July 13, 1954

D. C. GERBER

2,683,829

BRUSH HOLDER FOR ELECTRIC MOTORS

Filed Jan. 19, 1950

2 Sheets-Sheet 1

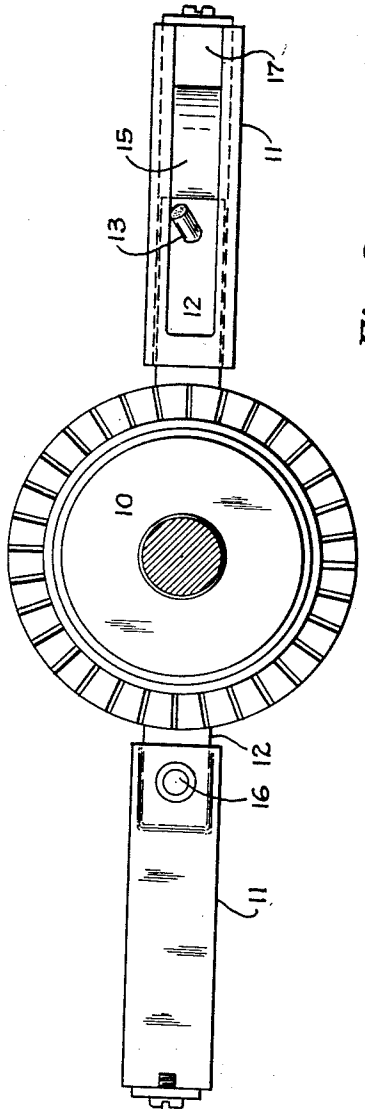


Fig. 2

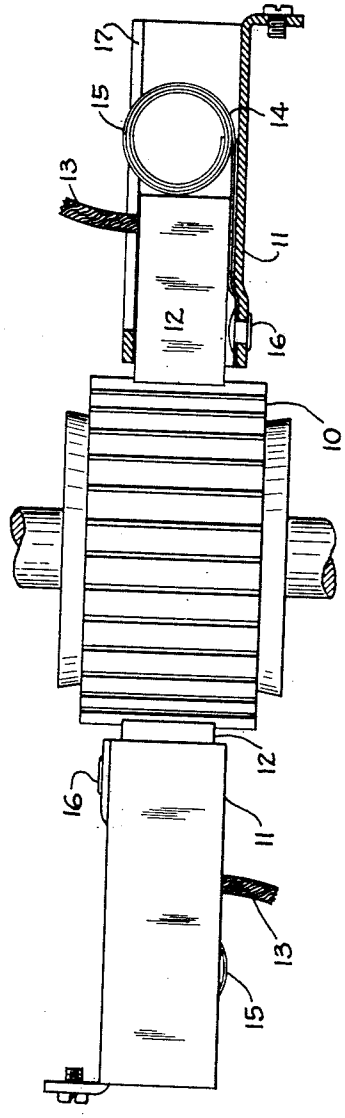


Fig. 1

INVENTOR.
Dale C. Gerber
BY
Harry S. Dunass
ATTORNEY.

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D. C. GERBER

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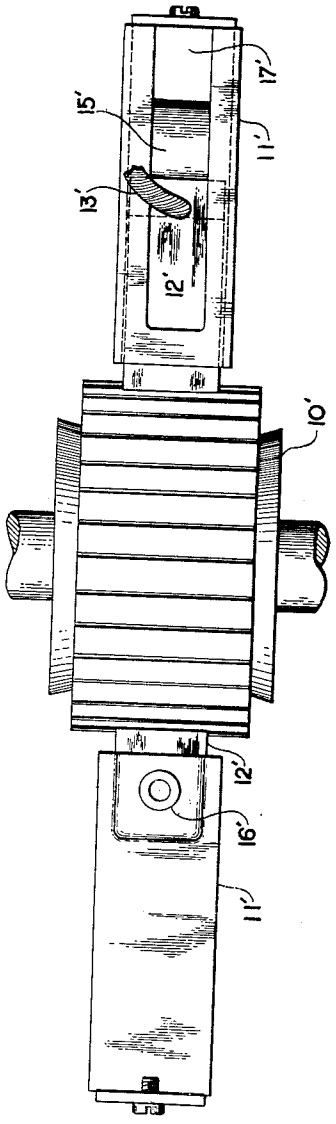


Fig. 4

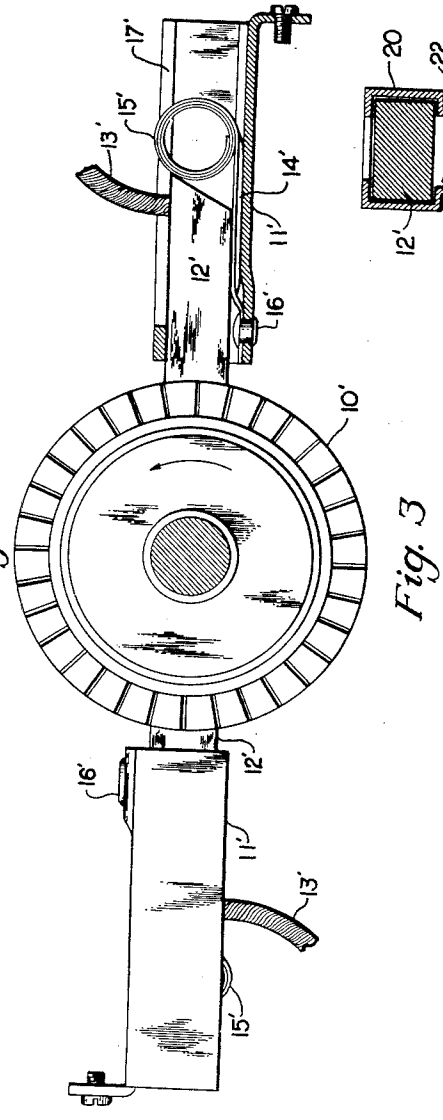


Fig. 3

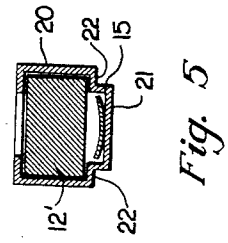


Fig. 5

INVENTOR.
Dale C. Gerber
BY
Harry S. Duncan
ATTORNEY.

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UNITED STATES PATENT OFFICE

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BRUSH HOLDER FOR ELECTRIC MOTORS

Dale C. Gerber, North Canton, Ohio, assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

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9 Claims. (Cl. 310—246)

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This invention relates to electric motors and more particularly to a cartridge type commutator brush holder therefor.

It is usual practice to provide a longitudinally coiled compression spring for holding commutator brushes against the commutator. Such constructions require that the upper end of the cartridge casing be closed to form an abutment for the upper end of the spring which must be removed and replaced each time the brushes are replaced.

In addition, the use of coiled compression springs have a tendency to permit the brush to move sidewise in the cartridge casing and thus produce brush chatter and a consequent rapid wearing of the brush. It is essential that the pressure between the brush and commutator does not go below a minimum. As a result compression springs are designed to give the necessary minimum pressure when the brush is at its minimum length and needs replacement. Thus, when the brush is new the pressure between the brush and commutator is greater than is necessary which results in further excessive wear of the brush.

According to one feature of the present invention, a tension spring is provided which does not require the upper end of the cartridge casing to be closed. Specifically, a flat spring is prestressed so as to naturally wind into a free tight volute. The one end of the spring is then attached to the inside of the cartridge casing at its commutator end and the free coil positioned over the outer end of the brush so that the natural tendency for the spring to rewind itself onto the coil presses the brush against the commutator.

Another disadvantage in the use of compression springs is that the pressure applied to the brush decreases as the brush wears away. The ideal situation is to apply constant pressure to the brushes at all times and complicated linkage mechanisms have been suggested for that purpose. According to the present invention, such complicated linkage mechanisms are unnecessary. As long as the unwound portion of the spring is held in a straight position, the forces tending to rewind it onto the coil have a negligible effect. Thus, the force applied to the brush is only that applied by the free portion of the spring between the coil and the end of the brush which is substantially constant.

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Numerous attempts have been made to prevent brush chatter by holding the entire length of the brush against the trailing edge of the cartridge casing. According to the present invention that result can be readily accomplished by merely positioning the circumference of the free coil against a wedge shaped end of the brush.

According to another object of this invention the flat spring is prestressed in such a manner that it takes a cross sectional camber as it unwinds from the tight volute and the camber is used to press the brush tightly against the brush holder and thus prevent the brush from chattering and the resulting excessive wearing away of the brush.

According to another feature of this invention the spring is prestressed in such a manner that as the diameter of the tight volute increases as the brush wears away to permit more of the spring to wind itself onto the volute the force tending to rewind the spring onto the coil will remain constant.

Other objects and advantages of this invention will become apparent as the description proceeds when taken in connection with the accompanying drawings in which:

Figure 1 is a plan view of a commutator with a pair of cartridge brush holders associated therewith showing how this invention is applied;

Figure 2 is a view of the invention of Fig. 1 taken at right angles to Fig. 1;

Figure 3 is a view similar to Fig. 2 showing how the invention is applied to prevent brush chatter;

Figure 4 is a view of the invention of Fig. 3 taken at right angles to Fig. 3; and

Figure 5 is a cross-sectional view of a modified form of the invention.

Referring to Figs. 1 and 2, the commutator is represented by the reference numeral 10, the cartridge brush casing by 11, the carbon brushes by 12, and the pigtail connections by 13.

Flat elongated narrow springs 14 are prestressed along their length so as to naturally assume a free, tight or solid volute coil 15 of a diameter approximately the width of the brushes 12. The ends of the springs 14 are secured to the interior of the cartridge casing 11 at their commutator ends by rivets 16 so as to lie between the brushes 12 and the interior of the cartridge casing 11.

The free coils 15 are positioned within the car-

tridge casing 11 with their edges extending through a slot 17 in the casing 11 and pressing against the outer ends of the brushes 12.

The straight portions of the springs lie between the brushes 12 and the walls of casing 11 and therefore there is no tendency for that portion of the spring to exert a force tending to wind itself onto the coils 15. Thus, the only force pressing upon the brush ends is the force exerted by that portion of the spring between the brush end and the periphery of the coil 15. It can thus be seen that the inward force exerted on the ends of the brushes is substantially constant regardless of the length of the brushes.

If the spring is stressed uniformly along its length the inner loop of the coil will assume a circle on its natural radius. As more loops are wound about the inner loop, the radius of the coil will increase and part of the pre-stressed forces will be locked out of action by the tendency to compress the inner loops. Thus, the coil diameter increases as the brush is shortened from wear and the force pressing inwardly on the brushes will decrease slightly as the diameter of the coil increases. To offset that tendency the spring may be prestressed so as to tend to form a free arc of decreasing radius starting from the free end and extending to the end which is attached to the commutator end of the cartridge casing. In other words, the spring is prestressed from end to end in such manner that the attached end of the spring will tend to assume an arc of smaller radius than the radius of the arc its free end tends to assume.

The prestressing of the spring is such that it tends to assume an outwardly bowed camber as it unwinds from the volute. That will cause the spring to hold the brushes in the cartridge casings against sideward movement and thus prevent chatter and the consequent excessive wear on the brushes.

The modification of Figs. 3 and 4 is especially designed to prevent chatter of the brushes by applying a force tending to hold the entire length of the brush against the cartridge casing on the trailing side. In this modification the axes of the coils 15' are rotated 90° from the position of Figs. 1 and 2 so that they are parallel to the axis of the commutator and the slots 17' are on the trailing side of the cartridge casing. The tops of the brushes 12' are wedge shaped and slope downwardly toward the leading side thereof. Thus, the pressure exerted by the coil 15' will hold the outer ends of the brushes 12' against the trailing side of the cartridge casing and the rotation of the commutator will hold their inner ends against it.

That will prevent the brushes from moving sideward in the cartridge casing to prevent chatter of the brushes and the consequent excessive wear.

Referring to Fig. 5 the brush holder 20 has a channel 21 to receive the spring 15. The channel 21 does not extend the entire width of the holder 20 so that shoulders 22 are formed. The shoulders 22 form close fitting guides for the brush 12' while the channel 21 is of such depth to receive springs having the maximum camber. In manufacturing springs it is difficult to make them all with the same camber and according to this modification the tolerances of the springs need not be held so closely as in the other modifications.

It is to be noted that in this modification the camber of the spring does not hold the brush against the side of the holder. In order to prevent brush chatter some expedient such as that shown in Figs 3 and 4 may be resorted to.

From the foregoing, it can be seen that this invention provides an arrangement in which the commutator brushes are given a substantially constant pressure regardless of the length thereof and are prevented from chattering. In each modification it is only necessary to pull the coils outwardly of the cartridge casing in order to replace brushes.

While I have shown but two modifications of my invention, it is to be understood that these modifications are to be taken as illustrative only and not in a limiting sense. I do not wish to be limited to the particular structure shown and described, but to include all equivalent variations thereof except as limited by the scope of the claims.

I claim:

1. A commutator brush holder comprising, an elongated brush casing, and a flat elongated spring in said casing and of a width to fit edgewise in said casing having a straight portion at one end secured to the commutator end of and within said casing and its other end coiled into a self-rewinding volute positioned within said casing with the inner edge of said volute resting against the outer end of a brush positioned in the casing.

2. A commutator brush holder according to claim 1 in which the straight portion of said spring extends into said casing between the walls thereof and a brush positioned therein whereby the tendency of the straight portion of said spring to rewind itself is locked out of action.

3. A commutator brush holder according to claim 2 in which said spring is prestressed along its length in such manner that the free end forms a solid coil whereby the entire length of said spring tends to rewind itself about said coil.

4. A commutator brush holder according to claim 3 in which said spring is prestressed in such manner as to form an outward camber as it is unwound from said coil whereby the camber will press against the brush in said casing to hold it from chattering yet permit it to move freely through said casing.

5. A cartridge type commutator brush comprising, an elongated brush holder in the form of a casing, a carbon brush in said casing and a flat elongated spring inside said casing having a flat portion at one end secured to the interior of said casing at the commutator end thereof and extending outwardly along the side of said brush and having its free end coiled into a self-rewinding volute resting against the outer end of said brush.

6. A commutator brush according to claim 5 in which said spring is prestressed along its entire length so as to tend to wind itself tightly about said volute.

7. A commutator brush according to claim 6 in which the outer end of said brush is wedge-shaped having its long edge at the trailing side of said casing whereby said spring tends to hold the outer end of said brush against the trailing side of said casing.

8. A commutator brush according to claim 6 in which the prestressing of said spring varies along its length in such manner that the commutator end of said spring tends to form an arc of smaller radius than that of its free end.

9. A commutator brush according to claim 5 in which said holder is provided with a channel

for receiving said spring and said spring is prestressed so as to form an outwardly bowed camber as it is unwound from said volute.

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