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⑤④ **Electrical brushes.**

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**US-A-3 153 164**  
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## Description

This invention relates to an electrical brush having a brush wear sensor in the form of a loop of insulated electrical conductor within the brush body and also relates to a method of anchoring a brush wear sensor in an electrical brush body.

United States Patent Specification No. 3 153 164 (R.M. JOPP) discloses a method of anchoring a flexible conductor in an electrical brush body. The specific method being the use of a button 21 to secure a loop 17 of a shunt or pigtail 16 in a recess 13, the shunt or pigtail loop being passed down a single passage 15 (see column 2 lines 17 to 28 of the specification).

However, in contradistinction to the electrical continuity necessary between conductor and brush, a wear sensor lead has to be insulated from the conductive brush body. 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 provided in a bore in the brush body leading from an upper surface thereof to a depth equivalent to the point at which brush wear is to be sensed, whereby a pair of fine bores lead from the brush upper surface to meet a transverse hole in a side face of said brush body at said wear depth, and a respective arm of said wear sensor loop lies in a respective one of said fine bores with the inner end of said sensor looping from one of said fine bores to the other of said fine bores via said transverse hole. The transverse hole may be filled with an epoxy resin cement or the like.

The invention is also directed to a method of anchoring a brush wear sensor in an electrical brush comprising the steps of:—

i) forming a transverse hole in a side face of the brush body at a depth (d) equivalent to the point at which brush wear is to be sensed;

ii) drilling an upper surface of said brush body to form a pair of said fine bores that meet said transverse hole;

iii) inserting the free ends of the arms of a loop of insulated electrical conductor into said transverse hole and passing each of said free ends through a respective one of said fine bores;

whereby a brush wear sensor is formed by the loop that is anchored in the brush body by virtue of its looping from one fine bore to the other via the transverse hole.

The invention is illustrated by way of example in the drawings, wherein:—

Fig. 1 is a side elevation of a brush in accord-

ance 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. Transverse 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 transverse 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 advantage of ease of assembly as the lead ends are simple to insert through the transverse 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.

## Claims

1. An electrical brush having a brush wear sensor in the form of a loop of insulated electrical conductor provided in a bore in the brush body (1) and leading from an upper surface thereof to a depth (d) equivalent to the point at which brush wear is to be sensed, characterised in that a pair of fine bores (5, 6) lead from said brush upper surface (4) to meet a transverse hole (8) in a side face (7) of said brush body (1) at said wear depth (d) and a respective arm of said sensor loop (10, 11) lies in a respective one of said fine bores with the inner end (13) of said sensor (9) looping from one of said fine bores to the other of said fine bores via said transverse hole.

2. An electrical brush as claimed in claim 1, characterised in that said sensor inner end (13) is bonded and sealed in said transverse hole (8).

3. An electrical brush as claimed in claim 1 or claim 2 and characterised in that said fine bores (5, 6) are located close to a side face (7) of said brush body (1), said transverse hole (8) is a short hole in said side face and said fine bores are angled towards one another to converge on said short transverse hole.

4. A method of anchoring a brush wear sensor in an electrical brush body (1), characterised in that it comprises the steps of:—

i) forming a transverse hole (8) in a side face (7) of the brush body (1) at a depth (d) equivalent to the point at which brush wear is to be sensed;

ii) drilling an upper surface (4) of said brush body to form a pair of said fine bores (5, 6) that meet said transverse hole;

iii) inserting the free ends (10, 11) of the arms of a loop of insulated electrical conductor into said transverse hole and passing each of said free ends through a respective one of said fine bores;

whereby a brush wear sensor (9) is formed by the loop (13) that is anchored in the brush body by virtue of its looping from one fine bore to the other via the transverse hole.

5. A method as claimed in claim 4 and characterised in that it comprises the steps of:—

i) twisting said sensor loop arms (10, 11) together above said brush body upper surface (4); and

ii) connecting said sensor loop free ends to a terminal (12).

6. A method as claimed in 4 or claim 5 and characterised in that it comprises the step of filling said transverse hole (8) with an adhesive material to bond said sensor loop (13) therein and to seal said hole.

### Revendications

1. Balai électrique comportant un détecteur d'usure de balai ayant la forme d'une boucle de conducteur électrique isolé prévue dans un canal du corps de balai (1) et s'étendant à partir d'une surface supérieure de ce corps de balai jusqu'à une profondeur (d) équivalant au point où l'usure du balai doit être détectée, caractérisé en ce que deux fines forures (5, 6) partent de la surface supérieure (4) du balai et débouchent dans un canal transversal (8) dans une face latérale (7) du corps de balai (1) à la dite profondeur d'usure (d) et une branche respective de la boucle de détecteur (10, 11) est disposée dans une fine forure respective, l'extrémité interne (13) du détecteur (9) passant en boucle d'une des fines forures à l'autre par l'intermédiaire du canal transversal.

2. Balai électrique suivant la revendication 1, caractérisé en ce que l'extrémité interne (13) du détecteur est fixée et scellée dans le canal transversal (8).

3. Balai électrique suivant la revendication 1 ou 2 et caractérisé en ce que les fines forures (5, 6) sont disposées près d'une face latérale (7) du corps de balai (1), le canal transversal (8) est un canal court dans la face latérale et les fines forures sont inclinées obliquement l'une vers l'autre et convergent vers le court canal transversal.

4. Procédé pour ancrer un détecteur d'usure de balai dans un corps de balai électrique (1), caractérisé en ce que:

i) on ménage un canal transversal (8) dans une face latérale (7) du corps de balai (1), à une profondeur (d) équivalant au point où l'usure du balai doit être détectée,

ii) on fore dans une surface supérieure (4) du corps de balai pour former deux fines forures (5, 6) qui débouchent dans le canal transversal,

iii) on introduit les extrémités libres (10, 11) des

branches d'une boucle de conducteur électrique isolé dans le canal transversal et on fait passer chaque extrémité libre par une des fines forures qui y correspond,

étant entendu qu'un détecteur d'usure de balai (9) est formé par la boucle (13) qui est ancrée dans le corps de balai grâce à son passage en boucle d'une fine forure à l'autre par l'intermédiaire du canal transversal.

5. Procédé suivant la revendication 4, caractérisé en ce que:

i) on commet les branches (10, 11) de la boucle de détecteur au-dessus de la surface supérieure (4) du corps de balai, et

ii) on connecte les extrémités libres de la boucle de détecteur à une borne (12).

6. Procédé suivant la revendication 4 ou 5, caractérisé en ce qu'on remplit le canal transversal (8) d'une matière adhésive pour y fixer la boucle de détecteur (13) et sceller le canal.

### Patentansprüche

1. Elektrische Bürste mit einem Bürstenverschleissensor in Form einer Schlaufe eines isolierten elektrischen Leiters, welcher in einer Bohrung im Bürstenkörper vorgesehen ist und von seiner oberen Fläche zu einer Tiefe (d) führt, die dem Punkt entspricht, in welchem der Bürstenverschleiss zu erfassen ist, dadurch gekennzeichnet, dass ein Paar enger Bohrungen (5, 6) von der oberen Fläche (4) der Bürste zu einem Querloch (8) in einer Seitenfläche (7) des Bürstenkörpers (1) in der Tiefe (d) führt und dass je ein Arm der Sensorschlaufe (10, 11) in einer der engen Bohrungen liegt, wobei das innere Ende (13) des Sensors (9) eine über das Querloch von einer zu der anderen der engen Bohrungen führende Schlaufe bildet.

2. Elektrische Bürste nach Anspruch 1, dadurch gekennzeichnet, dass das innere Ende (13) des Sensors im Querloch (8) fixiert und abgedichtet ist.

3. Elektrische Bürste nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass die engen Bohrungen (5, 6) nahe einer Seitenfläche (7) des Bürstenkörpers (1) angeordnet sind, dass das Querloch (8) ein kurzes Loch in der Seitenwand ist und dass die engen Bohrungen zueinander in einem Winkel angeordnet sind, so dass die an dem kurzen Querloch zusammenlaufen.

4. Verfahren zum Verankern eines Bürstenverschleissensors in einem elektrischen Bürstenkörper, dadurch gekennzeichnet, dass

(i) ein Querloch (8) in einer Seitenfläche (7) des Bürstenkörpers (1) in einer Tiefe (d) ausgebildet wird, welche dem Punkt entspricht, an welchem ein Bürstenverschleiss zu erfassen ist, dass

(ii) in einer oberen Fläche (4) des Bürstenkörpers gebohrt wird, um ein Paar enger Bohrungen (5, 6) auszubilden, die auf das Querloch treffen, und dass

(iii) die freien Enden (10, 11) der Arme einer Schlaufe eines isolierten elektrischen Leiters in das Querloch eingesetzt werden und die beiden

freien Enden durch je eine der engen Bohrungen geführt werden, so dass ein Bürstenverschleissensor (9) durch die Schlaufe (11) gebildet wird, welche im Bürstenkörper aufgrund ihres Verlaufes von einer engen Bohrung zur anderen über das Querloch verankert ist.

5. Verfahren nach Anspruch 4, dadurch gekennzeichnet, dass

(i) die Sensorschlaufenarme (10, 11) oberhalb

der oberen Fläche (4) des Bürstenkörpers zusammengedreht werden und dass

(ii) die freien Enden der Sensorschlaufe mit einem Anschluss (12) verbunden werden.

5 6. Verfahren nach Anspruch 4 oder 5, dadurch gekennzeichnet, dass das Querloch (8) mit einem Klebstoff gefüllt wird, um die Sensorschlaufe (13) darin zu verkleben und das Loch abzudichten.

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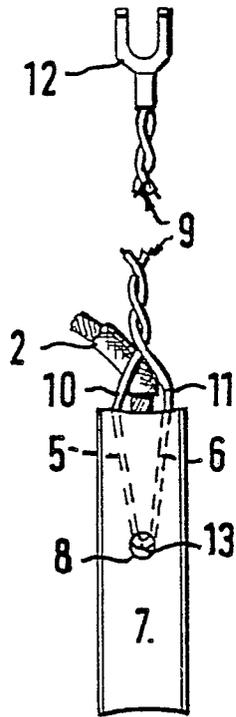


FIG. 1

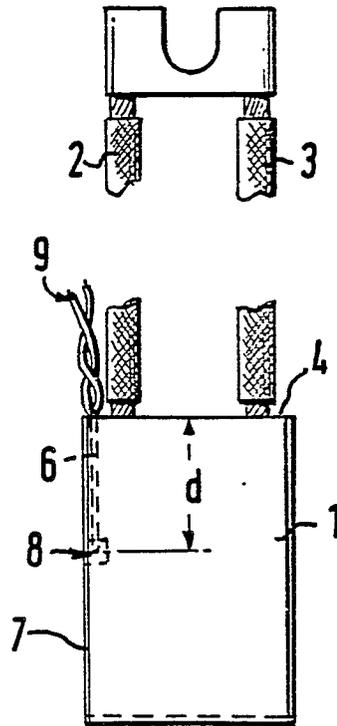


FIG. 2