United States Patent [19]

Heil et al.

[11] **3,908,265**

[45] **Sept. 30, 1975**

[54] **METHOD OF MAKING COMMUTATOR STRUCTURE FOR THE ROTOR OF A DYNAMO-ELECTRIC MACHINE**

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[22] Filed: **Feb. 26, 1974**

[21] Appl. No.: **445,956**

Related U.S. Application Data

[62] Division of Ser. No. 259,572, June 5, 1972, abandoned.

[30] **Foreign Application Priority Data**

June 15, 1971 Switzerland 8683/71

[52] **U.S. Cl.** **29/597;** 310/42; 310/43; 310/235; 310/236

[51] **Int. Cl.²** **H01R 43/06**

[58] **Field of Search** ..... 29/597, 205 CM; 310/233, 310/235, 236, 42, 43, 45

[56] **References Cited**

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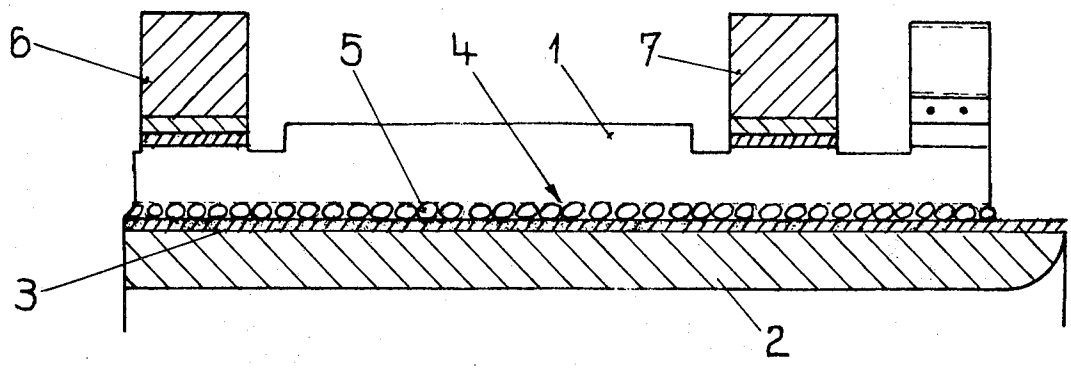
Primary Examiner—Carl E. Hall

Attorney, Agent, or Firm—Pierce, Scheffler & Parker

[57] **ABSTRACT**

A commutator structure for use on the rotor of a dynamo-electric machine includes a cylindric assembly of commutator segments held together by shrink rings. The commutator segment assembly is mounted on a cylindric support part such as a bush or the rotor shaft itself, there being established between the commutator segment assembly and support part an annulus with an elastic layer. Preferably the elastic layer is constituted by absorbant material such as fiber glass impregnated with a thermo-setting synthetic resin.

6 Claims, 3 Drawing Figures



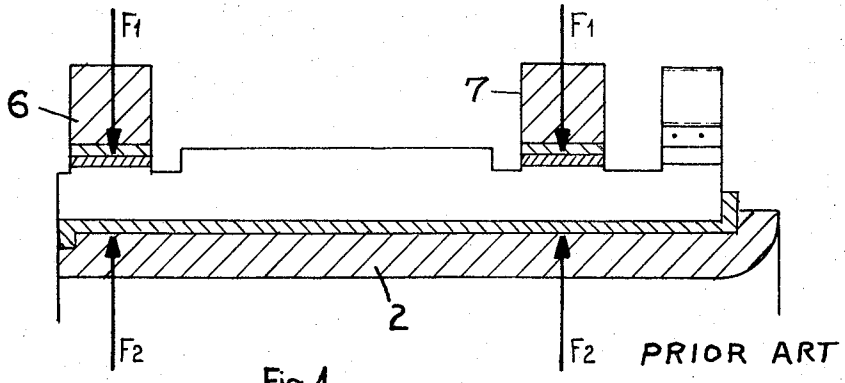


Fig.1

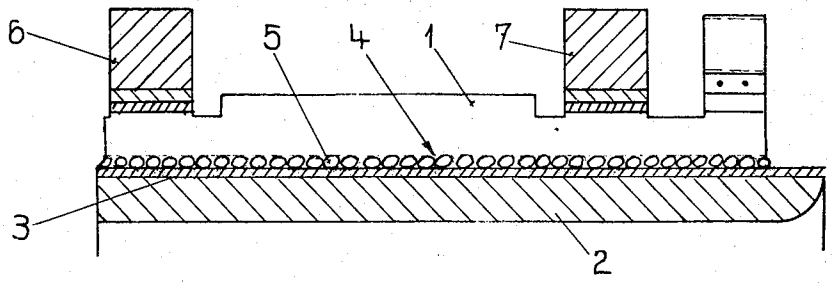


Fig.2

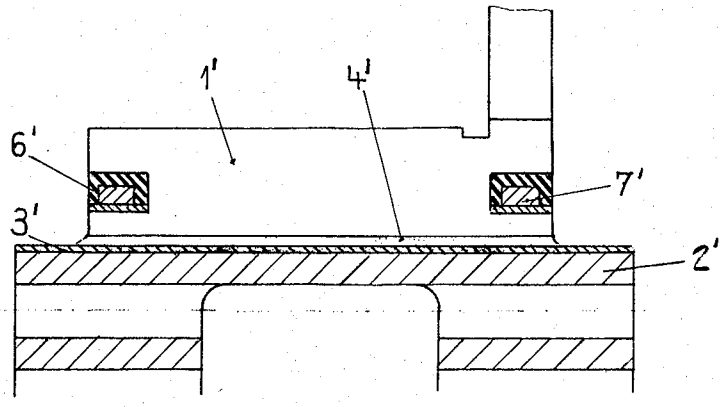


Fig.3

METHOD OF MAKING COMMUTATOR STRUCTURE FOR THE ROTOR OF A DYNAMO-ELECTRIC MACHINE

This is a division of application Ser. No. **259,572** filed June **5, 1972** now abandoned.

The present invention relates to a commutator component for the rotor of a dynamo-electric machine which is of improved construction, and also to an improved method for securing the commutator to the part on which it is supported.

It is already known to secure a cylindric assembly of commutator segments onto the supporting part — which latter may be an insulated metallic bush or an insulated part of the rotor shaft itself — by means of shrink rings which engage the cylindric assembly. The shrink rings perform not only the function of holding the commutator segments together but also serve to establish an arch pressure intended to prevent individual commutator segments from moving radially outward while the rotor is in operation as a result of the centrifugal forces acting upon them. However, the known arrangements of this type have not been found satisfactory for use on rotors operating at high speeds. Moreover, in an embodiment utilizing an insulated bush, the latter must be precision-machined which adds to the overall costs of production.

The principal objective of this invention is to provide an improved structure which does not suffer from these disadvantages and in which the individual commutator segments are prevented from shifting radially outward regardless of the speed at which the commutator-equipped rotor operates.

The improved mode of connection between the cylindric commutator segment assembly and the part on which it is supported, bush or shaft, is principally characterized by the use of an elastic layer intermediate the commutator segment assembly and support part, the elastic layer preferably being a plastic, more specifically a thermosetting synthetic resin which is heat hardened following introduction into an annulus of absorbant material between the commutator segment assembly and the support part and which is impregnated by the resin. The absorbant material is preferably glass fiber either in the form of a fabric or mat or helically wound-on glass fiber cord.

An advantageous method of producing the improved commutator structure as combined with its support part is to first secure the commutator segments of the cylindric assembly together by means of the shrink rings, then bring the cylindric assembly into position on the bush or shaft, as the case may be, and then fill the annulus between the two with the elastic material, which secures the commutator segment assembly to the supporting part. The elastic material may be applied directly into the annulus, or the annulus may be first provided with a filling of an absorbant material, e.g. fiber glass which is then impregnated with thermosetting synthetic resin and thereafter heat-hardened. Preferably, the absorbant material to receive the thermo-setting resin is applied to the supporting part for the cylindric commutator segment assembly before the latter is placed into position on the supporting part.

The foregoing as well as other objects and advantages of the invention will become more apparent from the following detailed description of two embodiments thereof and the accompanying drawings wherein:

FIG. **1** is a longitudinal section through a part of a conventionally mounted cylindric commutator segment assembly;

FIG. **2** is also a longitudinal section illustrating one mode of mounting the commutator segment assembly on its cylindrical support in accordance with the invention; and

FIG. **3** is a view similar to FIG. **2** illustrating another mode of mounting the commutator segment assembly on its cylindrical support according to the invention.

With reference now to the drawings and to FIG. **1** in particular, the conventional commutator structure there depicted, and as to which the present invention constitutes a marked improvement, includes a metallic bush **2** having thereon a sleeve **3** of insulating material on which the cylindric assembly of commutator segments **1** is secured by means of axially spaced shrink rings **6** and **7**. As previously indicated, the arch pressure created by the shrink rings is designed to prevent individual segments **1** from shifting radially outward while the rotor of the dynamo-electric machine on which the bush **2** is mounted is rotating. However, the radially inward force **F1** created by the shrink rings **6,7** is partially reduced by a counter-acting centrifugal force **F2** acting upon each of the commutator segments. As a consequence, the mode of mounting the commutator segment assembly depicted in FIG. **1** is not suitable for operation of the rotor at high speeds. Moreover, the insulated bush **2** must be precision-machined.

These disadvantages are overcome by use of the improved construction according to the invention as depicted in FIGS. **2** and **3**, respectively. In FIG. **2**, the bush **2** is provided with an insulating sleeve **3** which includes a glass fiber fabric and/or mica, and located between sleeve **3** and the inner circumference of the cylindric assembly of commutator segments **1** is an elastic layer **4** having a thickness of from **1** to **3** mm. and preferably between **1.5** and **2.0** mm. The intermediate layer **4** consists essentially of absorbent glass fiber mat or, as illustrated, an absorbant glass fiber cord **5** which is wound helically on the insulating sleeve **3** with the adjacent turns close to each other, the glass fiber mat or cord, as the case may be, being impregnated with an elastic material, preferably any of the well known thermosetting synthetic resins.

The preferred mode of procedure to produce the improved commutator structure depicted in FIG. **2** is to first mount the cylindric assembly of commutator segments, held together by the axially spaced shrink rings **6, 7** —with an intermediate insulating ring being provided to electrically isolate the rings from the commutator segments, — on the assembly of bush **2,** absorbant insulating sleeve **3** and absorbant layer **5.** The annulus thus formed by the absorbant insulating sleeve **3** and absorbant layer **5** between the outer surface of bush **2** and inner surface of the commutator segment assembly **1** is then completely impregnated with the thermosetting synthetic resin and heat-hardened. The synthetic resin impregnated annulus between bush **2** and commutator segment assembly **1** forms a sufficiently elastic intermediate layer and also cements the layer to the bush **2** and commutator segment assembly **1.** Moreover, since the connecting surface areas between the intermediate layer and the bush and commutator segment assembly, respectively are relatively large, the shearing stress appearing at the connecting surfaces is relatively low.

FIG. 3 illustrates a slightly different embodiment wherein the cylindric assembly of commutator segments 1' is mounted directly on the rotor shaft 2' itself rather than on a separate bush as in FIG. 2. The shrink rings 6' and 7' do not engage the exterior surface of the commutator segment assembly 1' as in FIG. 2 but rather are seated in annular recesses formed at the opposite ends of the assembly and properly electrically insulated from the assembly. The surface of shaft 2' carries the insulating sleeve 3', and the cylindric commutator segment assembly 1', which may have an inner diameter of about 200 mm, for example, is centered about the sleeve 3' with an annular gap of about 2 mm, for example, between the sleeve and segment assembly, which is thereafter filled with a thermosetting synthetic resin which is then heat hardened to establish the desired intermediate elastic layer 4'.

The provision of the elastic layer 4 or 4' intermediate the commutator segment assembly and mounting part, bush 2 or shaft 2' eliminates any possible net reduction in the arch pressure produced by the shrink rings. With practically the same expenditure of working material, one thus obtains a better technical product and at a lower production cost than has heretofore been possible.

We claim:

1. The method of producing and mounting a commutator structure for a dynamo-electric machine on a cylindric support part thereof which comprises the steps of:

assembling the commutator segments in a cylindric array,

applying shrink rings to said cylindric array of commutator segments to secure them together and establish a predetermined arch pressure thereon,

bringing said cylindric array of commutator segments into position over said cylindric support part, the inner diameter of said cylindric array of commutator segments being greater than the outer diameter of said support part thereby to establish an annulus therebetween,

filling said annulus with an elastic insulating material comprising glass fibers impregnated with a thermoset synthetic resin, and

cementing said elastic insulating material to the inner periphery of said shrink ring secured commutator segment array and to the periphery of said cylindric support part, the elasticity of said insulating material which fills said annulus serving to prevent any possible reduction in the arch pressure produced by said shrink rings.

2. The method as defined in claim 1 of producing and mounting a commutator structure for a dynamo-electric machine wherein said cylindric support part includes a metallic bush having a sleeve of electrical insulating material thereon which is cemented to said elastic insulating material.

3. The method as defined in claim 2 of producing and mounting a commutator structure for a dynamo-electric machine on a cylindrical support part thereof wherein said sleeve of insulating material includes a glass fiber fabric.

4. The method as defined in claim 2 of producing and mounting a commutator structure for a dynamo-electric machine on a cylindrical support part thereof wherein said sleeve of insulating material includes mica.

5. The method as defined in claim 1 of producing and mounting a commutator structure for a dynamo-electric machine wherein the glass fiber in said elastic insulating material is formed as a mat.

6. The method as defined in claim 1 of producing and mounting a commutator structure for a dynamo-electric machine wherein the glass fiber in said elastic insulating material is formed as a closely wound helical coil.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,908,265
DATED : Sept. 30,1975
INVENTOR(S) : Werner Heil, et al

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

[73] Assignee: BBC AKTIENGESELLSCHAFT BROWN, BOVERI & CIE.

Signed and Sealed this

thirtieth Day of December 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks

UNITED STATES PATENT OFFICE

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