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BRUSH HOLDER

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Fig. 1

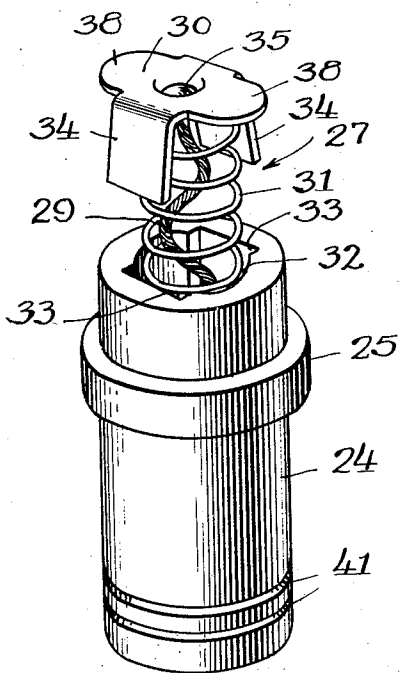
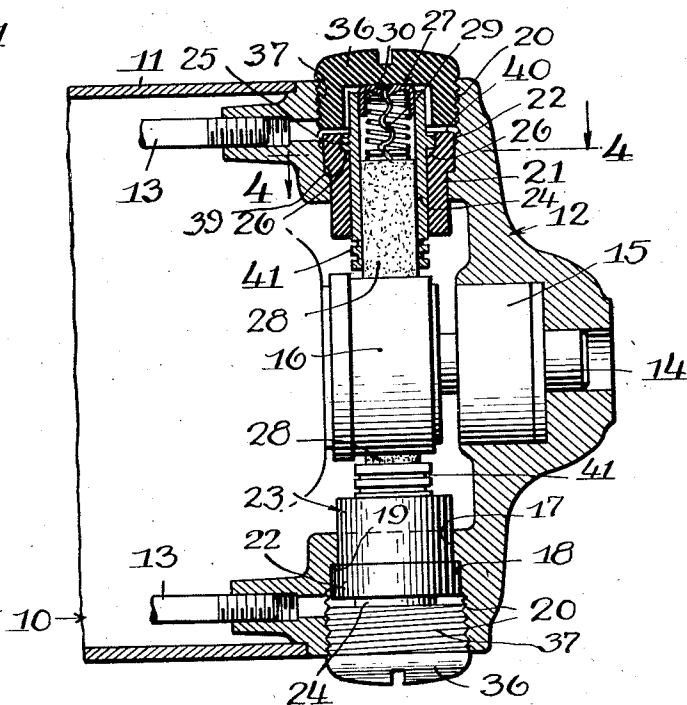


Fig. 2

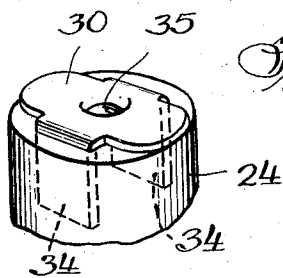


Fig. 3

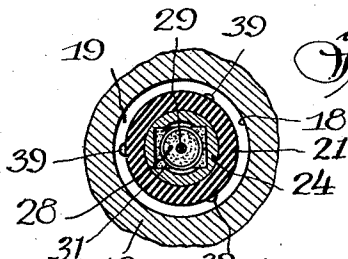


Fig. 4

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BRUSH HOLDER

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This invention relates to improvements in brush supporting construction for electrical motors.

In the usual form of brush supporting construction, the brush forms a part of a brush assembly, the parts of which are of current conducting material. Since the motor housing is also of current conducting material, the brush assembly is mounted in an insulating holder. The brush assembly includes a spring which urges the brush into electrical contact with the commutator of the motor, and since means must be provided against which the spring can react, the brush assembly includes a removable brush cap which is generally threaded on to the brush holder, and which serves to confine the spring. The brush cap may be removed to permit replacement of the brush and its associated parts.

In this usual form of construction, means such as a set screw or the like, are provided to anchor the brush holder with respect to the motor housing, so that the force exerted by the spring on the brush cap will not eject the brush holder and the brush assembly from the motor housing.

It is an object of my invention to provide a brush supporting construction which eliminates the necessity of anchoring the brush holder in the motor housing by a set screw or the like means. Thus, the cost of the brush supporting construction is reduced, and the assembly of the parts is facilitated.

Furthermore, in brush holders of the ordinary type, it is possible to force the inner sleeve through the insulating sleeve so that the inner sleeve presses against the commutator, which may not only lock the rotor and prevent it from rotating, but may also damage the commutator. It is an object of my invention to provide a construction that will eliminate this possibility.

A further object is to provide a flush mounting, that is, a brush supporting construction which does not project from the motor housing to any appreciable extent.

A further object of my invention is to provide a construction that is not only waterproof but also explosion-proof.

A still further object is to provide a construction that will afford a much better connection between the brush and the conducting sleeve than is achieved with the usual construction.

Still another object is to provide a brush supporting construction which includes an insulating brush holder which is not threaded. Thus, a less costly construction is provided as will be pointed out hereinafter.

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That embodiment of my invention which is herein shown and described is known as a shunt brush construction inasmuch as the brush is connected into the motor circuit by means of a shunt or pig tail, rather than through the brush spring. In this connection, it is a further object of my invention to provide an improved shunt brush construction in which certain parts are locked against rotation, to the end that the pig tail will not be twisted when the brush plug is screwed into position.

It will be understood, however, that my invention is equally applicable to non shunt brush constructions, and in either event, positive electrical contact between the current carrying parts is provided.

Other objects, features and advantages will become apparent as the description proceeds.

With reference now to the drawings, in which like reference numerals designate like parts,

Fig. 1 is a central sectional elevation through an electric motor embodying a preferred embodiment of my invention;

Fig. 2 is a perspective view of the brush assembly;

Fig. 3 is a partial view similar to Fig. 2, but showing the parts in a changed position; and

Fig. 4 is a section taken along line 4-4 of Fig. 1.

With reference now to Fig. 1, the reference numeral 10 designates generally an electric motor having two housing members 11 and 12, which, together with other parts of the motor, not shown, may be held together by means of screws 13 in the usual manner. The motor also includes the usual armature shaft 14 and a bearing 15, and a commutator 16, which is mounted on the armature shaft.

The housing member 12 is a die cast end piece which is provided with a bore 17 and a counterbore 18, so as to provide an outwardly facing shoulder 19. The counterbore 18 is provided with threads 20.

A brush holder 23 is disposed within the bore 17 and counterbore 18. The brush holder is a composite member comprising two concentric sleeves 21 and 24. The outer sleeve 21 is formed of insulating material such as Bakelite, and is provided with a flange 22 which engages and seats against the shoulder 19. Thus, the longitudinal position of the brush holder 23 may be determined. The conducting sleeve 24 is preferably made of brass and extends beyond both the upper and lower edges of the insulating sleeve 21. The parts are preferably press fitted one

into the other, and the conducting sleeve 24 is provided with a flange 25 which seats against a shoulder 26 formed in the flange portion of the brush holder 23.

A brush assembly indicated generally by the reference numeral 27 is disposed within the brush holder. It will be understood that the parts herein described which are related to the brush supporting means, including the bore and the counterbore, and the parts disposed therein, are provided in duplicate, as shown in Fig. 1, there being no distinction drawn between the two, insofar as this invention is concerned.

The brush assembly 27 comprises a brush 28, a shunt cap 30, and a pig tail 29, the opposite ends of which are secured to the brush and to the shunt cap in current carrying relationship. The brush may be of the usual carbon composition, and one end of the pig tail is embedded therein. The other end of the pig tail may be soldered to the shunt cap as indicated by the reference numeral 35. A spring 31 surrounds the pig tail 29 and is confined between the shunt cap and the brush.

The sleeve 24 is provided with a bore 32 having oppositely disposed channels 33, so as to accommodate a brush of rectangular cross section. These channels, in their upper portions, also receive a pair of depending arms 34 forming a part of the shunt cap 30, thus locking the shunt cap against rotation with respect to sleeve 24. Thus, there is no possibility of twisting the pig tail.

A plug 36, having screw threads 37, is threaded into the threaded counterbore 18, and thus serves to urge the laterally extending portions 38 of the shunt cap against the upper edge of the sleeve 24, as shown in Figs. 1 and 3, thus providing an electrical contact. At the same time, the brush holder 23 is in turn urged downwardly to the limit of its motion, as determined by the flange 22 and the shoulder 19. Thus, the parts are positioned with respect to the housing member 12, without the necessity of any set screw or the like.

As shown in Fig. 4, the shoulder 19 is provided with upset portions 39, which may either be formed by a staking tool or the like, or which may be formed in the casting process, so that when the holder 23 is initially urged downwardly, the upset portions 39 will bite into the relatively softer material of which the insulating sleeve 21 is formed. Since the conducting sleeve 24 cannot rotate within the insulating sleeve 21, due to the press fit between them, and since the insulating sleeve cannot rotate with respect to the housing 12, due to the locking effect of the upset portions 39, the entire brush holder 23, including its parts, are prevented from rotating. Thus, the rectangular brush 28 is always maintained in its desired angular position with respect to the commutator, without the use of a set screw. If desired, the under portion of the flange 25 may be provided with upset portions which bite into the shoulder 26 of the insulating holder, rather than resorting to the press fit above described. Similarly, other means such as suitable keys, may be employed to secure the parts against relative rotation.

In initially assembling the device, the sleeve 24 is pressed into the holder 23, and the parts are then inserted into the bore and counterbore so that the longer transverse dimension of the brush opening is parallel to the axis of the armature shafts. A slight amount of pressure at this time is sufficient to cause the upset portions 39 to bite into the flange 22, so as to secure the parts against

relative rotation. The brush assembly, comprising the brush 28, the pig tail 29, the shunt cap 30, and the spring 31 are then inserted into the sleeve 34, and the plug 36, which is recessed to accommodate the upper portion of the sleeve, is then threaded into the counterbore 18. As the plug is tightened up, the spring 31 is compressed, so that it will urge the brush 28 against the commutator 16 in the usual manner. The parts are so dimensioned that a slight clearance 40 is provided between the plug and the upper edge of the insulating sleeve 21, because the limit of the insertion of the plug should be determined by its engagement with the shunt cap 30 in order to provide satisfactory electrical contact between the shunt cap and the sleeve 24.

The plug 36 is formed from a suitable insulating material, and it will be seen that the current carrying parts of the brush assembly 27 are insulated from the housing member 12 by means of the plug 36 and the holder 23. By arranging the parts in the manner shown, so that the screw threads of the plug directly engage the housing member, rather than the insulating holder, as in the prior art, I am enabled to provide a much less costly construction. This is because I eliminate the set screw formerly used, and I also eliminate the screw threads on the insulating sleeve. Due to the difficulty and the expense of threading the Bakelite or other material of which the insulating sleeve is formed, the saving effected by the elimination of the threading operation is substantial.

It will be evident that by eliminating the pig tail, the usual non shunt construction may be employed if that is desired. In this instance, the current passes from the brush to the shunt cap through the spring 31. Connection to the field circuit may be effected in the usual manner by attaching a conductor to the lower portion of the sleeve 24, and as shown in the figures, grooves 41 are provided to facilitate this connection.

I do not intend to limit the housing member 12 to a die casting; it may be formed from any suitable material by any suitable process. Similarly, the bore 17 need not necessarily be of circular cross section. For instance, it may be of rectangular cross section, and the insulating sleeve 21 may be of a corresponding shape. In such an instance, the shape of these parts will prevent relative rotation between the brush holder and the housing, and the upset portions 39 may be eliminated. It is understood that the term "bore" as used herein may indicate a cavity or aperture of any desired cross sectional shape.

The plug 36 may be removably secured within the counterbore 18, or like aperture, by any suitable means, the screw threads 37 and 20 being shown herein only by way of example.

Although only a preferred embodiment of my invention has been shown and described herein, it is obvious that various modifications and changes may be made therein without departing from the spirit of my invention as defined in the appended claims.

I claim:

1. A brush supporting construction comprising a motor housing having an aperture, an outwardly facing shoulder in said aperture, a brush holder disposed within said aperture, a flange on said brush holder engaging said shoulder to limit the inward motion of said brush holder with respect to said motor housing, means interlocking with the outer portion of said aperture and limiting the outward motion of said brush holder to maintain

the same in a fixed position with respect to said motor housing, a brush slidably mounted in said brush holder, and a spring confined between said brush and said interlocking means to urge said brush inwardly, said brush holder including an insulating sleeve to insulate said brush from said motor housing.

2. A brush supporting construction comprising a motor housing having an aperture, an outwardly facing shoulder in said aperture, a brush holder disposed within said aperture, a flange on said brush holder engaging said shoulder to limit the inward motion of said brush holder with respect to said motor housing, a plug interlocking with the outer portion of said aperture and limiting the outward motion of said brush holder to maintain the same in a fixed position with respect to said motor housing, a brush of rectangular cross section slidably mounted in said brush holder, and a spring confined between said brush and said plug to urge the brush inwardly, said brush holder including a conducting sleeve providing a rectangular opening for said brush and a surrounding sleeve of insulating material, said shoulder and said flange cooperating to prevent angular displacement of said brush holder with respect to said motor housing.

3. A brush supporting construction comprising a motor housing having a bore and a counterbore forming an outwardly facing shoulder, an insulating brush holder disposed in said bore and counterbore and having a flange seated against said shoulder, a plug removably secured within said counterbore and engaging said brush holder to maintain the same in a fixed position with respect to said motor housing, a brush slidably mounted in said brush holder, a spring confined between said brush and said plug, and a conductor extending from the top of said spring along the interior surface of said brush holder and extending beyond the lower edge thereof.

4. A brush supporting construction comprising a motor housing having a bore and a threaded counterbore forming an outwardly facing shoulder, an insulating brush holder disposed in said bore and counterbore and having a flange seated against said shoulder, means on said shoulder interlocking with said flange to prevent angular displacement of said brush holder, a plug threaded into said counterbore and engaging the upper portion of said brush holder to maintain the same in a fixed position with respect to said motor housing, a brush slidably mounted in said brush holder, and a spring confined between said brush and said plug to urge said brush through the inward end of said bore.

5. A brush supporting construction comprising a motor housing having a bore and a threaded counterbore forming an outwardly facing shoulder, an insulating brush holder disposed in said bore and counterbore and having a flange seated against said shoulder, means on said shoulder interlocking with said flange to prevent angular displacement of said brush holder, a plug threaded into said counterbore and engaging the upper portion of said brush holder to maintain the same in a fixed position with respect to said motor housing, a brush slidably mounted in said brush holder, and a spring confined between said brush and said plug, said brush holder including a conductor extending from the top of said spring along the interior surface of said brush holder and extending beyond the lower edge thereof.

6. A brush supporting construction comprising a motor housing having a bore and a threaded

counterbore forming an outwardly facing shoulder, a sleeve-like brush holder disposed in said bore and counterbore and having a flange seated against said shoulder, said shoulder being provided with upset portions which bite into said flange in order to prevent relative rotation of said brush holder and said motor housing, a brush assembly disposed within said brush holder, and a plug threaded into said counterbore and closing the open end of said brush holder.

7. A brush supporting construction comprising a motor housing having a bore and a threaded counterbore forming an outwardly facing shoulder, a brush holder disposed in said bore and counterbore and having a flange seated against said shoulder, said shoulder being provided with upset portions which bite into said flange in order to prevent relative rotation of said brush holder and said motor housing, a brush assembly disposed within said brush holder, and a plug threaded into said counterbore, said brush assembly including a shunt cap which is confined between the upper edge of said brush holder and said plug, a brush slidably mounted in said brush holder, and a spring confined between said shunt cap and said brush, and said brush holder including an insulating sleeve and a conductor extending along the interior surface of said insulating sleeve, one end of said conductor being in electrical contact with said shunt cap, and the other end extending beyond the lower edge of said brush holder in order to provide a terminal to which a conductor may be secured.

8. A brush supporting construction comprising a motor housing having a bore and a threaded counterbore forming an outwardly facing shoulder, a brush holder disposed in said bore and counterbore and having a flange seated against said shoulder, said shoulder being provided with upset portions which bite into said flange in order to prevent relative rotation of said brush holder and said motor housing, a brush assembly disposed within said brush holder, and a plug threaded into said counterbore, said brush assembly including a shunt cap which is confined between the upper edge of said brush holder and said plug, a brush slidably mounted in said brush holder, and a spring confined between said shunt cap and said brush, and said brush holder being a composite member formed from two concentric sleeves secured to each other, the inner sleeve projecting beyond both ends of the outer sleeve, and being formed of a conducting material, and forming said upper edge of the brush holder, and the outer sleeve being of insulating material whereby said inner sleeve is insulated from said motor housing.

9. A brush supporting construction comprising a motor housing having a bore provided with a seat for a flanged sleeve, a brush holder comprising an insulating sleeve disposed in said bore and having a flange seated against said seat, said seat being provided with upset portions which bite into said flange in order to prevent angular displacement of said brush holder in said bore, a brush assembly disposed within said brush holder, and a plug threaded into said bore, said insulating sleeve being provided with a metallic lining which projects beyond said flange, said brush assembly including a shunt cap which is gripped between the upper edge of said metallic lining and said plug, a brush slidably mounted in said brush holder, a spring confined between said shunt cap and said brush, a pig tail connected at either end to said brush and said shunt cap, and means on

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said shunt cap interlocking with said metallic lining to prevent twisting of said pig tail.

10. A brush supporting construction comprising a motor housing having a bore and a threaded counterbore forming an outwardly facing shoulder, a brush holder disposed in said bore and counterbore and having a flange seated against said shoulder, said shoulder being provided with upset portions which bite into said flange in order to prevent relative rotation of said brush holder and said motor housing, a brush assembly disposed within said brush holder, and a plug threaded into said counterbore, said brush assembly including a shunt cap which is confined between the upper edge of said brush holder and said plug, a brush slidably mounted in said brush holder, a spring confined between said shunt cap and said brush, a pig tail connected at either end to said brush and said shunt cap, and means on said shunt cap interlocking with said brush holder to prevent twisting of said pig tail, said brush holder including an insulating sleeve and a con-

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ductor extending along the interior surface of said insulating sleeve, one end of said conductor being in electrical contact with said shunt cap, and the other end extending beyond the lower edge of said brush holder in order to provide a terminal to which a conductor may be secured.

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