

## Starter Switch – Maintenance and Repair

### From Steve Lovatt, Ristes Motor Company Ltd:

This is a maintenance tip which may be of interest to 20hp and early 20/25 members. I have had calls from owners in distress, being miles from home with starter function problems. I later find the problem is neglect! Owner just do not think to periodically check the oil in the starter switch, thus causing the starter contacts to burn and eventually break. The mechanical foot operated starter switch on 20hp and early 20/25 cars is a very reliable component. However, it should be included in the service schedule maintenance - yet it is often forgotten.

During recent years I have been approached on many occasions by owners who have found their starter to engage when the pedal is pressed, but it continues to keep the starter motor engaged when the pedal is released. Also, I have had reports of the starter motor failing to engage despite pedal being pressed and this is not good news if you are on a tour miles from home.

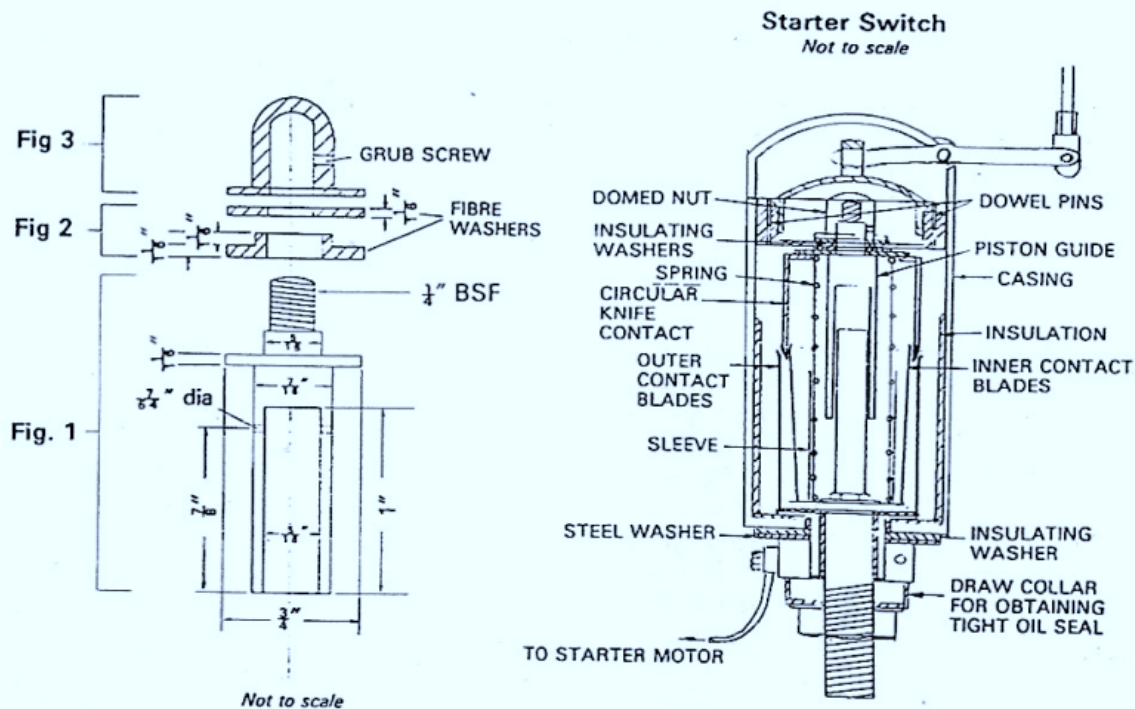
During an annual service, remember to check and top up the starter mechanical solenoid with oil to keep the contact tips cool during contact engagement. The oil breaks the circuit when the switch is opened and without the oil the contacts do not always break the current flow because an electric arc forms between the contacts; oil quenches the arc that forms when the contacts are open.

### The service schedule requires you to check the oil level.

If you have not had the assembly removed and dismantled, or have no records of it being dismantled in the past, it may be time to consider doing so before you get in an embarrassing position with the starting of your engine. Check for broken, distorted or burnt contact fingers – check before you get caught out!

Room for thought – some of these cars are now 100 years old – preventive maintenance is the answer so check and top up with oil!





## Rolls-Royce starter switch 20hp and 20/25

by D. J. Carpenter

WHEN I bought my 1927 20hp chassis with the remains of a shooting brake residing on it, one of the many things I noticed was the installation of a modern solenoid. However, in a box of bits that came with the car were the component parts of the original switch. Some time in the past it had broken at the top of the contact guide, and for some reason had been repaired by brazing, completely destroying the insulation, causing the contact guide piston to short out on the casing.

Over the years I have noticed a number of cars fitted with a modern solenoid, often hidden from view, with the original switch left in place. It occurred to me that the method I used to restore mine to working order might be of interest to others in a similar predicament. The first thing is to disconnect the battery, then remove the switch from the chassis. The best way is to disconnect the terminal at the starter motor, leaving the short cable still attached to the switch, remove the clevis pin from the operating linkage, then remove the nut which holds the unit to its mounting pedestal. The switch can now be lifted off the stud to facilitate the removal of the cable at the base, which goes to the battery. The switch can now be taken to the bench for stripping.

Remove the drain plug and drain out any oil that might be in it. Next remove the four nuts and bolts that hold the cover. The cover, with the operating fulcrum, can now be removed by lightly lifting and pulling towards the mounting stud hole: this will clear the fulcrum lever from its locating slot in the top of the guide piston. The piston guide, circular knife contact, spring guide sleeve and spring can now be lifted out.

Next remove the nut and washer holding the insulating cover on the base of the unit, then loosen the nut on the clamp ring of the terminal which feeds the starter motor; this can now be removed altogether with the cable. Then remove the steel washer and insul-



ating washer from the base. The inner set of contact blades can now be pushed out from underneath the switch, followed by the outer set of contact blades. These might be a bit tighter so be careful not to damage the insulating bush through the base of the casing.

The next part to deal with is the guide piston. This has a screwed cover, beautifully machined as to be almost undetectable. This is secured by two very small dowel pins 180 degrees apart very close to the rim, these must now be removed. It may be possible to tap them out with a very small pin punch from underneath, if not they will have to be carefully drilled. The best way to unscrew the cover is to hold the lower part of the piston, firmly but as lightly as possible, in a three jaw chuck in a lathe. With the lathe in back gear insert a suitable implement in the slot for the fulcrum lever in the cover and unscrew (right hand thread).

It was at this point that I had to work out the best way to restore the switch to working order. I decided the only way was to machine up a new contact guide assembly. I made this from a piece of  $\frac{3}{4}$ in diameter bright mild steel bar to the dimensions shown in figure 1. The next thing was to make two insulating washers, as shown in figure 2. I then made a domed nut with combined washer, figure 3, to hold the contact guide assembly together. This I locked with an  $\frac{1}{8}$ in grub screw through the side, plus a touch of Locktite. While the knife contact was stripped out I machined the bevel on the leading edge just enough to clean it up.

The secret of getting the switch to work was to tighten the domed nut to give an end float of 0.01in, leaving the knife contact free to float, so as to automatically centralise when the switch is depressed. After making sure that the casing is clean inside and out, the outer set of contact blades can be pushed back in place with a little smear of Wellseal on the underside. Next replace the inner set of contact blades. One of the problems I have experienced with various Rolls-Royce cars over the years has been the leakage of oil from the base of the starter switch, requiring constant vigilance of the oil level. To obtain a good oil tight joint at the base I replaced the insulating ring with a smear of Wellseal between it and the casing, then the metal washer, next the terminal clamp ring, lightly nipped in its correct position, i.e. terminal facing front of the car. I then machined up a draw collar, placed it over the terminal stud and against the clamp ring. Replace the nut and tighten firmly against the draw collar. This will pull the whole assembly together. Now tighten the terminal clamp ring locking bolt, remove the nut and draw collar. Now fit the Bakelite insulating cover with the cut out piece the right way round to suit the direction of the battery cable.

The next thing is to replace the cover to the piston guide, making sure there is clearance between the cover and the domed nut, otherwise it will short out. Tighten the cover until the dowel holes line up and replace dowels, making new ones if required. The guide piston and knife contact assembly can now be lowered into the casing, making sure that when depressed it returns freely. The switch cover can now be replaced, at the same time engaging the fulcrum lever in the guide slot.

The cover bolts only fit one way, one flat of the head having been machined almost to the shank, this side goes against the casting. Now is the time to connect the main feed cable to the base of the switch, providing there is enough cable to allow the switch to be lifted over the mounting stud. Make sure the switch is located on the square base of the stud and then fit the washer and nut. Next connect the cable from the switch to the starter motor. Now is the time to fill the switch with oil as per instruction book. Before connecting up the battery check for short circuits in the switch by connecting one battery terminal and gently flick the other terminal with the remaining cable. If no sparks occur all should be well and the switch should work. If so connect the foot pedal linkage. If not?

# Starter Switches

FOR 20hp AND 20/25hp

DEREK SMITH

Having owned a 20hp for many years, I have had occasion to delve inside the Starter Switch to undertake a repair, clean out the old oil and generally be nosey. A very good friend of mine and owner of two 20hp cars recently couldn't start his car and on further investigation discovered the switch was failing to work properly. It was removed from the car, having first disconnected the battery and stripped to investigate the cause.

The switch consists of two concentric sets of contacts, one connected to the battery and the other connected to the Starter Motor. On pushing the foot operated switch, a Contact Maker, as it is termed in the Parts Book, engages over the inner contact first and subsequently over the outer contact, thereby joining them together and allowing the 12 volt power feed to connect to the Starter Motor. The unit is housed in an aluminium casing, filled with oil to minimise arcing and reduce wear on the contacts during engagement and disengagement on the Contact Maker. Sadly, it is not uncommon for the casing to lose oil as the plunging action of the switch tends to try to force the oil out from the bottom of the unit. Of course, over the years, the cars have often been poorly serviced and this little unit is often missed from the servicing schedule and therefore operated without that necessary oil. Currently, with no original replacement parts available, I offered to repair my friend's switch by the method described below.

The switch was removed from the car and the contacts already removed from the casing. Picture 1 shows the assembled switch, showing burnt contacts, some shorter than others, together with the burnt Contact Maker. The Contact Maker is insulated from the chassis earth by tufnol insulators. The Inner and Outer Contacts are insulated from each other by a tufnol tube. This will need to be gently eased out of the





contacts. This is fragile and must be treated with great respect to avoid breakage. Pictures 2 and 3 show the contacts separated. The damage caused to the contacts is clear to see.

Picture 4 shows the upper face of the Contact Maker Guide. The guide is an assembly of several parts, housed in a two-part housing, screwed together, and locked in place by two small pins. These need to be removed, either by a small punch or drilled (0.065") to enable the Contact Maker to be removed. Picture 5 shows the guide housing with the pins having been removed and the two halves unscrewed from each other. Picture 6 shows the guide disassembled, the inner nut removed, (normally locked by a single centre punch indent to the thread), allowing the component parts of the guide to be removed, including the Contact Maker. On reassembly, I chose to use Loctite and a centre punch indent to the nut.

Picture 7 shows the Inner and Outer Contacts and the degree of damage to the shape and length of the contacts. Measure the length of the shortest finger of the outer contacts. Deduct this length from a finger which appears to be the least damaged. In this case, the difference was 0.1 inch. Very carefully either file or lightly



grind the remaining fingers down to the length of the lowest finger, ie. 0.1" off the inner fingers and 0.1" off the outer fingers. This will give the effect of the fingers being equal in length on the inner set, equal in length on the outer set but with a difference between inner and outer of  $\frac{15}{16}$ ". Originally the overall length of the Inner Contact was  $\frac{3}{2}$ " and  $\frac{29}{16}$ " for the Outer Contact. The difference, ie.  $\frac{15}{16}$ ", must be achieved after careful dressing of the fingers.

Picture 8 shows the fingers of both Inner and Outer Contacts all shortened by 0.1" and reshaped to allow smooth engagement of the Contact Maker. The Contact Maker was replaced by a slightly longer version, increased by the same amount as had been removed from the fingers, in this case, 0.1". The inner insulator was also shortened by 0.1".

Picture 9 shows the switch with the inner and Outer Contacts even in length, with the inner set protruding such that the Contact Maker engages with those first, then with the outer set. The Contact Maker is replaced on the stud, supported by the insulating pieces.

The finished switch is now repaired to allow good operation; the modification to the Contact Maker only lowering the point of contact within the switch, not externally. After the switch is replaced within the housing, care must be taken to ensure good electrical insulation from the chassis, as all the internal components are live relative to the chassis. Cleanliness is paramount as any small amount of swarf or other debris could result in complete discharge of the battery at that location, inevitably causing serious damage or a fire. Do not underestimate the need for cleanliness.

Lastly, before the first test, check the whole system for earths and continuity to the Starter Motor whilst operating the switch and if all seems to be correct, refill the unit with the correct oil. I often use syringes for small fillers like those on this casing with success. Reconnect the battery and start the car. ■

