Oct. 3, 1933. L. C. HOSFIELD 1,929,142

METHOD OF FORMING A BRUSH SHUNT CONNECTION

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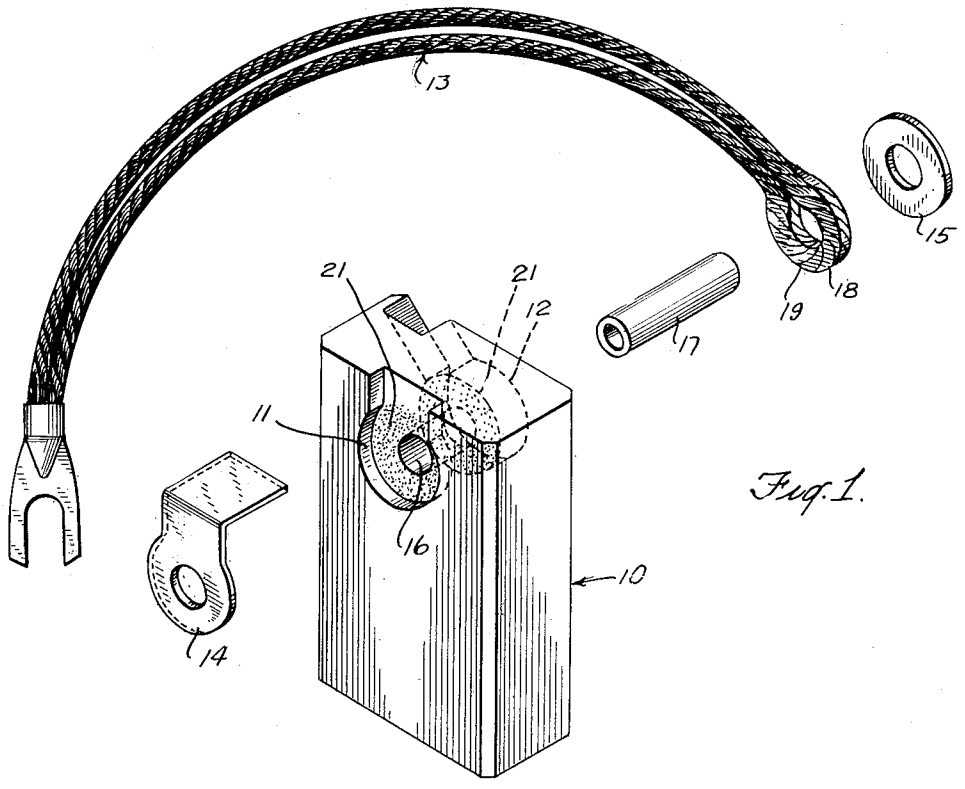


Fig. 1.

Fig. 3.

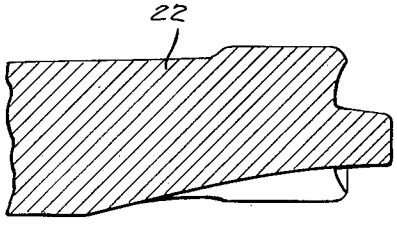
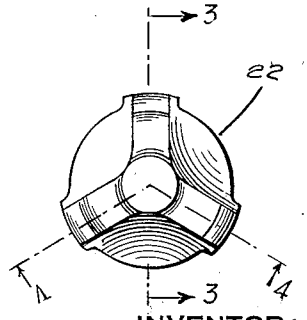


Fig. 2



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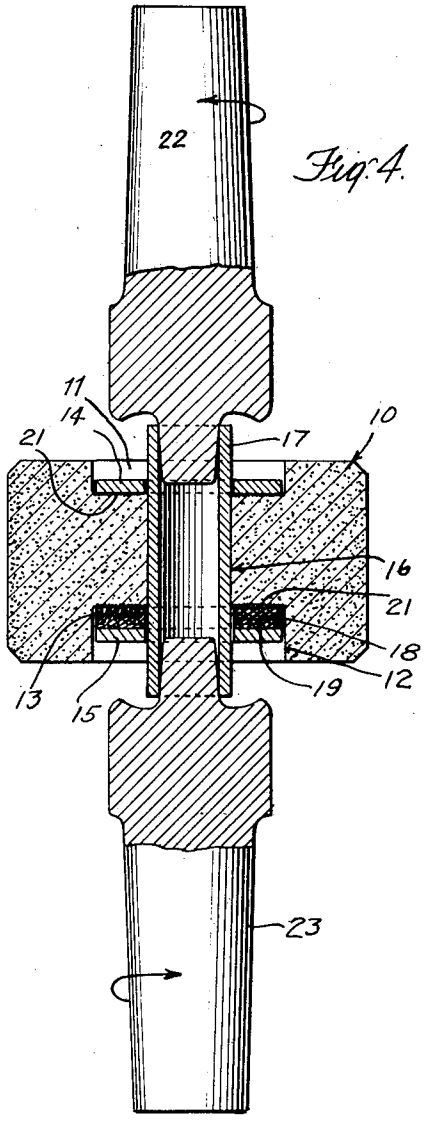


Fig. 4.

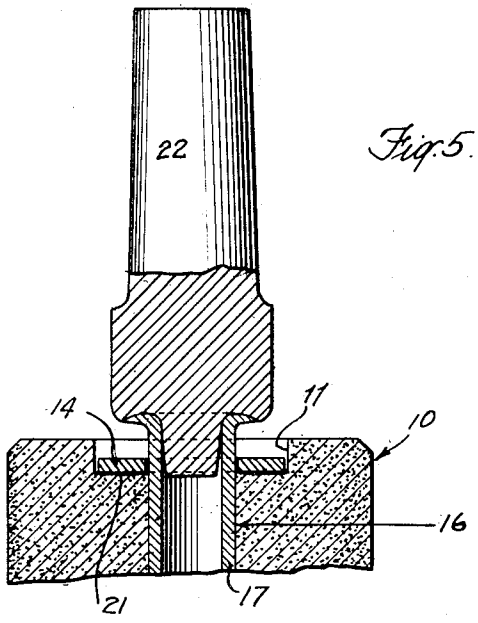


Fig. 5.

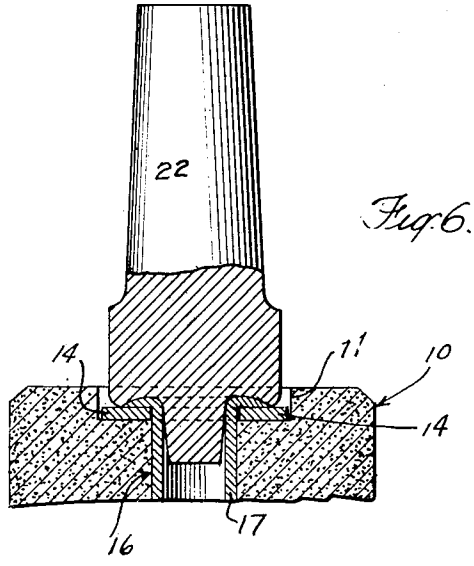


Fig. 6.

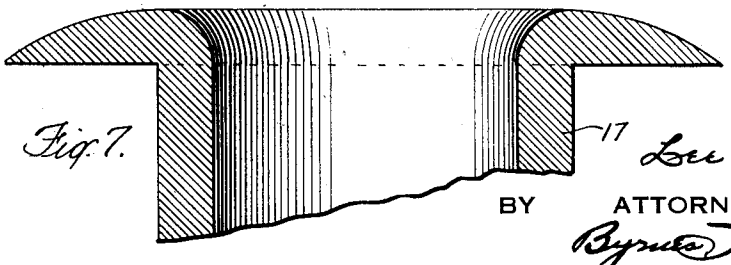


Fig. 7.

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UNITED STATES PATENT OFFICE

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METHOD OF FORMING A BRUSH SHUNT CONNECTION

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Application June 24, 1931. Serial No. 546,611

4 Claims. (Cl. 171—326)

This invention relates to brushes for electric machines and especially to a method of attaching a shunt to said brushes. An object of this invention is to secure better electric contact between the shunt cable and the brush body.

Another object of my invention is to provide additional mechanical strength to the rivet holding that connection to the brush.

A still further object of my invention is to provide an improved method of making a connection between the shunt cable and the body of the brush without the usual tinning operation.

These and other objects of my invention will be evident from the following specification having reference to the annexed drawings in which

Fig. 1 is an exploded view of the parts of a brush illustrating one embodiment of my invention.

Fig. 2 is an end view of a spinning tool.

Fig. 3 is a section of the spinning tool taken on the line 3—3 of Fig. 2.

Fig. 4 is a section showing the start of the spinning operation, the spinning tools being shown in a section taken on the line 4—4 of Fig. 2.

Figs. 5 and 6 are sectional views of one side of the brush showing the spinning operation in an intermediate stage and completed, and

Fig. 7 is an enlarged detail of one end of the spun rivet.

In Fig. 1 I show the parts from which the completed brush with its shunt connection are assembled. These comprise a brush body 10 provided with suitable recesses 11 and 12 for receiving a shunt 13 and washers 14 and 15. A hole 16 extends through the brush body to receive a tubular rivet 17. The shunt is provided with a loop 18 which is coated with solder as at 19. The brush body is coated with a suitable conducting material, as copper, at 21. This coating may be applied in any suitable manner as by spraying.

In assembling the brush and shunt connection, the rivet 17 is placed in the hole 16 and the loop 18 of the shunt is placed around the rivet. The washers 14 and 15 are then placed in position. The assembly is then placed between a pair of rotating spinning tips 22 and 23 which revolve in opposite directions. I have found speeds of from 900 to 1800 R. P. M. suitable, but prefer to use a speed of 1250 R. P. M. The spinning tips are then forced together, spinning the rivet over as shown in Figs. 5 and 6 to form a head of the shape shown in detail in Fig. 7. During this spinning operation it is unnecessary to support the brush except to the extent necessary to prevent its rotation. By using a pair of spinning tips the heads are formed of substantially equal size and no elaborate means for gaging are necessary.

The spinning tip is shown in detail in Figs. 2 and 3. While I have shown a tip having three spinning surfaces it is obvious that other forms may be used. The shape of the tip is such as to form a head of the shape shown in Fig. 7. This shape is very advantageous for several reasons. Heretofore, it has been the practice to form a head whose outer surface is an arc of a circle of which the brush surface is a chord. This shape does not permit the use of as thick a rivet as is possible when the rivet head is formed in the shape shown in Fig. 7. My improved shape is furthermore advantageous since the maximum thickness of metal and maximum strength is immediately above the outer wall of the rivet. The shear line coincides with this outer wall and consequently the improved shape of the spun head produces increased strength of the spun rivet with consequent greater permanent pressure in the assembled connection. This improved construction obviates the possibility of rupture of the spun heads such as has occurred in the past under severe conditions, especially with respect to vibration and expansion due to heating. Moreover, when it is desired to use a spring washer it is possible to use one of greater resiliency than has heretofore been possible with a riveted construction.

During the spinning operation heat is generated by friction to such an extent as to melt the solder on the loop on the shunt and this solder sweats the loop or eyelet to the copper coating 21 in the counterbore forming good electrical connection. Preferably the loop should also be soldered to the washer. Heretofore, it has been believed necessary to tin or solder the entire assembly after the rivet had been spun over. A flux was used which increased the corrosion of the auxiliary steel parts, such as the washers 14 and 15. Moreover, the heat of the dip soldering operation annealed and weakened the spun heads of the tubular copper rivets after they had been hardened by the spinning operation. In order to avoid the dip soldering operation it had been proposed to preheat the entire brush and connection and then solder with a soldering iron. This did not, however, avoid the disadvantages of the dip soldering method.

From the above it will be seen that I have provided a method of attaching a shunt to a brush

which dispenses with the tinning operation; which permits the use of a tubular rivet with thicker walls; which gives a spun-over head of improved shape permitting greater permanent pressures to be used; permitting the use, if desired, of spring washers; and which gives improved electrical contact.

I have shown a brush provided with counterbores since this is usually necessary because of the limited space available in the electric machine with which it is used. In case greater space were available the metallic deposit 21 could be applied directly to the surface of the brush. While I have shown only one cable it is obvious that a plurality may be employed and that in this case they might be disposed on both sides of the brush. In case cables were also disposed on the other side of the brush they should be beneath the washer 14 so that there would be no possibility of the spinning tip tearing the cables.

I claim:

1. Method of attaching a shunt to a brush which comprises providing a solder coated portion of the shunt, depositing conductive material around the hole in the brush, placing the solder coated portion of the shunt adjacent said deposited conductive material and spinning over an end of a rivet disposed in the hole and thereby generating sufficient heat to sweat the shunt to said deposited material.

2. Method of attaching a shunt connection to a brush which comprises applying solder to the shunt, placing the coated shunt adjacent a rivet and spinning the head of the rivet over with sufficient force to generate sufficient heat to melt the solder on the shunt.

3. Method of attaching a shunt to a brush having a hole extending therethrough which comprises applying solder to a shunt, applying a conductive coating to the brush adjacent the hole, placing a rivet in said hole with the shunt adjacent therethrough and deforming the rivet by spinning with sufficient force to generate sufficient heat to sweat said shunt to said conductive coating.

4. Method of attaching a shunt to a brush having a hole therein which comprises applying an easily fusible material to the loop in said shunt, depositing conductive metallic material adjacent said hole, placing a rivet in said hole with the loop of said shunt adjacent the end of said rivet and deforming the end of said rivet by spinning with a force sufficient to generate enough heat to sweat said loop to said conductive metal.

LEE C. HOSFIELD.