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ARMATURE

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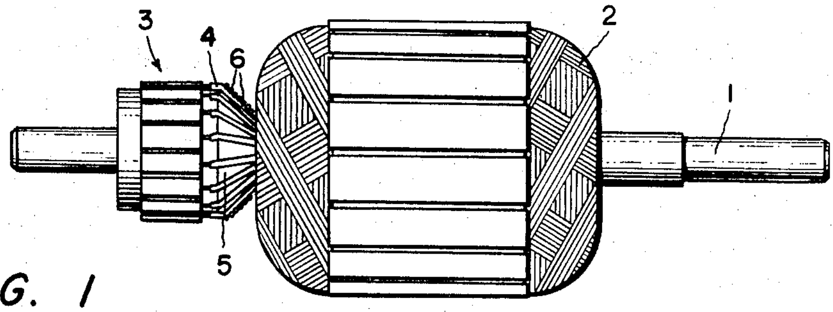

FIG. 1

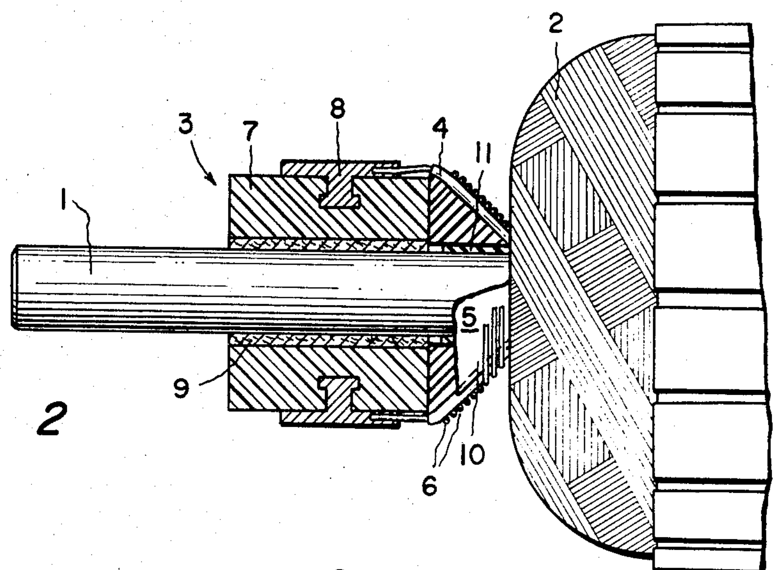

FIG. 2

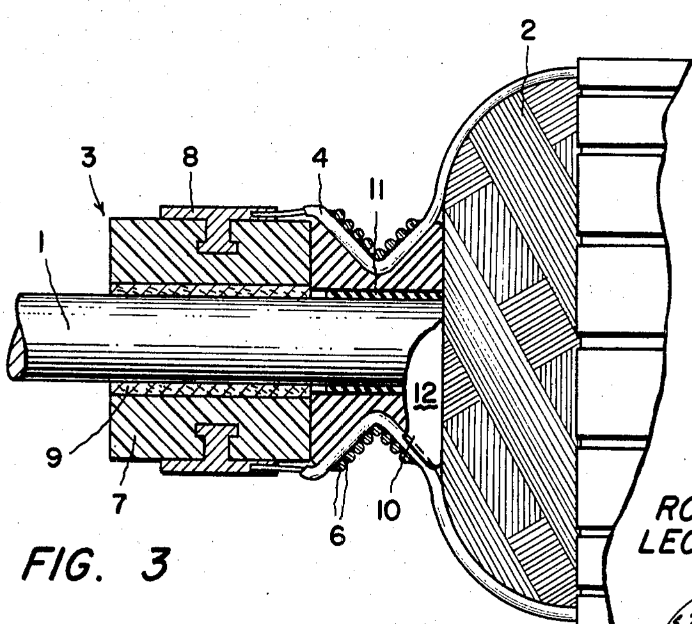

FIG. 3

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ARMATURE

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ABSTRACT OF THE DISCLOSURE

A durable armature structure which provides cushioning under the commutator leads to prevent breakage thereof, and has a fiber glass insulator between the commutator and the shaft.

This invention relates to armatures for electro-dynamic machines, and especially to an improved, durable armature structure.

It is conventional in prior art to fix the commutator leads, to prevent their breakage, by means of a heavy coating of varnish or plastic material. This has been necessary due to the vibrations and oscillations to which the leads are subjected when the armature is rotated in the electro-dynamic machine. Unless the leads are somehow protected against or made to accommodate for these stresses they exhibit fatigue and then breakage results. Some practices known in the prior art have a cushioning arrangement underneath or overlying the leads, or a portion thereof, adjacent the commutator. Commonly, the leads are prepared in lengths providing for, firstly, a slack portion. Then the slack portion is taken up in a binding—of resilient material or no—to draw the residual unbound portion of the leads taut. The binding put about the leads, or cushioning placed underneath and having binding holding the leads thereto, is disposed with a lead-receiving surface co-axial with the shaft. Yet, customarily, the leads radiate from the windings in angular fashion. That is, they diverge from the windings' inner dimension outward to the bars, or converge from the windings' outer dimension to the bars. With rotation of the armature, the forces of vibration and oscillation to which the leads are subjected proceed from the angular plane in which the leads lay. Where the binding is co-axial with the shaft, rather than co-angular with the leads, a torsional effect acts upon the leads at the terminus of the binding. Some other known practices use a heavy coating of varnish or plastic material to create a rigid mass over and about the leads at the commutator. The difficulty with these arrangements arises from the rigidity they attempt to create. There is always a small degree of relative movement between the commutator and the windings, due to impact loading of the machine. Thus, where the leads are so rigidly fixed that they cannot exhibit some "give," some will eventually snap at either ends of the rigid mass immediately adjacent the windings or the commutator.

Further, in prior art, it is conventional to form the commutator hub of molding material having a given dielectric value to insulate the commutator bars from the shaft. However, under conditions of elevated temperature it is known that the molding material will exhibit a dielectric breakdown and allow current leakage. Asbestos-filled phenolics, commonly used, carbonize at high temperatures, providing an electrically-conductive material thereby. Further, the molding material is quite frangible and subject to breakage or fracturing upon assembly of the hub to the shaft. Especially is this so, when the shaft is knurled to receive the hub and to hold it fast. As a result, manufacturers try to achieve close tolerances of the internal diameter of the hub and the outside diameter of

the shaft to avoid rupture of the hub while assuring a firm fit of same on the shaft. This is difficult to achieve, and results in the scrapping of many damaged and out-of-tolerance hubs. Accordingly, it is an object of the present invention to provide an improved armature structure with cushioning means for the leads which lay in angular disposition, whereby the leads are free to have a controlled "give," a damped flexure, across their angular disposition. It is another object of this invention to overcome the priorly-cited difficulties by providing an armature structure having an enhanced dielectric strength and which requires less exacting manufacturing tolerances.

A feature of this invention comprises the use of a high-dielectric-strength, fiber glass sleeve between the commutator and the shaft. Another feature of this invention is in the use of especially-shaped washers, annuluses of given configuration, on the shaft against which the commutator leads lay restrained, in damped flexure, in their angular disposition.

Further objects and features of this invention will become more apparent by reference to the following description taken in conjunction with the figures in which:

FIGURE 1 is a side view in elevation of an armature according to the invention;

FIGURE 2 is a side view, partially in cross-section of the armature of FIGURE 1; and

FIGURE 3 is a side view, partially in cross-section of another embodiment of the invention.

As shown in FIGURE 1 the armature, according to the invention, has a shaft **1** with windings **2** and a commutator structure **3** mounted thereon in spaced relationship. Commutator leads **4** are arranged between the winding and the commutator structure at an angle, and lie over an annulus **5** disposed on the shaft **1** between the commutator structure **3** and the windings **2**. The annulus **5** is a cone-shaped washer of resilient and electrically-insulating material, for example: rubber. The angle of the cone shape of the annulus **5** corresponds to the angle defined by the commutator leads **4** in their interconnection between the windings **2** and commutator structure **3**. Yet, the size of the annulus in cross-section, with respect to the annular space bounded by the array of commutator leads **4** and the shaft **1**, is greater. This insures a light restraint of the leads and a nesting of each, along the fully exposed length thereof, in resulting depressions formed in the annulus. Cording **6** is wound about the leads **4** to insure the nesting of them on the annulus **5**. FIGURE 2 shows the inventive arrangement in more detail, and illustrates the commutator structure which includes the core **7**, which may be of an epoxy resin or similar molding material, with commutator bars **8** arranged thereabout. Fiber glass sleeve **9** is interposed between the shaft **1** and the core **7**, providing for electrical insulation and improved dielectric strength of the commutator structure. In teaching the use of a fiber glass sleeve **9**, this invention avoids the severe manufacturing tolerance requirements necessitated prior thereto. As fiber glass has a measurable degree of compressibility, and whereas the commutator core **7** has virtually none, assembly of the core **7** to the shaft **1** is greatly simplified. The stresses and abrading which are incident in assembly are accepted by the fiber glass sleeve **9** without damage thereto, and the diameters concerned with the shaft **1** and core **7** interface need be less critical. Further, the fiber glass sleeve **9** provides a more certain bonding between the core **7** and the shaft **1**. The conventional core materials, like the metallic shaft itself, have a low coefficient of friction, hence the practice of knurling the shaft. The fiber glass sleeve **9**, however, militates against any possible slippage between the core **7** and the shaft **1**. The customary stresses, to which the fiber glass sleeve **9** is subjected at assembly—and in dynamic use in the machine—leave its dielectric strength unaltered and its physical dimensions and configuration virtually unchanged. Index numeral **10** denotes the "nesting" of leads **4** into the annulus **5**. According to a preferred embodiment of the invention, the fiber glass sleeve **9** is molded into the commutator structure **3**, and the annulus **5** is assembled on the shaft **1**, before the leads **4** are connected to the commutator bars. Other embodiments of the invention will occur to those skilled in the art. For instance, it may be found advantageous, in some applications, to mold the fiber glass sleeve **9** to the shaft **1**, without departing from the spirit of our invention. Shaft insulation **11** is disposed between the windings **2** and the shaft **1**.

In FIGURE 3, is shown another embodiment of our invention wherein the annulus **12** is formed of twin cones to receive the leads. The cording **6** is wrapped around the leads to nest them in the center of the twin cones, leaving them free to manifest a "give," a damped flexure, with the vibrations of the machine.

While we have described above the principles of our invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of our invention as set forth in the objects thereof and in the accompanying claims.

We claim:

1. An armature comprising:

a shaft;

a commutator structure and

a plurality of windings mounted on said shaft said structure and said plurality having a space therebetween;

said commutator structure comprising a hub of material of given dielectric value having electrically-conductive bars radially arranged thereon; an array of leads connecting, and disposed between, said windings and said bars each of which leads lay in wholly angular disposition, with respect to the axis of said shaft, along the full length of said leads which traverse an annular area bounded by said array, and which area extends from said windings to said bars;

a resilient first member, having a configuration which exactly corresponds with the configuration of said area, and in contact with said leads to cushion said leads;

said first member being effective to maintain said leads in said angular disposition; and

a second member, having a dielectric value greater than said given value, interposed between said commutator structure and said shaft.

2. The invention, according to claim **1**, further comprising: means overlying said leads to restrain them on said first member.

3. The invention, according to claim **1**, wherein: said resilient first member is in contact with said leads along the full lengths thereof.

4. The invention, according to claim **1**, wherein said second member is formed of compressible material which exhibits superior hoop and tensile strength.

5. The invention, according to claim **1**, wherein said second member is formed of fiber glass.

6. The invention, according to claim **1**, wherein said second member comprises a sleeve of dielectric material fixed to the inside diameter of said commutator structure.

7. The invention, according to claim **1**, wherein said second member comprises a sleeve of dielectric material molded into said commutator structure.

8. The invention, according to claim **1**, wherein said resilient first member comprises an annulus having a circular cross-section.

9. The invention, according to claim **1**, wherein said resilient first member comprises an annulus having a triangular cross-section.

10. The invention, according to claim **1**, wherein said resilient first member comprises an annulus having a plurality of triangular cross-sections.

11. The invention, according to claim **1**, wherein said resilient first member is formed of electrically-insulating material.

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