

T. C. RUSSELL.
COMMUTATOR.
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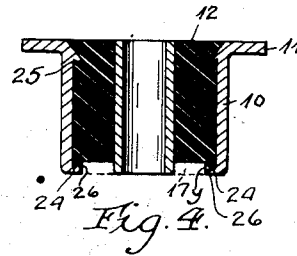
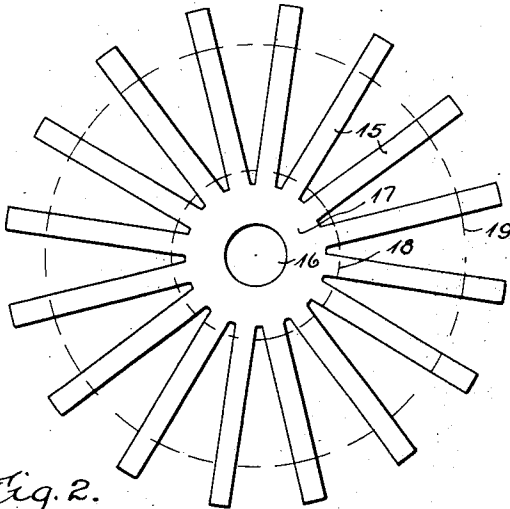
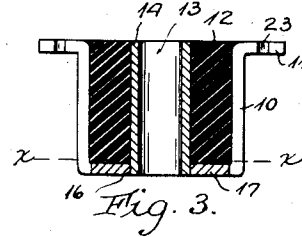
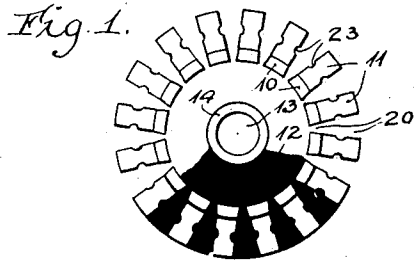
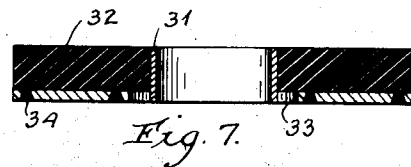
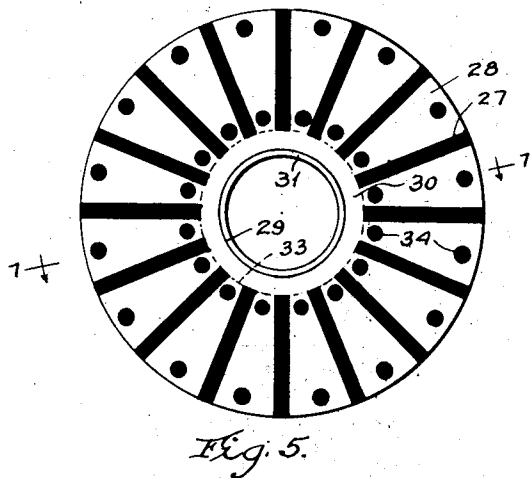
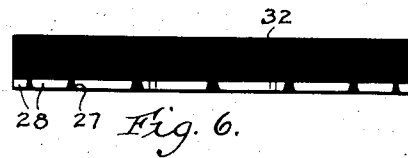


Fig. 2.



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UNITED STATES PATENT OFFICE.

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COMMUTATOR.

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To all whom it may concern:

Be it known that I, THOMAS C. RUSSELL, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Commutators, of which the following is a specification.

My invention relates to commutators for electric machines and in general the object of the invention is to provide an improved structure and an improved process for making such structure.

More in detail one object of the invention is to produce a commutator structure possessing great strength and rigidity and in which the commutator segments or bars are uniformly and efficiently insulated from each other. Another object is to provide an improved process for making the commutator which will greatly simplify and reduce the cost of manufacture, and insure rigid support for the commutator segments and uniform insulation thereof.

In accordance with my invention I first form a frame of the metal of which the segments are to be composed, as for example copper, the segments forming an integral part of the frame and being shaped and located just as they will be in the finished commutator and separated for the reception between them of insulating material. The segments are primarily held together at one end by a section of the frame and while thus held insulating material, as for example bakelite, is moulded to the frame and between the segments, whereafter that section of the frame which primarily held the segments together, is cut away so that the segments will be entirely supported by the insulating material and properly insulated from each other thereby. The metal frame may be in the form of an ordinary casting or a die casting, or it may be formed up from a sheet metal disk which is first cut or stamped to form radially extending and separated arms which form the commutator segments and their connecting flanges. The insulating material is applied to this frame and between the segment members, a steel bushing being preferably first inserted concentrically in the frame by means of which the finished structure may be mounted on a shaft.

My improved commutator structure and its manufacture are illustrated on the accompanying drawing, in which—

Fig. 1 is an end view of the commutator structure with part of the insulation removed to better show the shape of the segments,

Fig. 2 is a plan view of a sheet metal disk from which the commutator frame of Fig. 1 is formed up,

Fig. 3 is a diametral sectional view of the commutator,

Fig. 4 is a diametral sectional view showing a modified arrangement,

Fig. 5 is a front elevational view of a radial type commutator,

Fig. 6 is an end view of the commutator shown in Fig. 5, and

Fig. 7 is a sectional view on plane 7—7 Fig. 5.

The commutator shown in Fig. 1 is of the cylinder type comprising the commutator segments 10 with their connecting flanges 11 extending at right angles therefrom and the supporting core 12 of suitable insulating material, the axial cylindrical opening 13 being provided for mounting the commutator on a shaft, a metal bushing 14 being preferably provided in the opening.

In accordance with my invention I first make a frame of copper or other suitable material, the segments properly shaped and suitably separated for insulation purposes forming integral parts of this frame and being primarily held in proper spaced relation by a section of the frame. Insulating material such as bakelite is then moulded to the frame and into the spaces between the segments whereafter that part of the frame which primarily holds the segments in spaced relation is cut away so that the bars will then be held solely by the insulating material and properly insulated from each other.

In Figs. 2 and 3 a simple arrangement is shown for forming a cylinder type commutator. As shown in Fig. 2 a circular disk of copper is cut radially by dies or otherwise to form the arms 15 which eventually become the commutator segments. At the center of the disk the hole 16 is formed for receiving the commutator shaft, and between the hole and the arms is the solid section 17. The disk thus formed is subjected to a die operation which bends it at the lines 18 and 19 (Fig. 2) to produce the frame shown in Fig. 3. The frame comprises the head formed by the solid section 17 of the disk, the cylindrical part or brush

receiving part formed by the commutator segments 10, and the flange ends 11 to which the armature wires or other conductors are to be secured. After formation of the frame the segments 10 and the flanges 11 will be uniformly spaced from each other by the insulating spaces 20.

After formation of the frame it is placed in a mould and insulating material 12 such as bakelite is poured in to form a supporting core, the insulating material entering the spaces 20 between the segments 10 and the flanges 11. Preferably a metallic bushing 14 is inserted centrally in the frame and through the hole 16 thereof before the insulating material is poured in, this bushing serving to mount the commutator on a shaft. After the insulating material has become properly set and hardened the solid part or head 17 of the frame is cut away along the plane x Fig. 3 and then the insulated sections are no longer metallically connected but are uniformly insulated from each other by the insulating material.

A variety of ways may be resorted to for rigidly holding the segments to the insulating core. As shown in Fig. 1 the segments may be made wider at their inner sides so that the insulating material may have dovetail engagement therewith. Notches 23 may also be cut in the sides of the flanges 11 into which the insulating material engages to assist in locking the segments in place.

In Fig. 4 a modified arrangement is shown for holding the segments in place. During formation of the metal frame the arms 15 are given notches 24 near their inner bends, and at their outer bends the metal is displaced inwardly to form retaining hooks or points 25. After moulding in of the insulating material the frame is then cut along the line y and the section 17 is removed, the inner ends of the segment then presenting the retaining hooks or points 26. These hooks or points and the points 25 are received by and anchored in the insulating material and the segments are thus rigidly held in place on the insulating core.

After the commutator structure is formed its cylindrical section is turned in a lathe or otherwise finished so that the commutator segments will present a smooth cylindrical surface for brushes.

In Figs. 5, 6, and 7 my invention is shown applied to the radial type of commutator. A circular disk of copper or other suitable material is slotted radially as shown at 27 to form the insulating spaces between the commutator segments 28. At the center of the disk is the hole 29 between which the commutator segments is the solid section 30 which primarily supports the segments in properly spaced position. The disk is then placed in a mould and insulating material such as bakelite applied thereto, a bushing

31 being preferably first inserted in the hole 29. As shown a cylindrical backing or support 32 of insulating material is provided, the material entering the spaces 27 between the segments. The disk is then cut along the circular line 33 and the section 30 removed whereafter the commutator segments will be supported solely by the insulating material and uniformly insulated from each other. As shown in Fig. 6 the segments may be beveled at their sides so that the insulating material will have dovetail interlocking connection therewith to securely hold them in place. Flaring holes 34 could also be formed at the inner and outer ends of the segments into which the insulating material engages for dovetail interlocking connection with the segments to securely hold them in place.

I thus produce a very simple and efficient commutator structure which can readily and accurately be manufactured with little expense. The insulating material which forms the supporting core of the structure also engages between the commutator segments to insulate them from each other and to hold them in place. It is understood that changes and modifications can be made which will still fall within the scope of the invention.

Having described my invention, I claim as follows:

1. The method of constructing a commutator which consists in slotting a metal disk to form radial arms but leaving the center circular section of the disk unslotted, then deflecting the arms into parallelism with the disk axis to form and position the commutator segments, then applying insulating material to form a supporting core and to extend between the segments, and then cutting away the central unslotted part of the disk to leave the segments entirely insulated from each other and supported solely by the insulating material.

2. The method of constructing a commutator which consists in cutting a flat metal disk to provide radial arms but leaving the center circular section of the disk unslotted, then deflecting the arms into position to form spaced apart commutator segments, then applying plastic insulating material to form a supporting core and to extend between the segments, and then cutting away the center part of the disk after setting of the insulating material to leave the segments entirely insulated from each other and supported solely by the insulating material.

3. A metal frame for commutator structures comprising a circular disk part, arms forming an integral part of said disk and extending therefrom and spaced apart to form commutator segments, and terminal flanges at the free end of said segments.

4. The method of construction a commutator which consists in stamping out a metal

disk to leave the commutator segments and to leave the center section of the disk to primarily support the segments at one end, then moulding insulating material against and between the segments to form a supporting core therefor, and then cutting away the center section of the disk to leave the segments entirely insulated from each other and solely supported by said core. 15

5 and between the segments to form a supporting core therefor, and then cutting away the center section of the disk to leave the segments entirely insulated from each other and solely supported by said core. 20

10 5. The method of constructing a commutator which consists in subjecting a metal disk to a single die operation to cut out sections of the metal and to leave commutator segments

and also to leave the center section of the disk to primarily support the segments at one end, then moulding insulating material against and between the segments to form a supporting core therefor, and then cutting away the center section of the disk to leave the segments entirely insulated from each other and solely supported by said core.

In witness whereof, I hereunto subscribe my name this 1st day of March, A. D. 1922.

THOMAS C. RUSSELL.