United States Patent [19]

Gaudry

[11] **3,908,142**

[45] **Sept. 23, 1975**

[54] **ELECTRIC MOTOR BRUSH ASSEMBLY**

[75] Inventor: **Paul Emile Gaudry,** Laval des Rapides, Canada

[73] Assignee: **Consolidated Foods Corporation,** Old Greenwich, Conn.

[22] Filed: **Nov. 8, 1971**

[21] Appl. No.: **196,847**

Related U.S. Application Data

[62] Division of Ser. No. 79,511, Oct. 9, 1970, Pat. No. 3,666,258.

[52] **U.S. Cl.** **310/242;** 310/245

[51] **Int. Cl.** **H02k 13/00**

[58] **Field of Search** 310/239, 218, 242, 229, 310/245, 230, 246, 232, 247, 240; 267/179, 180

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Primary Examiner—R. Skudy
Attorney, Agent, or Firm—William S. Henry

[57] **ABSTRACT**

In accordance with the present disclosure there is provided a brush assembly having a brush guide or holder formed with a slot in one side extending parallel to the lengthwise extent of the brush. The slot is closed at least at the end remote from the commutator and is formed with a widened portion near this closed end. The spring for urging the brush against the commutator is of the extension coil type in which adjacent turns are in contact when the spring is relaxed. The spring has a main body portion and, at each end thereof, a reduced diameter neck portion followed by an enlarged knob-shaped terminal portion. The neck portion is of slightly less diameter than the width of slot while the diameter of the terminal portion is greater than the width of the slot but less than that of the widened portion thereof. The spring is assembled in the holder by inserting one terminal portion through the widened portion of the slot and moving it against the end of the brush, the neck portion of the spring extending through the slot. The spring is then bent more-or-less double and the opposite terminal portion inserted through the widened portion and released so as to abut against the closed end of the slot remote from the commutator.

6 Claims, 4 Drawing Figures

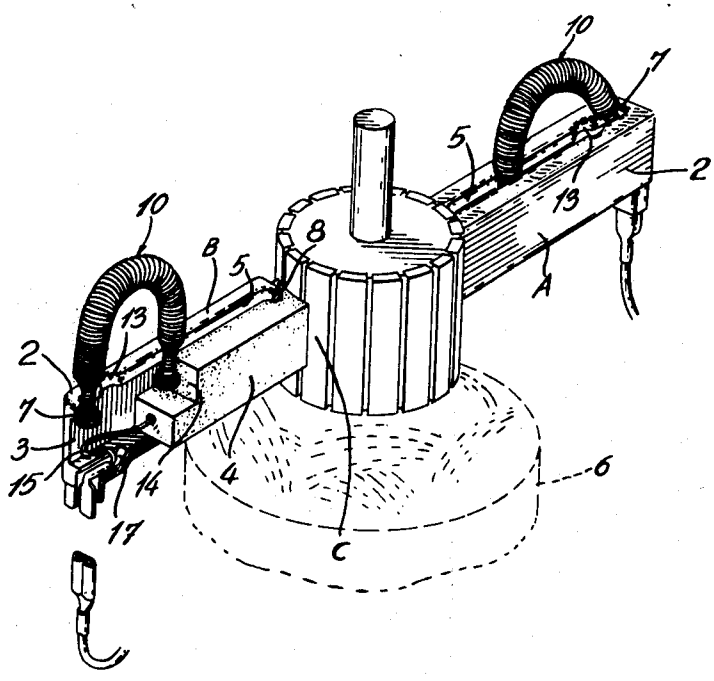


Fig. 1

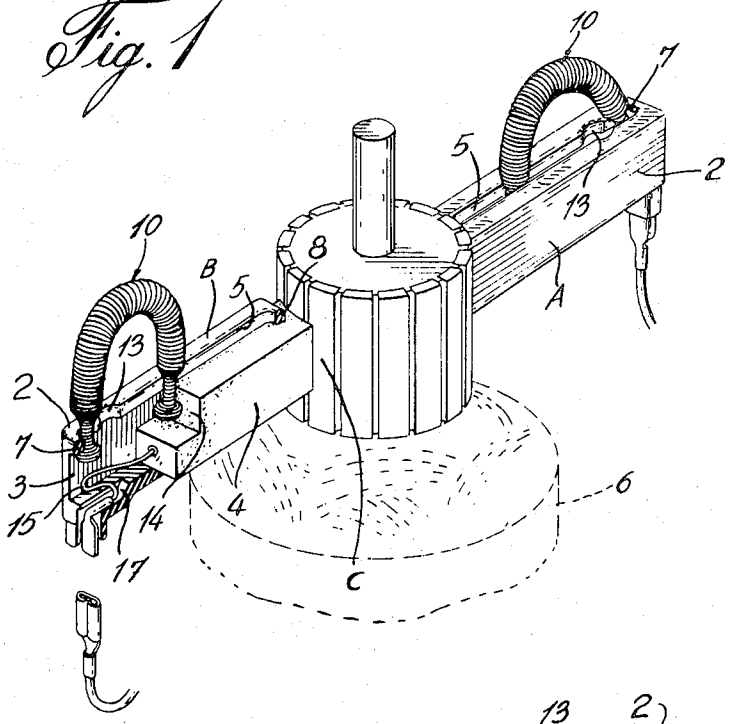


Fig. 3

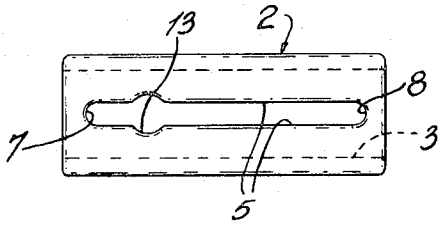


Fig. 2

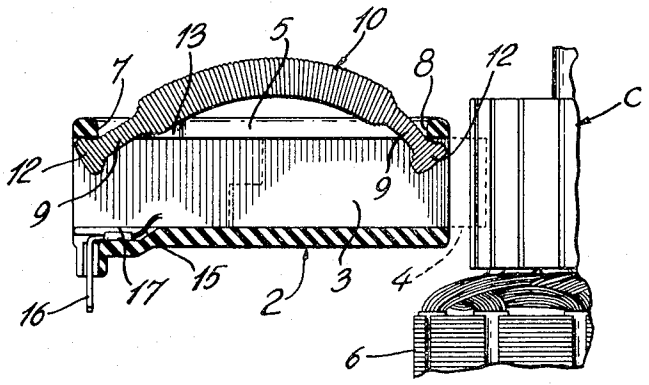
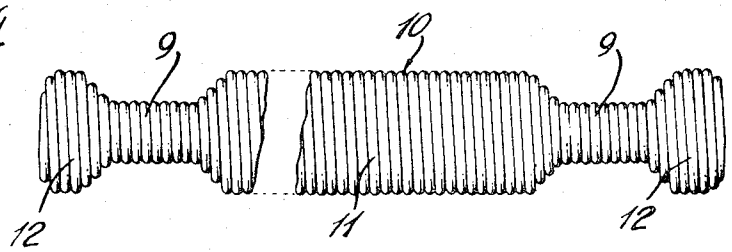


Fig. 4



ELECTRIC MOTOR BRUSH ASSEMBLY

This application is a division of my copending application Ser. No. 79,511 filed Oct. 9, 1970, now U.S. Pat. No. 3,666,258.

BACKGROUND OF THE INVENTION

The present invention relates to an electric motor brush holder and particularly to an improvement in the carbon brush holding and associated spring urging means used in fractional to low horsepower universal electric motors and the like.

In most electric motors of the fractional to low horsepower range, the brush springs which are used are more often than not compression springs; however, compression springs exhibit at least two disadvantages, the first and most obvious of which is the fact that such springs are not constant force springs and that, therefore, the force with which they act on the carbon brushes decreases as the length of each brush shortens. Brush holders are known in which constant force springs are used but it appears that the cost and complexity of these holders are such that the resulting motors are in a price class of their own and do not consitute an economic alternative for any motor wherein compression springs are used. A well known type of constant force springs which has been used is the so-called "Negator" spring.

A second and almost equally significant disadvantage of compression springs resides in the fact that such springs exhibit a strong tendency to becoming almost desperately entangled with one another, particularly when a large number of them are held in the same container from which to be individually sorted out. This disadvantage becomes a real problem in the chain line assembly of electrical motors as it necessitates that all compression springs be kept individually separated at all times.

SUMMARY OF THE INVENTION

The present invention proposes to avoid the aforementioned disadvantages of compression type brush springs and to offer an economically acceptable alternative therefor.

In the brush holding arrangement of the present invention, the spring which is used is characteristically an extension spring which, instead of being utilized tensionally, is utilized in bending or lateral flexing. It is generally recognized that the compression forces between the ends of flexed extension springs are very nearly constant, i.e. there is no appreciable difference between these forces at various degrees of flexural deformation.

Brush holders of the invention are also advantageous in that they simplify the assembly of motors.

A better understanding of the invention will be derived from the following disclosure of a preferred embodiment, reference being made throughout to the accompanying drawing thereof wherein:

FIG. **1** is a fractional schematic perspective view of a commutator and brush holders assembly in accordance with the present invention;

FIG. **2** is a longitudinal axial plan cross-section of a brush holding assembly in accordance with the invention;

FIG. **3** is a plan view of a holder forming a part hereof; and

FIG. **4** is a plan view of a brush spring forming a part of the invention.

There are shown in FIG. **1** two brush assemblies A and B of the invention extending radially outward in a common axial plane of a rotor **6** centrally disposed between them. For the purpose of the illustration only, the mounting sheath or assembly **2** of brush holder B has been sectioned and one half thereof removed to give a view of the relative disposition of parts therein. Each holder **2** has a bore **3** which extends longitudinally therein fully from one end to the other; the cross-sectional profile of the bore **3** geometrically coinciding with the cross-sectional profile of brush **4**, sufficient clearance being provided throughout to allow unrestricted passage of the latter through the former.

There is a longitudinally extending slotted track **5** in each brush mounting sleeve **2**; the slotted track **5** having closed far and near ends **7** and **8** respectively. The width of the track **5** corresponds to the diameter of the neck portion **9** integrally formed in extension-like coil spring **10** and particularly at each end of the main body portion **11** thereof. There is formed at the outer end of neck portion **9** a terminal portion **12** in the form of a knob increasing in diameter from that of neck portion **9** to approximately that of body portion **11.** Close to the far end **7**, there is formed in the slotted track **5** a widened gap **13** for insertion therethrough of the knob-like terminal portions **12** of the extension-like coil spring **10.** As is common with extension springs, adjacent turns of all portions of spring **10** are substantially in contact with each other when the spring is in relaxed condition, as is shown in FIG. **4.** This precludes the possibility of the springs becoming entangled with each other during storage.

The knob-like terminal portions **12** are provided for preventing escape of the neck portions **9** from the slotted track **5** and, also to provide sufficient bearing surface against back end **14** of the brush **4** for transmission therethrough of the urging force from spring **10.** The neck portion **9** integrally formed between the main body **11** and knob **12,** being of a reduced diameter offers more resistance to bending. Consequently the bending value is established by the main body **11** only.

The preferred material for the holder **2** being platic, the electrical connection of brushes **4** may be realized through the provision of flexible shunt wires **15** formed integrally of the brush **4** and projecting from the back end thereof. The connection of the shunt wires **15** may be realized through the provision of appropriate connector means **16** for which a connector seating recess **17** may conveniently be provided at the outer end of the holder **2.** The provision of a near end or bridge **8** terminally of the slotted track **5** is not absolutely necessary to the invention but it is preferred because a further advantage may be realized therethrough. Assuming that the length of the neck portion **9,** the thickness of the material of sleeve **2,** the distance of bridge **8** from the commutator C are all proportioned accordingly, it is seen from FIG. **2** that in the absence of a brush, bridge **8** prevents excessive inward extension of the spring **10,** thereby avoiding injury to the commutator surface that would otherwise result from the rubbing action of one of the knob-like terminal portions **12** of the spring against the surface of the commutator C.

In the assembly of motors and generators, the installation of brushes **4** in brush holders of the invention is the last operation; the holders **2** are secured in position

and brushes 4 are pushed in position therein; in each holder 2 a first terminal portion 12 of one extension-like coil spring 10 is pushed-in through the widened portion 13 of the slot-like track and as the neck portion 9 comes in line with the track 5 it is pushed longitudinally to engage it and thereby liberate the aperture widened portion 13; the spring 10 is bent or flexurally stressed to bring the second terminal portion 12 over the widened portion 13 of the track; the second terminal portion is then pushed through the widened portion 13 until the adjacent neck portion 9 thereof comes into engaging alignment with the track 5 whereupon the spring is released; as the spring 10 tends to straighten, the knob-shaped terminal portions 12 thereof will move longitudinally away from one another as far as possible, one terminal portion 12 bearing against the rear end 14 of the brush and the other terminal portion 12 bearing against the underside of the track's far end portion 7. Finally, the connection of the shunt wire 15 is made.

What is claimed is:

1. An electric motor brush assembly comprising a hollow elongated brush holder for slidably receiving and guiding a commutator brush along a rectilinear path, said holder being formed with an elongated slot parallel and adjacent to said path, the end of said slot remote from the commutator being closed, said slot having a widened portion near the closed end thereof, a symmetrical coil spring having a main body portion and, at each end thereof, a reduced diameter neck portion followed by an enlarged knob-shaped terminal portion, said knob-shaped portion being of less diameter than said widened portion of said slot but of greater diameter than the remaining portion thereof, adjacent turns of all portions of said spring being substantially in contact with each other when said spring is in relaxed condition, the reduced diameter neck portion of said spring extending through and slidably retained in said slot, the main body portion of said spring being disposed outside said holder in flexually stressed condition, and the knob-shaped terminal portions being disposed within said holder and respectively bearing against the closed end of said slot and said brush.

2. Brush holder as claimed in claim 1, wherein the main body portion of said coil spring is longer than the distance between the near and far ends of slot.

3. Brush holder as claimed in claim 1, wherein the holder is an open-ended tubular member of plastic having a bore, the cross-section of which geometrically matches the cross-section of the brush.

4. Brush holder as claimed in claim 3, wherein the brush has a shunt wire and means are provided for electrical connection thereof outside the open-ended tubular member of plastic.

5. Brush holder as claimed in claim 1 wherein the brush has a commutator and the like contacting end and a rear end and, the distance between these is less than the distance between the commutator and the like end and the short wider portion of the slot-like track.

6. Brush holder as claimed in claim 1, wherein the distance between the near and far ends of the slot is shorter than the flexurally unstrained length of the main body portion of the coil spring.

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