

## Failure of a Battery Isolator Switch

The switch was a Vehicle Wiring Products type BIS and was the second one to fail by apparently going open circuit when the switch was closed. The problem was more of an issue if the car had been left for sometime. It would occasionally occur even after starting the car with the engine cutting out on idle and then all the electric being dead. A sharp tap on the key would sometimes free it as would repeated operation. The switch was well used in that it would be set off any time the car was parked even when out for a day or while fueling up at a garage. It had worked for a round 2 years before this failure the first one failed after around 1 year. The switch was mounted in a Lotus Elan +2S on the foot well with the key down so it could be operated readily from the drivers seat. The switch was arranged so that did not pass the starter current but all other current would flow through it.

The rivets were drilled out and the picture shown in Figs 1 to 4 show the internal arrangement of the switch. The following points were found:-

(1) The contacts as shown in the figures are not in any way corroded – in fact they look a bit too clean to be a moderate to high current switch ! Fig 2 shows evidence of contact touching on the upper contacts. Signs of good contact are not readily visible.

(2) There are two springs and the spring visible in Figs 1,2, and 4 is of lower strength than the spring partly hidden in Fig1, shown by the red arrow. The lower strength spring clearly helps the contacts to part when the switch is turned off and the partly hidden stronger spring in Fig 1 forces the contacts together when the switch is operated to close.

(3) Fig 3 shows that the locking peg for the key, marked by an arrow, has noticeably worn the groove that the key locks into to keep the switch closed.

(4) Fig 2 shows what may have been the problem. The upper contact is not central, arrow points towards the longer side. Fig 4 the arrow points to the small moulded pin that holds the moving contact, through a small hole in the contact, in its fixed position. Clearly the moving contact while not being central is so close to the lower edge of the case that it may well snag and jam thus preventing closure. My feeling is this may be the problem.

The two visible leafs of the lower contact are 20mm and 17mm so a 1.5mm off centre for the locating of the moving contact is quite a big error.

**Update** However on further strip down it appears that there is not a hole in the moving contact see Fig 5 right but a indentation that is designed to locate the spring. The indentation



on the moving contact appears to be central but is smaller than the internal diameter of the spring. It would thus appear that over time the spring has pushed the contact over to one side and caused the off setting of the contact. This may well better explain why the switch appears fine for the first year or so as the side force of the coil spring gradually moves the contact over. Coil springs do have a certain amount of side force when compressed and this in conjunction with the high usage level explain why the switch is OK for a year or so.

Perhaps removing say 1mm from each side of the contact may reduce the amount of the contact moving and prevent it snagging on the case.

At present the car isolator has been re fitted using an old motor starter switch that uses wiping contacts. A Stone Platt type 304. This type has been used on another car for well over 20 years with no problems thus far.

Bob Richardson

B                      28/9/19 update contact location analysis

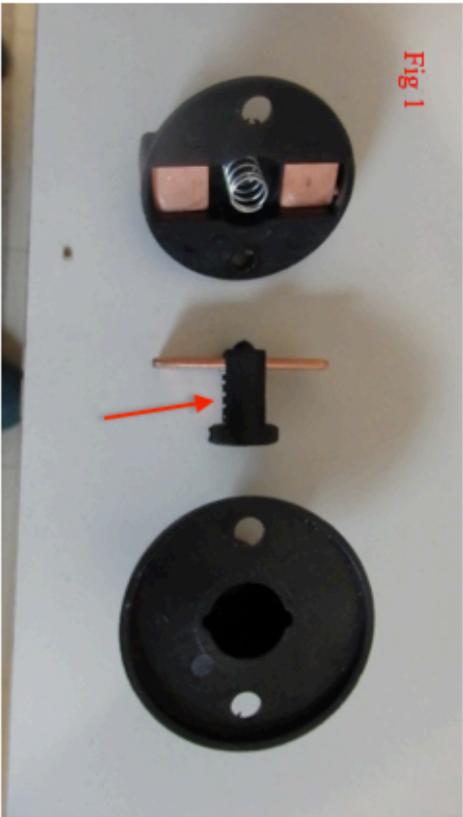


Fig 1

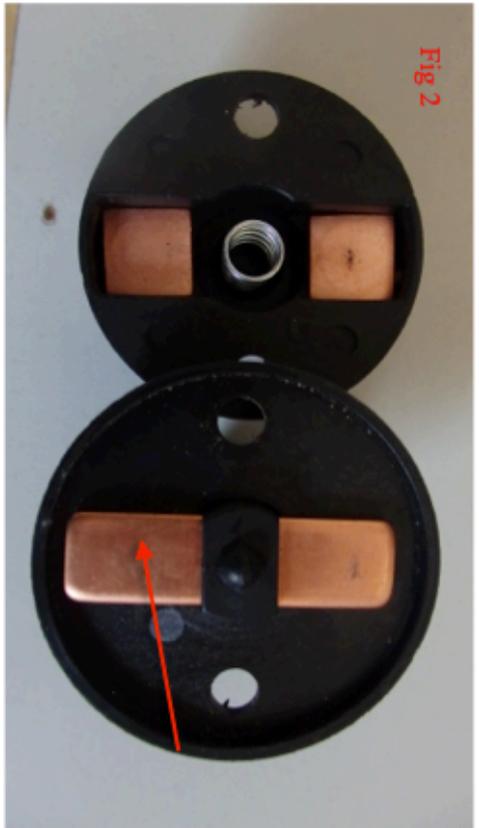


Fig 2

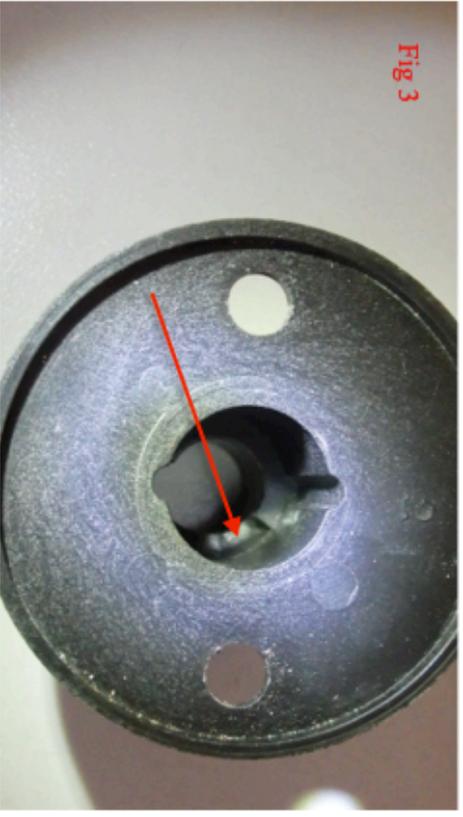


Fig 3

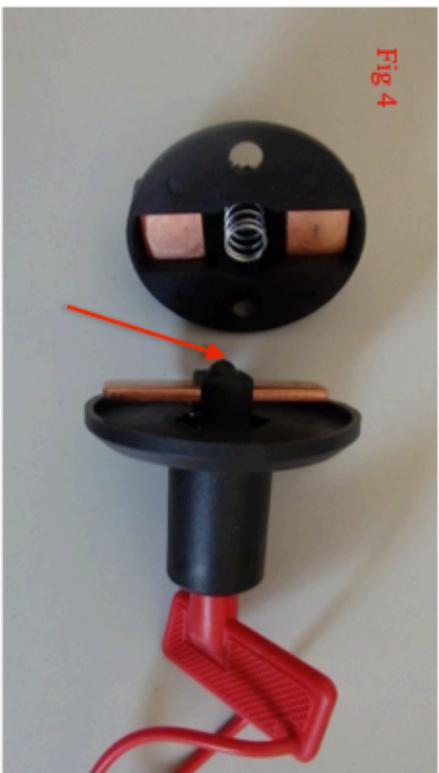


Fig 4