

R. G. LE TOURNEAU
SLIP RING CONSTRUCTION

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FIG. 1.

FIG. 2.

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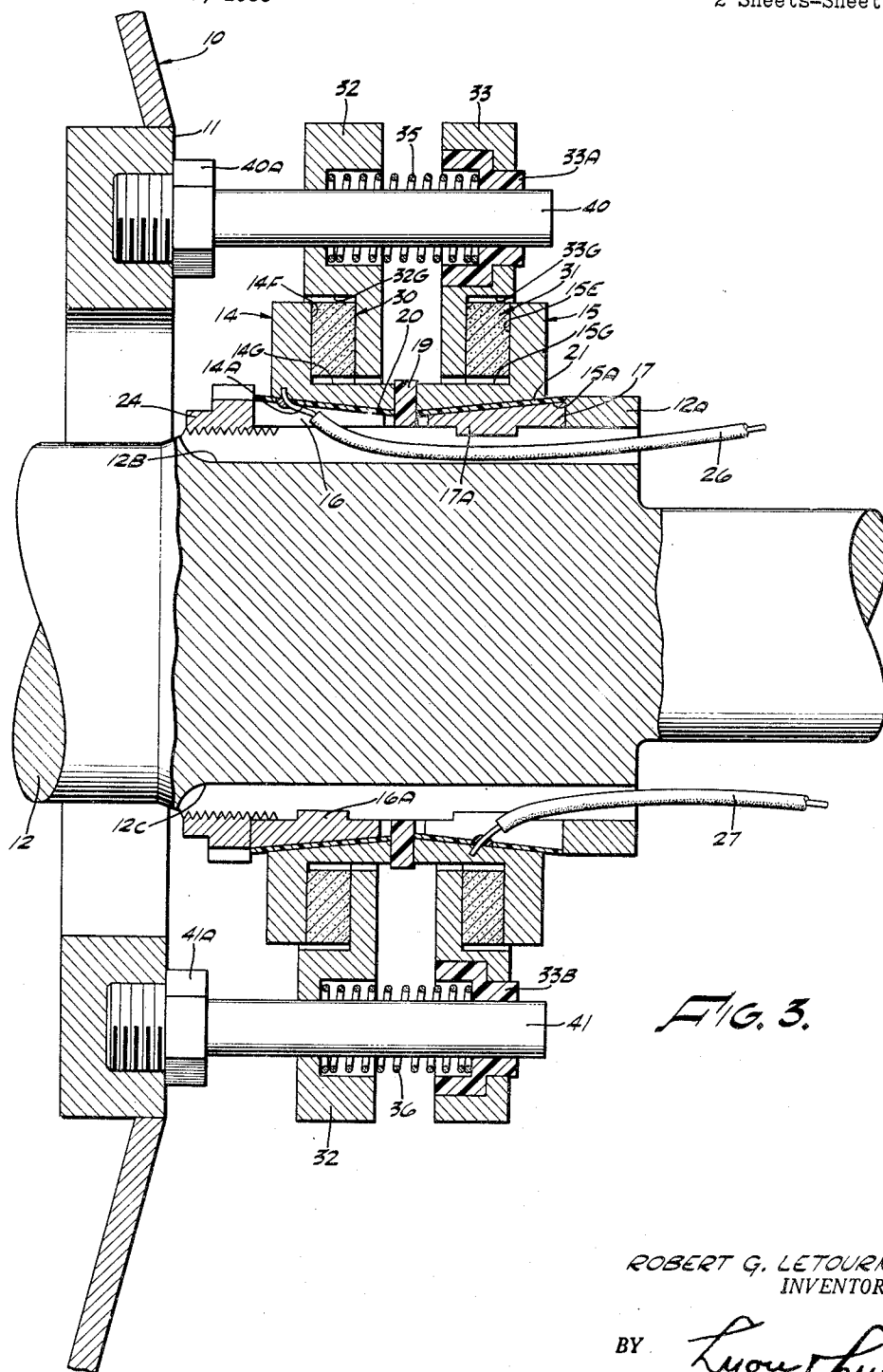


FIG. 3.

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SLIP RING CONSTRUCTION

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3 Claims. (Cl. 310—232)

The present invention relates generally to means and techniques for connecting an external electrical circuit with rotor windings of a dynamoelectric machine, and more specifically, to a slip ring construction for use in a machine of this character. In general, the slip ring construction as disclosed herein constitutes an improvement in radial face slip ring constructions of the character disclosed and claimed in United States Letters Patent of Robert G. Le Tourneau et al., No. 2,623,188.

Briefly, the present invention involves an arrangement wherein the electrical contact element disposed between a rotating element and a stationary element has its motion limited using a novel construction, to prevent such contact element from rotating with the rotating element. By this expedient, the contact element or so-called brush has less wear and thus lasts longer than in previous arrangements of this type. Further, the present arrangement contemplates a novel holder for the contact element or brush, such holder being conveniently disassembled to allow convenient access to the brush or contact element.

It is, therefore, a general object of the present invention to provide an improved slip ring construction of this character.

A specific object of the present invention is to provide an improved slip ring construction which involves a brush or contact element that is permitted to move through only a limited arc so that such brush or contact element may not continuously rotate about the axis of the rotor shaft.

Another specific object of the present invention is to provide an improved construction of this character in which the brush or contact elements are permitted to move a limited radial distance while yet confined to move through a limited arc, such arc having as its center a point on the axis of the rotor shaft.

Another specific object of the present invention is to provide an improved construction of this character which allows uneven supports on the brush or contact element to wear off, but yet prevents excessive wear of such brush or contact element.

Another specific object of the present invention is to provide an improved construction of this character wherein the brush or contact elements may be conveniently replaced.

Another specific object of the present invention is to provide a construction of this character wherein the brush or contact element holder comprises two complementary sections which may be easily and conveniently separated to gain access to the brush or contact elements which are housed by such sections.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. This invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may be best understood by reference to the following description

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taken in connection with the accompanying drawings in which:

Figure 1 is a view in side elevation of a slip ring construction embodying features of the present invention;

Figure 2 is an irregular sectional view taken generally on the line 2—2 of Figure 1;

Figure 3 is a longitudinal sectional view taken generally as indicated by the line 3—3 in Figure 1.

The drawings show a dynamoelectric machine 10 which has a stationary frame member 11 and rotatable shaft 12, such shaft 12 being journaled for rotation in conventional bearings (not shown) suitably mounted in the frame member 11.

A pair of radial face slip rings 14 and 15 are mounted on the rotor shaft 12 for rotation therewith by various means and particularly by the construction which is now described in the following paragraphs.

The slip rings 14 and 15 are each of identical structure, but they are mounted in a complementary manner and insulated from each other.

Each slip ring 14, 15 is ring-shaped but each has a substantially L-shaped cross-section as shown in Figure 3 with, however, the inner walls 14A and 15A thereof, respectively, tapered for suitable cooperation with the tapered sleeves 16 and 17, respectively. A washer 19 of insulating material is disclosed between the slip rings 14, 15 and engages the same to maintain the slip rings in spaced relationship in conjunction with the tapered sleeves 16 and 17. An annular strip 20 of insulating material is disposed between, on the one hand, the slip ring 14 and on the other hand the tapered sleeve 16 to thereby insulate the slip ring 14 from the sleeve 16. Likewise, for the same purpose, a strip of insulating material 21 is disposed between the slip ring 15 and the threaded sleeve 17 to insulate the slip ring 15 from the tapered sleeve 17.

The shaft 12 is provided with a shoulder 12A against which the tapered sleeve 17 abuts. The other tapered sleeve 16 is engaged by the nut 24 which is threaded on the shaft 12.

The shaft 12 is provided with two axially extending grooves 12B, 12C which are disposed 180° apart to accommodate the rotor leads 26 and 27, respectively, the conductor of lead 26 being electrically connected to the slip ring 14, while similarly the conductor of lead 27 is electrically connected to the other slip ring 15.

From the foregoing description, it should be clear that when the nut 24 is tightened, the tapered sleeves 16 and 17 serve to lock the slip rings 14 and 15 in place with the insulated washer 19 squeezed therebetween. By these means, the slip rings, as well as the tapered sleeves 16 and 17, are mounted on the shaft 12 for rotation therewith. In order to assure further rotation of the sleeves 16 and 17 with the shaft 12, there is provided inwardly extending extensions 16A and 17A on the sleeves 16 and 17, respectively, such extension 16A cooperating with the walls defining the shaft groove 12C, while similarly the extension 17A cooperates with the walls defining the shaft groove 12B.

The radial face 14F of the slip ring 14 is electrically engaged by a two-piece contact element or brush which has the general reference numeral 30. Likewise, the radial face 15F of the slip ring 15 is engaged by an identical two-piece contact element or brush having the general reference numeral 31.

Each of these two-piece brushes 30 and 31 is housed, and nonrotatively maintained in a corresponding two-piece brush housing 32 and 33, respectively, in accordance with important features of the present invention.

Each housing 32 and 33 is of identical construction with the exception that the housing 33 includes two annular

shouldered inserts 33A and 33B which form a seat for one end of a prestressed compression spring 35 and 36, respectively. The other end of spring 35 abuts a recessed portion of the housing 32; and, likewise, the other end of spring 36 abuts a spaced annular recessed portion of housing 32.

In order to prevent rotation of the housings 32 and 33, a pair of threaded shafts 40 and 41 pass through aligned circular apertures in the housings 32 and 33, both of these shafts 40 and 41 being threaded in the machine frame 11 which is, of course, stationary with respect to the rotating shaft 12. The shaft 40 passes through the coil spring 35 and is provided with a hexagon-headed shoulder 40A, so that the same may be conveniently removed and replaced. Likewise, the shaft 41 passes through the coil spring 36 and is provided with the hexagon-headed shoulder 41A.

Since the housing for the brush 31 is essentially the same as the housing for brush 30, the following description of the housing for brush 31 suffices as a description for the housing for brush 30. Referring to Figure 2, the housing 33 comprises a pair of complementary semicircular members 33C and 33D which are bolted together by a pair of bolts 45 and 46. Such bolts 45 and 46 pass through an apertured portion of flat plates 48 and 49, respectively, each of which extends inwardly, in accordance with an important feature of the present invention, to act as a stop member for engagement with the brush elements 31A and 31B which, when considered together comprise the aforementioned brush 31.

The plates 48 and 49 thus prevent complete rotative movement of the brush elements 31A and 31B, but since the brush elements 31A and 31B, each extend less than 180°, such brush elements 31A and 31B are allowed some relatively small limited angular movement. Such limited amount of movement is desirable so as to allow the brush elements to adjust themselves and wear off any high spots.

Some radial movement of the brush elements 31A and 31B is considered desirable and for that reason, as shown in Figure 3, the axial width of the brush elements is somewhat less than the distance defined between, on the one hand, the circumferentially disposed face 15G of the slip ring 15 and, on the other hand, the circumferentially disposed face 33G of the housing 33. Thus, each of the brush elements 31A, 31B (as well as corresponding brush elements 30A and 30B) is free to move a limited amount both in the axial direction as well as in the circumferential direction for purposes of allowing the brush elements to adjust themselves and to wear off high spots.

The housing 32 is provided with a binding post 50 to which the lead 51 is connected. Likewise, the brush housing 33 is provided with the binding post 54 to which the lead 55 is connected.

The aforementioned plates 48 and 49 which may be considered to be inserts or stop members are preferably of corrosion resistant material such as brass and these are maintained in position by the bolts or cap screws 45 and 46.

These elements 48 and 49, as mentioned above, limit the rotative movement of the brush elements. Without these stop members 48 and 49 the brush elements would rotate, and cause considerable wear on the brush holders, particularly if such brush holders were made of material such as aluminum. With the brush elements relatively stationary with respect to the brush holders, the wear on the brush holders is reduced considerably, and since the slip rings 14 and 15 are of brass, these slip rings do not wear to an objectionable amount.

Besides reducing the wear on the brush holders, the present arrangement allows quick and convenient replacement of the brush elements. It is observed that such brush elements may be replaced without removing the slip rings. As a matter of fact, such brush elements

may be removed and replaced simply by removing the threaded shafts 40 and 41 and by removing the cap screws 45 and 46 in the case of brush elements 31A and 31B (and in the case of brush elements 30A and 30B, the cap screws 55 and 56 are removed).

It is obvious that the rotor winding which is connected to the leads 26 and 27, may be mounted on the shaft 12 using any one of well known techniques and means; and further, that an abutment for the tapered sleeve 17 may take other forms than the particular form of a shoulder 12A on the rotor shaft 12.

While the particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. A slip ring arrangement for dynamo electric machines including a rotor shaft, comprising: a pair of radial face slip rings supported on the shaft, a pair of brush holders spaced from said slip rings, semicircular wearable brushes disposed between said slip rings and said brush holders, common means operating between the brush holders to urge said brushes into contact with said slip rings, each of said brush holders including a pair of complementary elements, means disposed between said complementary elements and engageable with said brushes to limit rotative movement of the same, and quickly releasable means for fastening said complementary elements together.

2. A slip ring arrangement for dynamo electric machines including a rotor shaft, comprising: a pair of radial face slip rings spaced apart longitudinally on the shaft, a pair of generally circular brush holders surrounding the shaft between the slip rings, semicircular wearable brushes disposed between each adjacent slip ring and brush holder, means between said brush holders to cause forcible engagement of said brushes and slip rings, said means comprising circumferentially spaced compression springs, each of said brush holders including a pair of complementary elements, means disposed between said elements for engaging said brushes to limit circumferential movement of the same, and quickly releasable means for maintaining said complementary elements together.

3. A slip ring arrangement for dynamo electric machines including a rotor shaft and rotor windings, comprising: a radial face slip ring supported on the shaft, a brush holder spaced from said slip ring, brush means between said slip ring and said brush holder, said brush means contacting said slip ring throughout a major portion of said radial face, said brush holder comprising a pair of complementary elements, a plate disposed between said elements, means releasably fastening said complementary elements and said plate as a unit, said brush means comprising a pair of arcuate brush elements, said plate extending between said brush elements and engaging the same to prevent rotative movement of said brush elements with respect to said brush holder.

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