July 30, 1940. H. G. JUNGK 2,209,335

COLLECTOR RING FOR DYNAMO-ELECTRIC MACHINES

Filed March 21, 1939

Fig. 1.

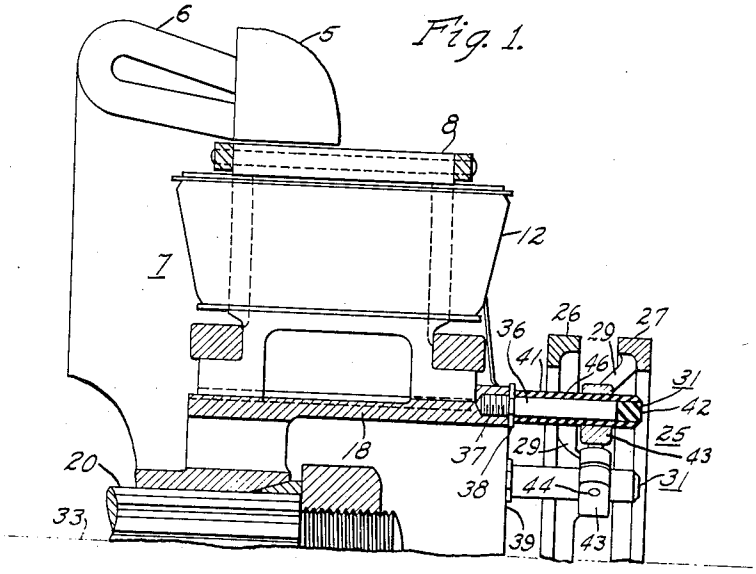


Fig. 2.

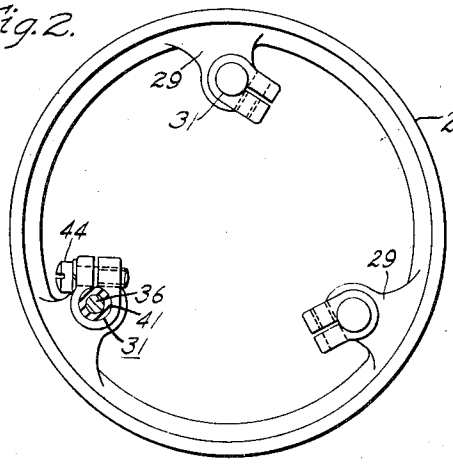


Fig. 3.

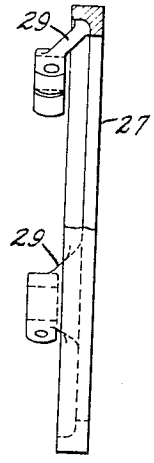
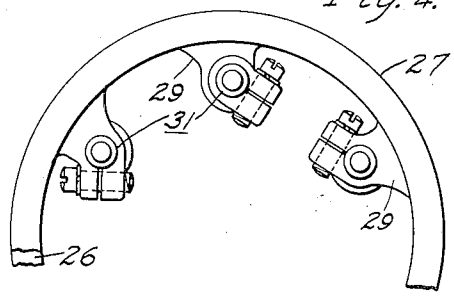


Fig. 4.



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COLLECTOR RING FOR DYNAMO-ELECTRIC MACHINES

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Application March 21, 1939, Serial No. 263,161

2 Claims. (Cl. 171—322)

My invention relates to a collector-ring assembly for a dynamo-electric machine, and it has particular relation to a high-voltage collector-ring assembly for a high-frequency synchronous generator which is designed for use on an airplane, where space and weight requirements are at a premium. More particularly, my invention relates to a collector-ring assembly which is designed for high voltage and low current, which means that the current-collecting equipment for both the positive and negative terminals can have a narrow width, in an axial direction, which makes it possible to obtain a design having a minimum weight.

Since 1902, it has been common to mount collector rings by means of inwardly extending supporting arms carried by the inner side of the ring and terminating in abutment-pieces which are insulatedly bolted within insulated annular grooves which are provided in the side of the rotor-member of a dynamo-electric machine, as shown in a Siegfried Patent 702,599, granted June 17, 1902. For a long period of years since then, the essential idea of this Siegfried construction has constituted the inspiration and pattern of subsequent designs, with only minor variations, all of which retained the idea of bolts for clamping the supporting-arms to the annular groove, as shown by a Mills Patent 1,378,049, granted May 17, 1921, and a McCarty Patent 1,404,871, granted January 31, 1922. While the advantages of a high-voltage, low-current excitation-system, as a means for reducing weight and cost, has been obvious, the designs heretofore have contented themselves with heavily insulating the annular grooves within which the ring-supporting arms were bolted, as shown in the above-mentioned patents.

According to my present invention, I depart from this construction, which has been standard in the prior art, by providing a construction in which the ring-supporting arms are not clamped against the side of the rotor-member of the dynamo-electric machine, but are supported near the ends of sturdy, insulated supporting-pins which are large enough to have lateral stiffness. These supporting-pins, according to my invention, are screwed into the side of the rotor-member, with an insulating sleeve over them, so that a long, effective surface-creepage distance is provided along the surface of the insulated pins along the space which is provided between the ring-supporting arms and the body-portion of the rotor-member. This construction, at one and the same time, provides a greater creepage-distance, and a lighter-weight construction, avoiding the massive insulation which was required in the early designs.

With the foregoing and other objects in view, my invention consists in the collector-ring structures, mountings and assemblies hereinafter described and claimed and illustrated in the accompanying drawing, wherein:

Figure 1 is a fragmentary longitudinal sectional view of the dynamo-electric machine embodying my invention.

Figs. 2 and 3 are end and side elevational views, respectively, of one of the collector-rings, and

Fig. 4 is a fragmentary end-view showing a collector-ring assembly consisting of two collector-rings as shown in Fig. 1.

In Figure 1, my invention is illustrated as being applied to a high-frequency synchronous generator for auxiliary power purposes on an airplane. This generator comprises a stator member 6 having an alternating-current winding 6, and a rotor-member 7 having a large number of salient pole-pieces 8 which are provided with exciting windings 12, the pole-pieces being mounted on a spider 13 which is directly mounted on the shaft 20 of a gasoline engine or other prime mover (not shown). The details of the particular rotor-member construction which is shown in Fig. 1 constitutes the subject matter of my pending application Serial No. 263,160, filed March 21, 1939.

The novel collector-ring assembly of my present invention is illustrated, at 25 in Fig. 1, as being assembled at a side or end of the spider member 13 of the rotor-member 7. In the illustrated form of embodiment of my invention, I utilize two collector-rings 26 and 27, which are identical with each other, except that one ring is mounted with one of its sides toward the rotor-member, and the other ring is mounted with its other side toward the rotor-member. Each ring 26 or 27 consists of a ring-member proper, which is made of L-shaped cross-section, as shown in Fig. 1, in order to achieve a construction having a minimum weight, and also in order to provide right-angled flanges within the angle of which are disposed three equally spaced supporting-arms or lugs 29, which extend both inwardly and laterally with respect to the ring-portions proper.

Each of the ring-supporting lugs 29 is supported on a separate insulated supporting-pin 31. Since there are two rings 26 and 27, and each ring has three supporting-lugs 29, there are six insulated supporting-pins 31, and these sup-

porting-pins are rigidly mounted on the side of the rotor-member 7, at the end of the rotor-supporting spider 18, so that the six insulated pins 31 stand out from the end of the rotor-member in directions which are substantially parallel to the axis 33 of the rotor-member, the insulated pins 31 being preferably equally spaced from each other and being all disposed in the surface of a common imaginary cylinder.

Each insulated supporting-pin 31 consists of a heavy steel pin 36 which is threaded, for a distance, at one end, as shown at 37, the threaded end 37 being separated from the main portion of the pin 36 by means of an integral flange in the form of a nut 38 or shoulder which is of sufficient size to make a firm abutment against the flat or plane end-surface 39 of the rotor-spider 18, so that the pin 36 stands out rigidly from the end of the spider, without any wabbling or bending. The main portion of the steel pin 36 is enclosed within a mica tube 41, or tube of other insulated material, which extends out beyond the free end of the metal pin 36, and this extending portion of the mica tube 41 is filled with a plug 42 of a suitable insulating material such as a molded phenolic condensation product.

The insulated steel supporting-pins 31, thus formed, are each engaged, at a point close to the free end of the steel core 36, by a separate clamping-member 43 which is carried by the end of one of the three supporting-lugs 29 of one of the collector-rings 26 or 27, as shown in Fig. 1. The other collector-ring 27 is mounted with its three supporting lugs 27 extending inwardly toward the rotor-member 7, with their clamping-members 43 respectively clamped onto the remaining three insulated pins 31 at points near the free ends of the metal cores 36 of the pins, as illustrated in Fig. 1. Each clamping-member is split for ready assembly on its pin 31, and the split ends are drawn together by a bolt 44.

It will be observed that the supporting-spider 18 of the rotor-member 7 is of conducting material. In the particular embodiment of my invention illustrated in the drawing, I have made no effort to cover the surface of this hub portion 18 of the rotor-member with insulating material.

It will be noted that the clamping members 43, which secure the ring-supporting lugs 29 to the respective insulated pins 31, are disposed on said supporting pins at points which are well spaced from the rotor-member 7, or from the supporting-spider or hub 18 thereof, so that the surface-creepage path from one collector-ring 26 to the other ring 27 includes, in each case, two insulated surfaces 46 of two adjacent supporting-pins 31. This creepage-path, along which current might leak from one high-voltage collector-ring to the other, may be traced as extending, from the clamping-member 43 which is shown in cross-section in Fig. 1, along the major portion of the insulated surface 46 of the supporting pin 31, along the free space from the clamping-member 43 to the flange 38 which engages the metal spider 18. The metal of the spider 18 then conducts the leakage-current freely around to, say, the next insulated supporting pin 31 on either side of the supporting pin 31 which was taken as the starting-point of the leakage-path being traced. The leakage-path then continues out, along the corresponding creepage-surface 46 of this other supporting-pin, until it reaches the corresponding supporting-clamp 43 which is in electrical contact with the other collector-ring.

It will thus be seen that my insulation between the two high-voltage collector-rings 26 and 27 is provided by linear creepage-paths extending axially along the outer surface of the insulating tubes 41 which encase the metal supporting-pins 36, as distinguished from the older forms of insulation which were utilized in the prior-art constructions. As a result of my novel mounting-arrangement, I achieve much greater surface-creepage distances, along the insulation, than was obtainable heretofore, and I also achieve a construction having the lightest possible weight of parts, thus achieving the main objects of my invention.

While I have described my invention in a single preferred form of embodiment, I wish it to be understood that many changes, by way of substitutions, additions and omissions, can be made by those skilled in the art without departing from the essential spirit of my invention. I desire, therefore, that the appended claims shall be accorded the broadest construction consistent with their language and the prior art.

I claim as my invention:

1. In a current-collecting device, a collector-ring assembly for mounting on the side of a conducting rotor-member, comprising a plurality of collector rings, each collector ring having a plurality of inwardly extending supporting-lugs, and a separate, rigid, insulated supporting-pin for each supporting-lug of each collector ring, said supporting-pins being mounted on said side of the rotor-member so as to stand out therefrom in directions substantially parallel to the axis of the rotor-member and in positions spaced from each other, said supporting-lugs being all secured to their respective supporting-pins at points well spaced from said rotor member so that there is a considerable length of insulated supporting-pin interposed between the back surface of each lug and the front surface of the rotor-member, whereby the surface-creepage path from one ring to another includes, in each case, two insulated surfaces of two supporting-pins along the aforesaid spaces between the respective supporting-lugs and the rotor member.

2. In a current-collecting device, a collector-ring assembly for mounting on the side of a conducting rotor-member, comprising a plurality of collector rings, each collector ring having a plurality of inwardly extending supporting-lugs, and a separate, rigid insulated supporting-pin for each supporting-lug of each collector ring, said supporting-pins being mounted on said side of the rotor-member so as to stand out therefrom in directions substantially parallel to the axis of the rotor-member and in positions spaced from each other, each supporting-lug terminating in a split clamping member the ends of which are bolted together around its associated insulated supporting-pin at a point near the end of the latter, said clamping points being well spaced from said rotor member so that the surface-creepage path from one ring to another includes, in each case, two insulated surfaces of two supporting-pins along the aforesaid spaces between the respective supporting-lugs and the rotor member.

HERBERT G. JUNGK.