

Nov. 24, 1964

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3,158,773

BRUSH HOLDER WITH SPLIT BRUSH

Filed Dec. 26, 1962

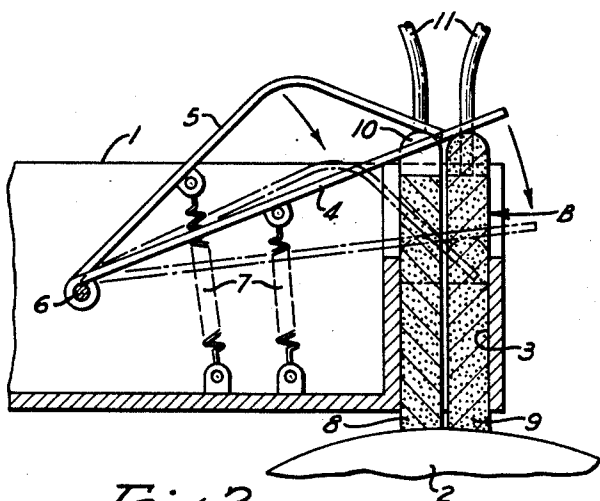


Fig. 2

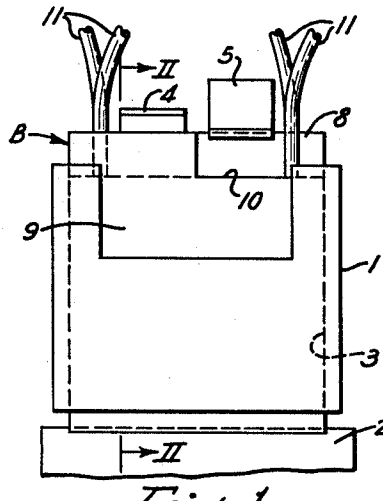


Fig. 1

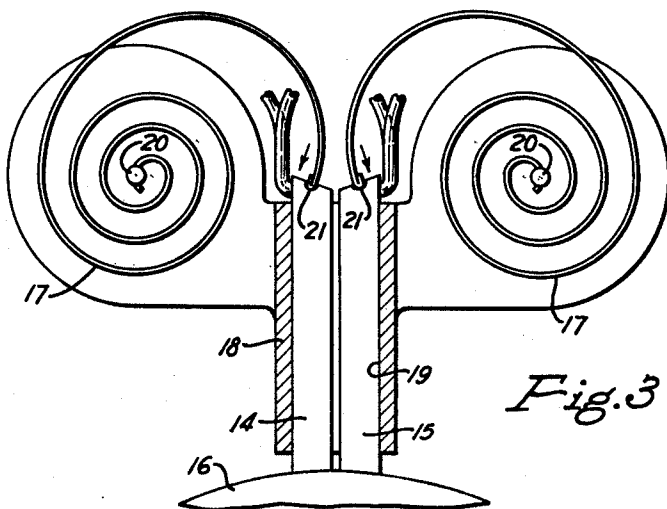


Fig. 3

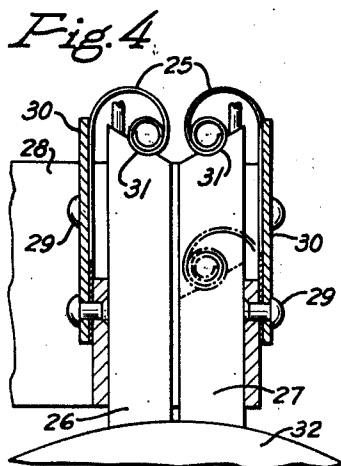


Fig. 4

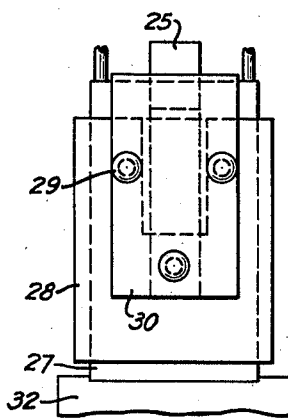


Fig. 5

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3,158,773

BRUSH HOLDER WITH SPLIT BRUSH

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Filed Dec. 26, 1962, Ser. No. 247,108

3 Claims. (Cl. 310--245)

This invention relates to electric brushes, and more particularly to a brush holder containing a brush formed from a pair of thin carbon brush half-sections disposed face to face.

It is common practice to make an electric brush for a rotating electrical machine from two similar half-sections that are disposed face to face. The two sections are thin, by which is meant that their thickness is so small in relation to their length that when they are used with reversible commutators or slip rings they tend to tilt in the brush holder in a clockwise or counter-clockwise direction, depending upon the direction of rotation of the electrical collector against which they ride. Any such change in the position of the brush halves, particularly upon and immediately after reversing the direction of rotation of the machine, results in new line contacts with the collector surface and eventually in so called double seating. Even though the brushes do not get into a chattering condition because of the slight leading angle allowed by the necessary clearance in the brush holder, and do not chip or break before the second seat is formed, the new location of electrical contact results in a different and less favorable time of commutation for each direction of rotation, whereby performance of the machine and the life of the brushes and commutator are impaired.

It is an object of this invention to provide a combination brush holder and brush of the split type, in which the brush sections are constantly urged apart toward opposite sides of the brush holder passage regardless of the direction of rotation of the electrical machine with which the brush is used. Another object is to do this in a simple and inexpensive manner that does not require the brush to be modified.

In accordance with this invention, a pair of thin carbon brush half-sections are disposed face to face in the brush-receiving passage through a brush holder. The passage is disposed radially of a rotating cylindrical member adjacent its inner end, and the opposite ends of the brush project from the passage. Engaging the outer end of each brush section is a different pressure means, the two pressure means pressing those sections inwardly against the rotating member and simultaneously laterally away from each other against the opposite sides of the brush passage. The pressure means may be spring-pressed arms or they may be special types of springs.

The invention is illustrated in the accompanying drawings, in which

FIG. 1 is a view of one end of a brush holder containing a split brush;

FIG. 2 is a cross section taken on the line II--II of FIG. 1;

FIGS. 3 and 4 are views, similar to FIG. 2, of two further embodiments of the invention; and

FIG. 5 is an end view of the assembly shown in FIG. 4.

Referring to FIGS. 1 and 2 of the drawings, a well-known type of brush holder 1 is mounted beside a rotating cylindrical electrical collector 2, such as a commutator or slip ring of a rotating electrical machine (not shown). For convenience of description only, the rotating collector will be referred to herein as a commutator. The machine is reversible, so that the commutator can be rotated in either direction. The brush holder is provided with a rectangular passage 3 that is disposed radial-

ly of the commutator and a short distance away from it. Mounted in an opening in the holder outside of the brush passage is a pair of stiff arms 4 and 5. One end of each arm is pivotally mounted at 6 in the holder on an axis parallel to that of the commutator so that the free ends of the arms, which extend toward the outer end of passage 3, can be swung toward and away from the commutator. The arms are urged toward the commutator by resilient means of any suitable design, coil springs 7 being shown simply for the purpose of illustration.

A brush B is slidably mounted in the brush holder passage and the free ends of the arms press against the outer end of the brush to hold its inner end against the commutator at all times. As is common practice, the brush is formed from a pair of thin carbon half-sections 8 and 9 that are disposed face to face. The outer end of each brush is rounded about half way along the brush and the rest of it is provided with a recess or notch 10. The two brush halves are substantially identical, but one is turned 180° relative to the other so that the notch in one brush is beside the projecting end portion of the other brush. The brush is placed in the brush holder in such a way that arm 4 extends across the notch in the outer end of the inner brush section 8 and rests on the rounded outer end of the outer brush section 9. This arm may be straight. The other arm 5 rests on the rounded outer end of the inner brush section, but as the brush is worn down the end of this arm will move into the notch in the outer section as shown in dotted lines in FIG. 2. Since both arms engage the brush sections, the latter are pressed against the commutator. The outer ends of the brush sections are connected in the usual manner by two or more shunt wires 11 to a common terminal (not shown).

It is a feature of this invention that regardless of the direction in which the commutator is rotated, both sections of the brush will continually engage the adjoining opposite sides of the brush holder passage. Accordingly, the angle of the straight arm 4 across the outer brush section 9 is such that the arm engages that section at the inner side of the central plane of the section that is parallel to its inner and outer faces and thereby the arm urges the brush outwardly toward the outer side of the brush holder passage. The other arm is bent to provide it with a dog leg so that the free end of the arm will engage the outer end of the inner brush section outwardly of the central plane of that section. The result is that the bent arm presses the inner brush section toward the inner side of the brush holder passage. Another way of expressing it is that the free end portions of the two arms extend obliquely across the brush sections and engage them between their opposed faces and the central planes of the sections, so the pressure of the arms toward the commutator forces the outer end portions of the brushes apart and against the opposite sides of the brush holder passage.

With this invention, a standard brush can be used in a standard brush holder by merely bending the arm that engages the inner brush section so that its free end portion will engage that section in the manner just described. It will be seen that tilting of the brush sections in the brush holder while the commutator is rotating, regardless of its direction, is restrained. As a result, chatter, chipping and breakage are greatly reduced and the brush seat is not changed appreciably with reversal of the commutator. The life of the brush and commutator are increased, and performance of the machine remains good.

In the modification shown in FIG. 3, the two brush half-sections 14 and 15 have outer ends that are inclined toward each other in such a manner that they converge toward the rotating cylindrical member 16 that the brush engages. To hold the brush against the commutator, a

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spiral spring 17 is mounted in the brush holder 18 at each side of its central passage 19. The inner end of the spring is anchored in a rigid pin 20 and its inner end presses against the inclined outer end of the nearest brush section. The outer end of each spiral spring has to be pulled radially away from its supporting pin 20 in order to engage a brush section, so the tendency of the outer end of the spring to spring back toward the center of the spiral causes the spring to press the brush section against the adjoining side of the brush holder passage. Any danger of the spring slipping off the end of the brush section can be avoided by providing the inclined end with a longitudinal groove 21 that receives the outer end of the spring.

In the further embodiment of the invention shown in FIGS. 4 and 5, there are two constant-pressure type spirally rolled springs 25 engaging the brush half-sections 26 and 27. The outer end of each spring is unrolled and fastened flat against the adjoining outer surfaces of the slotted brush holder box 28 by rivets 29 or the like and a flat backing plate 30. The spring rolls or coils press on the outer ends of the brush sections, which have longitudinal grooves 31 in their inclined outer ends to receive the coils, and force the brush sections against the commutator 32 and the adjoining inner surfaces of the holder. As the brush wears, the spring rolls gradually coil up more and more in the brush grooves as shown in dotted lines in FIG. 4 and continue to exert the desired constant pressure against the brush sections. It can be seen that in addition to the space and cost advantages of this form of the invention; it all continuously affords constant forces on the brush sections in the direction of the commutator and the sides of the brush box. It is the firm engagement of the brush with the opposite sides of the brush box which is responsible for the additional feature of the vibration damping effect, found to be a major factor contributing the brush stability and all the associated benefits.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. The combination with a brush holder having a brush-receiving passage therethrough disposed radially of a rotating cylindrical member adjacent its inner end,

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of a pair of thin carbon brush half-sections disposed face to face in said passage with their opposite ends projecting therefrom, a pair of arms each engaging the outer end of a different one of said sections and being pivotally mounted at one side of said holder and having a free end portion extending obliquely across the brush section end engaged by it, said arms engaging the brush sections at points between said faces and the central planes of said sections, and resilient means for pressing said arms against the brush sections to press those sections inwardly against said rotating member and simultaneously laterally away from each other against the opposite sides of said passage.

2. The combination with a brush holder having a brush-receiving passage therethrough disposed radially of a rotating cylindrical member adjacent its inner end, of a pair of thin carbon brush half-sections disposed face to face in said passage with their opposite ends projecting therefrom, the outer ends of said brush sections being inclined and converging toward said cylindrical member, and a spiral spring at each side of said holder having its inner end anchored at that side and having its outer end pressing against the inclined outer end of the adjacent brush section, the outer end of each spring being urged toward its inner end to press the brush sections inwardly against said rotating member and simultaneously laterally away from each other against the opposite sides of said passage.

3. The combination with a brush holder having a brush-receiving passage therethrough disposed radially of a rotating cylindrical member adjacent its inner end, of a pair of thin carbon brush half-sections disposed face to face in said passage with their opposite ends projecting therefrom, the outer end of each brush section being provided with a longitudinal groove, and a constant-pressure type spring at each side of said holder having its outer end anchored at that side, the rest of each spring being tightly coiled and disposed in the said groove of the adjacent brush section, and said springs urging their coiled portions away from each other and toward the inner end of said passage to press the brush sections inwardly against said rotating member and simultaneously laterally away from each other against the opposite sides of said passage.

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MILTON O. HIRSHFIELD, *Primary Examiner*.