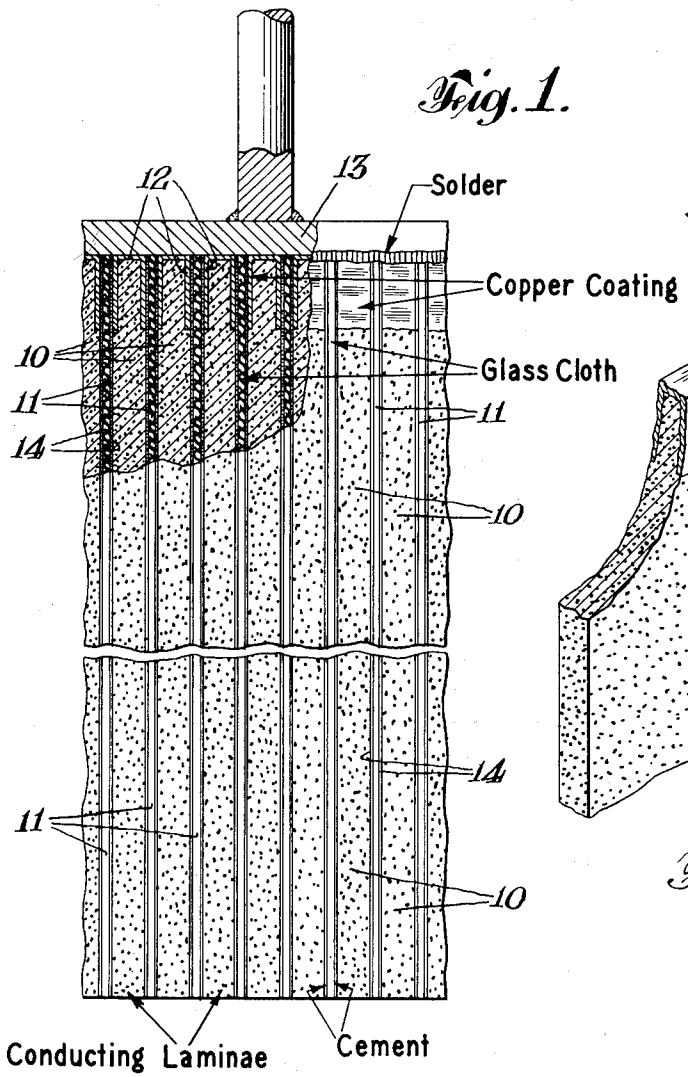
Feb. 27, 1951 D. RAMADANOFF 2,543,301

ELECTRICAL CONTACT BRUSH

Filed March 19, 1949

Fig. 1.



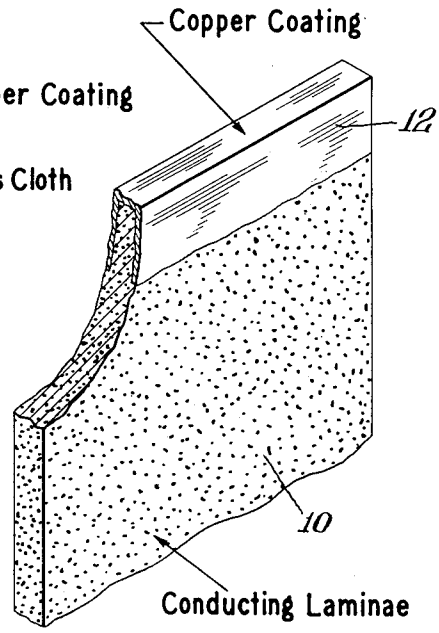


Fig. 2.

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ELECTRICAL CONTACT BRUSH

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7 Claims. (Cl. 171—325)

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This invention relates to improvements in electrical contact brushes and more particularly to brushes for use in electrical machines which operate under conditions conducive to the formation of undersirable films on the commutator or slip ring with which the brush makes sliding contact.

The surface of the commutator or slip ring of an electrical machine should be kept smooth and well polished so that proper contact between the brush and the surface can be maintained. Many factors affect adversely the condition and composition of this surface, some of the more common ones being smoke, vapors, corrosive gases and excessive sparking between the brush and the surface. Under the influence of any of these or similar factors the surface can become coated with a black, smutty film which acts as a high and erratic resistance. Since the contact drop is greatly increased by such a film, the machine's performance is impaired and its efficiency decreased.

Currents circulating from one segment of the commutator or slip ring to another are one of the causes of sparking. Laminated brushes in which the interstices run perpendicular to the direction of flow of these currents offer greater resistance to the circulating currents than do solid brushes and decrease sparking. Laminated brushes have been found helpful in retarding film formation when sparking is responsible for it.

Usually, however, the smutting of the surface of the commutator or slip ring is the result of the action of a combination of the factors mentioned above, and, under circumstances where it is impossible or impracticable to prevent the smutting, the deleterious film must be removed as it forms. A common practice with carbon brushes is to disperse an abrasive material throughout the brush. As the brush wears away, the abrasive particles in the brush face polish the surface. Often during the polishing process small bits of copper are picked up by the abrasive particles. These bits of copper and the abrasive particles cut grooves in the commutator or slip ring. To restore the smooth surface, the commutator or slip ring must be turned on a lathe to the depth of the deepest groove. Such machining is expensive and results in a waste of materials.

One object of the invention is to provide a brush that retards the formation of a deleterious film on the surface of a commutator or slip ring and at the same time removes such deleterious film as is formed.

Another object of the invention is to provide

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a brush that polishes the commutator or slip ring uniformly without cutting or grooving.

To accomplish the objects of the invention, glass cloth is placed between conducting laminae which run lengthwise of the brush and are in a plane perpendicular to the plane of rotation of the commutator or slip ring. The glass cloth has good insulating properties so the advantages of laminated brushes are obtained. Glass cloth has the further advantage of being abrasive and cleans the surface of the commutator or slip ring evenly over the entire width of the brush.

In many instances it is advantageous to have a low contact drop between the moving surface and the brush interface. This can be obtained by impregnating one or more laminae of the brush with a metal such as silver. The impregnation of the laminae can of course be accomplished by methods already known, the simplest perhaps being that of soaking the laminae in a silver nitrate solution and then heating the impregnated laminae to decompose the silver nitrate to metallic silver. Finely divided silver remains in the laminae.

A specific embodiment of the invention is represented by the accompanying drawing which shows a preferred brush structure within the invention.

In the drawing:

Fig. 1 is a side view, partly in section, of the brush of this invention as it would appear during the operation of the electrical machine when viewed perpendicular to the plane of rotation of a commutator or slip ring.

Fig. 2 is a perspective view, partly in section, of the upper end of one of the conducting laminae.

Carbon laminae 10 are coated on one end with copper 12. The copper is deposited electrolytically or by spraying on the carbon laminae and extends along the length of the laminae for about ¼". Glass cloth 11 is cut in strips having approximately the same length and width as the carbon laminae. Each of the carbon laminae 10 are coated with phenol formaldehyde cement 14, and the carbon laminae and the glass cloth strips are arranged alternately to form the brush. The carbon laminae and the glass cloth strips are pressed together. Care must be taken during the assembling of the brush to place all copper coated portions of the carbon laminae at the same end of the brush. The brush is baked at about 200° C. to harden the phenol formaldehyde cement 14. The brush is then attached to a copper terminal by soldering the copper coated

portions of the brush to the terminal 13, and the brush is ready for use.

The phenol formaldehyde cement was chosen because it can be applied in a liquid form and will harden when heated. Other thermosetting resins, as for example the alkyd or furfuryl resins, could be used as a cement.

The laminæ in the specific embodiment were made of carbon but any material from which brushes are usually constructed could be employed. Among those that would give satisfactory results are graphite and metal-graphite mixture. It is preferable to use the metal-graphite mixture for the construction of the laminæ if a low contact drop is desired. The size and number of the laminæ can be varied according to the requirements of each particular commutation problem. For some purposes it might be advantageous to have laminæ in the same brush that differ from each other in composition or size or both. Such a brush could be made within the scope of this invention.

The deposit of copper on the laminæ permits the soldering of the brush to the terminal. Other metals could be used and they could be deposited by methods other than electrodeposition. Any of the conventional means for obtaining contact between the brush and the terminal could be adopted without departing from the teachings of this invention.

A brush made according to this invention has the advantages of laminated brushes mentioned above. In addition the glass cloth is so disposed as to be capable of polishing the surface with which it is in sliding contact over the entire width of the brush. In practice, it has been found that the smutty film as well as small bits of copper are picked up by the glass cloth leaving the conducting laminæ free of contaminating materials. The bits of copper retained by the glass cloth do not have the tendency to cut the surface of the commutator or slip ring as do copper particles picked up by an abrasive material in the conducting medium.

A particular situation in which the brush of this invention has been found to give excellent results is in commutation in an atmosphere containing silicone vapors. The presence of such

vapors is conducive to the formation of an abrasive and unstable film which causes fluctuations in contact drop, sparking and rapid brush wear. Most of the brushes of the prior art do not remove the film satisfactorily. The brush of this invention removes the film evenly without appreciable increase in brush wear.

I claim:

1. An electrical contact brush comprising a plurality of laminæ consisting alternately of a conducting material and glass cloth.

2. An electrical contact brush comprising a plurality of laminæ consisting alternately of graphite and glass cloth.

3. An electrical contact brush comprising a plurality of laminæ consisting alternately of a metal-graphite mixture and glass cloth.

4. An electrical contact brush comprising a plurality of laminæ consisting alternately of silver impregnated carbon and glass cloth.

5. An electrical contact brush comprising a plurality of laminæ consisting alternately of conducting graphite plates and glass cloth, said glass cloth being bonded to said graphite plates with a thermo-setting resinous cement.

6. An electrical contact brush comprising a plurality of laminæ consisting alternately of conducting plates of a metal-graphite mixture and glass cloth, said glass cloth being bonded to said plates with a thermo-setting resinous cement.

7. An electrical contact brush comprising a plurality of laminæ consisting alternately of conducting carbon plates and glass cloth, said glass cloth being bonded to said carbon plates with a thermo-setting resinous cement, said carbon plates being impregnated with silver.

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