F. L. COOLEY.

COMMUTATOR BRUSH.

APPLICATION FILED JAN. 6, 1921.

1,396,948. Patented Nov. 15, 1921.

Fig. 1

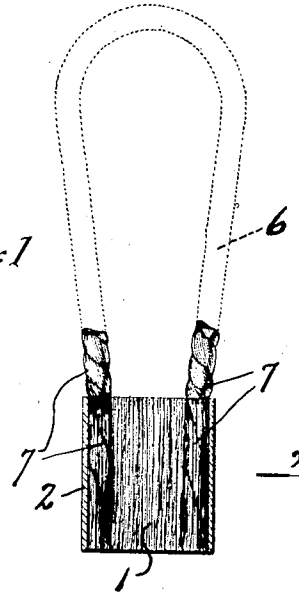


Fig. 2

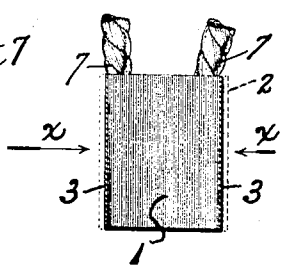


Fig. 3

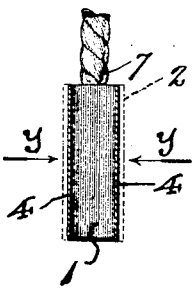


Fig. 4

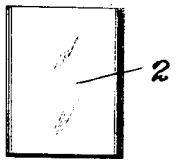


Fig. 5

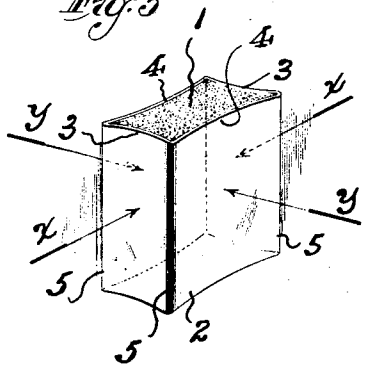
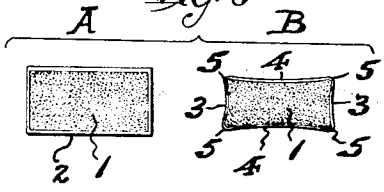


Fig. 6



INVENTOR

Frank L. Cooley,

BY

Fraser & Richards,

ATTORNEYS

UNITED STATES PATENT OFFICE.

FRANK L. COOLEY, OF BROOKLYN, NEW YORK.

COMMUTATOR-BRUSH.

1,396,948. Specification of Letters Patent. Patented Nov. 15, 1921.

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To all whom it may concern:

Be it known that I, FRANK L. COOLEY, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Commutator Brushes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

The present invention relates, generally, to improvements in commutator brushes for electric generators, motors and other electrical machines.

The invention has for its principal object to provide a novel construction of commutator brush adapted to provide the following advantages in use, to wit; (1) by reason of the disposition and arrangement of the materials making up the brush the same is rendered of greater density and consequently possesses a higher carrying capacity; (2) the novel construction of brush provides for lower resistance, less likelihood of cutting or maring the commutator surface upon which it is engaged; (3) the brush will not fray out like brushes made of wire cloth or gauze; (4) where pig-tails or shunts are used the same may have their attaching ends incorporated with the main body of the brush so as to become a part thereof, thus eliminating voltage drop and similar loss of efficiency as is the case where such elements are soldered or similarly connected with the brush body; (5) a brush constructed according to the principles of the present invention will long retain lubricants when the brush body is impregnated therewith at high temperature and allowed to cool; (6) the novel construction of brush made according to the present invention is provided with a casing, preferably made of material offering a higher resistance to conductivity whereby arcing is reduced to a minimum, said casing may be concaved or inwardly arched to reinforce the same to resist spreading of the brush-body, said casing also holding the brush body against warping or distortion so that the same may be prevented from binding in the holders provided for the same in use.

To the above described ends the novel brush comprises a body of metallic fibers or fine wires disposed in substantially longitudinal extension, the same being laterally compressed by pressure into a relatively homogeneous mass of desired contour, and then inclosed in a longitudinally enveloping casing of high resistance material, the sides of said casing being preferably inwardly arched to retain the brush body in its initial compressed state. Where pig-tails or shunts are employed, the ends of the same are disposed to extend longitudinally through the body of wire fibers upon the compression of which the said ends are both mechanically anchored to and electrically incorporated with the brush body as a part thereof, and thus eliminating the necessity of soldering, brazing or otherwise securing the same, so that electrical losses, such as voltage drops between the brush body and pig-tails or shunts are eliminated.

Other objects of the invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

With the various objects of the invention in view, the same consists, primarily, in the novel construction of commutator brush hereinafter set forth; and the invention also consists in the novel combination and relation of the material and parts making up the brush.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figure 1 is a vertical longitudinal section through a commutator brush made according to and embodying the principles of the present invention, and showing the connection of a pig-tail therewith. Fig. 2 and Fig. 3 are respectively a similar view and a transverse longitudinal section showing the method of applying pressure to the casing to arch the same inwardly to reinforce the same against spreading of the brush body.

Fig. 4 is a side elevation of the novel brush; Fig. 5 is a perspective view of the novel brush; and Figs. 6, A and B, are respectively end views of the brush body and

its casing before and after compression or inward arching of the casing.

Similar characters of reference are employed in all of the hereinabove described views, to indicate corresponding parts.

Referring now to said drawings, the reference character 1 indicates the mass of substantially longitudinally disposed or extending metallic strands or wire fibers, which comprise the main body of the novel brush. The metal of which said strands or fibers are composed may be selected from any desired species which possesses the property of low resistance to the conductivity of electric current, since the main body of the brush is designed to carry the load of the current delivered by or through the brush. Such metal may be copper, brass, bronze, etc. The mass of substantially longitudinally disposed or extending metallic strands or wire fibers 1 are arranged together and submitted to high compression by hydraulic pressure or pressure otherwise administered to thereby compact the mass together into a comparatively homogeneous body.

The reference character 2 indicates a tubular casing which extends longitudinally about the brush body 1, to inclose or envelop the faces and sides of the same, while leaving the ends thereof exposed. Said casing is preferably made of metal, selected from any desired species which possesses the property of comparatively high resistance to the conductivity of electric current. The casing is arranged so as to bound the outer cross-sectional periphery of the operative end of the brush body, when the same engages the commutator surface, and serves the purpose of choking off and preventing arcing between the operative end of the brush and the commutator. In order to securely hold the brush body in its compressed and compacted condition, the casing 2 is compressed to inwardly arch its faces and sides to thereby reinforce the same so as to adequately resist internal spreading or warping pressures to which the brush body may be subjected. To this end, by any suitable means, inwardly directed pressure is applied to the opposite sides of the casing, in the directions of the arrows x (see Figs. 2 and 5,) to thereby press or bow inwardly said sides to provide inwardly arched portions 3. In like manner, inwardly directed pressure is applied to the opposite faces of the casing, in the directions of the arrows y (see Figs. 3 and 5,) to thereby press or bow inwardly said faces to provide inwardly arched portions 4. The junctures of said respective arched portions 3 and 4 provide stiff corner ribs or beads 5, which add to the longitudinal rigidity of the incased brush body to stiffen the same against distortion. The metals best suited for the casing, may be lead, zinc, antimony alloys, aluminum, or the like. The brush being thus held, by the special form of casing above described, against distortion or spreading, is consequently free to move longitudinally through the brush holding boxes without danger of binding or sticking, thus eliminating one of the sources of trouble and annoyance commonly occurring with the ordinary types of brushes.

Since the longitudinally disposed metallic strands or wire fibers making up the brush body are free from transverse parts which tend to fray out, as is the case with brush bodies made up of wire cloth or gauze, consequently the novel brush makes a better contact with the commutator, and is less likely to cut, scratch or mar the surface of the commutator. It is also to be observed, that since the metallic strands of wire fibers 2 run all in one direction, a much more tightly compressed body may be produced therewith, which provides more effective conducting material and increases the carrying capacity of the brush. Before compressing the metallic strands or wire fibers making up the brush body, a lubricant may be introduced into the mass, which will be retained therein, and will serve to lightly lubricate the brush as it rides on the commutator and as it wears down in use.

When brushes having pig-tails 6 or similar connecting terminals are desired, the same may have their ends 7 embedded in the mass of metallic strands or wire fibers 1, and when the latter are compressed together, said ends 7 become incorporated with the body of the brush as a part thereof, since said ends preferably run through the entire length of the brush, thus not only firmly anchoring the pig-tail 6 to the brush but also connecting the same electrically therewith in such a manner as to prevent voltage drops or other loss of electrical efficiency in the passing of the current from brush body to pig-tail or other terminal. This latter feature is of considerable importance, and one which, it is believed, adds a very practical advantage to the brush construction.

I claim:—

1. A commutator brush comprising a main body composed of substantially longitudinally disposed metallic strands compressed together laterally to form a comparatively homogeneous mass, and a metallic casing surrounding the sides of said main body.

2. A commutator brush comprising a main body composed of substantially longitudinally disposed metallic strands compressed together laterally, and a metallic casing surrounding the sides of said main body, the walls of said casing being forced inwardly to provide reinforcing arched faces and sides adapted to maintain said main body in compressed condition.

3. A commutator brush comprising a main body composed of substantially longitudi-

nally disposed metallic strands compressed together laterally to form a comparatively homogeneous mass, said metallic strands possessing comparatively low electrical resistance, and a longitudinally tubular metallic casing surrounding said main body, said metallic casing possessing comparatively high electrical resistance.

4. A commutator brush comprising a main body composed of substantially longitudinally disposed metallic strands compressed together laterally, said metallic strands possessing comparatively low electrical resistance, and a longitudinal tubular metallic casing surrounding said main body, said metallic casing possessing comparatively high electrical resistance, the walls of said casing being forced inwardly to provide reinforcing arched faces and sides adapted to maintain said main body in compressed condition.

5. A commutator brush comprising a main body composed of substantially longitudinally disposed metallic strands impregnated with lubricating material and compressed together laterally to form a comparatively homogeneous mass, said metallic strands being made of comparatively good electric conducting material, and a longitudinal tubular metallic casing surrounding said main body.

6. A commutator brush comprising a main body composed of substantially longitudinally disposed metallic strands impregnated with lubricating material and compressed together laterally, said metallic strands being made of comparatively good electric conducting material, and a longitudinal tubular metallic casing surrounding said main body, the walls of said casing being forced inwardly to provide reinforcing arched faces and sides adapted to maintain said main body in compressed condition.

7. A commutator brush comprising a main body composed of substantially longitudinally disposed metallic strands, a terminal device having its attached end running longitudinally through the mass of metallic strands, said metallic strands and said attached end of said terminal device being compressed together laterally to form a comparatively homogeneous mass, and a longitudinal tubular metallic casing surrounding said main body.

8. A commutator brush comprising a main body composed of substantially longitudinally disposed metallic strands, a terminal device having its attached end running longitudinally through the mass of metallic strands, said metallic strands and said attached ends of said terminal device being compressed together laterally to form a comparatively homogeneous mass, and a longitudinal tubular metallic casing surrounding said main body, the walls of said casing being forced inwardly to provide reinforcing arched faces and sides adapted to maintain said main body in compressed condition.

9. A commutator brush comprising a main body composed of substantially longitudinally disposed metallic strands, a terminal device having its attached end running longitudinally through the mass of metallic strands, said metallic strands and said attached ends of said terminal device being compressed together laterally to form a comparatively homogeneous mass, said metallic strands and said terminal device being made of metal offering comparatively low resistance to electrical conductivity, and a longitudinal tubular metallic casing surrounding said main body, said casing being made of metal offering comparatively high resistance to electrical conductivity.

10. A commutator brush comprising a main body composed of substantially longitudinally disposed metallic strands, a terminal device having its attached end running longitudinally through the mass of metallic strands, said metallic strands and said attached ends of said terminal device being compressed together laterally to form a comparatively homogeneous mass, said metallic strands and said terminal device being made of metal offering comparatively low resistance to electrical conductivity, and a longitudinal tubular metallic casing surrounding said main body, said casing being made of metal offering comparatively high resistance to electrical conductivity, the walls of said casing being forced inwardly to provide reinforcing arched faces and sides adapted to maintain said main body in compressed condition.

11. A commutator brush comprising a main body composed of substantially longitudinally disposed metallic strands, a terminal device having its attached end running longitudinally through the mass of metallic strands, said metallic strands and said attached ends of said terminal device being compressed together laterally to form a comparatively homogeneous mass, said metallic strands and said terminal device being made of metal offering comparatively low resistance to electrical conductivity, said main body being impregnated with lubricating material, and a longitudinal tubular metallic casing surrounding said main body.

12. A commutator brush comprising a main body composed of substantially longitudinally disposed metallic strands, a terminal device having its attached end running longitudinally through the mass of metallic strands, said metallic strands and said attached ends of said terminal device being compressed together laterally to form a comparatively homogeneous mass, said metallic strands and said terminal device being made of metal offering comparatively low resistance to electrical conductivity, said main

body being impregnated with lubricating material, and a longitudinal tubular metallic casing surrounding said main body, the walls of said casing being forced inwardly to provide reinforcing arched faces and sides adapted to maintain said main body in compressed condition.

In testimony that I claim the invention set forth above I have hereunto set my hand this 3rd day of January, 1921.

FRANK L. COOLEY.

Witnesses:

GEORGE D. RICHARDS,

MARION M. BANTA.