Nov. 15, 1932. F. S. MARCELLUS 1,887,559

BRUSH FOR ELECTRICAL APPARATUS

Filed May 27, 1931

Fig. 1.

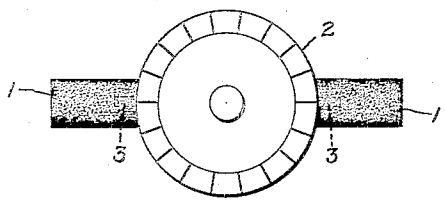


Fig. 2.

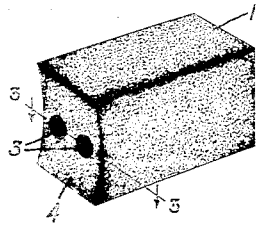
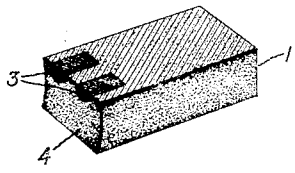


Fig. 3.



Inventor:
Fredrick S. Marcellus,
by Charles E Fuller
His Attorney.

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UNITED STATES PATENT OFFICE

FREDRICK S. MARCELLUS, OF SCOTIA, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

BRUSH FOR ELECTRICAL APPARATUS

Application filed May 27, 1931. Serial No. 540,392.

My invention relates to brushes for electrical apparatus.

It is desirable to provide brushes for electrical apparatus having constant contact resistance. This is particularly desirable in brushes used with electrical measuring instruments such as electric tachometers, meters, and the like, because inaccurate readings are obtained if the contact resistance is not substantially constant. Substantially constant contact resistance is not obtained from ordinary brushes as the roughening of the brush face results in the collection of dirt particles between the brush faces and the current collecting device.

The object of my invention is to construct an inexpensive brush which provides approximately constant contact resistance in electrical measuring instruments or other apparatus in which it is used. I accomplish this by providing a brush having a face thereof comprising an amalgam having an excess of mercury adapted to form a mercury coating on a current collecting device.

My invention will be more fully set forth in the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In the drawing, Fig. 1 is an end view of a current collecting device and brushes embodying one form of my invention; Fig. 2 is a perspective view of a brush made in accordance with my invention, and Fig. 3 is a sectional perspective view taken on the line 3—3 of Fig. 2.

Referring to the drawing, I have shown my invention in connection with a pair of carbon brushes 1, which are shown in Fig. 1, and which may be supported in any well known manner in contact with the surface of a rotating current collecting device 2. In order to obtain an approximate constant contact resistance, recesses 3 are formed in the brush faces 4, and filled with an amalgam including cadmium or tin, copper, silver, and a small amount of mercury to form a gloss or coating of mercury with traces of silver on the surface of the current collecting device adjacent the recesses 3. The proportions of the different elements used can be varied considerably to obtain the coating on the surface of the current collecting device, and I have found the proportion of approximately 75% of a metal of the class constituted of cadmium and tin, 15% silver, and 10% copper gives good results. Cadmium or tin is used in a larger proportion than copper and silver because these metals are softer and amalgamate more readily than copper, and resist corrosion better than silver which blackens upon oxidation. As copper hardens better than cadmium or tin it is used in my alloy to give the amalgam strength.

When brushes of this construction are used the amalgam fillings in the recesses form high spots on the brush faces, and these spots maintain good contact with the coating of mercury with traces of silver formed on the surface of the current collecting device by the slight excess of mercury in the amalgam. Since the surface tension of the mercury in the amalgam is high, the metallic bars of the current collecting device, which have an affinity for the mercury, will be coated, but the insulation between the bars, which has no affinity for the mercury, will not be coated. Furthermore, the coating is very thin and does not extend between adjacent bars, because only a slight excess of mercury is employed in the amalgam. For these reasons the coating does not short-circuit the bars of the current collecting device, so that undercutting of the mica insulation is not necessary. I have found that this material gives substantially constant contact resistance when used in connection with electrical apparatus.

I prefer to make the brushes above described by mixing a quantity of finely divided metallic material, such as an alloy of cadmium, silver and copper in the proportions previously mentioned, with sufficient mercury to form a paste. I then fill the recesses 3 of the brushes with the amalgam paste and compress it to squeeze out most of the mercury, but leave a small amount of it in the mixture to form the mercury coating on the

surface of the current collecting device with which the brush is used. In the making of an amalgam the mercury serves as a solvent for the finely divided material, and after the application of heat or pressure, or both, to expel part of the free mercury, a solid mass is obtained which hardens in a very short time. In the making of my brushes I employ mercury in the ordinary manner to make it easier to work the finely divided material, but leave a small amount of it in excess of that required to form the amalgam to form a coating when on the current collecting device of the electrical apparatus in which the brush is used.

While I have shown and described a particular embodiment of my invention, it is obvious that amalgam paste having an excess of mercury may be compressed and molded in the form of a brush, or a brush face may be provided with the amalgam in any other suitable manner, so that a mercury coating will be formed on the surface of a current collecting device contacting with the brush.

Although I have mentioned the proportions of elements which I prefer to use as an alloy in my amalgam it is obvious that other proportions may be used for the same purpose. Other alloys will also readily present themselves to those skilled in the art, and I therefore intend in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A brush for electrical apparatus having a face thereof provided with an amalgam having an excess of mercury.

2. A brush for electrical apparatus having a face thereof provided with an amalgam including an alloy of silver and copper, said amalgam having an excess of mercury.

3. A brush for electrical apparatus having a face thereof provided with a recess filled with an amalgam having an excess of mercury.

4. A brush for electrical apparatus having a face thereof provided with a recess filled with an amalgam including an alloy of silver and copper, and a small amount of mercury in the amalgam.

5. In combination, a current collecting device, and a brush in contact therewith having the contacting face thereof provided with an amalgam having an excess of mercury adapted to form a mercury coating on said current collecting device.

6. In combination, a current collecting device, and a brush in contact therewith having the contacting face thereof provided with an amalgam including an alloy of silver and copper, and an excess of mercury in the amalgam adapted to form a mercury coating with traces of silver on said current collecting device.

7. In combination, a current collecting device, and a brush in contact therewith provided with a recess in the contacting face thereof, said recess being filled with an amalgam having an excess of mercury adapted to form a mercury coating on said current collecting device.

8. In combination, a current collecting device, and a brush in contact therewith provided with a recess in the contacting face thereof, said recess being filled with an amalgam including an alloy of silver and copper, and an excess of mercury in the amalgam adapted to form a mercury coating with traces of silver on said current collecting device.

In witness whereof, I have hereto set my hand.

FREDRICK S. MARCELLUS.