

Oct. 28, 1924.

1,513,355

R. H. WARD

INTERCHANGEABLE ELECTRICAL CONNECTION FOR CARBON BRUSHES

Filed Jan. 17, 1923

Fig. 1

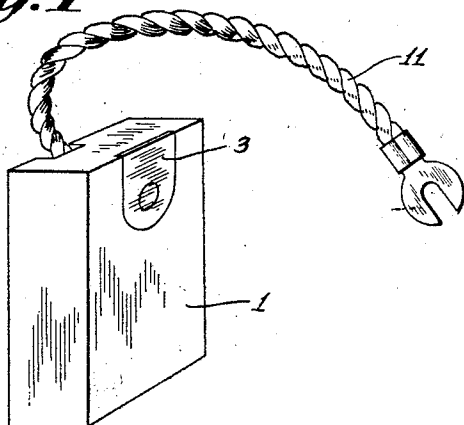


Fig. 2

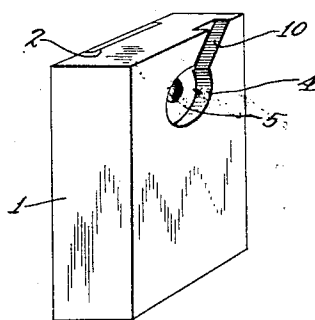


Fig. 4

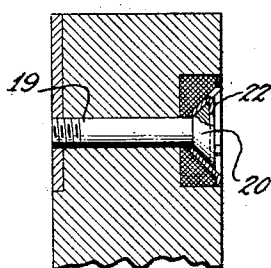


Fig. 3

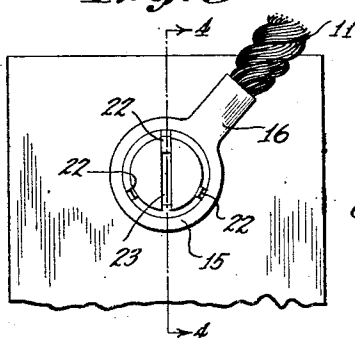


Fig. 5

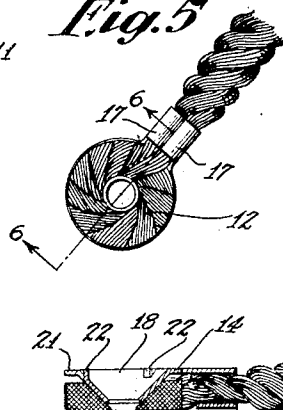


Fig. 7



Fig. 10

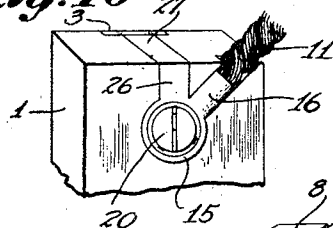


Fig. 6

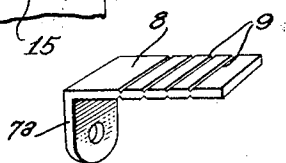


Fig. 9

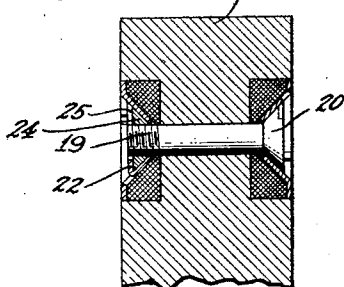


Fig. 8

INVENTOR.
Richard H. Ward
BY Jas. H. Griffin.
ATTORNEYS.

UNITED STATES PATENT OFFICE.

RICHARD H. WARD, OF QUEENS, NEW YORK.

INTERCHANGEABLE ELECTRICAL CONNECTION FOR CARBON BRUSHES.

Application filed January 17, 1923. Serial No. 613,124.

To all whom it may concern:

Be it known that I, RICHARD H. WARD, a citizen of the United States, residing at Queens, in the county of Queens and State of New York, have invented a certain new and useful Interchangeable Electrical Connection for Carbon Brushes, of which the following is a specification.

This invention relates to improvement in electrical connections for carbon brushes of dynamo electric machines, and is more particularly directed to an improved manner of associating a flexible metallic conductor with such brushes.

It is well known that electrical connections with carbon brushes must be such as to make the best possible electrical connection between the connector and brush in order to preclude undue resistance and increase the conductivity of the connection.

Many improvements have been made from time to time to insure better electrical connection between the flexible conductor and the brush and this invention is particularly directed for accomplishing this result in a simple, although more efficient manner than has heretofore been attained.

It has normally been the practice to chamber the brush to receive one end of the flexible connection and screws, bolts, rivets and other similar means have been employed to clamp such end of the conductor within the chamber in such manner that the conductor will be clamped tightly to the base of the chamber and at this point make a good electrical contact therewith.

The present invention goes further in that it contemplates the expanding of the end of the conductor within the chamber in such manner that it will not only form a good electrical contact with the base of the chamber, but will also form a similar contact with the side walls of such chamber, with the result that I obtain a greater conductive contact between the parts and thus reduce the resistance in the connection. Furthermore, the means for expanding and holding the end of the conductor within the chamber is forced into intimate contact throughout an extended surface with the conductor and serves to further increase the conductive engagement between the parts.

Another important feature of the invention resides in the fact that the connector of this invention is so constructed that its parts

may be assembled to form an interchangeable unit which is adapted to be brought into cooperative relation with the brush and readily and expeditiously associated therewith to secure the conductor to the brush until such time as it is desired to replace the brush by another brush whereupon the conductor may be readily removed from the old or worn brush and easily and expeditiously associated with the new brush.

In prior practice, conductors generally have been so associated with their cooperating brushes that when the brush is discarded for any reason, the conductor is so associated therewith that it must also be discarded.

The conductor of the present invention however may be successfully associated with many brushes and is such that it will cooperate with the successive brushes in the same efficient manner as it initially cooperated with the first brush. This feature of the invention enables the conductors to be completely prepared during their course of manufacture for association with any brush and no time need be lost at the time of securing the conductor to the brush in the preparation of such assembly.

Heretofore it has been usually necessary to prepare the conductor for cooperation with the brush at the time of securing the parts together.

A further feature of the invention resides in the provision of novel means for precluding the parts from working loose, so that when they are brought into assembled relation, they may be locked in this condition until manually released to permit of their detachment.

Features of the invention, other than those specified, will be apparent from the hereinafter detailed description and claims, when read in conjunction with the accompanying drawings.

The accompanying drawings illustrate different practical embodiments of the invention, but the constructions therein shown, are to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is a perspective view of a brush and flexible connection assembled in accordance with the present invention.

Figure 2 is a perspective view of the brush with the connection removed.

Figure 3 is a front elevation of the up-

per portion of the brush with the connection in place.

Figure 4 is a section on the line 4—4 of Figure 3.

Figure 5 shows the metallic conductor removed from the brush, but in a condition to be readily attached thereto.

Figure 6 is a section on the line 6—6 of Figure 5.

Figure 7 is a perspective view of an anchor plate employed in the construction.

Figure 8 is a perspective view of a modified form of anchor plate.

Figure 9 is a section corresponding to Figure 4, but showing a modified form of construction, and,

Figure 10 shows a still further modified construction.

Referring to the drawings, 1 designates a carbon brush of any well known conventional form. One end of the brush is recessed in its opposite faces, as shown in Figure 2, that is to say, one face is provided with a recess 2 to receive an anchor plate 3, while the other face is recessed as shown at 4 to receive one end of the flexible conductor. The recesses are connected by a hole or passage 5 leading directly through the brush.

The anchor plate 3 is shown in detail in Figure 7 as constituting a flat plate provided with a tapped hole 6 and the recess 2 is shaped to conform with the contour of the plate 3, so that when the plate is seated in the recess, its outer face will be flush with the outer face of the brush with the tapped hole 6 in alignment with the passage 5 leading through the brush. The type of anchor plates shown in Figures 1 to 6 is preferred, though, if desired, the upper edge of the anchor plate may have an extension formed integral therewith and adapted to extend over the upper end of the brush to constitute a hammer plate as is common in brush construction. Thus, in Figure 8, I have shown a modified form of attaching plate 7^a provided with such an extension 8 adapted to overlie the top of the brush and in order to adapt this plate for employment with brushes of various thicknesses, the plate is made considerably longer than is ordinarily required and at spaced intervals of its length is transversely scored or grooved as indicated at 9, so that after the plate has been placed in position on the brush, it may be broken off to the desired length at any of the grooves 9.

The recess 4 is, in the main, substantially cylindrical and at one side thereof is connected by a short channel 10 to the top of the brush, so that a flexible conductor 11 may be led through this channel 10 into the main recess 4 in such manner that it will lie wholly within the contour of the brush and obviate protuberances.

The flexible conductor employed is of conventional material embodying a large number of very fine wire strands twisted together to form a cable. Soft copper wire is employed so that the resulting cable is plastic in a high degree. That is to say, it may be readily bent or formed and will, when thus manipulated, maintain substantially the shaping into which it has been formed.

In practice, I so manipulate this flexible conductor 11 as to form an eye 12 at one end thereof and manipulate this eye in a die or press to impart thereto an outer contour which is substantially cylindrical and of substantially the same diameter as the diameter of the recess 4 in the brush. The opposite faces of the eye are made flat while the hole through the eye is, by the same manipulation, made of tapering configuration, all, as clearly shown in Figure 6. As a result of these operations, the conducting cable is provided at one end with a flat terminal having a cylindrical contour and a tapered hole therethrough. With this terminal is associated an expanding member 14 constructed of sheet metal. The expanding member has a main portion 15 which is circular and has a diameter substantially equal to the diameter of the depression 4, while at one side said member is provided with a laterally extending arm 16 integral with which are formed wings 17. The central portion of the part 15 of the expanding member is struck up to constitute a frustoconical portion 18, perforated at its center and the taper of this frustoconical portion is made the same as the taper of the hole in the terminal of the flexible cable. This having been accomplished, the frustoconical portion 18 of the expanding member is introduced into the tapered hole in the eye 12 and the wings 17 are thereupon bent to embrace the cable 11 adjacent the eye as shown in Figures 5 and 6 and to tightly clamp the expanding member to said cable with the parts in assembled relation shown best in Figures 5 and 6.

It will be noted particularly from Figure 6 that the expanding member extends into the tapered hole of the eye and forms a wedging engagement therewith, so that if force is applied to project the frustoconical member further into the eye, the eye will be caused to expand in a radial direction. The connection including the cable and expanding member is assembled as shown in Figures 5 and 6 and is maintained in this assembled relation in a condition ready to be associated with the conventional brush shown in Figures 1 and 2.

The parts are shipped in the manner described to the place where they are to be installed and there the terminal with the associated expanding member is slipped into the recess 4 of the brush with which they are to

be associated. The anchor plate 3 is associated with the recess 2 and a screw 19 provided with a tapering head 20 is passed through the perforation in the expanding member through the passage 5 in the brush and screwed into the tapped hole 6 of the anchor plate. As the screw is tightened, the tapered head thereof will wedge into the frustoconical portion 18 of the expanding member and draw said expanding member in the direction of the base of the recess 4, thereby causing the frustoconical portion 8 to be forced into the tapered hole of the terminal eye 12. A wedging action will be set up which will not only cause the inner face of the eye to tightly bear against the base of the recess 4, but will also cause the radial expansion of the eye for the purpose of forcing its outer circumference into tight engagement with the side wall of the recess. In other words, the frustoconical portion 18 of the expanding member will exert a force on the eye of the cable in a direction against the base of the recess and also against the side walls of the recess and by so doing will force the eye into intimate conformity with all parts of the recess 4 and positively insure proper electrical contact therewith.

Furthermore, a narrow flange 21, which extends around the base of the frustoconical portion and forms the outer margin of the part 15 will bear against the outer face of the eye. Accordingly, the eye will be in proper electrical contact not only with all surfaces of the recess 4, but also with the long tapering surface of the frustoconical member and with the inner face of the flange 21, so that every part of the surface of the eye will have close electrical contact either with the brush proper or with some metallic part having proper electrical contact with the brush proper. Accordingly, maximum current capacity in joints thus formed is assured and the resistance is minimized.

In order to preclude the screw 19 from working loose, this screw may be locked in position in the simple and efficient manner shown in Figures 3, 4 and 6. That is to say, small tongues 22 preferably, though not essentially, three in number, may be stamped up from the frustoconical portion so as to normally partake of parallel relation shown in Figure 6. These tongues are of a width substantially equal to the width of the slot 23 in the screw head, so that after the screw has been tightened and this slot moved into juxtaposition with one of these tongues, that particular tongue may be bent over as shown in Figures 3 and 4, so as to lie within the slot 23 and thus lock the screw against inadvertent rotation. When it is desired to remove the parts however, the tongue may be readily bent up and the screw removed. In this manner, I obtain a positive lock

without the employment of any extraneous means and insure the integrity of the parts, so that they cannot possibly inadvertently work loose under vibration. The parts will maintain their proper assembled relation until it is desired to dismantle them, for the purpose, for example, of replacing a new brush for one which has been worn down. In this event, it is only necessary to remove the screw and retract the assembled eyelet and expanding member together with the anchor plate and thereupon reassemble these parts on the new brush. It thus becomes apparent that the connector parts of this invention are efficiently interchangeable and that said parts may be used over and over with successive brushes. This obviates the necessity of providing new flexible conductors when installing new brushes.

The foregoing detailed description has dealt with the brushes which employ single connecting cables. However, the present invention is readily adaptable for use in brushes employing cables in pairs and in Figure 9 I have shown the manner in which the invention may be applied to a brush of this character.

In such a brush, both faces of the brush are provided with recesses 4 and cooperating channels 10, which are juxtaposed on the opposite sides of the brush. Anchor plates are dispensed with and a cable with a cooperating expanding member, as shown in Figures 5 and 6, is associated with each of these recesses. Then, instead of screwing the screw into an anchor plate, the screw is threaded into a tapered nut 24, which is seated in the expanding member opposite to the one through which the screw is passed. By tightening the screw, both the tapered screw head and tapered nut are simultaneously drawn toward one another, the nut performing the same function on its associated expanding member as the tapered screw head exerts upon its cooperating expanding member, so that the eyes of both cables are simultaneously expanded within their respective recesses. The nut 24 may be slotted as shown at 25, after the manner of the screw head so that it may be locked by one of the tongues 22 in the same manner as the screw head is locked. It will be apparent from the foregoing detailed description of the invention that I obtain proper electrical contact through expansion of an eye at the end of the flexible cable and at the same time by compression of the cable to effect proper contact at the opposite faces of the eye. By this construction, maximum surface contact is produced and the resistance due to improper contact is minimized.

In Figure 10, I have illustrated a further modified form of construction which differs from the construction of Figures 1-7 solely

in the fact that the expansion member 14 is provided with an upstanding portion 26, a portion 27 of which is bent so as to overlie the top of the brush 1 and constitute a hammer plate. The portion 27 is preferably received into a transverse channel in the top of the brush so that the exposed face of the part 27 will be flush with the top of the brush though this is not essential. The expansion member shown in Figure 10 may be stamped integral from a piece of sheet metal and constitute a one-piece construction.

In the accompanying drawings, the single cable 11 is shown as constituting the electrical conductor. I am aware however that a double cable may be employed in lieu of the single cable shown. Such a conductor may be formed by taking a length of cable substantially twice the length of the cable 11 shown in the drawings and doubling it upon itself and forming an eye corresponding to the eye 12 at the point where the cable is bent. The use of a double cable in lieu of a single cable is well known to the art and it is not considered necessary to illustrate the construction as the applicability of the present invention to such structure will be apparent to those skilled in the art. The foregoing detailed description sets forth the invention in some of its preferred forms, but the invention is to be understood as fully commensurate with the appended claims.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. An assembly of the character described embodying a brush provided in one of its faces with a circular recess, a flexible connection provided at one end with a circular apertured eye of less thickness than its outside diameter, and means for expanding said eye in a radial direction within the recess of the brush to insure tight contact between the periphery of the eye and side wall of the recess and to simultaneously secure the eye to the brush.

2. An assembly of the character described embodying a brush provided in one of its faces with a circular recess, a flexible connection provided at one end with a circular apertured eye of less thickness than its outside diameter, and means for forcing the eye to a seat in the base of the recess and for simultaneously radially expanding said eye to bring its periphery into tight engagement with the side wall of the recess.

3. An assembly of the character described embodying a brush provided in one of its faces with a substantially cylindrical recess, a flexible connection provided at one of its ends with a substantially cylindrical terminal of slightly less diameter than the diameter of the recess of less thickness than its

diameter, and means for forcing the terminal to a seat in the base of the recess and simultaneously radially expanding said terminal to bring its cylindrical periphery into tight engagement with the cylindrical wall of the recess.

4. An assembly of the character described embodying a brush provided with a substantially cylindrical recess, a flexible connection provided with a substantially cylindrical terminal having a tapering aperture therethrough, said terminal being of less thickness than its outside diameter, a frustoconical member projecting into the tapering opening in the terminal, and means for forcing the frustoconical member into said tapering opening for the purpose of forcing the terminal to a tight seat in the base of the recess and to simultaneously expand the terminal in a radial direction to bring the cylindrical periphery of said terminal into tight engagement with the cylindrical wall of the recess.

5. An assembly of the character described embodying a brush provided with a substantially cylindrical recess, a flexible connection provided with a substantially cylindrical terminal having a tapering aperture therethrough, a frustoconical member projecting into the tapering opening in the terminal, means for forcing the frustoconical member into said tapering opening for the purpose of forcing the terminal to a tight seat in the base of the recess and to simultaneously expand the terminal in a radial direction to bring the cylindrical periphery of said terminal into tight engagement with the cylindrical wall of the recess, and means associated with the frustoconical member and operating independently of the forcing means for tightly gripping the flexible connection.

6. An assembly of the character described embodying a brush provided with a recess, and a passage leading from the base of the recess through the brush, a flexible connection provided at one end with an apertured terminal adapted to be positioned in the recess, a frustoconical member projecting into the aperture of the terminal, a clamping member extending through the frustoconical member through the aperture of the terminal and through the brush and cooperating with means at the opposite side of the brush for drawing the frustoconical member into the aperture of the terminal to force the terminal to a tight seat within the recess and to simultaneously radially expand said terminal to cause its periphery to tightly engage the side wall of the recess.

7. An assembly of the character described embodying a brush provided with a recess, and a passage leading from the base of the recess through the brush, a flexible connection provided at one end with an apertured

terminal adapted to be positioned in the recess, a frustoconical member projecting into the aperture of the terminal, a clamping member extending through the frustoconical member through the aperture of the terminal and through the brush and cooperating with means at the opposite side of the brush for drawing the frustoconical member into the aperture of the terminal to force the terminal to a tight seat within the recess and to simultaneously radially expand said terminal to cause its periphery to tightly engage the side wall of the recess, and means associated with the frustoconical member for locking the clamping member against inadvertent loosening.

8. An assembly of the character described embodying a brush, one face of which is provided with a substantially cylindrical recess from the base of which a passage leads through the brush to a recess at the opposite side of the brush, a current conductor provided with a substantially cylindrical terminal having a central tapered opening, a frustoconical member associated with said opening and extending thereinto, and an anchoring member having a conical head seated in the frustoconical member and extending through the passage in the brush to the opposite side of said brush, and means at the opposite side of said brush and associated with the recess therein for exerting a pull on the clamping member to force the frustoconical member into the opening of a terminal to seat the terminal in the base of the cylindrical recess to simultaneously radially expand said terminal against the cylindrical walls of said recess.

9. An assembly of the character described embodying a brush provided in at least one of its faces with a recess, an electrical conductor provided with a terminal having a contour corresponding to the shape of the recess and of a thickness less than its width, and means for expanding said terminal within the recess to bring the terminal into tight engagement with the walls of the recess.

10. An assembly of the character described embodying a brush provided in at least one of its faces with a recess, an electrical conductor provided with a terminal of the same shape as the recess, and provided with a tapering aperture in said terminal, an expanding member comprising a frustoconical portion projecting into the tapering recess of the terminal and having associated therewith means for tightly gripping the electrical conductor adjacent the terminal for normally maintaining the expanding member in associated relation with the terminal, whereby the terminal with its associated expanding member may be simultaneously brought into cooperative relation with the recess of the brush, and means for forcing the frusto-

conical portion of the expanding member into the opening in the terminal while the terminal occupies the recess in the brush for the purpose of forcing the terminal to a tight seat in the recess and simultaneously expanding said terminal in a radial direction into engagement with the walls of said recess.

11. An assembly of the character described embodying a brush provided in at least one of its faces with a recess, an electrical conductor provided with a terminal of the same shape as the recess, and provided with a tapering aperture in said terminal, an expanding member comprising a frustoconical portion projecting into the tapering recess of the terminal and having associated therewith means for tightly gripping the electrical conductor adjacent the terminal for normally maintaining the expanding member in associated relation with the terminal, whereby the terminal with its associated expanding member may be simultaneously brought into cooperative relation with the recess of the brush, and means for forcing the frustoconical portion of the expanding member into the opening in the terminal while the terminal occupies the recess in the brush for the purpose of forcing the terminal to a tight seat in the recess and simultaneously expanding said terminal in a radial direction into engagement with the walls of said recess, and a hammer plate integral with said expanding member and adapted to expand and overlie the top of the brush.

12. A connector of the character described embodying an electrical conductor provided at one end with a substantially flat faced cylindrical terminal provided with a central tapering opening extending therethrough, and an expanding member embodying a frustoconical portion projecting into the tapering opening of the terminal and means for tightly gripping the electrical conductor adjacent the terminal to maintain the expanding member in assembled relation with respect to the terminal.

13. A connector of the character described embodying an electrical conductor provided at one end with a substantially flat faced cylindrical terminal provided with a central tapering opening extending therethrough, and an expanding member embodying a sheet metal plate having a lateral extension provided with wings embracing and gripping the electrical conductor adjacent the terminal, said plate being provided with a depressed frustoconical portion extending into the opening in the terminal.

14. A connector of the character described embodying an electrical conductor provided at one end with a substantially flat faced cylindrical terminal provided with a central tapering opening extending therethrough, an expanding member embodying a sheet metal

plate having a lateral extension provided with wings embracing and gripping the electrical conductor adjacent the terminal, said plate being provided with a depressed frustoconical portion extending into the opening in the terminal, and a tongue associated with said frustoconical depression and adapted to

be bent over to engage with the slot of a bolt or bolt or screw head positioned within the frustoconical portion. 10

In testimony whereof I have signed the foregoing specification.

RICHARD H. WARD.