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COMMUTATOR WITH ONE ANCHOR LOCATION

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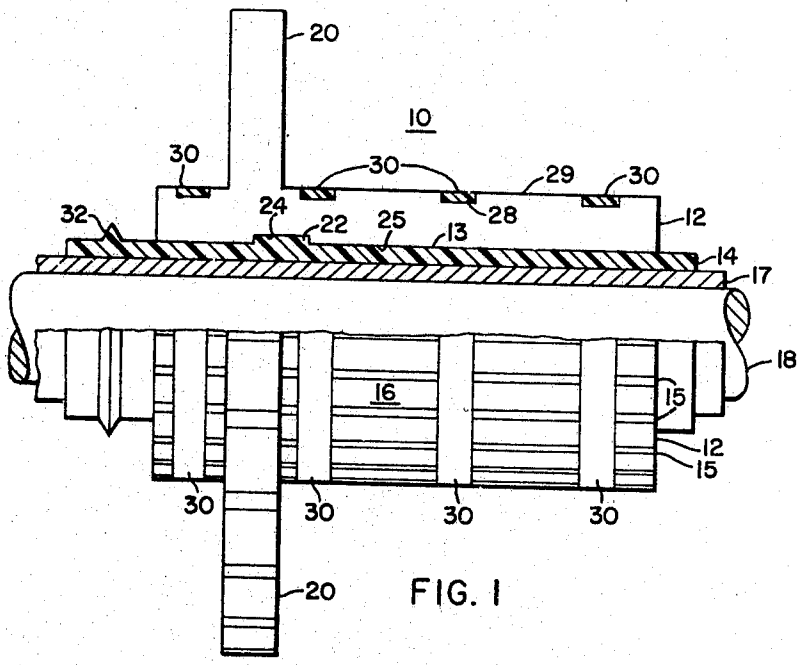


FIG. 1

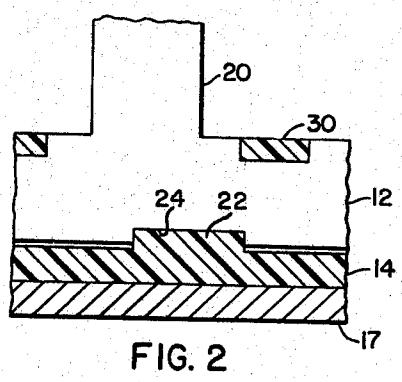


FIG. 2

WITNESSES

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COMMUTATOR WITH ONE ANCHOR LOCATION

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ABSTRACT OF THE DISCLOSURE

A commutator for a rotating machine, the commutator comprising segments or bars with each segment having one anchor location on a high strength insulating bushing in an area axially adjacent the armature connecting riser of each segment.

BACKGROUND OF THE INVENTION

The invention relates generally to commutators for dynamoelectric machines, and particularly to the shrink ring type of commutator where the commutator bars or segments are fixed on a bushing or shaft by a heavy shrink fit of banding material.

In the design and construction of such commutators for rotating machines, the segments or bars comprising the commutator must be held firmly in place on a supporting insulating bushing in order to prevent the bars from coming loose and moving as a result of commutator rotation and the centrifugal forces attendant therewith, and to prevent the armature connecting riser of each bar from breaking as a result of bar movement. However, the commutating bars should also have a degree of flexibility so that portions thereof can move axially along the bushing with changes in temperature, which changes cause thermal expansion and contraction of the bars.

Heretofore, the concern of the prior art has been primarily with rotational stability of the bars to the neglect of axial or lateral flexibility. Thus, the bars have been secured to the insulating bushing and shaft with heavy shrink fits along substantially the entire length of the bars so that the amount of lateral expansion of the bars, due to temperature increases, has been essentially nonexistent. As a result, when the temperature in the machine and commutator rises, the bars expand against the securing bands and against the insulation separating the bars to the extent that the bars twist and buckle against the bands and the insulation, and the armature connecting risers of the bars move and thereby tend to break.

BRIEF SUMMARY OF THE INVENTION

The present invention comprises a simple structure which provides both rotational stability and lateral flexibility for commutator bars or segments in an economical and efficient manner. Briefly, the structure comprises a supporting bushing made from a high strength insulating material, the bushing having an annular raised portion or boss formed on its outer periphery, and an accommodating or mating slot or recess provided in each of the commutator bars. The depth of the recess is slightly less than the height of the boss so that when the commutator is banded on the bushing a heavy shrink fit will result only in the area of recess and boss, which area forms a single anchor location for each bar. The remainder of the bar is thus free to move axially since the remainder of it is secured to the bushing by a fit substantially lighter than that at the anchor location.

The boss and slot are located axially in the area of the armature connecting riser of each of the bars so that the riser is held firmly in place while the remainder of the bar is allowed to move. In this manner, the riser is

prevented from breaking and the remainder of the bar prevented from expanding circumferentially and radially against the bar insulation and securing bands.

THE DRAWINGS

The invention, and the objects and advantages will be better understood from consideration of the following detailed description read in connection with accompanying drawings, in which:

FIGURE 1 is a partial side elevation view and longitudinal section of a commutator constructed in accordance with the principles of the invention; and

FIG. 2 is an enlarged view of a portion of the commutator shown in FIG. 1.

PREFERRED EMBODIMENT

Specifically, there is shown in FIG. 1, a commutator generally designated **10** comprising a plurality of bars or segments **12** disposed about the outer surface **13** of an insulating bushing **14**. The bars are separated and insulated from each other by thin insulating sheets of material **15** such as mica disposed between adjacent bars. When the bars and sheets are placed together they form a cylindrical commutator shell generally designated **16**.

The bushing **14** is shown disposed on a metal bushing **17** fixed on a shaft **18** of a machine rotor not shown. Each of the bars is provided with a radially extending riser **20** for connection with armature windings not shown.

In accordance with the invention, the bushing **14** is made from a high strength, insulating material, for example a glass woven laminate with a resin impregnated bond, and provided with an annular raised portion or boss **22** on its outer surface **13** at an axial location beneath the armature connecting riser **20** of each of the bars **12**. The annular boss **22** may be machined or otherwise formed on the high strength bushing **14**.

In a similar manner, each of the commutator bars **12** is provided with a slot or recess **24** in the inner surface **25** thereof for receiving the annular boss **22** on the bushing **14** when the commutator bars are placed thereon. When the bars are placed together to form the commutator shell **16**, the individual recesses **24** form an annular recess.

The commutator **10** is assembled by first curing the insulating bushing **14** on the metal bushing **17**, or on the shaft **18** if a metal bushing is not used, and then forming the annular boss or raised portion **22** thereon. The bushing is cured by a suitable process to give the bushing its high strength characteristic mentioned above.

The commutator bars **12** and the insulating sheets **15** are placed together to form the cylindrical shell **16** for disposal on the bushing **14**. The shell is first, however, machined or otherwise formed to provide annular recesses **28** in the outer periphery **29** thereof to accommodate clamping rings or bands **30** disposed therein as shown in the figures.

The bands **30** are formed about the shell **16** in a manner to clamp and compress the commutator bars **12** and the insulating sheets **15** together to form an inner shell diameter similar to the outer diameter of the bushing **14**. The bands **30** may be made from a resin impregnated woven glass tape, and cured to form a high strength insulating material similar to that of the bushing **14** though the invention is not limited thereto.

The commutator shell **16**, as formed and described above, is now disposed on the insulating bushing **14** in a manner to provide a heavy shrink fit about the annular boss **22** of the bushing, and a lighter fit about the remaining portion of the bushing. This is accomplished by forming the annular boss **22** to have a height dimen-

sion larger than the depth dimension of the recess **24** provided in each of the commutator bars, as shown in FIG. 2, and the diameter dimensions of the remaining portions of the shell and bushing are chosen to provide the light fit when the shell is suitably located on the bushing. The dimensional difference between the boss **22** and the recess **24**, as depicted in FIG. 2, is somewhat exaggerated, the difference depending upon the overall size of the commutator **10**.

To fit the commutator shell on the bushing, it is first heated to expand its inner diameter so that it can be slipped on the bushing **14**, and the annular recess (formed by the combined recesses **24** in the bars) positioned to receive the annular boss **22**. As the commutator shell **16** cools, it shrinks on the insulating bushing to form a heavy shrink fit on the annular boss **22**. This anchors the commutator bar **12**, and thus the entire shell **16**, on the boss **22** which is axially disposed in the area of the riser **20** of each bar.

Thus a single anchor location is formed for each of the bars **12** which is axially limited to the boss and slot arrangement **22**, **24** as described. With temperature conditions causing thermal expansion of the bars, the portion of each bar in the area of riser **20** remains substantially fixed while the remainder of the bar is free to move axially along the remainder of the bushing surface **13** because of the lighter fit existing between the remainder of the bar and bushing. In this manner, the riser **20** is prevented from moving and thereby breaking.

A sealant material (not shown) may be employed at the ends of the bars **12** and the outer surface of the insulating bushing **14** to seal the engaging surfaces of the bars and bushing against dust and other foreign matter.

For a similar reason, the insulating bushing **14** is shown provided with an annular pointed projection **32** which functions as a dust thrower and provides extra creepage distance between the end of the commutator bars **12** and the metal bushing **17**.

It should now be apparent from the foregoing description that a new and useful commutator bar anchoring arrangement has been disclosed wihch anchors the bar at one location while remaining portions of the bar are free to move axially along the outer surface of a high strength insulating bushing with thermal expansion and contraction of the bars. The anchor location is axially adjacent a radial riser portion of the bar employed for armature connection, the riser portion thereby prevented from breaking due to movement of the bar. The single location anchoring arrangement is economically provided by simple use of an annular raised portion formed on the high strength insulating bushing and an annular accommodating recess formed when the commutator bars, with their individual recesses, are disposed together to form a commutator shell.

Though the invention has been described with a certain degree of particularity, it should be noted that changes may be made therein without departing from the spirit and scope thereof.

What is claimed is:

1. A commutator comprising

an insulating bushing made from a high strength insulating material,

a plurality of commutator bars or segments disposed on said bushing,

said bars and said bushing having respectively inner and outer mutually engaging surfaces, said surfaces being provided with a mating recess and boss arrangement for mutual engagement,

the depth dimension of said recess being less then the height dimension of said boss, and

each of the bars having radially extending riser located in an area axially adjacent that of said slot and boss arrangement,

said commutator being fitted on said bushing in a manner providing a heavy shrink fit only in the area of said recess and boss arrangement.

2. The commutator recited in claim **1** in which the mating recess and boss arrangement comprises

an annular raised portion formed on the outer, bar engaging surface of the bushing, and

a recess provided in the inner, bushing engaging surface of each of the bars.

3. The commutator recited in claim **1** in which the bars and bushing are mounted on the rotor shaft of a dynamoelectric machine.

4. The commutator recited in claim **1** in which the insulating material of the bushing is a cured, resin impregnated glass cloth laminate.

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