

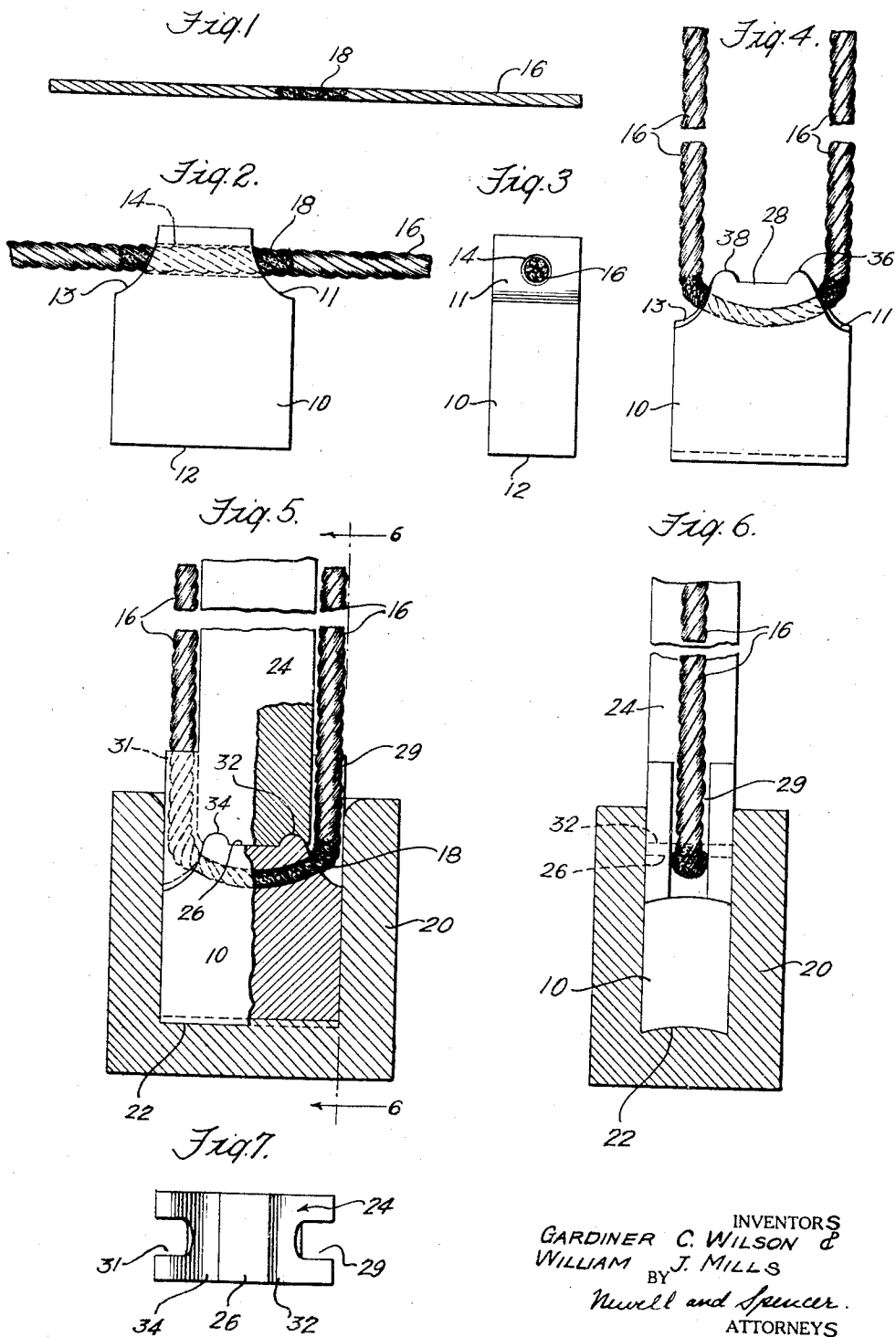
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BRUSH AND METHOD OF ATTACHING CONDUCTORS TO BRUSHES

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BRUSH AND METHOD OF ATTACHING CONDUCTORS TO BRUSHES.

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The present invention relates to a metallic brush having a conductor attached thereto and to a method of attaching a pigtail or flexible conductor to a brush, which is particularly adapted for use in starters for automobiles or electrical generators and similar apparatus.

It has heretofore been customary to finish or substantially finish a metallic brush and thereafter to attach the conductors or pig-tails thereto by a soldering operation. This method, however, is exceedingly cumbersome and expensive on account of the slow soldering operation involved.

We have discovered a method whereby the conductor or pigtail may be firmly attached to the brush and an excellent connection between the brush and the conductor may be attained at a greatly reduced cost. This method consists essentially in forming the brush to its approximate shape with a hole or aperture in the brush, inserting the conductor into the hole and then, by means of pressure, simultaneously giving the brush its desired form and securely fastening the conductor in place. By our method we are able to produce a brush to which the conductor is firmly attached both mechanically and electrically so that the electrical resistance between the brush and the conductor will be low and there will be little likelihood of the conductor becoming loose.

It is a primary object of the present invention to provide a method of forming a combined brush and conductor having a high electrical conductivity at the junction whereby a much longer life of the brush will be produced than has heretofore been attained.

Another object of the invention is to provide a metallic brush having a conductor attached thereto in such a manner that the tendency of the conductor to shear off at the junction of the conductor with the brush is substantially completely avoided.

Another object of the invention is to provide a method by means of which conductors or pigtails may be attached to metallic brushes and by means of which the brush may be brought to its final form in substantially a single stamping operation by

the application of pressure. The pressure is preferably applied by means of a suitable die so as to produce a flow of the metal of the brush into contact with the conductor, and a lateral flow thereof along the portion of contact of the conductor with the brush. The pressure is furthermore applied in such a manner as to produce an arc along the contacting portion of the conductor with the brush, having its lowest portion at substantially the vertical center line of the brush, as will be hereinafter explained.

With these and other objects in view the invention comprises the various features hereinafter more fully described and more particularly defined in the claims.

The preferred mode of carrying out our invention will be described in connection with the accompanying drawings in which—

Fig. 1 is a side view of a conductor or pigtail to be attached to a brush;

Fig. 2 is a view in elevation of a blank to which the conductor is to be attached, the conductor being shown passing through the opening in the blank;

Fig. 3 is a profile view of the blank and conductor shown in Fig. 2;

Fig. 4 is an elevational view similar to Fig. 2, illustrating the form of the brush and conductor after the stamping operation has taken place by means of which the conductor is fastened to the brush;

Fig. 5 is a view in elevation partly in section of a conductor and brush in a stamping press illustrating the manner of carrying out the stamping operation;

Fig. 6 is a view partly in section taken on the line 6—6 of Fig. 5; and

Fig. 7 is a plan view of the die employed in the stamping operation illustrated in Fig. 5.

The method of making a brush having a conductor or pigtail attached thereto consists essentially in first forming a blank to the approximate shape desired, with a hole or aperture passing transversely through the brush, preferably in a direction substantially parallel to the base thereof, as indicated in Fig. 2. The blank is preferably made so that the base 12 is substantially at right angles to the sides thereof (see Fig. 3)

and the upper portion of the blank is preferably reduced to a width so as to form substantially an isosceles trapezoid having the opening 14 in substantially the mid-portion of the trapezoid part of the blank in which the conductor is to be inserted. The sides of the trapezoid portion of the blank to which the pigtailed are to be attached may be conveniently made with curved faces 11, 13, as indicated in Fig. 2 of the drawings. After the blank has been prepared a suitable form of conductor 16 is inserted into the opening 14, and the brush is then ready for the stamping operation. By means of the form of blank above described, the metal thereof is more readily compressed by the application of pressure at its central portion whereby a spring seat 28 in the upper surface thereof is formed, and a lateral flow of metal of the brush takes place simultaneously with its movement into contact with the conductor, the lateral displacement of the metal taking place along the portion of contact between the conductor and the brush, whereby a juncture of the metals having a high electrical conductivity is obtained.

The blank of the brush may be made of any suitable composition such as copper plate or a copper alloy, but is preferably a metal graphite composition, such as copper to which a suitable proportion of graphite has been mixed, in order to attain the desired lubricating qualities in the brush.

The pigtail or conductor 16 is preferably coated with mercury before it is attached to the blank or brush. A coating of mercury, indicated at 18 in Figure 1, is preferably applied to the portion of the conductor which is to be in contact with the brush and may be applied to the pigtail in any suitable manner, as for example, by means of a mercuric sulphate solution containing a small amount of free acid. The solution may be readily applied to the pigtail by means of a brush, for example, or in any other suitable manner. After the mercury coating has been applied to the pigtail it is preferably dried in an oven in order to remove the excess of moisture. The conductor 16 is preferably inserted into the opening 14 in the blank so that the lengths of the projecting portions of the pigtail are substantially equal.

The blank having the conductor thus attached is thereafter placed in a suitable stamping press for the stamping operation, in the manner indicated more particularly in Fig. 5. A mold 20 in which the brush is placed has an upwardly curved base 22 (see Fig. 6) so as to give the desired form of base to the brush. Pressure is preferably applied in a downwardly direction on the top of the blank by means of a die 24. The form of die shown in Figs. 5, 6 and 7 has a flat base portion 26 extending in

a plane somewhat beyond the other parts of the die face, whereby a depressed central portion 28 will be attained in the top of the brush, forming a spring seat therein. In the side portions of the die 24 are openings or cut out portions 29, 31, through which the pigtailed project during the stamping operation. In the die face at the sides of the projecting portion 26 thereof are concaved portions 32, 34 indicated more particularly in Fig. 5 by means of which upwardly projecting portions 36, 38, are formed on the top face of the brush during the stamping operation, which serve partly as side walls to assist in the seating of a spring member whereby the brush is held in contact with the armature when in use.

The form of die employed serves to attain the desired amount of flow of metal from the central portion of the brush to the side portions of the top face thereof, whereby the portion of the pigtail which is in contact with the brush is formed substantially into an arc having the lowest portion thereof below the spring seat 28 or substantially in the vertical center line of the brush.

When the stamping operation on the brush is completed the side faces of the isosceles trapezoid portion from which the conductors or pigtailed extend are inclined at angles of substantially 45° with the base of the brush, and the pigtailed are turned upwardly from the base so as to be substantially perpendicular thereto. The angles formed between the pigtailed and the side faces of the brush are therefore large, so that the tendency of the pigtailed to shear off or to break at the points of connection to the brush is substantially entirely overcome.

It is to be understood that various changes or modifications may be made in the invention which has been described without departing from the spirit or scope thereof as defined in the claims.

Having thus described our invention, what we claim is—

1. A method of forming a metallic brush having a conductor connected thereto which comprises forming a metallic blank having an opening therein substantially parallel to the base of said blank, inserting a flexible conductor in said opening, inserting the said blank with the conductor therein into a stamping press and applying pressure to attain the desired form of the brush and to cause the metal of said brush to intimately contact with the said conductor and to be moved or transferred in a lateral direction from the central portion of the brush around said conductor whereby the said conductor is formed into an arc along the contacting portion of the conductor with the said brush.

2. A method of attaching a metallic conductor to a metallic brush which comprises forming an opening through the said brush in proximity to one end thereof, inserting a
5 metallic conductor in the said opening, applying pressure to the said brush to depress the central portion thereof and the sides thereof to a lesser degree than said central portion whereby the metal of said brush is
10 moved into intimate contact with the said conductor and the central portion of said conductor is depressed to a greater degree than the side portions thereof whereby an arc is formed along the said contacting
15 portion of said conductor with said brush.

3. A method of securing a conductor in a metallic brush which comprises forming an opening in said brush, inserting a conductor through the said opening so that the free
20 ends thereof form a pair of pigtails for the brush and depressing the upper portion of the said brush so as to form an arc along the contacting portion of said brush with said conductor whereby the ends of the said
25 pigtails will extend in an upward direction, thereby decreasing the tendency of said pigtails to shear at the junctions thereof with the said brush.

4. A method of forming a metallic brush
30 having a flexible conductor attached thereto which comprises forming a blank having an upper portion thereof reduced in width, forming a hole in the reduced portion, substantially parallel to the base of said
35 blank, inserting said flexible conductor in said hole and compressing the metal of the brush by means of a stamping block to attain an arcuate contact between the metal of the said brush and said conductor, and
40 forming simultaneously a spring seat at the top of the said brush and a concave contact surface at the bottom of the said brush.

5. A method of attaching a conductor to a metallic brush which comprises forming a
45 blank for said brush having a portion thereof to which a conductor is to be attached in a form approximating an isosceles trapezoid in order to attain the desired flow of metal in the directions of the sides thereof when
50 pressure is applied to its upper base, forming an opening in the trapezoid portion of the said brush substantially parallel to the base thereof, applying mercury to the portion of the conductor which is to be in contact with the metal of said brush, inserting
55 the said conductor into the said opening, and applying pressure by means of a stamping press to the upper surface of said brush in a direction toward the base thereof to attain the desired final form of said brush
60 and to depress the metal at the upper surface of said brush whereby intimate contact with the metal of said brush with said conductor is attained, and an arc along the
65 contact portion of said conductor with said

brush is formed having the lowest portion thereof substantially in the center line of the brush.

6. An article of manufacture comprising a brush of metallic moldable material having a concave base and an upper portion of
70 reduced width, pigtails attached to the brush at the reduced portion thereof, the metal of said brush being swaged into intimate contact with said pigtails, and a spring seat
75 in said upper portion between said pigtails.

7. An article of manufacture comprising a brush of metallic graphite composition having a mercury coated flexible conductor located in a hole therein, the material of
80 said brush being compressed around said conductor so as to break down the walls of said hole and firmly compact the materials thereof into intimate contact with substantially all portions of the surface of said
85 conductor throughout a material portion of its length in said hole, whereby intimate contact with the brush and a high electrical conductivity at the junction of the conductor and brush are attained.
90

8. A brush of moldable conducting material having a flexible conductor located in a hole therein, the material of said brush being compressed around said conductor so
95 as to break down the walls of said hole and firmly compact the material thereof into intimate contact with substantially all portions of the surface of said conductor throughout a material portion of its length
100 in said hole, said broken down hole and conductor having assumed an arcuate shape, whereby intimate contact between the surface of said conductor and brush and good electrical conductivity between the two is
105 attained.

9. A brush of moldable conducting material having a flexible conductor located in a hole therein formed transversely through a portion of said brush having a reduced
110 cross-section, the material of said brush having been compressed downwardly into a spring seat thereby forcing the material thereof around said conductor so as to break down the walls of said hole and firmly
115 compact the material thereof into intimate contact with the surface of said conductor throughout a material portion of its length in said hole and to cause said hole and conductor to assume an arcuate shape, whereby
120 intimate and compacted contact between the surface of said conductor and brush and good electrical conductivity between the two is attained.

10. The process of manufacturing a brush
125 which consists in forming a definite charge of carbon and metal into a slug, with a hole therein to receive a leader wire, inserting a leader wire in the slug, and submitting the slug to endwise pressure to clinch the
130 wire thereto and to contemporaneously

compress the slug into a predetermined form. edge of the slug to correspond to a predetermined curvature. 10

11. The process of manufacturing a brush which consists in forming a definite charge of carbon and metal into a slug having a hole therein, inserting a leader wire into said hole and submitting the slug to end-wise pressure to clutch the leader wire thereto and to contemporaneously shape the

Signed at St. Marys, EHk Co., Pa., this 24th day of October, 1924.

GARDINER C. WILSON.

Signed at Brielle, Monmouth Co., N. J., this 21st day of October, 1924.

WILLIAM J. MILLS.