Feb. 23, 1932. O. WULFERT 1,846,930

COMMUTATOR AND METHOD OF MAKING SAME

Filed April 17, 1931

Fig.1.

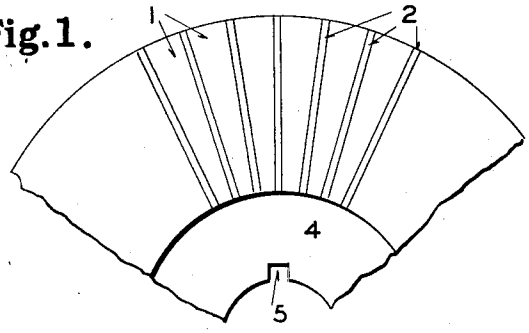


Fig.2.

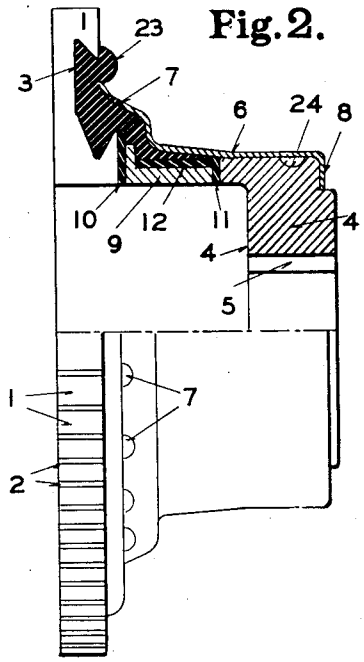


Fig.3.

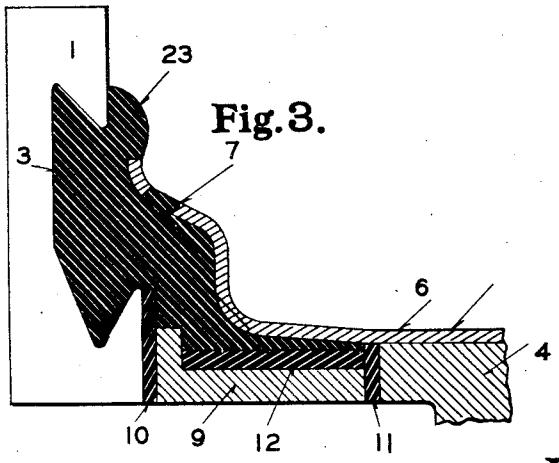
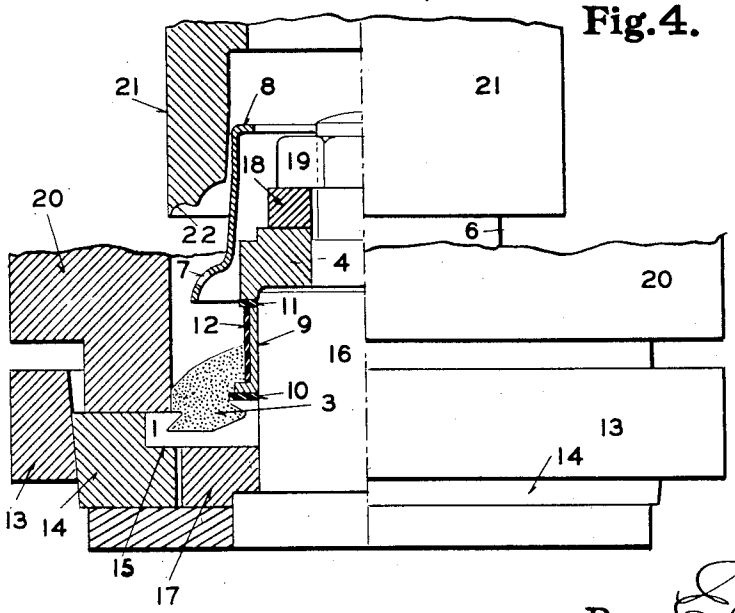


Fig.4.



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Att'y.

Patented Feb. 23, 1932

1,846,930

UNITED STATES PATENT OFFICE

OTTO WULFERT, OF ST. LOUIS, MISSOURI, ASSIGNOR TO WAGNER ELECTRIC CORPORATION, OF ST. LOUIS, MISSOURI, A CORPORATION OF DELAWARE

COMMUTATOR AND METHOD OF MAKING SAME

Application filed April 17, 1931. Serial No. 530,804.

My invention relates to a commutator assembly and method of making same and it has particular reference to commutators of the "vertical" type and associated parts used on repulsion induction motors.

One of the objects of my invention is to build a commutator of the vertical type which is strong and durable and at the same time adapted to be placed in a limited space. By producing a compact commutator greater space is allowed for the ends of the armature winding which in turn results in a decrease in the size of the motor.

Another object of my invention is to provide a form of commutator assembly embodying an insulated short-circuiting ring, which can be more economically manufactured than prior apparatus with which I am familiar and which will constitute a single unit for assembly in the motor.

In the accompanying drawings Figure 1 is an end view of the commutator showing the commutator bars and the insulation therebetween; Figure 2 is a side view of the commutator assembly, partly in cross section; Figure 3 is an enlarged view of part of Figure 2; and Figure 4 is a cross sectional view showing the parts and the method of securing them together.

Referring to the drawings, and particularly to Figures 1, 2 and 3, 1 represents the copper segments of the commutator which are insulated from each other by suitable material 2. The back of each of these commutator segments has a dovetail recess, as clearly disclosed in Figures 2 and 3. This recess is adapted to receive a moldable material 3, such as that commercially known as "bakelite."

A commutator hub member 4, which is the main support for the commutator, has a keyway 5 for attachment to the armature shaft and carries the reinforcing and supporting shell or member 6 which is cylindrical in form and is provided with an outwardly flanged end having a series of perforations 7 equally spaced about the periphery into which the moldable material 3 flows during the assembly process hereinafter described. The other end of the shell 6 is flanged inwardly as at 8. There is a tight press fit between the hub 4 and the shell 6.

The short-circuiting ring 9, which is preferably made of brass or copper, is positioned between the hub 4 and the commutator segments and is separated therefrom by insulating rings 10 and 11 of suitable material. In order to insulate the short-circuiting ring from the supporting shell 6 a cylindrical ring 12 is placed between these two parts. This insulating ring is necessary to assure that insulation exists between the holding cap and the short-circuiting ring as without it the moldable material 3 may not completely fill the clearance during the process of assembly.

It is noted here that the supporting shell 6 is an important feature of the invention since its use permits the construction of a strong and durable commutator unit with a minimum amount of moldable material.

The method of manufacture of the commutator unit will now be explained, reference being had to Figure 4. A cylindrical ring member 13 forms the base for the assembling mechanism. The inner surface of the ring is tapered and is adapted to receive a plurality (four in this instance) of cooperating tapered arcuate sections 14. The commutator segments 1 and insulating strips are assembled in the annular recess 15 formed by the sections 14. The ring 13, sections 14, and assembled commutator segments are then placed in a press for compressing the segments into a compact assembly. This assembly is now placed on a mandrel 16 having a backing plate.

The insulating ring 10, short-circuiting ring 9, insulating cylinder 12, insulating ring 11, and the hub 4 are now placed on the mandrel in the order named. These parts are all clamped together by means of a washer 18 and nut 19 on the end of the mandrel. This entire assembly is placed in a suitable press and the upper part of the mold 20 placed in position.

The moldable material 3 is placed around the insulating cylinder 12 so as to be in position to be molded in the dovetail recesses in the commutator segments. The shell 6 is next

placed in its position for cooperation with the press plunger 21. This press plunger 21 is hollow in form and the face cooperating with the shell 6 is shaped to the form of the outwardly extending flange having the holes 7. A peripheral groove 22 is also cut in the face of the press plunger to form an annular thick end portion 23 on the molded material.

The complete assembly is now heated and the plunger 21 forced downwardly until the flange 8 of the shell 6 comes into contact with the hub 4, as shown in Figure 2. If the amount of moldable material has been correctly selected it will be forced into the dovetail recesses of the commutator segments, and also into the perforations in the shell and the excess will flow past the flange of the shell into the groove 22 to produce the thickened portion 23. It is to be noted that the producing of this thickened portion is very important as otherwise it is not possible to have the moldable material flow uniformly into all the corners and spaces desired. Since the end of the plunger 21 is shaped to conform with the flange of shell 6 the full pressure of the plunger is transmitted through the shell to the moldable material. This results in a tight fit between the moldable material and the cap and commutator segments.

The shell 6, as previously stated, has a tight press fit with the hub 4. However, in larger commutator units this tight press fit may not be sufficiently strong and, therefore, if desired a recess 24 may be formed in the hub and the cap member may be pressed thereinto by means of a suitable tool.

From the above description it can be clearly seen that I have produced a very strong, durable, and compact commutator unit which is cheaply and easily manufactured.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A commutator unit comprising a plurality of commutator segments, a hub, a tubular supporting member mounted on said hub and having a perforated flange, and a moldable insulating material between the segments and flange and imbedded in the perforations.

2. A commutator unit comprising a plurality of commutator segments, a hub, a supporting shell carried by said hub and having a flange containing perforations in juxtaposition to said segments, and moldable material imbedded in said segments and the perforations of said flange.

3. A commutator assembly comprising commutator segments secured together by a body of insulating material, a hub, a short-circuiting ring between the hub and segments and spaced therefrom, and a supporting shell carried by the hub and surrounding the short-circuiting ring and reinforcing the insulating material.

4. A commutator unit comprising a plurality of vertical commutator segments, a hub, a short-circuiting ring lying between the hub and segments and insulated therefrom, a supporting shell carried by the hub and having a cylindrical body surrounding the short-circuiting ring and an annular flange extending outwardly therefrom and spaced from the segments, and moldable material encased by the shell commutator segments and the short-circuiting ring.

5. A commutator assembly comprising a plurality of commutator segments, a hub, a short-circuiting ring lying between the hub and segments and insulated therefrom, insulating material surrounding the short-circuiting ring, a supporting shell carried by the hub and having a cylindrical body surrounding the insulating material, and moldable material completely filling the space between the segments and the shell and the space between the insulating material and the shell.

6. The combination of a commutator element comprising a plurality of segments, a hub spaced from the segments, a tubular supporting member connected to the hub and extending toward the segments, a short-circuiting ring between the hub and segments and within the supporting member, and moldable material between the supporting member and segments and overlying the short-circuiting ring.

7. A method of making a moldable commutator assembly embodying commutator segments, a short-circuiting ring and a perforated supporting shell, which consists of assembling the elements on a mandrel in the order named, surrounding them by a mold, placing moldable material in the mold between the segments and the shell and around the short-circuiting ring, heating the assembly and forcing the shell over the short-circuiting ring and against the moldable material to imbed the moldable material in the segments and in the perforations of the shell.

8. A method of making a moldable commutator assembly embodying commutator segments, a short-circuiting ring, a hub and a perforated supporting shell, which consists of assembling the elements on a mandrel in the order named, surrounding them by a mold, placing moldable material in the mold between the segments and the shell and around the short-circuiting ring, heating the assembly and forcing the shell over the hub and short-circuiting ring and against the moldable material to imbed the moldable material in the segments and in the perforations of the shell, and to engage the shell with the hub.

9. A method of imbedding moldable material in the segments and the perforated flanged tubular supporting member of a commutator assembly, which consists of placing

the segments on a mandrel, placing a mold, whose diameter is greater than the diameter of the flange of the tubular member, around the mandrel in juxtaposition to the segments, inserting moldable material in the mold against the segments, applying heat to the assembly and forcing the tubular member over the mandrel and against the moldable material to imbed the moldable material in the segments and in the perforations of the flanged tubular member, the excess moldable material being allowed to flow into the space between the flange and the wall of the mold.

In testimony whereof, I hereunto affix my signature, this 7th day of April, 1931.

OTTO WULFERT.