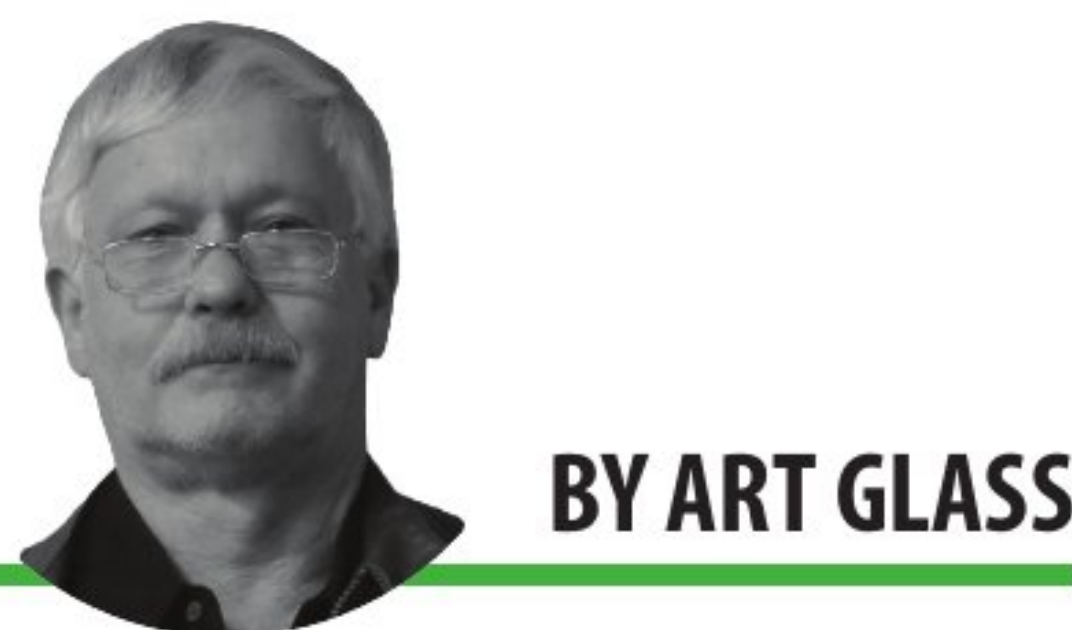


DENSO – FUSED FIELD COILS

Rebuilding Opportunities Are Alive



Recently, a Denso 2kW planetary gear starter came in with what appeared to be burned out connection wires between the main field case lead and the coils (see Figures 1 and 2). There was absolutely no sign that the armature, brushes or field coils had been overheated. In fact, the brushes were not even completely broken in and the rest of this starter was in “like new” condition. This starter's Denso part number is 228000-4593. It fits a many Kubota compact tractor and small equipment applications from the late 90's through 2009.

We decided that the burned connection bar was most likely a fuse wire and could be easily repaired. Denso has fused the field coils in several different series starters going back into the late 1990's to protect them from over-cranking. You could look at that as a potential problem area for the over-zealous and under-educated operator. But at the same time, it presents an opportunity to rebuilders.

To begin the repair we first cut away the damaged wire. Then we measured an undamaged section of the original wire (see



Figure 3 – Precise measurements are needed when replacing fuse wire.



Figure 1 – This is the 2kW Denso field case with burned field coil lead wires.

Fuse Wire Size Chart	
Fuse Wire Rating - Amps	Fuse Wire Size - Millimeters
3 A	0.15 mm
5 A	0.20 mm
10 A	0.35 mm
15 A	0.50 mm
20 A	0.60 mm
25 A	0.75 mm
30 A	0.85 mm
45 A	1.25 mm
60 A	1.53 mm
80 A	1.80 mm
100 A	2.00 mm

Figure 4 – This chart helped to identify the size and amperage of the fuse wire we needed.

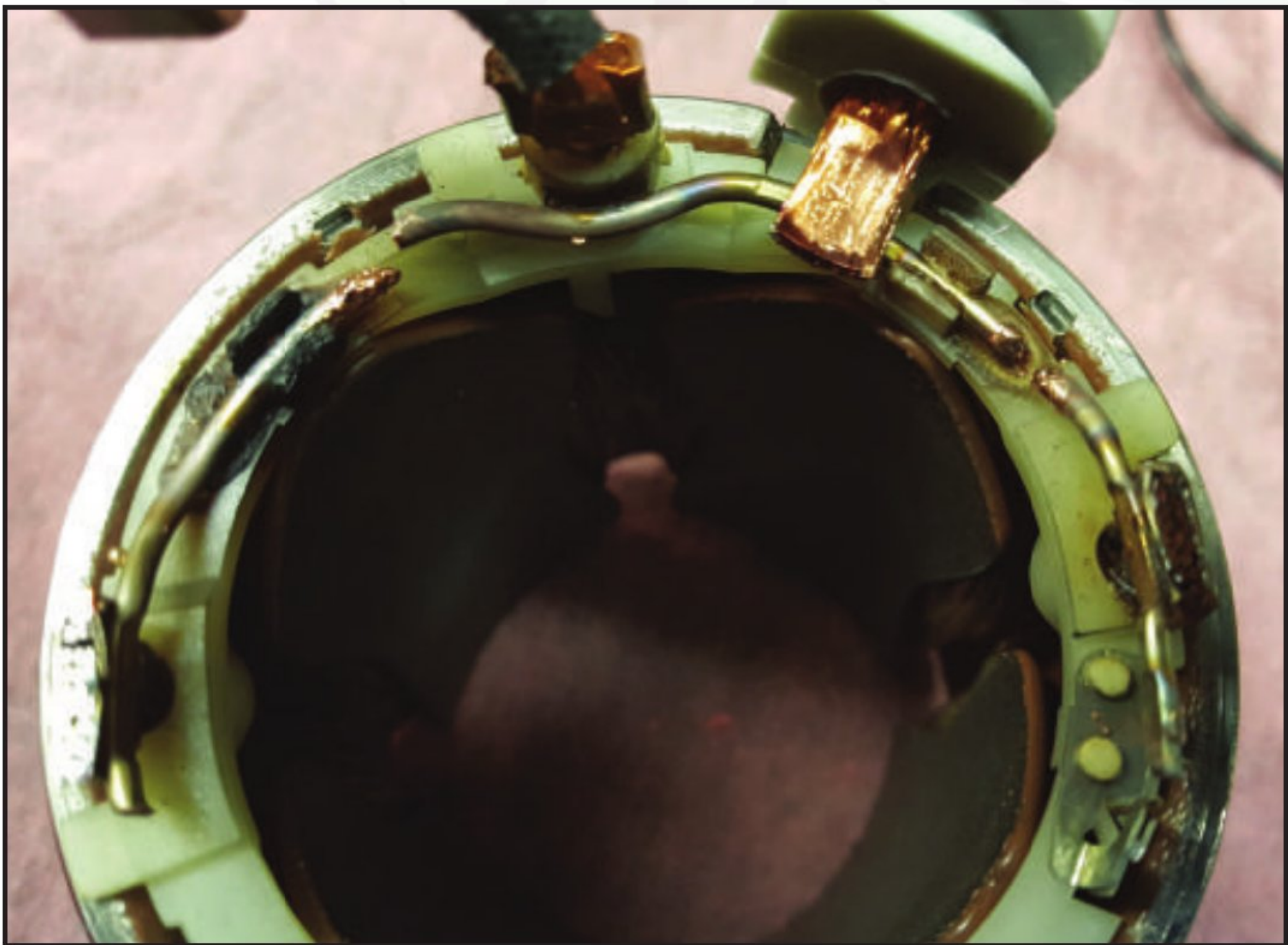


Figure 2 – Here you can see where they burned open on both sides of the field case lead.

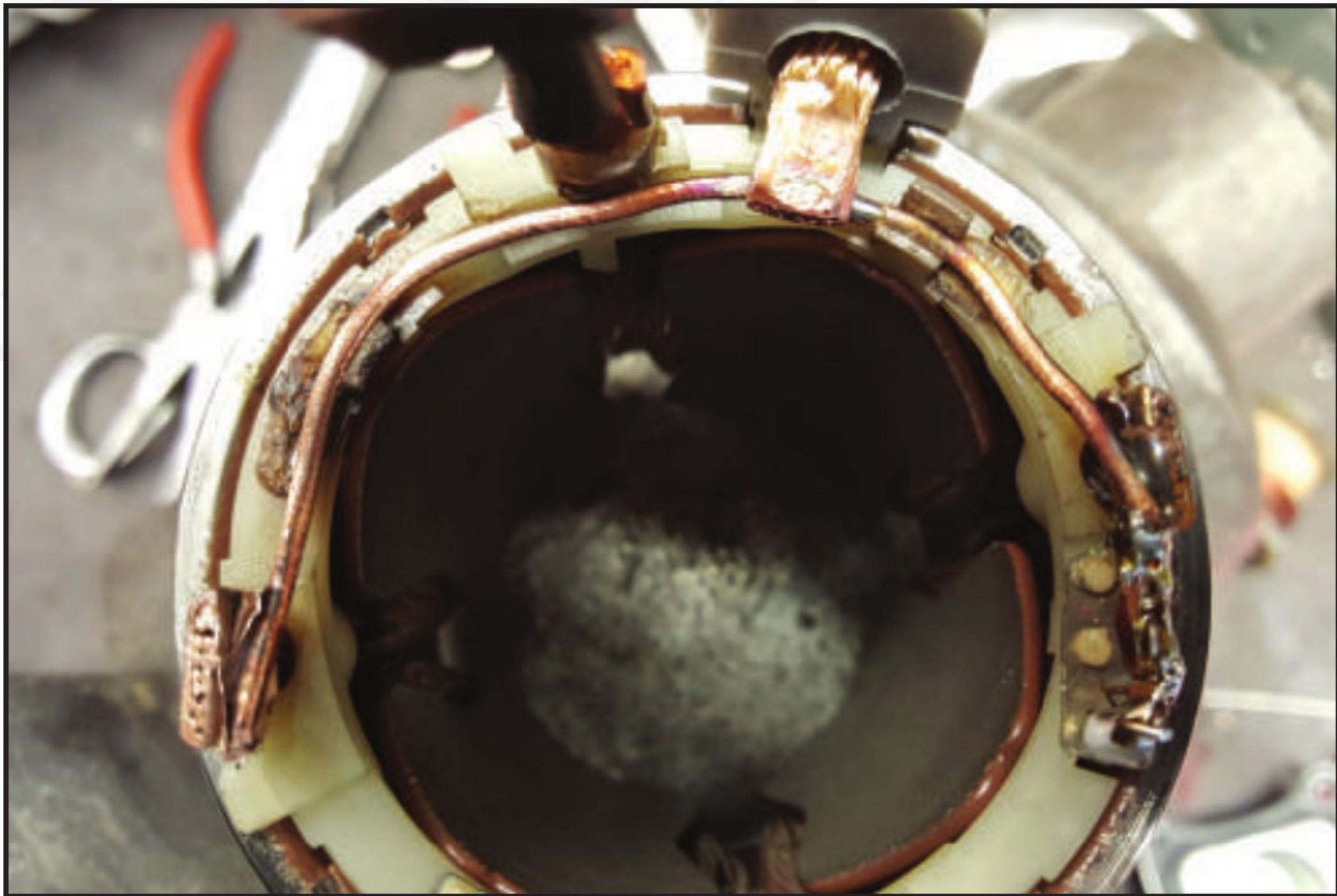


Figure 5 – Here is a view of the repaired field case.

DENSO-FUSED FIELD COILS

Figure 3) to confirm the wire size. As you can see from the chart that we found using a web search (see Figure 4), the 2 mm wire size is rated at 100 amps, meaning it should be able to withstand 100 amps for extended periods without burning. Fuse wire can withstand a higher amount of current for brief periods. While that seemed to be a little low for a 2kW diesel starter, we decided to take the prudent approach and follow what Denso had used.

We used a spot welder to connect the new wire (see Figures 5 and 6). You could use silver solder in place of welding if you do not have access to a spot welder. But in our shop, we spot weld when the application is diesel. Note in the photos that this starter has a shunt coil connection in parallel with the series coils. You can see it on the right side in Figure 5 and on the bottom in Figure 6.

Art Glass is Owner of Willard Generator Inc in Bridgeville, PA.

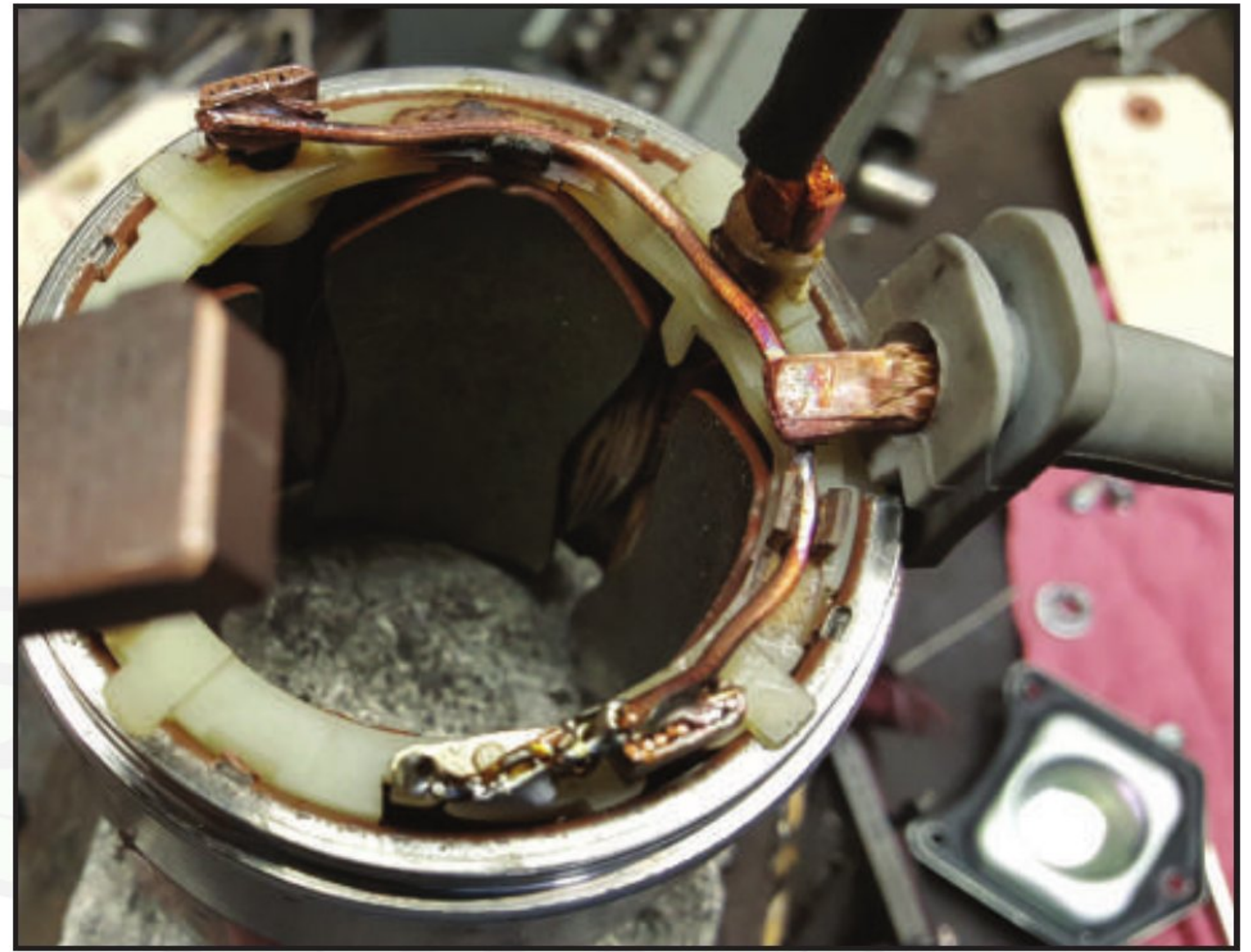


Figure 6 – Another view here. Note the shunt coil connection on the bottom of this photo.