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J. P. FAY

3,103,060

COMMUTATOR

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Fig. 1

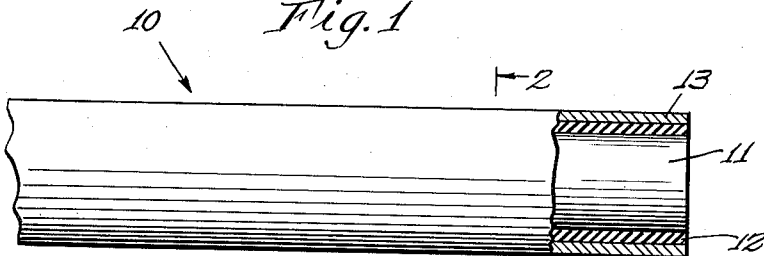


Fig. 2

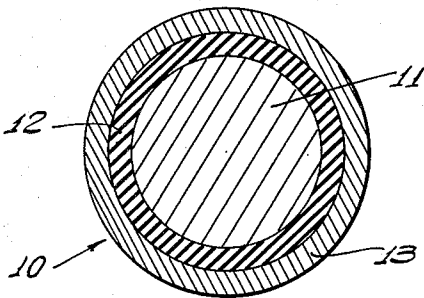


Fig. 3

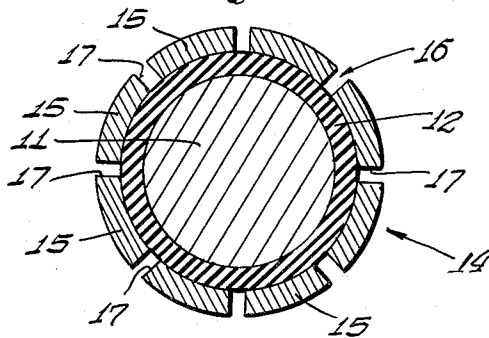


Fig. 4

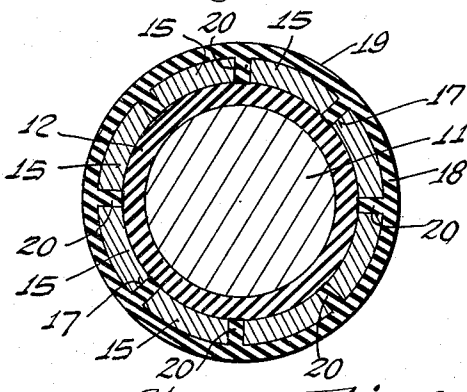


Fig. 5

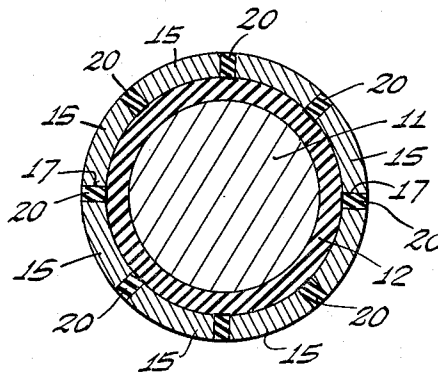
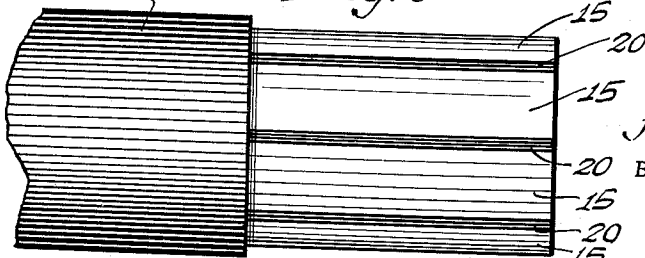


Fig. 6



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3,103,060

COMMUTATOR

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4 Claims. (Cl. 29—155.54)

This invention relates to commutators for use with motors and similar devices. More specifically, it pertains to an improved form of commutator structure and a method of making the same.

Prior to this invention the most common commutator devices included an assemblage of copper bars each connected to a coil of the winding but insulated from each other. In the commutators formerly in use there was a tendency for the bars to move with respect to one another, as the result of centrifugal force, a commutator shrink-ring being necessary to hold the segments in position against such force. Further, in many of the prior art commutators the support member, the insulating rings and the conducting bars were separable units which were difficult and time consuming to mount in operable position. The manufacturing processes involved in the manufacture of prior art structures were delicate in that the related parts of the commutator device had to, of necessity, be of close tolerance, increasing the cost of the unit, while the very nature of the structure enhanced the possibilities of malfunction.

This invention overcomes the problems aforementioned and provides an improved commutator device readily adapted to modern production methods. It is a fundamental object of the invention to provide a commutator unit including a support means having formed therearound a plurality of spaced individual conducting bars, the conducting bars being insulated from the supporting means and from one another and being exposed for electrical association with brushes or other contact means.

It is another object of the invention to provide a commutator assembly or commutator blank, including a support member having formed thereon an insulating layer and outwardly thereof a conducting element, for use in making commutator units of predetermined size and character.

A feature of the invention is the provision of the commutator assembly or blank, which may be utilized in making a number of commutator units, each having different characteristics. By means of the assemblies, the basic portion of the commutator unit may be mass produced, conveniently stored and used as needed in the manufacture of various types of commutator units.

It is also an object of the invention to provide a method for making a commutator assembly which may be utilized in the manufacture of commutator units of varying lengths and electrical characteristics.

It is further an object of the invention to provide a method for making commutator units of different sizes and electric capacities, all of which include a commutator assembly in their structure.

With these and other objects in mind, reference is had to the attached sheet of drawings, illustrating one form of the invention, wherein like characters represent like parts and in which:

FIGURE 1 is a fragmentary view, partially broken away, illustrating one form of commutator assembly;

FIG. 2 is a cross-sectional view taken in the direction of the arrows 2—2 in FIG. 1;

FIG. 3 is a cross-sectional end view of a commutator unit formed from the commutator assembly of FIGS. 1 and 2;

FIG. 4 is a cross-sectional end view of the first step in modifying the commutator unit of FIG. 3;

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FIG. 5 is a cross-sectional end view of a modified commutator unit; and

FIG. 6 is a fragmentary side view illustrating an alternative form of the commutator unit of FIG. 5.

Broadly, the instant invention is directed to a commutator unit comprising a supporting means, which may or may not be an electrical insulator, having a plurality of spaced individual conducting bars secured therearound with insulating material between the bars, and between the bars and support means, if the latter is not itself an insulator, and lead wires secured to the conducting bars for the passage of electric current. The invention is also directed to a commutator assembly or blank for use in manufacturing commutator units of the type about described.

Referring now to the drawings, and FIGS. 1 and 2 in particular, a commutator assembly or blank, generally indicated by the numeral 10 is shown. The commutator assembly 10, which is adapted for use in making commutator units, may be any convenient length and is preferably, as here shown, circular in cross-section. To facilitate the mass production of the commutator units, to be hereinafter described, it is often desirable to form the commutator assemblies in lengths sufficient to manufacture a number of units. A support member 11, which may be in the form of a tube or rod, forms the center of the commutator assembly. In the illustrated embodiment of the invention the support member 11 is stainless steel, however, it may be formed from any material having the proper support characteristics, and as aforementioned may be an electrical insulator. In the case where support member 11 is an insulating body, it has been found convenient to utilize an aluminum rod which has been converted to form a refractory insulator on its outer surface, however, any other insulating material having the proper characteristics may be used. If the aluminum support is used it may be anodized, in situ, to convert the aluminum to form the refractory insulating layer.

In the illustrated embodiment of the invention the non-insulating support member 11, of stainless steel or like material, is provided with an insulating layer 12, which is secured thereto and substantially completely covers the same. In the preferred embodiment of the invention, insulating layer 12 is formed by depositing aluminum on support member 11, by vacuum depositing or in any other manner known to the art, and anodizing the same, in situ, to convert the aluminum and form a refractory insulator. The insulating layer may, of course, be ceramic or similar dielectric material and may be formed on the support member by spraying or in any other desired manner. Outwardly of insulating layer 12, and in substantially covering relation thereto, is formed a conducting layer or element 13, of silver, copper or like material. This element may be deposited by spraying, plating or in any other convenient manner.

After the commutator assembly, as shown in FIGS. 1 and 2 and described above, has been formed, desired lengths may be stored or they may be further processed before storage. It is contemplated that the lengths of commutator assembly be grooved to form the conducting element 13 into spaced, longitudinally extending conducting bars, as shown in FIG. 3.

A commutator assembly, as above described, is adapted to be utilized in making commutator units of varying size, shape and electrical characteristics. It should at this point be noted that a number of variations may be made in the structure of the commutator assembly and in its method of manufacture. Among these, the thickness of the conducting elements and the depth of the insulating layer may be changed since they are entirely dependent upon the electrical characteristics sought in the final product and are determined by the requirements thereof.

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With respect to the method for forming the commutator assemblies, and in addition to the variety of insulating materials which may be used, converted aluminum may be deposited directly on the supporting member 11, by spraying or otherwise, in lieu of depositing the aluminum and anodizing it in situ.

Referring now to FIG. 3, a commutator unit 14 is shown. This unit, which may be formed from the commutator assembly of FIGS. 1 and 2, includes a support member 11, and insulating layer 12 formed thereon and a plurality of individual spaced, parallel, longitudinally extending conducting bars 15 secured to the insulating layer and adapted to extend substantially its full length. Lead wires, not shown, are secured to the conducting bars, by any method commonly known to the art, for providing a passage for electric current. In forming the commutator unit 14 a commutator assembly 10, or a portion thereof, having a desired length is provided. The assembly, if the same has not previously been done, is longitudinally cut, as indicated at 16, by means of a grooving machine or in any other well known manner, to form individual conducting segments or bars 15, which are spaced from one another by grooves 17, for electrical association with brushes or other contact means. The grooves 17, which extend completely through conducting element 13 to insulating layer 12, are preferably formed longitudinally of the assembly, however, it may at times be desirable to form the grooves out of the plane with the axis of the assembly.

If it is desired to provide further insulation between conducting bars 15, as within grooves 17, a second insulating layer 18, similar to that previously described, may be formed as shown in FIG. 4. The layer 18 comprises a cylindrical body 19 having inwardly extending radial ribs 20, which engage layer 12 and bond thereto to completely insulate the conducting bars 15 one from another. After second insulating layer 18 has been formed the structure is machined, as by a lathe or similar tool, to reduce the thickness of cylinder 19 and expose the outer surfaces of conducting bars 15 (FIG. 5).

Referring to FIG. 6, a commutator unit is shown, which is similar to that described with respect to FIGS. 4 and 5, but in which the cylindrical insulating body 19 has been reduced in thickness for only a portion of its length, thereby providing an insulated portion 21 for operably mounting the unit.

Thus, among others, the several objects of the invention aforementioned are achieved. Obviously, numerous changes in construction and method may be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. A method for making a commutator blank comprising the steps of providing an elongate aluminum rod supporting member, anodizing said member to convert the aluminum and form a refractory insulator over the outer surface thereof and thereafter depositing a conducting layer over said insulating outer surface, said blank being adapted to be cut into desired lengths to facilitate the manufacture of a plurality of commutator units.

2. A method for making a commutator unit comprising the steps of providing a desired length of preformed commutator blank, said blank including a supporting

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member having an electrical insulating outer surface and a conducting layer deposited in covering relation with respect to said insulating surface; cutting a plurality and grooves through said conducting layer of said length of blank to form a plurality of spaced conducting elements; depositing an outer layer of insulating material over said length of blank to substantially cover said elements and fill the spaces therebetween; reducing the thickness of said outer insulating layer to expose the outer surface of said conducting elements; and thereafter connecting lead wires to said elements for the passage of electricity therethrough.

3. A method for making a commutator unit comprising the steps of providing a desired length of preformed commutator blank, said blank including a conducting layer deposited on and in covering relation with the an insulated supporting member; forming a plurality of longitudinal grooves through said conducting layer of said length of blank to form a plurality of spaced parallel conducting bars; forming an outer insulating layer over said length of blank to substantially completely cover said bars and fill the spaces therebetween; reducing the thickness of said outer insulating layer to expose the outer surface of said conducting bars; and thereafter connecting lead wires to said bars for the passage of electricity therethrough.

4. A method for making a plurality of commutator units comprising the steps of providing an elongate preformed length of commutator blank, said blank including a conducting layer deposited over an insulating supporting member; cutting said commutator blank into a plurality of desired lengths of commutator blank corresponding to the number of commutator units it is desired to make; forming a plurality of grooves through the conducting layer of each of said lengths of commutator blank to form a plurality of spaced conducting elements on each length of blank; forming an outer layer of insulating material over each length of commutator blank to substantially cover the conducting elements thereof and fill the spaces between the latter; reducing the thickness of the outer insulating layer of each length of blank to expose the outer surface of the conducting elements thereof; and thereafter connecting lead wires to said conducting elements for the passage of electricity therethrough.

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