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(12) # EUROPEAN PATENT APPLICATION

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(54) **Electrical brushes.**

(57) Disclosed herein is an electrical brush (1) having a brush wear sensor (9) in the form of a loop (10, 11, 13) of insulated electrical conductor lying in a bore (5, 6) leading from an upper surface of the brush to a depth (*d*) equivalent to the point at which brush wear is to be sensed, the sensor loop passing around a fixed point of or in the brush at the bottom of the bore to anchor the sensor loop in the brush.

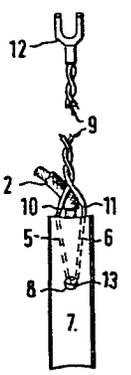

FIG.1

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ELECTRICAL BRUSHES

This invention relates to electrical brushes having a wear sensor in the form of an electrical conductor or lead within the brush body.

Such wear sensor leads have, of course, to be insulated from the electrically conductive brush bodies, United Kingdom Patent Specification No. 1,158,298 in the name of Cello-Pak A/S is an example of a brush body incorporating an embedded loop of an insulated conductor extending down to the limit of permissible wear of the brush. However, in the high temperature conditions experienced by heavy duty or heavy current brushes, difficulty is experienced in anchoring the necessary high temperature insulators which are based on materials such as polymers of fluoroethylene. These high temperature insulators have a smooth, generally inert surface that cannot be simply bonded in the brush body to anchor the sensor.

It is an object of the present invention to overcome the aforesaid difficulty of anchoring sensor leads in a brush body.

According to the present invention an electrical brush has a brush wear sensor in the form of a loop of insulated electrical conductor lying in a bore in the brush leading from an upper surface thereof to a depth equivalent to the point at which brush wear is to be sensed, the sensor loop

passing around a fixed part of or in the brush at the bottom of the bore to anchor the sensor loop in the brush.

In a preferred embodiment of the invention, a pair of fine bores led from the brush top to meet a transverse hole in a side or face of the brush at said depth, the wear sensor conductor lying in the two bores and looping from one to the other via the transverse hole. In this embodiment the brush body between the two bores provides the loop anchorage. The transverse bore may be filled with an epoxy resin cement or the like.

The invention is illustrated by way of example in the Drawings, wherein:-

Fig. 1 is a side elevation of a brush in accordance with the invention, and

Fig. 2 is a front elevation of the brush of Fig. 1.

As shown, a brush 1 has a pair of silastomer sleeved flexible current shunts 2 and 3 located by tamped copper powder connections in the top 4 of the brush.

Two fine bores 5 and 6 are drilled from the brush top 4, close to the side 7, and angled towards one another to converge at a short hole 8 drilled transversely from the side 7. Hole 8 is drilled at a depth d from the brush top 4 at which it is desired to sense brush wear.

A brush wear sensor 9 in the form of a lead or conductor insulated with TEFLON (Trade Mark) is made into

a loop of which the two arms 10 and 11 are each fed into one of the bores 5 and 6 via the side hole 8. The sensor arms are twisted together above the brush and the free ends are connected to a terminal 12. This construction has the advantages of ease of assembly as the lead ends are simple to insert through the side hole 8 into the bores 5 and 6. Also the wear depth d can be set accurately, as it is a combination of the siting of hole 8 and the protrusion into the hole of the loop end 13.

Finally, the hole 8 is filled with ARALDITE (Trade Mark) to bond the loop end 13 in the hole 8, to seal the hole and to help to retain the loop and the ends thereof formed as the brush wears past the hole 8.

The sensor lead 9 is used in known manner to detect wear by current leakage.

In an alternative, unillustrated embodiment, a single larger diameter bore leads from the brush top to a side hole at the wear depth. A loop of sensor lead is passed down the bore and is anchored into the brush by a plug or locking pin of brush or other conducting or non-conducting material passed and locked into the side hole and through the loop end. The plug or pin material must be one which would not cause damage to the surface of a commutator as it comes into rubbing contact.

CLAIMS:

1. An electrical brush having a brush wear sensor in the form of a loop of insulated electrical conductor provided in the brush and leading from an upper surface thereof to a depth equivalent to the point at which brush wear is to be sensed, characterised in that the sensor loop (10, 11) lies in a bore (5, 6) in the brush (1) and passes around a fixed point of or in the brush at the bottom (8) of the bore to anchor the sensor loop (13) in the brush.

2. A brush as claimed in claim 1 and further characterised in that a pair of fine bores (5 and 6) lead from the brush top to meet a transverse hole (8) in a side or face of the brush at said depth (d), a respective arm (10 or 11) of the sensor loop lying in a respective one of the bores and looping from one to the other via the transverse hole.

3. A brush as claimed in claim 2 and further characterised in that the sensor loop end (13) is bonded and sealed in the transverse hole (8).

4. A brush as claimed in claim 1 and further characterised in that a single bore leads from an upper surface of the brush (1) to meet a transverse hole (8) in a side or face of the brush at said depth (d) and the sensor loop (9) is anchored in the brush body by a plug or locking pin passed and locked into the transverse hole and through the loop end (13).

5. A brush as claimed in any of claims 1 to 4 and further characterised in that the sensor (9) is a lead or conductor insulated with a fluoroethylene polymer.

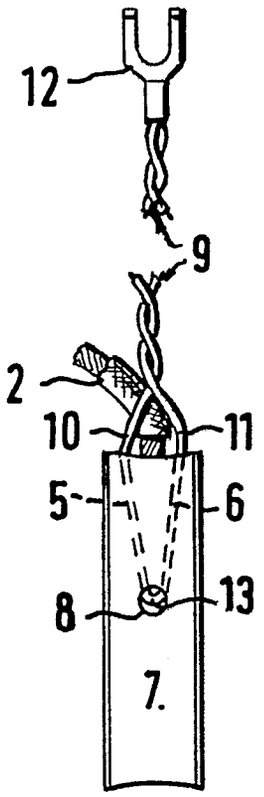

FIG.1

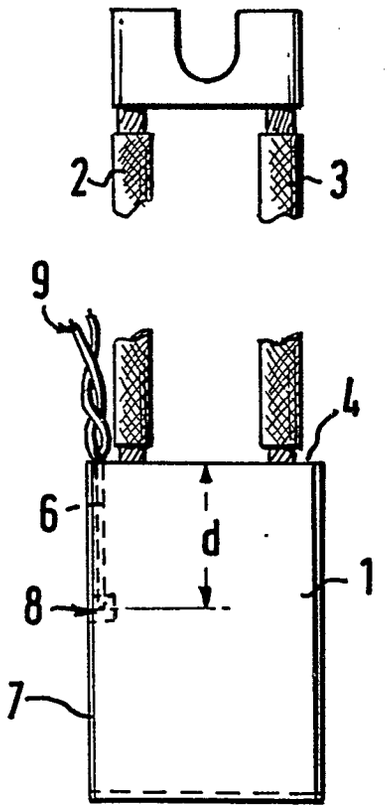

FIG.2