July 13, 1926. 1,592,326

A. J. BASTIAN

COMMUTATOR

Filed August 14, 1924

Fig. 1.

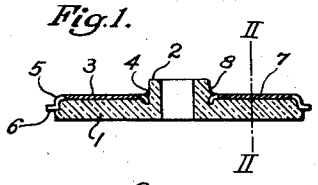


Fig. 2.



Fig. 8.

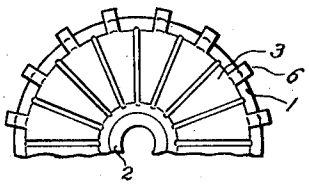


Fig. 3.

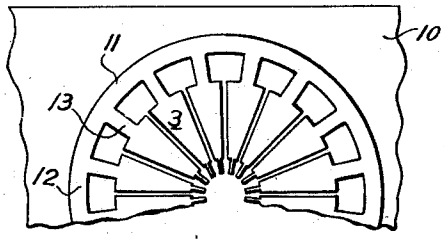


Fig. 9.

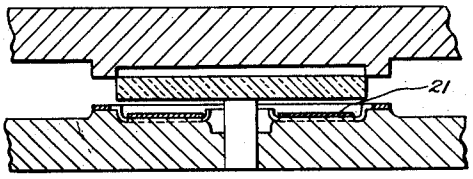


Fig. 4.



Fig. 10.

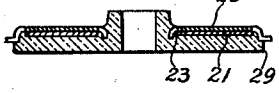


Fig. 11.

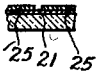


Fig. 5.

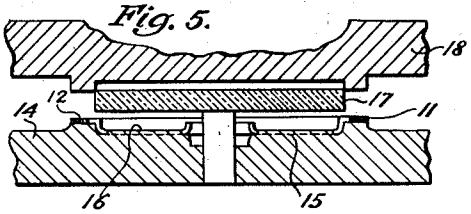


Fig. 12.

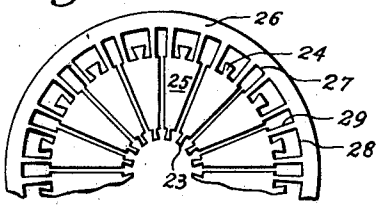


Fig. 6.

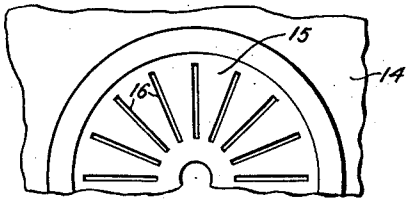


Fig. 13.

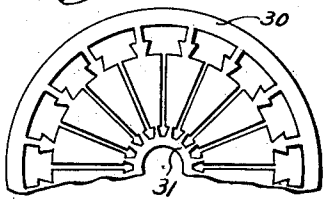
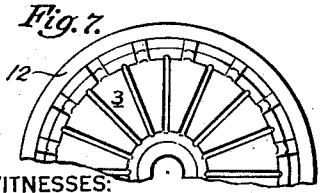


Fig. 7.



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UNITED STATES PATENT OFFICE.

ARTHUR J. BASTIAN, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

COMMUTATOR.

Application filed August 14, 1924. Serial No. 731,955.

My invention relates to commutators for dynamoelectric machines and it has particular relation to molded commutators for small machines.

One object of my invention is to provide a small disk-like commutator that will effect the utmost saving in the cost of manufacture and will be reliable in operation.

Another object of my invention is to provide an improved method of manufacturing commutators of the above described character.

With the foregoing and other objects in view, my invention comprises the details of construction and processes of manufacture described and claimed hereinafter and illustrated in the accompanying drawing, wherein—

Figure 1 is a diametral sectional view of a commutator made according to my invention,

Fig. 2 is a sectional view along the line II—II of Fig. 1, illustrating a fragment of the commutator with the slot between adjacent segments,

Fig. 3 is a plan view illustrating the shape of a metal blank utilized in making my improved commutator,

Fig. 4 is a view in section illustrating the shaped blank prior to inserting the same into the mold,

Fig. 5 is a view in section through the mold when making the commutator,

Fig. 6 is a plan view illustrating the base of the mold employed in making the commutator,

Fig. 7 is a plan view illustrating the composite article obtained after the molding operation is performed,

Fig. 8 is a plan view illustrating the finished commutator after the same is ready to be assembled upon the machine,

Fig. 9 is a view similar to Fig. 5 illustrating the molding of a commutator of somewhat different construction than that shown in Fig. 1.

Figs. 10 and 11 are views similar to Figs. 1 and 2 illustrating the commutator as made in the modified manner illustrated in Fig. 9, and

Figs. 12 and 13 are plan views of different blanks employed in modifications of my invention.

Referring to Figs. 1 and 8, a commutator comprises a disk-like supporting plate 1 of molded insulating material provided with a central hub portion 2 for mounting upon the shaft of an armature of a dynamo-electric machine (not shown). A plurality of sheet-metal segments 3 are disposed upon the face of the supporting plate 1 and are secured to the plate by means of laterally bent inner anchor lugs 4 and outer anchor lugs 5. The outer lugs may extend into terminals or projections 6 to which armature wires may be electrically connected.

The commutator illustrated in Fig. 1 adapts itself for manufacture in large quantities by use of moulded materials as a substance of the supporting plate 1. The materials most adapted for use in commutators are the well known phenolic condensation products Such materials carbonize when exposed to sparking, and the construction embodying my invention as hereinafter described, permits the full utilization of the insulating properties and manufacturing advantages presented by the use of such materials, without encountering the electrical difficulties in performance which would result from carbonization of the material of the supporting plate due to sparking.

In order to prevent carbonization of the moulded material constituting the supporting plate 1, I so build the commutator that the working surface 7 of the segments is elevated above the surface of the supporting plate 1 between the slots constituted by the edges of adjacent segments, as shown in Fig. 2. In order to secure the segments to the supporting plate, the hub portion 2 extends over the central edge of the commutator segments at 8 and the inner lugs 4 are imbedded in the body of the supporting plate. At the outer circumference of the commutator, the moulded material may surround the edge portions of the segments and additional mechanical strength is obtained by providing laterally bent outer anchor lugs 5 extending into the supporting plate.

A distinct feature of my invention is an improved process for making the commutator which results in a uniform product and requires a minimum of operations.

The first step in the process of the manufacture of the commutator comprises the preparation of blanks as shown in Fig. 3. From a strip of sheet metal 10 are punched blanks 11 comprising circumferentially dis-

posed segments 3 which are connected to an integral outer peripheral portion 12 by means of connecting strips 13. In the final product, the connecting strips 13 constitute the outer anchor lugs 5 and the segment terminals 6. The blanks 11 are bent into shape as shown in Fig. 4, the main section of the contact segments being raised out of the plane of the rim portion 12, the inner edge of the segments and the inner lugs 4 being bent laterally similarly to the portions of the outer connecting strips 13 which constitute the outer anchor lugs 5. The operations of punching the blank and of bending the same may be performed in a single step.

The blank, as shaped in Fig. 4, is thereupon introduced into a mold shown in Fig. 5. The mold has a base portion 14 provided with a cavity 15 conforming to the outer surface of the working face of the commutator. The portion of the mold corresponding to the portion of the segments upon which the commutator brushes slide carries keys 16 fitting into the slots between the edges of adjacent segments, as shown in Figs. 5 and 6. After the prepared blank 11 has been inserted into the mold, a tablet 17, containing the exact amount of moldable material necessary to make the supporting member 1 of the commutator, is placed above the cavity 15 in the mold and is pressed, by means of a pressure plate 18, into the final shape and hardened by applying heat, in a familiar manner.

As the molded material flows into the cavity of the mold it fills all the spaces thereof, leaving a free space between the working edges of the commutating segments on account of the keys 16 of the mold.

After the molded article is removed from the mold it has a shape as shown in Fig. 7, the disk-like molded material having a diameter somewhat less than the outer rim portion 12 and the segments 3. By a single operation, the outer rim portion 12 is punched off, leaving the segments 3 insulated from each other, with terminal portions 6 extending radially from the outer edge of the commutator.

Where the motor is exposed to severe operating conditions, it is desirable to increase the margin of safety against the carbonization of the moulded material within the space between adjacent working edges of the commutating segments. In many cases, it is difficult to fully prevent the inflow of molded material within the slot space by use of keys as shown in Fig. 5. A construction and process which fully meets these difficulties and results in a commutator, the cost of which is only slightly larger than that described in connection with Figs. 1 to 8, is shown in Figs. 9 to 11.

In the form of my invention shown in Figs. 9 to 11, a circular washer 21 of a material that is practically unaffected by sparking, such as mica, is placed in the mold over the portions of the segments which are disposed around the keys 16 of the mold to prevent the flow of the molded material into that portion of the commutator segments and in order to provide an inert insulating layer under the working edges of the adjacent segments. The resultant commutator, as shown in Fig. 10, combines cheapness and simplicity of manufacture with the high-grade insulating and operating properties of larger commutators.

In Fig. 12 is shown a modification of my invention wherein the lug portions 23, 24 of the commutator segments 25 are of dove-tail shape in order to increase the mechanical strength of the commutator. I have found that commutators employing such construction will greatly outlive commutators employing straight lug portions. The segments 25 are held together to an outer rim portion 26 by means of connecting strips 27 separate from the outer lug portions 25. In the final product, the outer rim is cut off along the dotted lines 28 leaving terminal portions 29 for providing a connection to the armature winding.

In Fig. 13 is shown a modification of my invention wherein both outer and inner integral rim portions 30 and 31 are provided for holding the commutator segments in place during the molding operation, said rim portions being subsequently cut off to remove the integral connections between the several commutator segments.

I claim as my invention:

1. A commutator comprising an insulating support of a material that loses its insulating properties when exposed to sparking, a plurality of flat contact segments circumferentially secured to the surface of said insulating support, said contact segments being spaced from each other, and insulating material that is substantially unaffected by sparking immediately underlying the working edges of said flat segments and overlapping the same.

2. A commutator comprising a disc-like supporting body of molded insulating material, a plurality of flat contact segments circumferentially secured to said supporting body, said contact segments being spaced from each other, and insulating means immediately underlying the working edges of said flat segments and overlapping the same for preventing the molded material from entering the spaces between said edges.

3. In a sliding-contact making and breaking device the combination with a supporting body of molded insulating material, of a plurality of flat contact members anchored in said body, and means underlying the edges of said contact members and overlap-

ping the same for preventing the molded material from entering the spaces between the working edges of said contact members.

4. A commutator comprising a disc-like supporting body of molded insulating material which loses its insulating properties when exposed to sparking, a plurality of sheet-metal contact segments circumferentially secured to the surface of said supporting body, said contact segments being spaced from each other and having the flat sides disposed upon the surface of the supporting body, and insulating means immediately underlying the working edges of said segments and overlapping the same for preventing the molded material from entering the spaces between said edges, said means being substantially unaffected by sparking.

5. In a sliding contact making and breaking device, the combination with a supporting body of molded insulating material which loses its insulating properties when exposed to sparking, of a plurality of sheet-metal contact members having their flat sides disposed on the face of said body and anchored therein, and insulating means immediately underlying the working edges of said contact members and overlapping the same for protecting the molded material from exposure to sparking, said means being substantially unaffected by sparking.

6. A commutator comprising a disk-like supporting body of molded insulating material, a plurality of sheet-metal segments disposed flatwise upon said supporting body and having tongues embedded therein, and insulating means immediately underlying the working edges of said segments and overlapping the same for preventing the molded material from entering the spaces between said edges.

7. A commutator comprising a disk-like supporting body of molded insulating material, a plurality of sheet-metal segments disposed upon the face of said supporting body and having tongues embedded therein, and a washer of insulating material immediately underlying the working edges of said segments between the body portions of the segments and the molded material.

8. A commutator comprising a disk-like supporting body of molded insulating material, a plurality of sheet-metal segments disposed upon the face of said supporting body and having tongues embedded therein, and a mica washer immediately underlying the working edges of said segments for preventing the molded material from entering the spaces between said edges.

9. In a sliding-contact making and breaking device, the combination with a supporting body of molded insulating material, of a sheet-metal contact member disposed flatwise upon the surface of said body, and an insulating sheet of spark-resisting material immediately underlying the working edge of said contact members, said contact member and insulating sheet being molded into said supporting body.

10. In a sliding-contact making and breaking device, the combination with a supporting body of molded insulating material, of a plurality of sheet-metal contact members flatwise disposed in side-by-side relation upon said body and spaced from each other, and a mica sheet immediately underlying the working edges of said contact members, said contact members and mica sheet being molded into said supporting body.

11. The method of making a molded commutator which comprises preparing an integral sheet-metal blank having slots to provide anchoring lugs individual to each of the segments as finally disposed upon the commutator, placing insulating sheet material over the portions of the blank that constitute the underlying working edges of said segments, molding a supporting body of insulating material around the side of said blank that has thereon said insulating material to embed therein the lugs individual to said segments and subsequently removing the portions of the blank which provide the continuous connection between the individual segments.

12. The method of making a molded commutator of the disc type which comprises preparing an integral sheet-metal blank having a portion corresponding in size and shape to the working face of the commutator segments and bent anchor lugs individual to the segments as finally arranged upon the commutator, molding a supporting body of insulating material over one side of said blank to embed therein only the anchor lugs individual to said segments, and subsequently removing the portions of the blank which provide the continuous connection between the individual segments.

13. The method of making a molded commutator which comprises preparing an integral, disk-like sheet-metal blank of dish shape having central slots to provide a set of inner lugs, individual to each of the commutator segments as finally arranged upon the commutator, and peripheral slots to provide a set of outer lugs individual to each of said segments, molding a supporting body of insulating material on one side of said blank to embed therein said two sets of lugs but leave unembedded the portion of the blank disposed therebetween and subsequently removing the portions of the blank which provide the continuous connection between the individual segments.

14. The method of making a commutator of the disk-type which comprises preparing a sheet-metal blank comprising a plurality of circumferentially disposed contact

segments and a rim portion united with all of said segments, placing a sheet of insulating material over one side of said segments to cover the slots extending between the working edges of said segment, molding an insulating material around said segments and said sheet while preventing the flow of molded material into said slots, and subsequently removing said rim portion.

15. The method of making a commutator of the disk-type which comprises preparing a sheet-metal blank comprising a plurality of circumferentially disposed contact segments and a rim portion united with all of said segments, molding an insulating material around said segments on one side of said blank while preventing the flow of molding material into the slots between the working edges of said segments, and removing said rim portion.

16. The method of making a commutator of the disk-type which comprises circumferentially placing a plurality of sheet-metal segments in a mold, the individual segments being spaced from each other by substantially radial slots, and molding an insulating material around said segments to securely hold the same while preventing the flow of molding material into the slots between the working portions of the edges of said segments.

17. The method of making a commutator of the disk-type which comprises preparing a sheet-metal blank comprising a plurality of circumferentially disposed contact segments and a rim portion united with all of said segments, the inner and outer peripheries of said segments having laterally bent lug portions, placing said blank in a mold with the lug portions projecting upwardly, said mold having keys registering with the slots between said segments, molding insulating material around said lug portions, and subsequently removing said rim portion.

18. The method of making a commutator of the disk-type which comprises preparing a sheet-metal blank comprising a plurality of circumferentially disposed contact segments and a rim portion united with all of said segments, the inner and outer peripheries of said segments having laterally bent lug portions, placing said blank in a mold with the lug portions projecting upwardly, said mold having keys registering with the slots between said segments, placing sheet material over the slot portions extending between the working edges of said segments, and subsequently molding insulating material around said lug portions and removing said rim portion.

19. The method of making a commutator of the disk-type which comprises placing a plurality of sheet-metal segments in a mold, the individual segments being spaced from each other by substantially radial keys extending in the mold and filling the slots between the working edges of said segments, placing sheet material over said edges, and molding an insulating material around said segments and said sheet material.

In testimony whereof, I have hereunto subscribed my name this 31st day of July 1924.

ARTHUR J. BASTIAN.