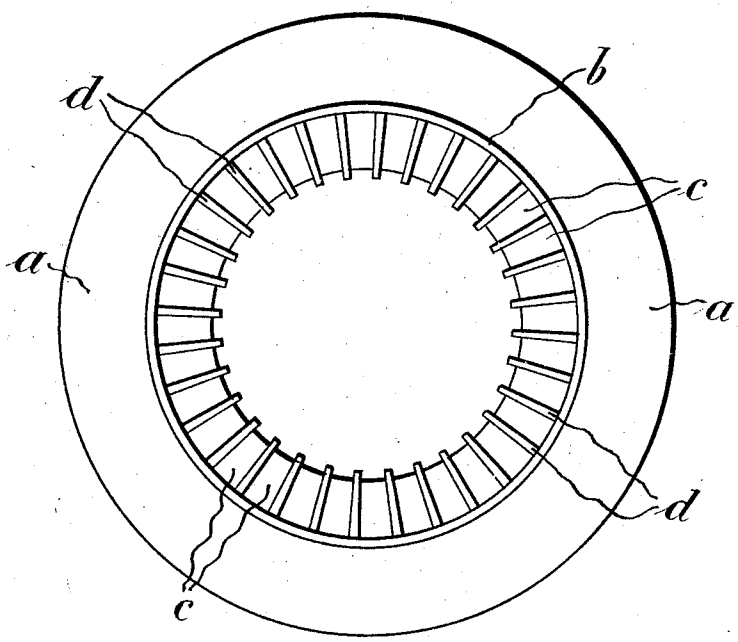
P. BOSSU.
ELECTRIC COMMUTATOR.
APPLICATION FILED NOV. 14, 1917.

1,390,192.

Patented Sept. 6, 1921.
2 SHEETS—SHEET 1.

Fig. 1



Witnesses;
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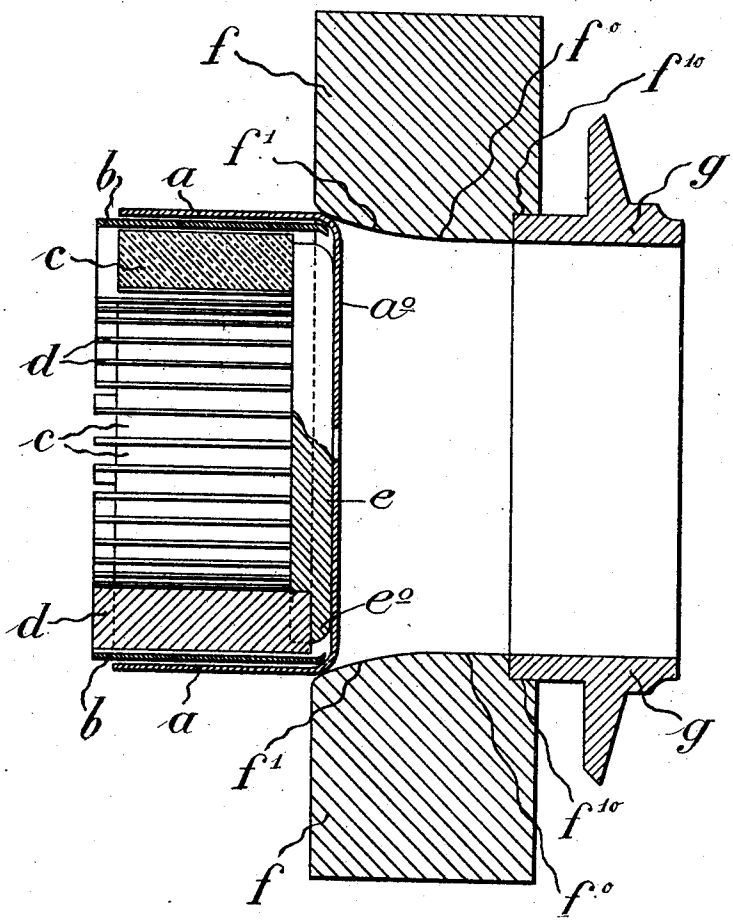
2 SHEETS—SHEET 2.

Fig. 2



Witnesses:

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UNITED STATES PATENT OFFICE.

PIERRE BOSSU, OF PARIS, FRANCE, ASSIGNOR TO SOCIÉTÉ ANONYME DES ETABLISSEMENTS L. BLÉRIOT, OF PARIS, FRANCE.

ELECTRIC COMMUTATOR.

1,390,192. Specification of Letters Patent. Patented Sept. 6, 1921.

Application filed November 14, 1917. Serial No. 201,939.

To all whom it may concern:

Be it known that I, PIERRE BOSSU, citizen of the French Republic, residing at Paris, France, have invented certain new and useful Improvements in Electric Commutators, of which the following is a specification.

This invention relates to electric commutators and it concerns more particularly commutators which are used with brushes which bear on their internal cylindrical surface.

The invention has mainly for its object to obtain commutators of great strength, which can be easily manufactured and mounted on the electric machines. These commutators are of the class wherein the current passes through the internal cylindrical surfaces or through the side surface and not through the external cylindrical surface of the commutator.

The invention consists mainly in inserting the commutator segments, which have been insulated from each other, into a malleable cover, from which they are insulated by suitable matter; and in subjecting the said malleable cover to a strong radial pressure which produces a permanent reduction of its diameter.

The invention consists also in other features which will be more particularly described hereinafter.

The invention will be clearly understood with the aid of the following description and of the following drawing which illustrates the present embodiments of the invention.

Figure 1 shows in end view a commutator made according to one method of carrying out the invention.

Fig. 2 shows, in longitudinal section, during its manufacture, a commutator made according to another method of carrying out the invention.

According to the invention, in manufacturing the commutator, use is first made of a ring *a* of malleable metal of suitable thickness and having such an internal diameter that, first, an insulating ring *b*, and secondly, the commutator segments *c* may be introduced easily in it, without being pressed.

The insulating ring *b* is preferably made of micanite, and the desired or proper thickness of the ring is either obtained with several thin strips with alternate joints, or with a single thin strip rolled up on itself.

The segments *c* introduced in the ring *b* are insulated from each other by means of insulating sheets *d*.

The ring *a*, containing the insulating ring *b* and the commutator segments *c*, is then subjected to a radial pressure in a direction from its periphery to its center, for instance, by means of a mechanical or hydraulic press.

In the commutator thus obtained, the segments are maintained in their proper fixed relation by means of the malleable ring *a*, which has been contracted by means of a radial pressure.

It is however preferable to use for the malleable ring *a*, a comparatively thin ring rather than a ring of suitable thickness to maintain its form when the radial pressure is no longer exerted on it.

In fact, in practice, the malleable ring could not keep its exact form and the segments would be likely to become slightly loosened; furthermore if the ring *a* is of a great thickness, the external part of the ring is subjected, during the pressure operation, to a greater compression than the internal part, and the segments would be maintained under compression only in consequence of the hardening by hammering or drawing out of the external ring, and if afterward a portion of the external surface is removed, a portion of its hardened part is, in consequence, taken away and the segments would become loosened.

In order to avoid the objection stated, the ring *a* is made very thin, of a metal having anti-friction properties, for instance from yellow brass; and preferably the said ring has a head a° in one of the ends, as shown in Fig. 2. The insulating ring *b*, and the segments *c* insulated from each other by means of insulating sheets *d* are inserted in the said ring *a* as hereinbefore explained, but preferably a disk *e* having a suitable thickness and of a diameter less than the internal diameter of the ring *a*, is introduced in the said ring against its head a°, before the ring *b*, and the segments *c* are introduced into the said ring *a*; and preferably, the disk *e* has its edge e°, between its periphery and the face which is applied against the head a°, rounded; and if it is desired that the sheets *d* should project beyond the segments *c*, the disk *e* is provided with suitable grooves to receive the ends of the sheets *d*.

Use is then made of a ring f of relatively great section and made of a highly resistive metal.

The internal surface of this ring comprises a cylindrical part f^0 and a conical part f^1. The part of greater diameter of the said conical part has a diameter slightly greater than the external diameter of the ring a, and the diameter of the cylindrical part f^0 is equal to the external diameter which must be given to the said ring a.

Furthermore, use is made of a ring g, having the same internal diameter as the cylindrical part f^0 of the ring f and any suitable external form, as the said ring can take the place of a part of the machine on which the commutator is to be mounted.

The ring a is introduced, its bottom a^0 first, in the conical part f^1 of the ring f; it is then pressed into the ring f by means of a suitable device, such as a piston acting on the front edges of the segments c, so that it is progressively brought into the cylindrical part f^0 of the ring f.

It is to be understood that during this operation the head a^0 would be liable to breakage by the segments c, exerting a strong pressure on it; the disk e has for its object to prevent this breaking by distributing equally the pressure of the segments c on the head a^0; furthermore the edge e^0 of the said disk is rounded to prevent cutting of the ring-head a^0 by the said edge.

It is to be noted that during the pressing operation, as the external diameter of the ring a is reduced, the said ring will press the edge of the insulating ring b against the periphery of the disk e, so that the said ring b will not be subjected to lateral displacement due to the lengthening of the ring a.

The ring a passes directly from the ring f into the ring g, this ring g serving to prevent breakage or enlargement of the ring a, under the pressure exerted by the segments c, which would happen if the ring a were left free upon reaching the outlet of the ring f.

To accomplish this result the ring g is mounted so that its internal surface is a continuation of the cylindrical internal surface f^0 of the ring f.

When the commutator is mounted in the ring g, the ring-head a^0 is cut away, the disk e taken away, and the commutator can then be finished in the usual way.

The ring f constitutes a tool which may be used continuously for the manufacture of commutators of the same diameter.

Obviously the invention is not limited to the peculiar method of carrying it out, which has been more particularly described, it comprising all modifications within the scope of the claims. For instance, if the brushes must bear on the external cylindrical part of the commutator, the ring g, the ring a and the ring b, could be cut away in the part where the brushes must bear on the segments; the said segments being then maintained firmly in proper relation by the remaining parts of the said rings.

I claim as my invention—

1. A commutator for electric machines, of the class wherein the current passes through an internal surface but not through the external surface of the commutator, said commutator comprising an annular series of segments, a ring of insulating material surrounding the segments on their outer cylindrical surface, a comparatively thin ring of metal having anti-friction properties and covering the said insulating ring, and a relatively strong outer binding ring which exerts permanently a force on the said thin ring, which force is transmitted through the said thin ring to the insulating ring and in turn is transmitted through the insulating ring to the segments, whereby the latter are maintained under compression and in proper relation.

2. The method of making commutators for electric machines which comprises assembling an outer ring, an intermediate ring of insulating material and an inner annular series of segments, and then subjecting the assembled structure to a radially-contracting pressure which will produce a permanent contraction of the outer ring upon the insulating ring and the segments.

3. The method of making commutators for electric machines which comprises assembling an outer ring, an intermediate insultating ring and an inner annular series of segments, subjecting the assembled structure to a radially-contracting pressure which will produce a permanent contraction of the outer ring upon the insulating ring and segments, and forcing a ring of highly resistive material over said outer ring while the assembled structure is under the influence of said contracting pressure.

4. The method of making commutators for electric machines which comprises assembling an outer ring which is of a comparatively thin ductile metal having anti-friction properties, an intermediate ring of insulating material and an inner annular series of segments, and forcing said assembled structure into a plain outer ring of a diameter smaller than the diameter of said assembled structure, and thus producing a permanent compression which will maintain the segments in proper relation.

5. The method of making commutators for electric machines which comprises assembling a comparatively thin ring of ductile metal having anti-friction properties and having a flat head, an intermediate ring of insulating material, and an inner annular series of segments, then forcing the thus

assembled structure through a substantially rigid annular tool, the inner diameter of which is smaller than the outer diameter of the said thin ring, into an outer ring so located as to receive the assembled structure from the opening in said tool and to cause the head of the said thin ring to be first presented to said outer ring which latter possesses sufficient rigidity to maintain at least a part of the compression which the tool imposed upon the assembled structure and has the same diameter as the smallest diameter of the rigid annular tool, whereby forcing of said assembled structure into the outer ring produces a permanent compression upon the assembled structure to maintain the segments in proper relation.

6. The method of making commutators which comprises assembling a comparatively thin ring of ductile metal possessing anti-friction properties and having a flat head, a disk within said thin ring and located against its flat head, a cylindrical ring of insulating material within said thin ring and an inner annular series of segments within the insulating ring and abutting against said disk, then forcing the said assembled structure with the head of said thin ring foremost, through a substantially rigid annular tool having an inner diameter smaller than the outer diameter of the thin ring, into an outer ring so located as to receive the assembled structure from the tool, said outer ring having sufficient rigidity to maintain at least a part of the compression imposed upon the assembled structure by the tool, then cutting off the head of the thin ring and removing the disk.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

PIERRE BOSSU.

Witnesses.
CHAS. P. PRESSLY,
EUGÈNE JULLER.