Feb. 6, 1962 M. H. NEUHARDT 3,020,430

SPLIT BRUSHES AND SUPPORT THEREFOR

Filed June 16, 1960

FIG. 1

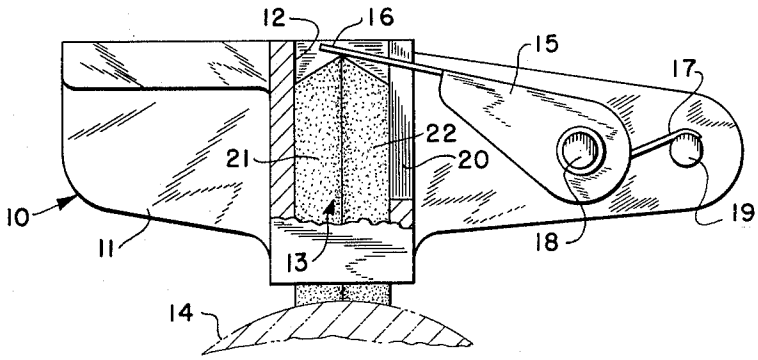


FIG. 2

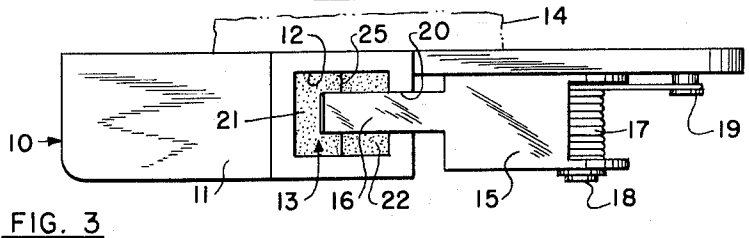


FIG. 3

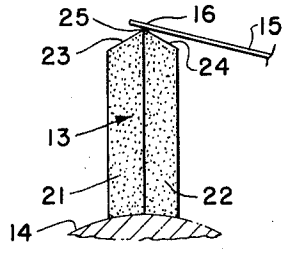


FIG. 4

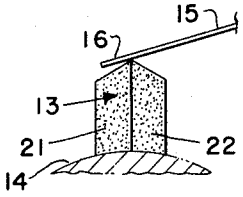


FIG. 5

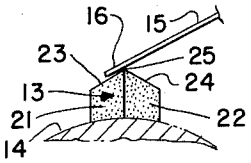


FIG. 6

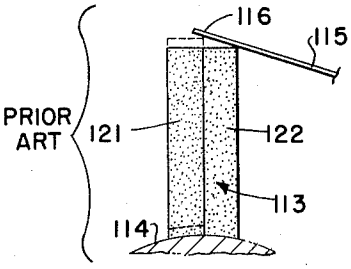


FIG. 7

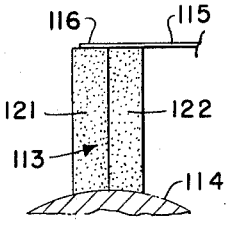
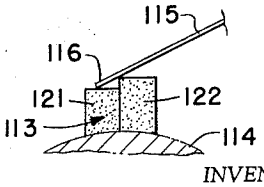


FIG. 8



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SPLIT BRUSHES AND SUPPORT THEREFOR

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The present invention relates to a split brush and support therefor, and more particularly, to such a split brush which includes a pair of adjacent brushes having their respective ends beveled to form an apex therebetween.

In the prior art of which I am aware, split brushes are often employed so as to increase the short circuit resistance and thus achieve greater brush life by preventing, to a certain degree, the arcing that may normally occur between the brush and the commutator. One of the problems that is associated with the split brush, such as those used in the prior art, is to maintain an equal amount of tension or mechanical pressure upon each of the adjacent brushes comprising the split brush assembly so as to achieve a uniform wearing of each of the individual adjacent brushes and thus to distribute the electrical load equally among them. This may be accomplished by having additional linkages in the brush holder assembly itself, that is to say, additional members linking the conventional brush tensioning arm in such a manner as to bear with equal pressure upon each of the individual members of the split brush assembly; and again under certain circumstances, it has been the practice to connect the respective ends of the split brush by means of a suitable end cap upon which the brush tensioning arm will bear. However, the use of additional linkages, or in the alternative, the use of an end cap, necessitates additional elements or members which add to the cost and complexity of the overall brush holder assembly; and it would be much more desirable, therefore, to provide a convenient and economical method of equally distributing the mechanical pressure ordinarily brought to bear upon the individual members of the split brush.

Accordingly, it is an object of the present invention to provide a split brush which includes a pair of adjacent brushes having their ends beveled and held together to form an apex for the split brush.

It is another object of the present invention to provide means whereby the free end of the brush tensioning arm will rest only upon the apex at all times during the normal wearing cycle of the split brush.

It is yet another object of the present invention to provide means whereby at any one time during the normal wearing cycle, the mechanical pressure that is applied to one of the adjacent brushes will be equal to the pressure that is applied to the other adjacent brush.

It is still a further object of the present invention to provide means whereby the pair of adjacent brushes will wear evenly and will carry an equal amount of the electrical load.

These and other objects of the present invention will become apparent from the foregoing specification taken in conjunction with the enclosed drawings, in which:

FIGURE 1 is a front elevational view, partly in section, of a complete split brush and support therefor as shown in relation to a commutator, which is shown in phantom view;

FIGURE 2 is a top plan view thereof;

FIGURES 3, 4, and 5 are schematic views of the pair of adjacent brushes which comprise the split brush of the present invention, together with a portion of the conventional brush tensioning arm, showing the successive stages in the normal wearing cycle of the split brush and further showing how the free end of the conventional brush tensioning arm will bear upon or rest upon the apex of the split brush at all times during the normal wearing cycle of the split brush; and

FIGURES 6, 7, and 8 are schematic views (corresponding to FIGURES 3, 4, and 5, respectively) of the type of conventional split brush, such as has been used in the prior art, illustrating in successive stages the non-uniform amount of mechanical pressure that will be brought to bear upon the individual adjacent members of the split brush during its normal wearing cycle.

With particular reference to FIGURE 1, there is illustrated a conventional brush holder assembly **10** having a supporting bracket **11** which is provided with a suitable brush guideway **12** adapted to confine and guide the split brush **13** into an operative contact with the conventional commutator **14**, which for sake of convenience has been illustrated only partially and in phantom view.

The brush holder assembly **10** is further provided with a spring-loaded brush tensioning arm **15** having a free end **16** and adapted by means of a coil spring **17** and pins **18** and **19**, together with a slot **20** formed in the brush holder assembly **10**, to bear upon and press the split brush **13** down within the brush guideway **12** so as to engage and rest upon the commutator **14**.

It will be appreciated that the split brush will be provided with suitable electrical connections, such as the shunting means, which being conventional are herein omitted for ease of illustration and clarity of understanding.

It will be further appreciated that in the illustration shown in FIGURES 1 and 2, the entire brush holder assembly **10**, including, of course, the brush tensioning arm **15**, will be included within the electrical circuit. However, it should be understood that the invention may be practiced equally as well with other types of brush holder assemblies and supports therefor, including, of course, those of the insulated type; and hence, the invention is not necessarily to be confined thereto to any one type or configuration of brush holder assembly.

As shown in FIGURES 1 and 2, and also in diagrammatic or schematic view in FIGURES 3–5, the split brush **13** comprises a pair of adjacent individual brushes **21** and **22**; and the respective ends **23** and **24** of the adjacent brushes **21** and **22** are bevelled or chamfered so as to provide an apex **25** at the very top of the split brush **13**, it being understood that preferably, but not necessarily, the longitudinal axis of the brush tensioning arm **15** will be perpendicular to the apex **25**, and each of the ends **23** and **24** will be bevelled by an equal amount.

As shown in FIGURES 3–5, there are three successive stages which occur during the normal wearing cycle of the split brush **13**, namely, the initial or "brand new" stage as shown in FIGURE 3, the final or "fully worn" stage as shown in FIGURE 5, and an intermediate stage therebetween, substantially as illustrated in FIGURE 4.

It will be appreciated from an examination of FIGURES 3–5, that in accordance with the teachings of the present invention, at all times during the normal wearing cycle of the split brush **13**, the free end **16** of the brush tensioning arm **15** will rest upon the apex **25**. This will enable the mechanical pressure or tension that is applied to each of the adjacent brushes **21** and **22** (at any one time during the normal wearing cycle) to be substantially equal, that is to say, uniformly distributed between the adjacent brushes **21** and **22**; and hence, the adjacent brushes **21** and **22** will wear evenly and will thus carry an equal amount of the electrical load.

As contradistinguished from these teachings of the present invention, FIGURES 6, 7, and 8 illustrate in diagrammatic or schematic fashion, three successive stages (corresponding roughly to FIGURES 3, 4, and 5 respectfully) that occur during the normal wearing cycle of a split brush **113** having a pair of adjacent brushes **121**

and 122 and not being provided with any additional linkages or end caps.

It will be appreciated from FIGURES 6, 7, and 8, that the free end 116 of the brush tensioning arm 115 will not bear evenly upon the adjacent brushes 121 and 122 when both brushes are new. That is to say, first one of the brushes, say 122, will bear against the commutator 114 during the initial stages of the normal wearing cycle as shown in FIGURE 6 (where the degree of movement of adjacent brush 121 is indicated in phantom); and then, after brush 122 has worn down during its normal wearing cycle, the free end 116 of the brush tensioning arm 115 will bear upon the other of the adjacent brushes, namely 121, as shown in FIGURES 7 and 8. In the interim, brush 122 will conduct all of the current to the commutator; and since the brush capacity would be halved, this might result in appreciable damage to the brushes, commutator, or both. Hence, of the adjacent brushes 121 and 122, 122 would at first carry all of the current; then the brushes would have exerted upon them unequal forces which would cause them to wear more rapidly as certain pressures must be adhered to for good life. Prior art has resorted to additional parts to avoid this difficulty, thus resulting in increased cost and complexity.

It will be further appreciated that the present invention has been illustrated by means of a split brush 13, including a pair of adjacent brushes 21 and 22, but that the teachings of the present invention are equally applicable to any number of split brushes 13 that may be stacked along side of each other, say in parallel, for more heavily-loaded applications. It will also be appreciated that the particular angle to which the respective ends 23 and 24

are beveled must be chosen in relation to a number of factors, including of course, the length of the brush tensioning arm 15, so that at all times during the normal wearing cycle of the split brush 13, the free end 16 of the brush tensioning arm 15 will rest upon the apex 25, substantially as shown in FIGURES 3–5.

Obviously, many minor modifications may be made without departing from the basic spirit of the present invention; and therefore, within the scope of the appended claim, the invention may be practiced other than has been specifically described.

I claim:

A split brush and support therefor comprising a supporting bracket having a brush guideway, said guideway having a longitudinal slot formed therein, a split brush confined within said guideway, said split brush comprising a pair of adjacent individual brushes having respective ends beveled oppositely to each other, whereby an apex is formed for said split brush, a pivoted brush tensioning arm carried by said supporting bracket, said arm extending through said slot in said guideway to rest upon the apex of said split brush, and spring means urging said arm upon said split brush, whereby said arm rests upon the apex of said brush at all times during the normal wearing cycle of said split brush, and whereby said pair of adjacent brushes wear evenly and carry an equal amount of the electrical load.

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