

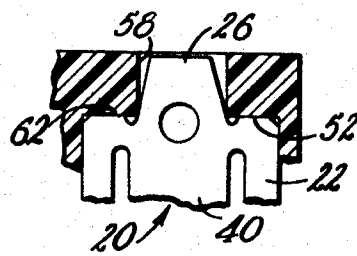
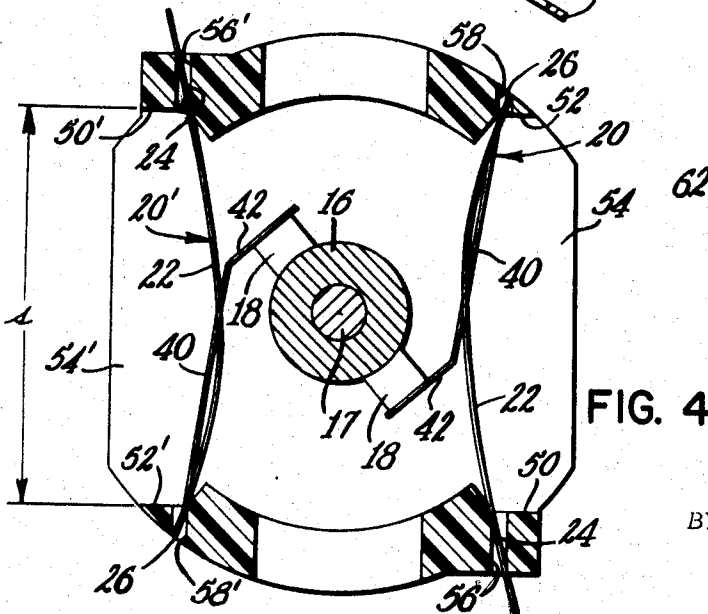
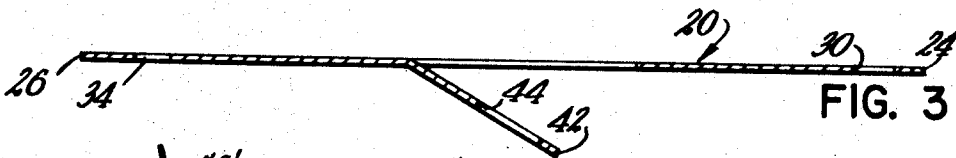
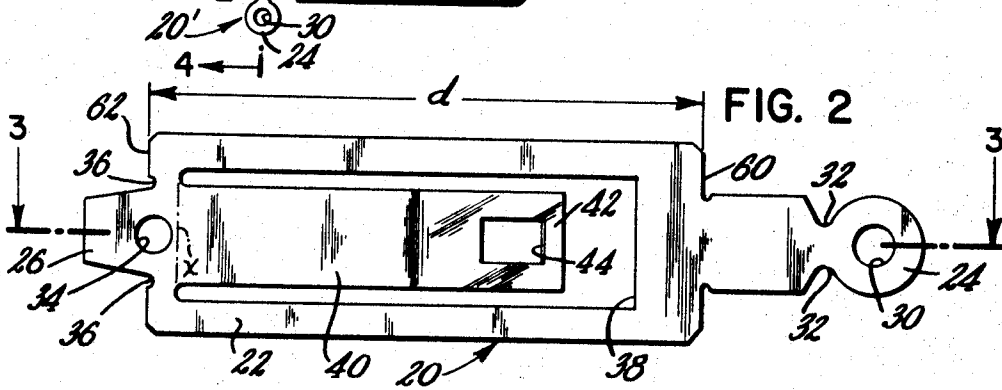
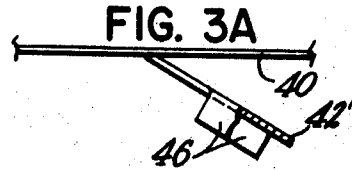
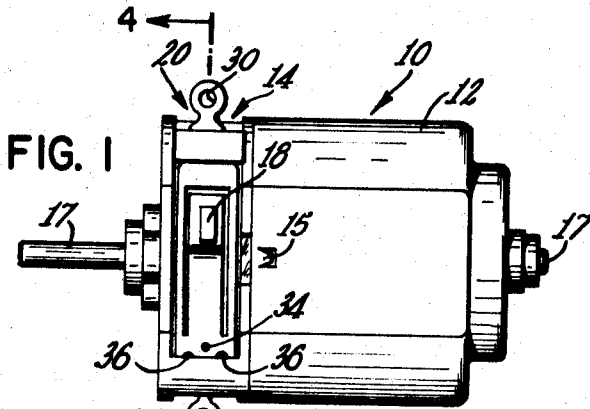
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BRUSH RETAINING MEANS FOR AN ELECTRIC MOTOR

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BRUSH RETAINING MEANS FOR AN ELECTRIC MOTOR

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5 Claims

ABSTRACT OF THE DISCLOSURE

An easily replaced brush for electric motors which employs a bowed spring member having a resilient, elongated, leaf member depending therefrom. The spring member clips into a plastic housing arranged to cause the spring member to assume a bowed configuration.

This invention relates generally to dynamoelectric machines and in particular to removable means for holding the brushes thereof.

In dynamoelectric machines, such as an electric motor, springs are used to hold the electrically conductive brushes against the commutator. The most common form of holding means for the brush is a coil spring disposed radially to the axis of the motor shaft and commutator. In the past, leaf springs have also been used to resiliently support the brushes.

The present invention is particularly directed to improved springs of the leaf type. The brushes themselves are secured to a tab that is resiliently integral with the body of the leaf spring. Means are provided on two opposed sides of the housing for easily inserting the leaf springs whereby the face of the brushes is in tangential contact with the rotating commutator of the motor.

The construction of the present invention, to be described in detail hereinafter, provides several important advantages. The brush holders are easily manufactured by a stamping operation from beryllium copper, and in contrast to the prior art there is a bare minimum of waste material. Because the brush holder is loaded upon insertion, the brush itself will apply a uniform force against the commutator through a composite spring action. The brush holder is characterized by a more benign permanent set and, in addition, has no highly stressed areas. Accordingly, a longer life is available and a greater deflection is possible without a permanent set.

It has been found that at 40,000 r.p.m., for example, brushes of other designs will produce sharp spikes on an oscilloscope. The pattern observed is a result of spring bounce. The construction of the present invention substantially reduces this undesirable characteristic. The brush itself may be rigidly secured to the resilient brush block tab by any one of several means. For example, the brush may be staked or integral gripping tabs may be provided.

Slot car motors are examples of devices that can advantageously employ the removable brush block of this invention. These motors are hobby trade items and accordingly, a low initial cost and ease of repair are essential. Replacement of the brushes by the user himself and not a skilled mechanic is very important. The motors used with slot cars operate at high rates of rotation, typically 20,000 r.p.m., and brush wear is severe. Even higher rotational rates are desirable but generally have not been available with low cost motors. By way of contrast, the present invention provides a motor that successfully operates in the 40,000 r.p.m. range.

Accordingly, it is an object of this invention to provide improved brush block mounting means for a low cost, dynamoelectric machine.

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It is another object of this invention to provide an improved brush mounting member that is easily manufactured with a minimum of waste material.

A further object of this invention is to provide brush mounting means that may readily be inserted and removed from the motor housing.

Still another object is to provide improved brush mounting means as described above that minimizes the spring bounce characteristic.

A further object of this invention is to provide improved brush mounting means having a long life while exhibiting uniform spring characteristics.

A particular object of this invention is to provide an improved leaf spring type brush holder for a dynamoelectric machine.

Another object is to provide a holder having a cantilevered resilient tab arranged to hold the commutator brush of a dynamoelectric machine.

Yet another object of this invention is to provide a brush holder of the aforementioned type wherein the body of the holder is resilient.

A feature of this invention is that the leaf spring type brush holder is inserted in the housing of the dynamoelectric machine in a "loaded" condition and is held therein at the ends of the holder.

A different feature of this invention is that the body of the holder is bowed and spans the commutator while an integral brush holding tab is substantially tangential to the commutator.

A particular advantage of this invention is that the improved brush holder permits the manufacture of an improved low cost motor capable of attaining high rotational rates, the motor being further characterized by a greater ease of brush replacement than was available with prior art devices.

These and other features, objects and advantages of the invention will, in part, be pointed out with particularity, and will, in part, become obvious from the following more detailed description of the invention taken in conjunction with the accompanying drawing which forms an integral part thereof.

In the various figures of the drawing like reference characters designate like parts.

In the drawing:

FIG. 1 is a side elevational view of a typical motor employing the brush mounting means of this invention; FIG. 2 is an enlarged plan view of the brush mounting member of this invention;

FIG. 3 is a longitudinal sectional view taken along line 3—3 of FIG. 2;

FIG. 3A is a fragmentary side elevational view partly in section, illustrating an alternative configuration for the brush holding member;

FIG. 4 is a sectional end elevational view taken along line 4—4 of FIG. 1 showing the relationship of the brush mounting means to the motor end cap and commutator; and

FIG. 5 is a fragmentary elevational view that is typical of the abutment of both brush holder ends and the slots in the motor end cap in which they are contained.

Referring now to FIG. 1 of the drawing, motor 10 is comprised of a housing 12 and an end cap 14 that is made of an insulating material. A convenient way of securing the end cap to the housing is by means of a pair of diametrically opposed locking tabs 15 integral with the housing. Tabs 15 snap into oppositely facing recesses in the end cap.

Motor 10 also includes a commutator 16 mounted on a shaft 17 rotatable within the housing. Although not specifically illustrated, the shaft is carried by bearings. A stator is also included and is comprised of a permanent magnet. These components are all conventional in the motor art

and will not be described in great detail. A brush 18, made of a suitable, electrically conductive material such as a molded carbon composition, is secured to each of the two brush holders 20 and 20' which will be described subsequently. The brushes are positioned to wipe the commutator 16.

The configuration of the brush holders is clearly illustrated in FIG. 2 and FIG. 3. Therein it will be seen that the body 22 of the holder is substantially rectangular and is provided with opposite ends 24 and 26. By way of example, the brush holder may be stamped from half hard beryllium copper which is subsequently heat treated and electro-tin-plated. The thickness of the holder may vary in accordance with the application.

Although solder tabs may be placed at various locations on the body of the brush holder, in the embodiment illustrated, end 24 is provided with an aperture 30 for this purpose. End 24 is also provided with a reduced cross section defined by two opposed edge notches 32 which serve as a heat dam when a wire is soldered in aperture 30. At the opposite end 26 of the brush holder, an installation hole 34 and a pair of removal notches 36 are also included, the function of which will be explained hereinafter.

The central portion of the body of the brush holder has a U-shaped notch 38 stamped therein, thus defining a resilient spring finger 40 that is hinged along a theoretical line X. The free end 42 of the spring finger is bent away from the body of the brush holder (FIG. 3) in a direction towards the commutator and includes an opening 44 in which brush 18 may be secured. Alternatively, as shown in FIG. 3A, the free end 42' of spring finger 40' may have a pair of opposed tabs 46 integrally formed thereon. In the alternative embodiment, the brush would be captured between the tabs. Still another method of securing the brush (not illustrated) is by staking or riveting the brush to the spring finger of the holder.

The installed brush and brush holder may be seen in relationship to the commutator in FIG. 4. The remaining internal structure of the motor has been omitted for clarity. This conventional structure forms no part of the present invention.

In the embodiment illustrated, the length dimension *d* (FIG. 2) of the body of the holder is 0.735 inch, whereas the spaces *s* (FIG. 4) between shoulder 50, 52 and 50', 52' in the motor housing is 0.720 inch. These dimensions are given by way of illustration only and are not intended to be limiting. It will be seen then that because the body dimension is greater than the space in which it is contained, the body will be bowed inwardly. Thus the bent end of the spring finger as well as the brush will be tangential to the surface of the commutator.

End cap 14, in addition to openings 54, 54' between the shoulders, is also provided with slots 56, 58 and 56', 58'. Ends 24 of the two brush holders are dimensioned to be received in slots 56 and 56' while somewhat narrower ends 26 of the brush holder are dimensioned to be received in slots 58 and 58'. The brush holders are inserted in their respective slots, one end at a time through openings 54 and 54'. After the first end is inserted in its slot the holder is flexed to permit the opposite end to be inserted in the other slot. End faces 60 and 62 (FIG. 2) bear against shoulders 50 52, respectively (FIG. 4), to prevent the holder from relaxing. This is also shown in FIG. 5.

The foregoing assembly procedure is simplified by inserting a suitable tool in installation hole 34. To take out the brush holder another spanner type tool is used in conjunction with removal notches 36. A force is applied against the notches forcing end 26 out of its slot. With

the brush holder in place, a lead wire may be soldered to end 24. When the holder is to be removed for replacement of the brushes, the end 24 is cut off and the holder is discarded and replaced by a new one. The holder is sufficiently inexpensive to permit its mutilation.

The brush holder hereinabove described is easily and inexpensively manufactured. In addition, the composite spring action provides for uniform brush tension and greater deflection without imparting a permanent set to the brush holder. Various means have been included for mounting the brush on the holder. Further, the holder is easily installed, securely held in a loaded condition, and may readily be removed when the brush must be replaced.

Having thus disclosed the best embodiment of the invention presently contemplated, it is to be understood that various changes and modifications may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In a dynamoelectric machine having a slotted, apertured housing and a commutator rotatable together with a shaft mounted in the housing, improved means to hold a conductive brush in wiping contact with the commutator comprising:

(a) a substantially rectangular spring member insertable through the housing aperture and having first and second end portions dimensioned to be received in the housing slots whereby the central portion of said spring member is bowed inwardly towards the axis of the shaft;

(b) a resilient, elongated leaf member integral at one end with said spring member intermediate said first and second ends thereof, the opposite, free end of said leaf member being disposed in proximity to the commutator surface; and

(c) retaining means to secure a conductive brush to the free end of said leaf member whereby the brush is in tangential, wiping contact with the commutator surface.

2. The device in accordance with claim 1 including stop means integral with said spring member, said stop means being arranged to maintain the central portion of said spring member in an inwardly bowed condition.

3. The device in accordance with claim 1 wherein one of said end portions includes a reduced cross section defining a heat dam.

4. The device in accordance with claim 1 wherein said spring member and said leaf member are one piece, said leaf member being hingedly connected to said spring member along one edge and spaced therefrom on the three remaining edges thereof.

5. The device in accordance with claim 1 wherein said retaining means comprises a pair of spaced tabs formed integrally with the free end of said leaf member, said tabs being dimensioned to securely receive the brush.

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