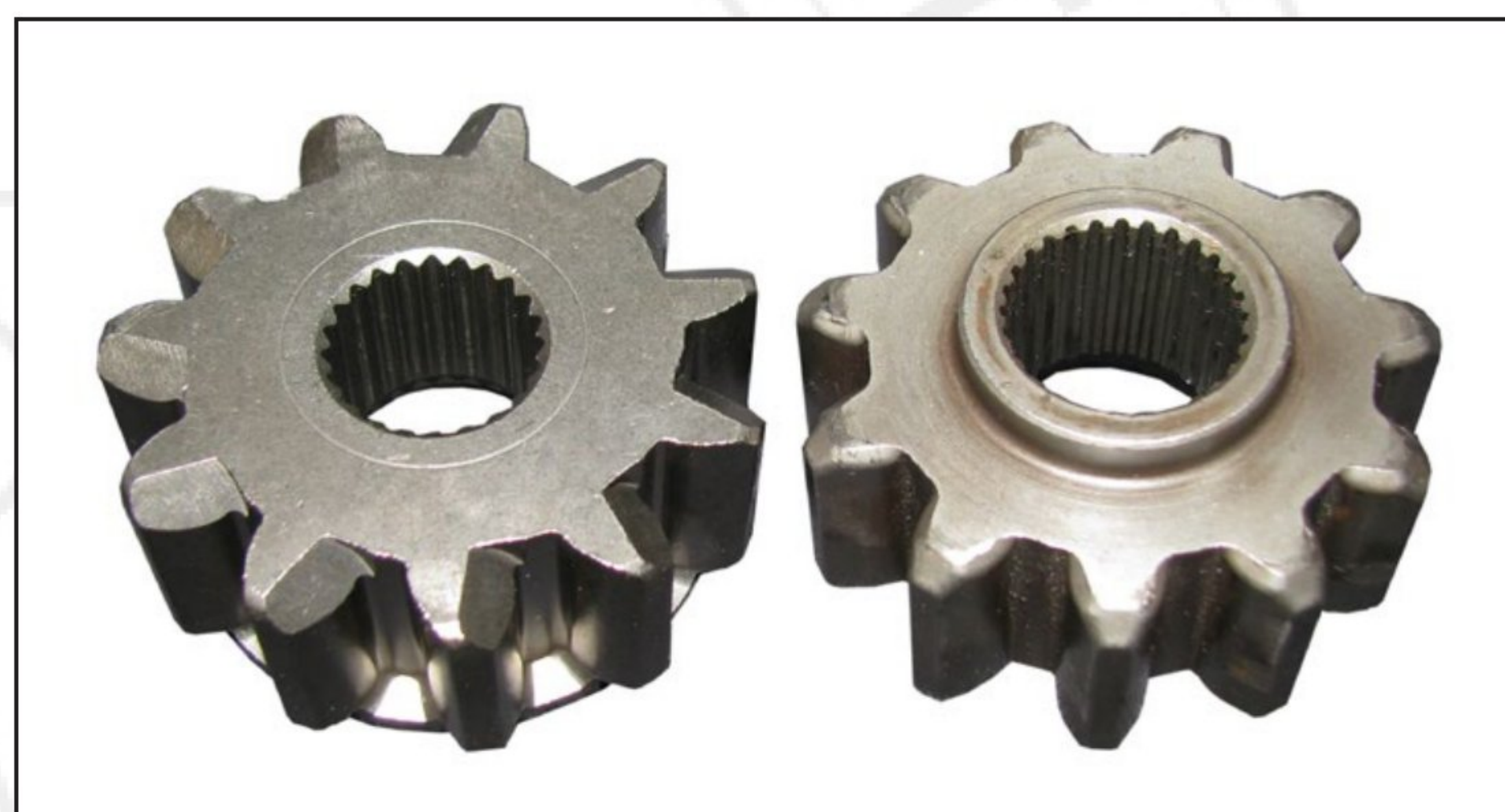


Figure 3—The Generation II pinion is on the left. The Generation III and IV pinion is on the right. Note that the inside diameters are different, as well as the faces of the gears.



Figure 4—Generation II, III and IV starters use the same solenoid. Mounting screws thread into the DE housing.

GENERATION II—There was a complete redesign of the 39MT when production was moved to Korea for 2003. All 39MT starters after that move look very similar. Generation II starters can be identified by the flat face of the pinion gear on the left in the photo (*see Figure 3*). The pinion on the right was used only in Generation III and IV starters. If you are rebuilding a 39MT Generation II, you cannot use parts from the DE housing assembly of any other generation. The housing, pinion, pinion hardware, drive clutch and shaft are all different from later versions. The drive clutch shaft is 18mm in diameter. The solenoid for all Generation II, III and IV starters is the same and mounts differently as described earlier (*see Figure 4*).

GENERATION III AND IV—Production was later moved to Mexico, and significant modifications were made to the Korean 39MT, which included a larger diameter drive clutch shaft. Most of the DE housing assembly was changed. These starters can be differentiated from their Generation II counterparts by the visibly different pinion gear as described above. The pinion hardware, clutch, shaft and DE housings are all different from Generation II. However, they may appear similar enough to get them mixed up or confused.

An over crank protection (OCP) thermal switch similar to that used with the 42MT was originally added as an option, but it is now being included on all new 39MT starters (*see Figure 5*). Note that the self-resetting OCP switch is located on the brush holder right above a ground brush (*see Figure 6*).

Perhaps the most popular feature to be added to the 39MT since its inception was the addition of rotatable DE housings (*see Figure 7*). This allows dealers and installers to achieve wider coverage with fewer part numbers. It also makes it possible to replace almost any aging 42MT with a 39MT.

Soft Engagement Solenoid

All versions of the 39MT incorporate a soft engagement feature that was designed to eliminate flywheel milling. The 39MT solenoid accomplishes this in a way that is different from past starters. The pull-in coil of this solenoid in 12 volt applications is wound with 10 gauge wire that requires about 230 amps. The hold-in coil draws an additional 40 amps. Combined, this solenoid needs 270 amps to work properly. The amperage draw of this solenoid during free-run bench testing, initially caused much concern in the rebuilding community.

Current flows the same as it does in most other starter solenoids. All of the pull-in coil's amperage flows through the starter's motor as it travels to ground. This high current causes the 39MT's motor to turn slowly, but with a significant amount of force, until the pinion is fully engaged into the ring gear. At that point the solenoid's contacts close, the pull-in coil's ground is lost, and the hold-in coil keeps the solenoid contacts and drive pinion in place during cranking. The ability to rotate a pinion at a controlled speed while it is pressed tightly against a ring gear, is what makes the 39MT's soft engagement different. Extended cranking can easily overheat this solenoid, because it consumes over 3,000 watts during pull-in and 400 watts during cranking.

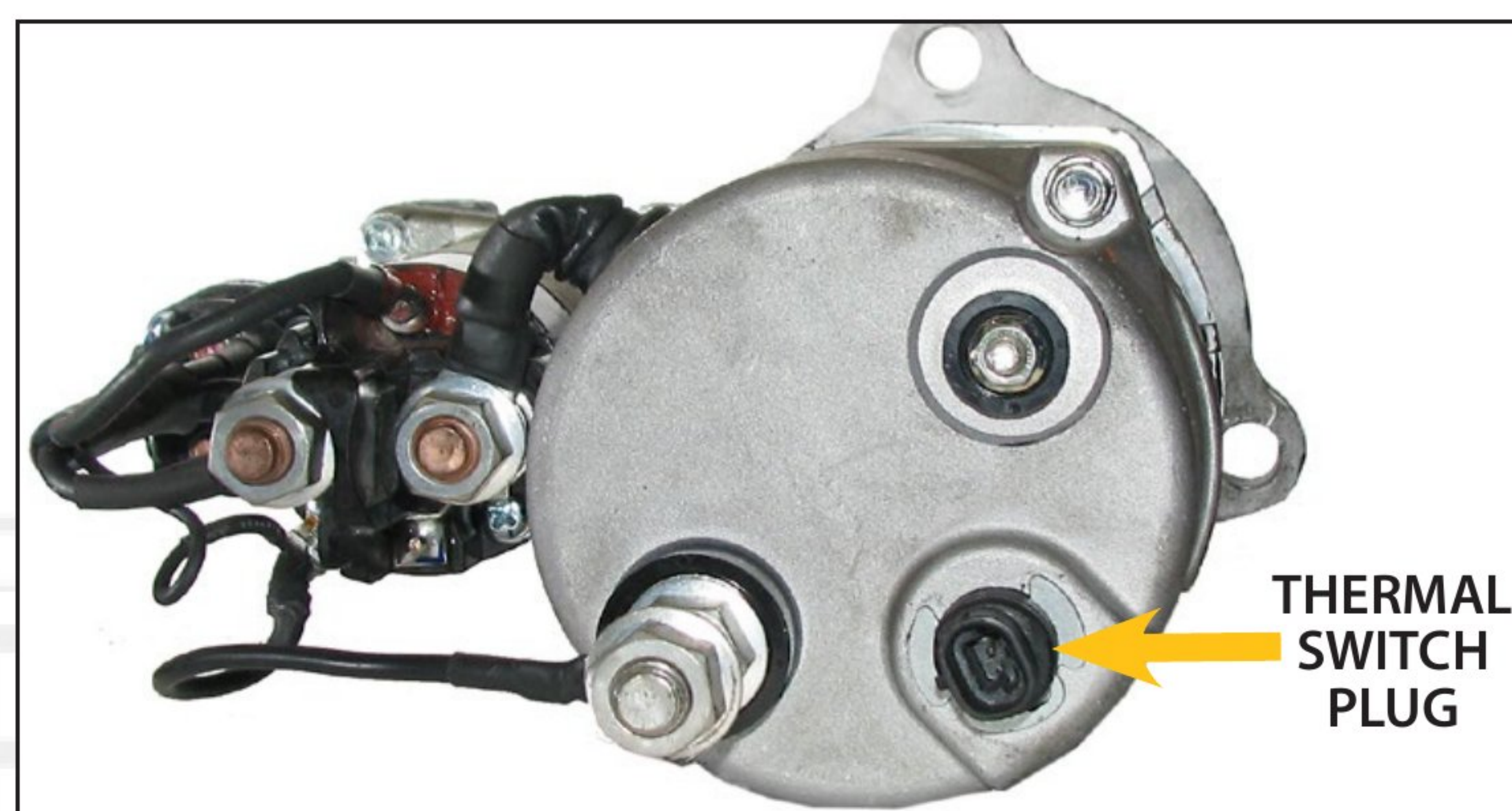


Figure 5—The plug on the CE Housing is for the OCP thermal switch.

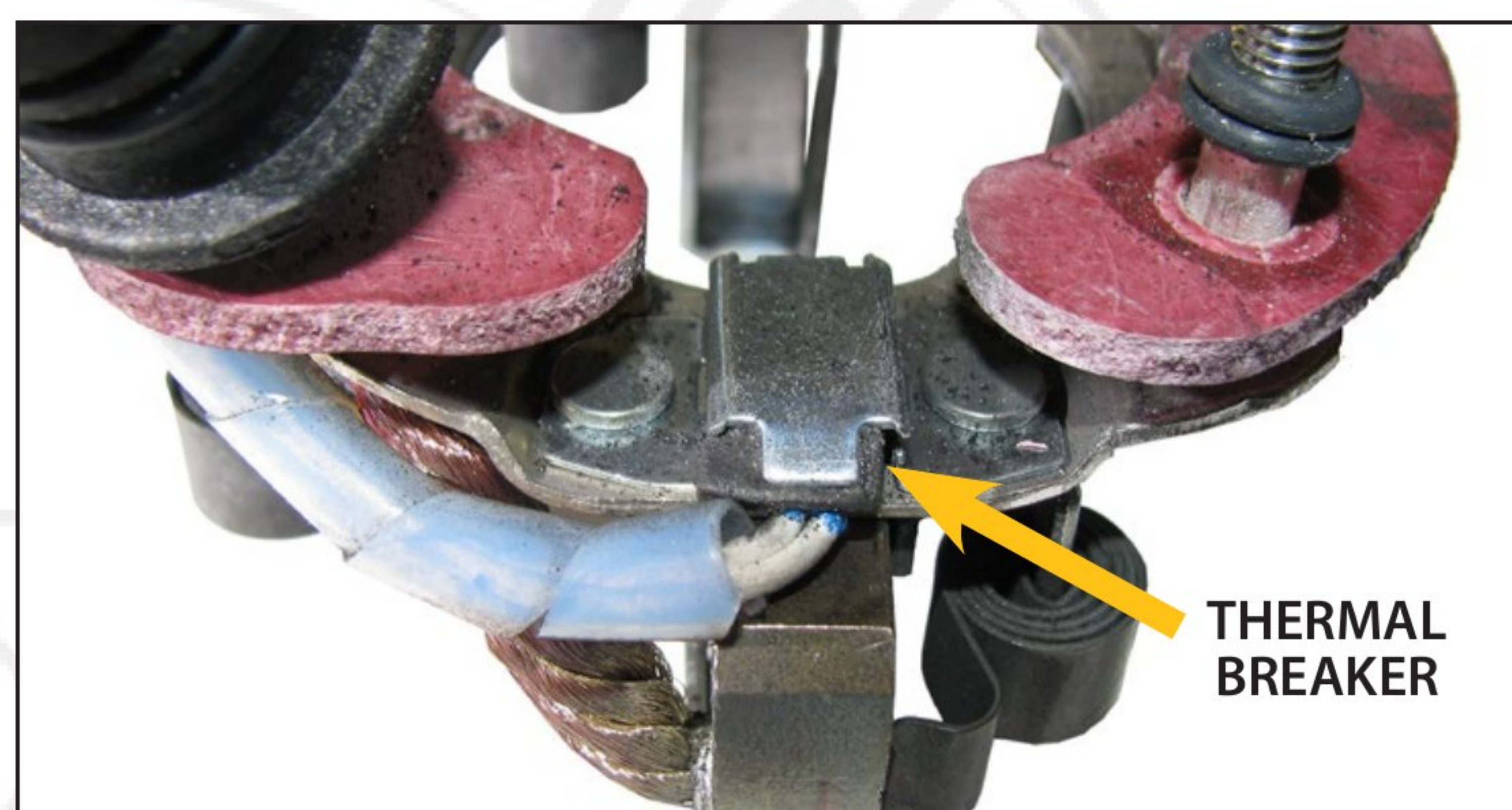


Figure 6—The OCP thermal breaker is mounted on the brush holder, just above a ground brush. Once an option, it is now standard on all 39MT starters.

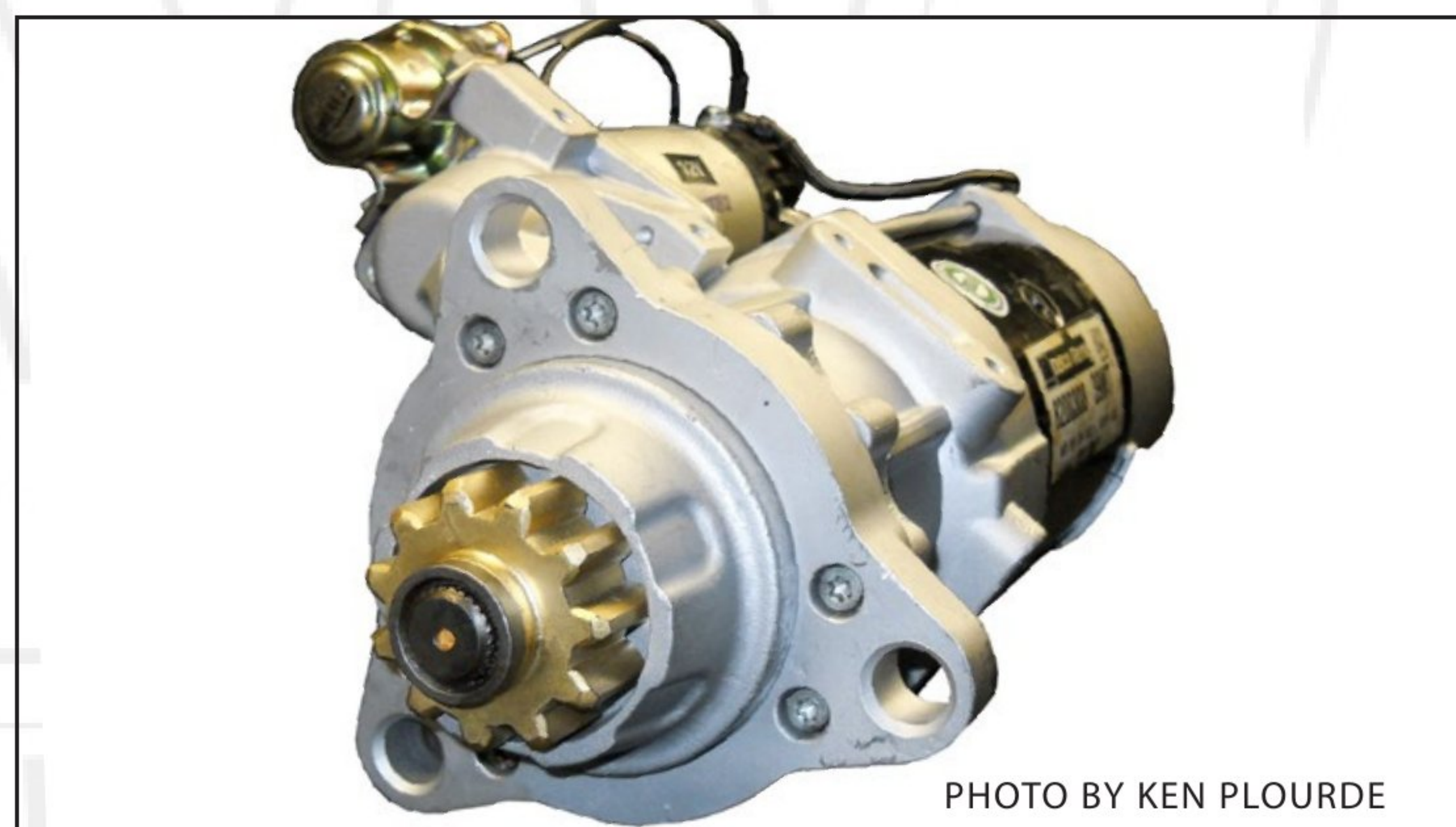


Figure 7—The rotatable DE housing was introduced more recently and can be purchased as a component part to retrofit any Generation III or IV starter.

IMS Relay

All generations of 39MT DE housings provide for the mounting of Delco-Remy's Integrated Magnetic Switch (IMS) Relay (see Figure 8). However, this relay was initially considered an option by Delco-Remy. That decision was probably based on the many applications that already had a heavy duty start relay, hence thinking it not really essential. While many of the heavy duty start relays commonly used with 42MT may have been rated to handle 300 amps intermittently, the wiring circuit was another matter. In most cases it was not. The rebuilding community figured this out pretty quickly when customers began showing up with 39MT start problems. More than one 39MT application was retrofitted to a 42MT, because it came without the IMS relay. Delco-Remy responded with recommendations to install the relays in all applications and now includes the relay as a standard part on every new 39MT.

Through Bolts

The external through bolts on all Delco-Remy 39MT starters are installed at the factory with a permanent thread-locking compound. We strongly advise that you apply heat to the housing before attempting to remove these bolts (see Figure 9). Loose through bolts have been a common problem with this starter, and we strongly advise using a good thread locker when you reassemble one.

While on this subject, there is another tip that we would like to share for those who missed the 39MT seminar that was presented by John Kaiser of the Ryder Rebuild Center at the 2014 ERA EXPO in Atlanta. As mentioned above, loose through bolts have been causing an ongoing problem with the 39MT. At Ryder, they tightly seat the commutator end (CE) frame and field housing onto the DE housing assembly before the final tightening of the through bolts (see Figure 10). Other rebuilders who are doing this have confirmed that it is an important step. Delco-Remy's torque specification for the through bolts is 7.7-9.8 Nm or 68-87 in-lb.

Brushes

Initially Delco-Remy used different brush formulas for 12 volt and 24 volt starters, and the aftermarket followed suit. Since then, Delco-Remy changed this to use the same brush compound for both voltages. We are aware of some production rebuilders who were using the 24 volt brush in 12 volt starters before Delco-Remy made that change, because of overheating problems with the 12 volt brushes. Based on this, we recommend that the new 12-24 volt brushes be used in all applications.

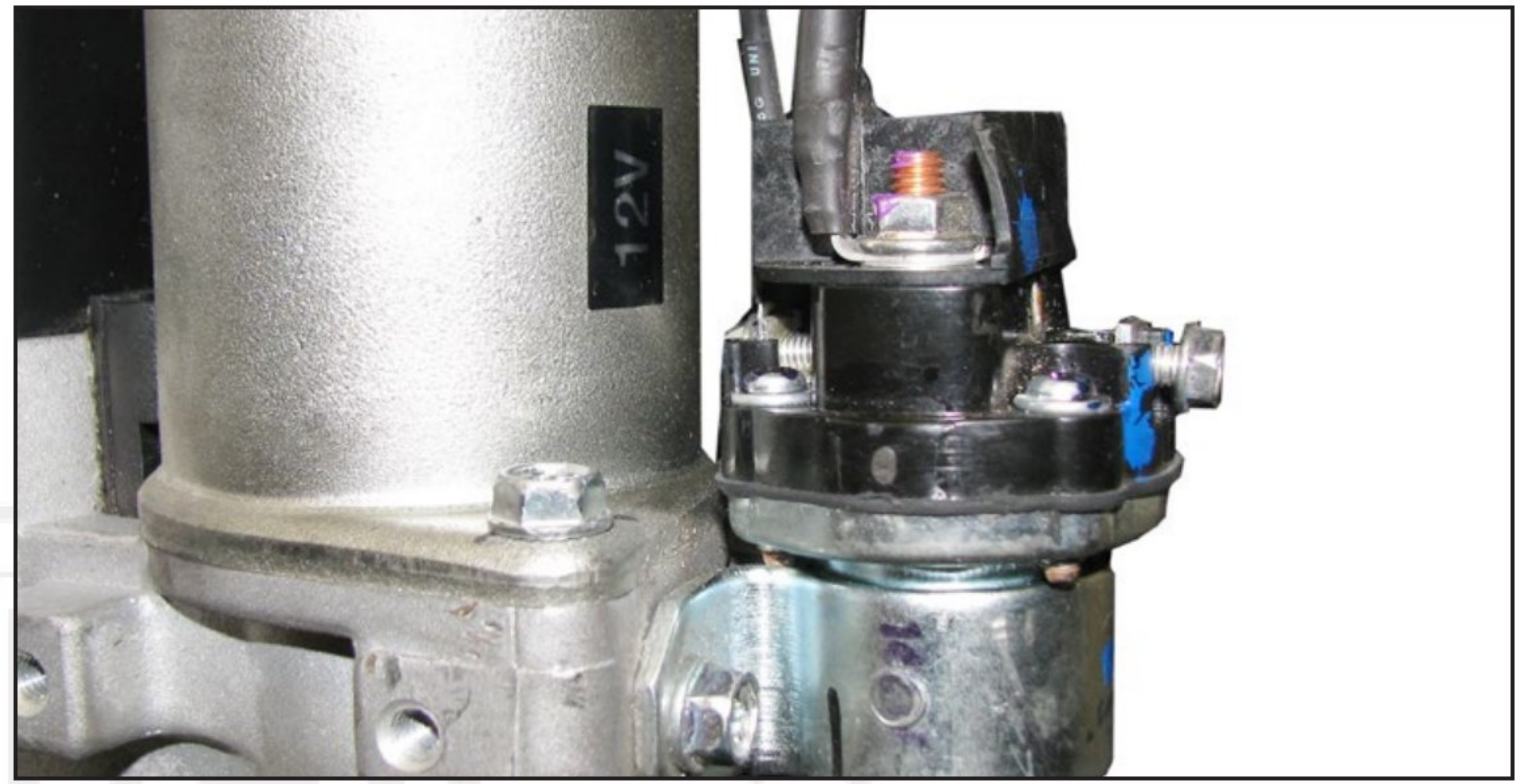


Figure 8—Once considered an option by Delco, the Integrated Magnetic Switch (IMS) Relay should be used in all applications.



Figure 9—Permanent thread-locking compound must be heated prior to removal of the through bolts during disassembly.



Figure 10—We recommend seating the CE housing tightly against the field case and DE housing prior to final tightening of the through bolts during re-assembly.

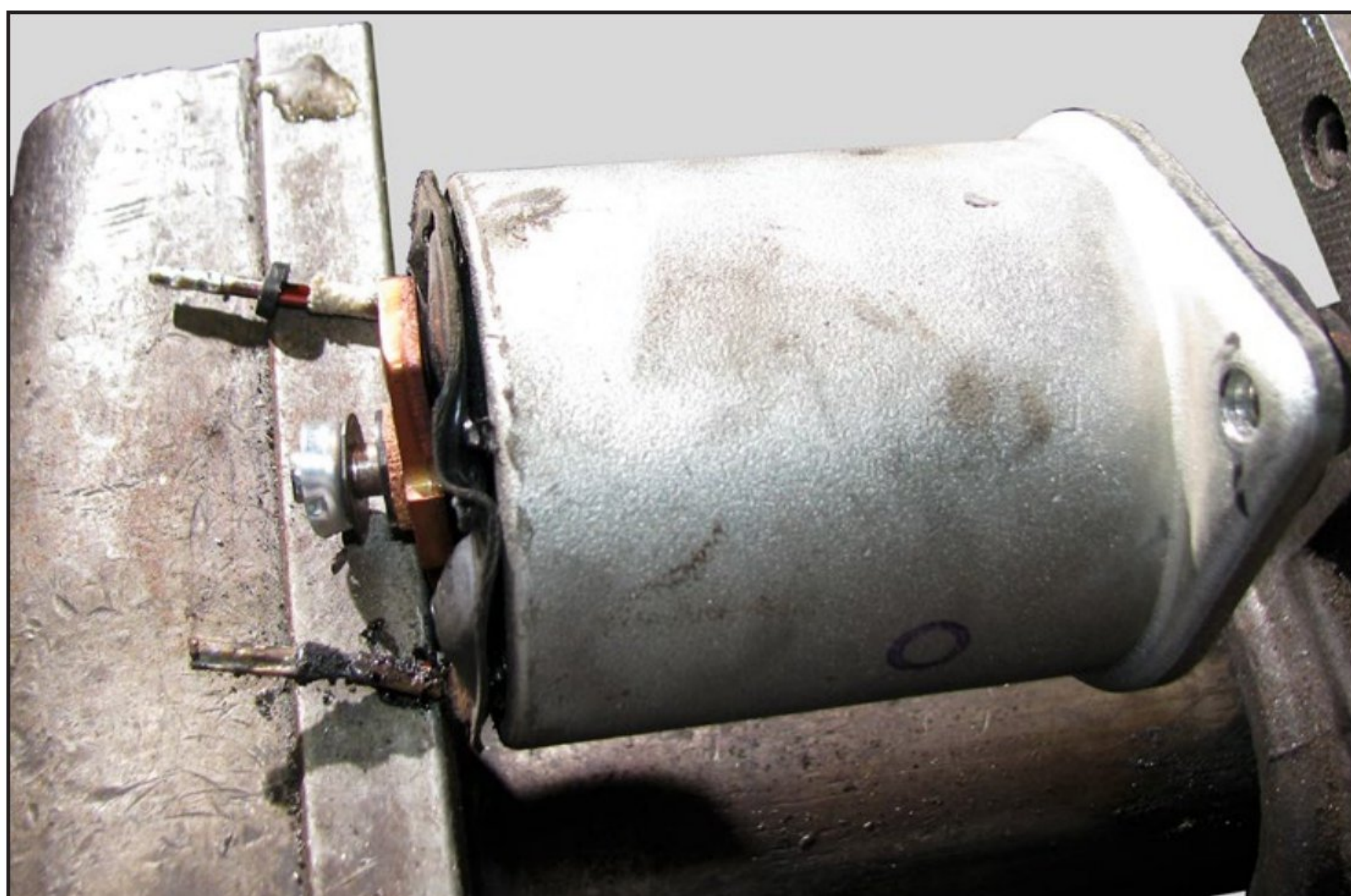


Figure 11—Compress the moving contact spring in a vise to remove the collar and the clip holding the contact.

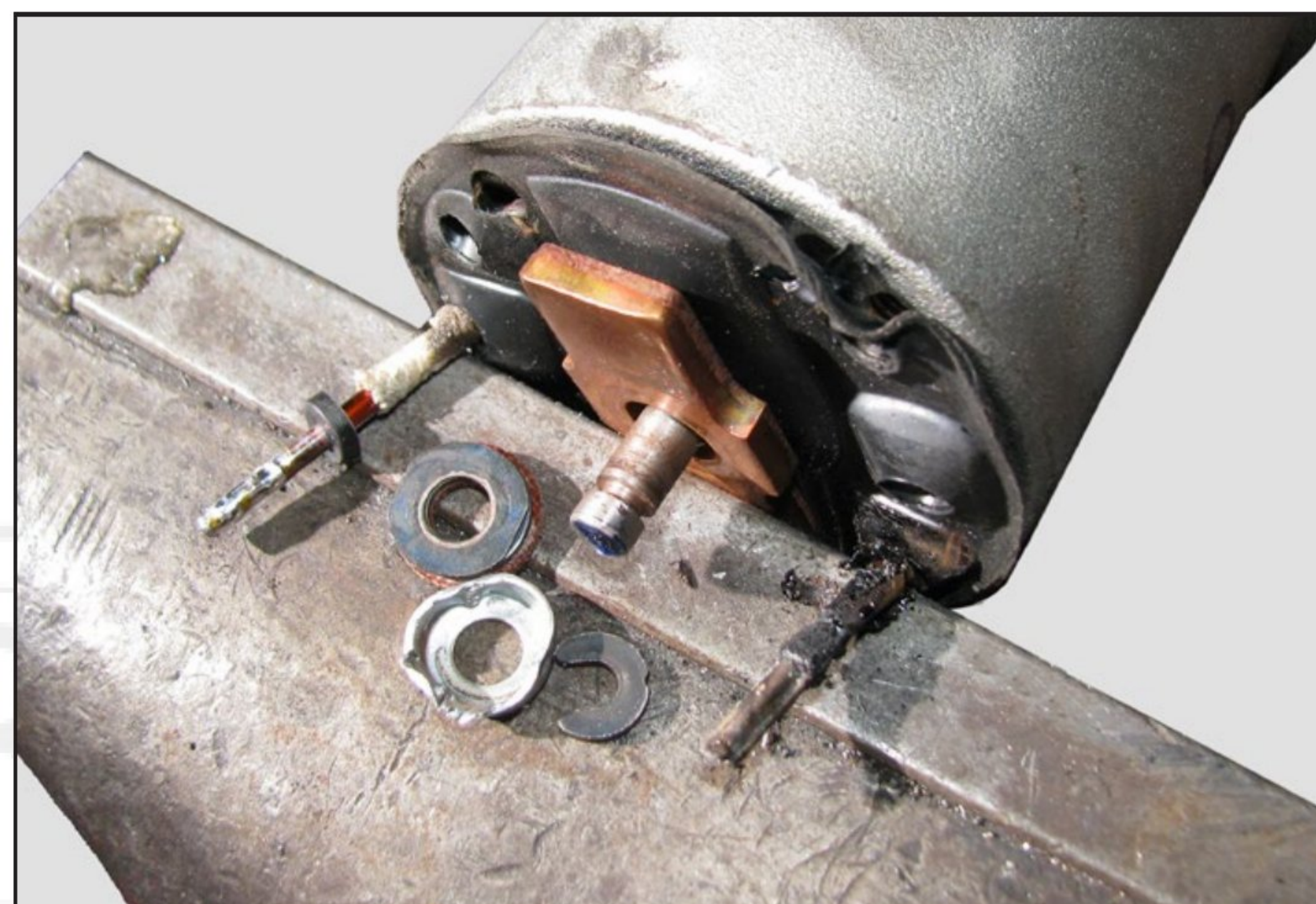


Figure 12—Remove the clip, collar, insulators and moving contact from the contact rod. This will release the plunger from the solenoid.

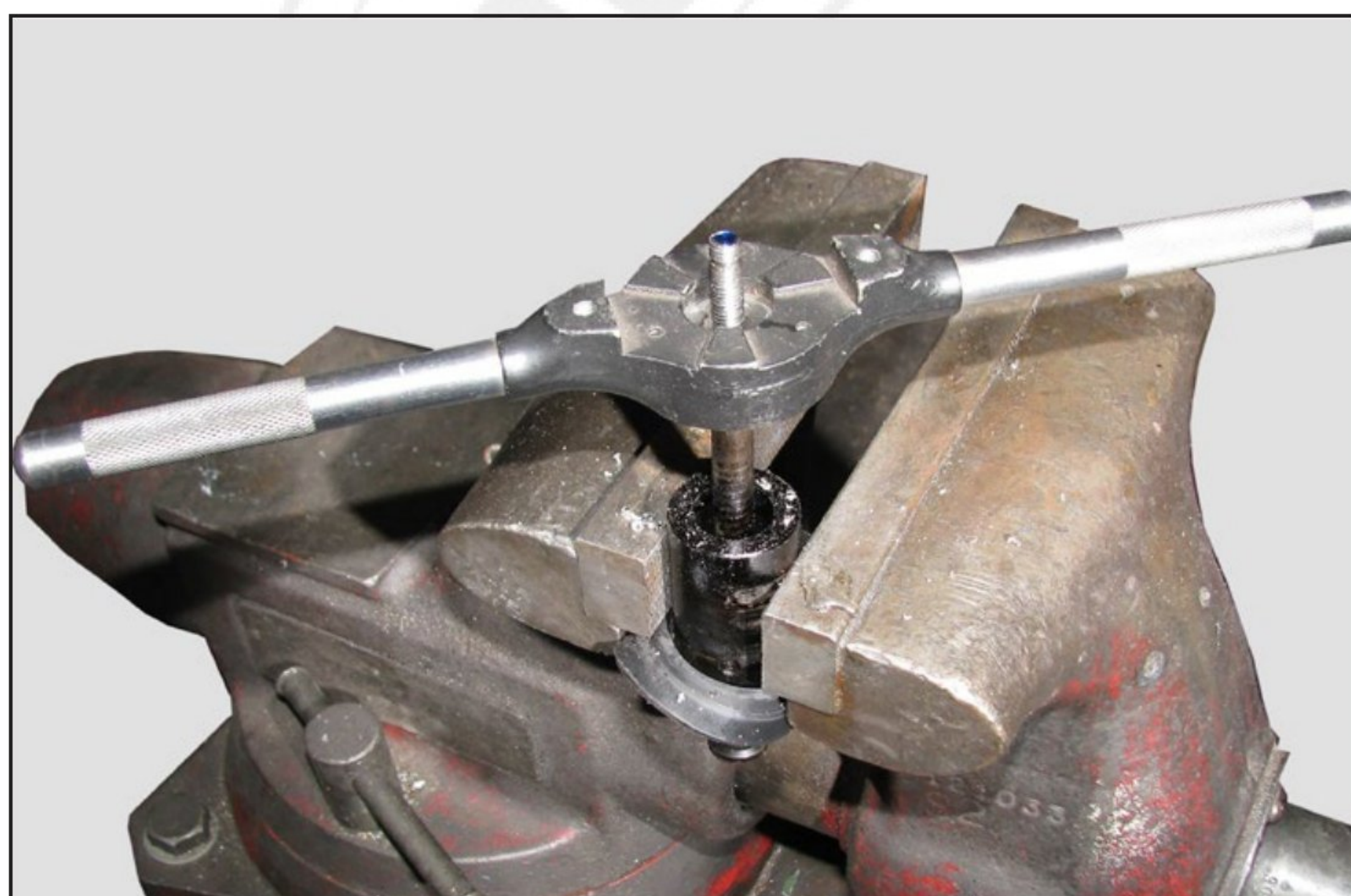


Figure 13—Hold the plunger in a vise and cut threads down the rod until the shaft steps to a larger diameter.



Figure 14—The large flat washer and nut complete the tool. You can now install it on a starter and tighten the nut to extend the drive for pinion removal.

Pinion Removal

One rebuilding problem that the 39MT posed was finding an easy way to remove the pinion gear. Something or someone is required to hold the drive in the extended position to remove the snap ring and collar holding the pinion. Two hands simply are not enough. Dean and Mike Conner of Conner's Repair Service in Morgan City, La., came up with a simple tool that can be made in 10 minutes using a 39MT solenoid core and a tap.

Simply remove the solenoid's cap and use your vise to

compress the plunger while holding the moving contact (see *Figure 11*). Remove the clip, collar, insulators and moving contact from the contact rod (see *Figure 12*). Remove the plunger and discard the springs. Lock the plunger in your vice with the contact rod facing up, and use the tap to cut threads on the rod (see *Figure 13*). We used a 6mm tap, but a 1/4-28 will also work. A large flat washer and nut are all that is needed to complete this inexpensive tool (see *Figure 14*). When this device is mounted on the starter, you can simply tighten the nut to extend the drive. You will find a video on the ERA's website

which shows how to make and use this tool.

Like many planetary gear starters we have seen in the past, the 39MT utilizes blind splines on the drive shaft to limit drive travel (see Figure 15). Note that the splines on the shaft alternate between open and blind (closed). To remove the drive clutch from the shaft, you must first remove the C-clip behind the drive clutch (see Figure 16). This will permit the drive to slide back off the splines and be rotated to an open spline for removal. When re-installing a drive clutch, it is imperative that you ensure that it is on a blind spline before replacing the C-clip. If a starter is assembled with the clutch on an open spline, it will perform normally on your bench. However, it will fail within a short time once it is installed on an engine. The likely result will be a broken drive end housing and a bell housing full of drive and starter parts.

Special thanks to Ken Plourde, owner of Guy's Electric Service in South Windsor, CT for providing some of the photos and information we have assembled here. There are two videos on the ERA website about 39MT starters which were filmed in his shop.

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Figure 15—Note that every other spline on the 39MT shaft is blind. The drive must be on a blind spline when it is reassembled.

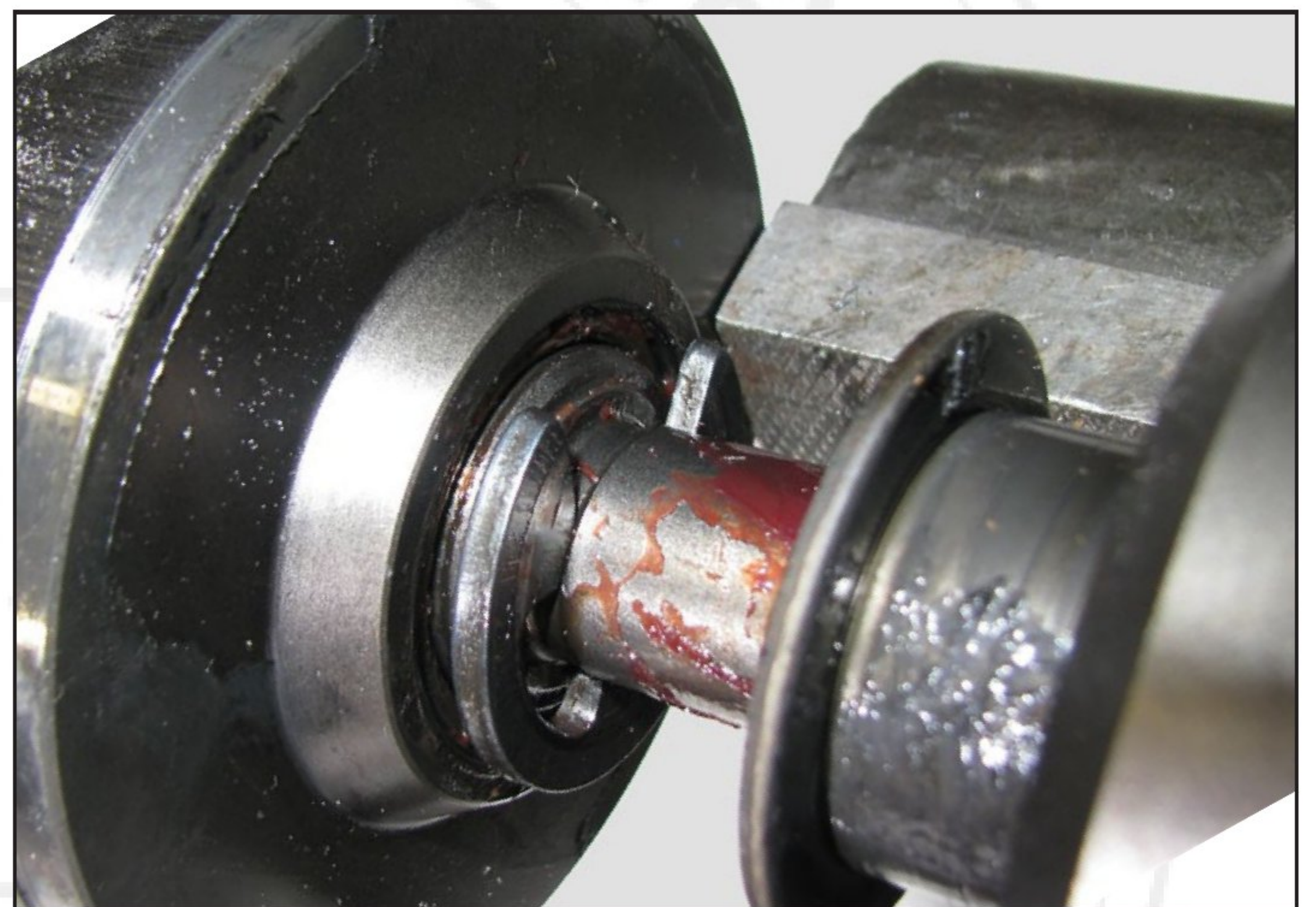


Figure 16—Note the C-clip behind the drive. It must be removed before you can rotate the drive clutch to an open spline for removal during dis-assembly.