S. N. SLOAN.

COMMUTATOR AND METHOD OF ASSEMBLING SAME.

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1,354,005.

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Fig. 1.

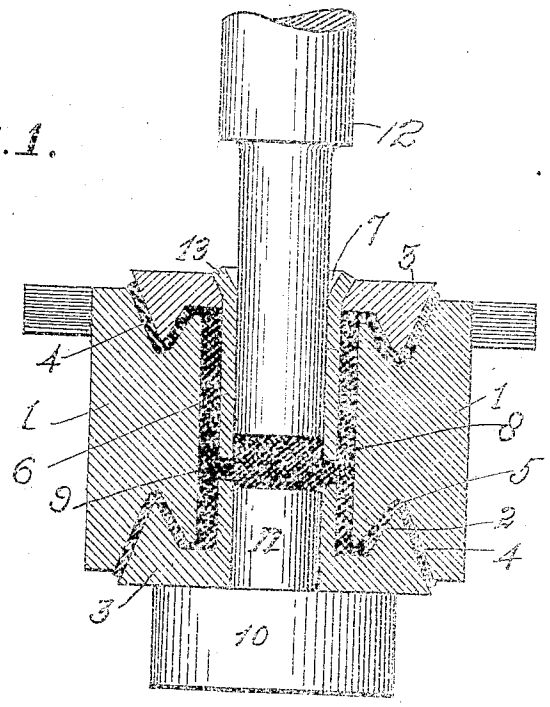


Fig. 3.

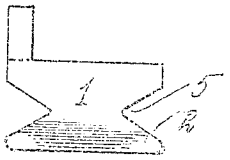
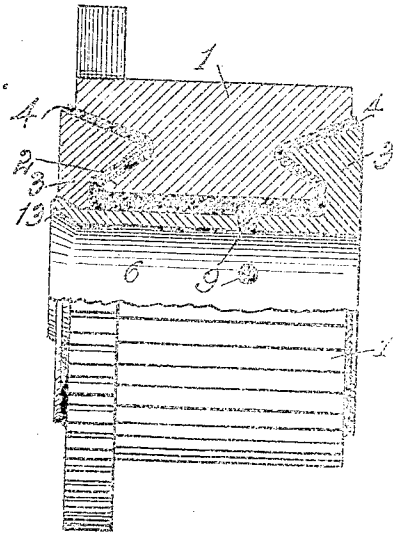


Fig. 2.



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UNITED STATES PATENT OFFICE.

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COMMUTATOR AND METHOD OF ASSEMBLING SAME.

1,354,005. Specification of Letters Patent. Patented Sept. 28, 1920.

Application filed March 3, 1917. Serial No. 152,239.

To all whom it may concern:

Be it known that I, SEBASTIAN N. SLOAN, a citizen of the United States, residing at Maumee, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Commutators and Methods of Assembling Same; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

In the assembling of the numerous parts which go to make up a commutator for an electric dynamo or motor, it is necessary that the alternating segmental bars and insulating pieces be relatively disposed with great accuracy and that they be held rigidly against displacement either radially or longitudinally, since such movement of either of the parts might cause short circuits, or grounds and other accidents.

The usual method of building up a commutator is, briefly, to gather the copper segments, separated by corresponding mica segments, into cylindrical form in a stout ring or former leaving an axial hole for the shaft. These segments have, respectively, at each end angular notches which, taken collectively, form deep circular channels in the ends of the cylinder. Into these channels are forced stout steel rings which are shaped in cross-section to conform to the channels, there being, of course, insulating material between the rings and the copper segments. The centrifugal pressures upon the segments due to the many thousand revolutions per minute now required in small electric motors is very great. Therefore the inward pressure upon the rings amounting, in modern practice to many tons, necessary to bring the several parts into their final relative positions and to there rigidly and immovably retain them, is so great that frequently the points or tangs,—formed in the copper segments by the angular notches above referred to,—as well as the inner edges of the segments, are distorted or caused to "flow" and to overlap or penetrate the adjacent insulation and to contact with the neighboring copper. This mishap renders the commutator inoperative until the accidental contact is discovered and corrected. This involves undue time and labor and ofttimes results in the throwing away of the work.

My invention relates to new and useful improvements in commutator construction, the main objects being to overcome the difficulties and fruitful source of trouble here pointed out, and, more particularly, to furnish an unyielding support for the inner edges of the segments and for the segment-tangs throughout their length against distortion due to the end-pressure of the steel clamping-rings; to prevent radial movement of the copper segments under the end-pressure of the clamping-rings; to prevent movement of mica insulating-rings as well as the movement of their natural and artificial laminæ upon each other, and to provide an improved insulation for the various parts of the commutator.

In the accompanying drawings are illustrated means for practising my invention. Figure 1, is a central longitudinal sectional elevation of a commutator showing one step in the method hereinafter described; Fig. 2, a commutator, partly in radial section, after the completion of the operation illustrated in Fig. 1; and Fig. 3, a side elevation of a commutator segment detached.

Corresponding numerals indicate like parts throughout the drawings.

In order that the inner edges of the copper segments 1, including the tangs 2, shall not be displaced or distorted by the great end-pressure of the clamping-rings 3, I have found that these edges should be rigidly supported throughout their length during and after the application of the pressure upon the clamping-rings which are to hold the segments in fixed operative relation. The several copper segments 1, with the usual interposed mica segments, are assembled in a forming ring in the usual way. Channeled mica rings 4 are fitted into the circular grooves formed by the notches 5 in the copper segments. A sleeve 6 formed, preferably, integral with one of the clamping-rings extends through the axial shaft-opening 7. Between the outer surface of this sleeve and the inner edges of the segments 1 is an annular space 8. By means of a suitable press the clamping-rings are given a preliminary squeeze toward each other, bringing the parts nearly into their ultimate relation, through the wedge-like action of the angular surfaces of the rings upon the opposed corresponding surfaces of the end-

grooves of the device. The several parts and the manner of assembling them thus far referred to, as well as the instrumenetalities eemployed, are well understood and need not be here further illustrated or explained.

Now, as above explained, it becomes necessary to rigidly support the copper segments at their inner edges in order to prevent their distortion under the severe final squeeze of the clamping-rings. To this end the sleeve 6 is provided with a series of holes 9 leading through the sleeve into the annular space 8. Projecting upwardly from a base 10 is a cylindrical plug 11 of such dimensions as to fill the shaft opening 7 up to near the holes 9. A plunger 12, actuated by any suitable mechanism, is arranged to enter and operate in the upper part of the shaft opening in opposition to the plug 11. A substance which can be made to assume a liquid or semi-liquid state, and which solidifies, or when suitably treated solidifies and becomes exceedingly hard (as for instance, bakelite, hereinafter mentioned) is inserted while in a soft state into the opening 7 on top of the plug 11. The plunger 12 follows, forcing the soft material through the holes 9, and under pressure filling the annular space 8 and all of its surrounding crevices and interstices. Subsequently the plunger is withdrawn and after this material has assumed its solidified state, the final pressure is given to the clamping rings, during which operation the tangs 2 and the inner edges of the segments 1, unyieldingly supported as described, maintain their shape and relative positions. The outer end of the sleeve is peaned over the clamping ring, through which it protrudes, as at 13, and now all of the parts are securely fastened in proper and fixed relation, and when the hardened material left in the shaft-opening is bored out the work is complete.

The material which I find best adapted for filling the vacancies around the sleeve 6 is commercially known and is readily obtainable as bakelite. As is well known, this material can be obtained in a soft or plastic state and on being heat treated or baked becomes exceedingly hard. It also forms an admirable insulator. Other substances which are nonconductors and which are fluidal or solid under varying conditions will suggest themselves to those skilled in the art and I do not therefore limit my invention to the material referred to.

Having described my invention, what I claim and desire to secure by Letters Patent, is—

1. In a commutator, a group of segments insulated from each other, a holder therefor comprising a sleeve or barrel extending through the group of segments, a pair of clamping elements insulated from the segments which elements tightly clamp the segments together and hold them from axial and radial displacement, and an unyielding insulating support between the sleeve and the inner edges of the segments of sufficient hardness to hold the segments against distortion and to prevent movement of the insulation between the segments themselves and between the clamping elements and segments under severe clamping pressure of the clamping elements.

2. In a commutator, a series of segments in cylindrical formation, a supporting sleeve extending co-axially with the commutator through the segments, end clamping rings at the ends of the segments and forced together so as to tightly clamp the segments and hold them from axial and radial displacement, insulation between the segments and between the clamping rings and the segments, and between the sleeve and the inner edges of the segments a solidified insulating medium which supports said segments and said insulation from distortion due to the pressure of the clamping rings.

3. In a commutator, a series of cylindrically arranged segments suitably insulated from each other, a supporting sleeve extending co-axially with the commutator through the segments, end clamping rings at the ends of the segments and forced together so as to tightly clamp the segments and hold them from axial and radial displacement, insulation between the clamping rings and the segments, and between the sleeve and the inner edges of the segments a hard insulating medium to support said segments and said insulation from distortion due to the pressure of the clamping rings.

4. As an article of manufacture, a commutator comprising a series of radially disposed segments insulated from each other and provided at their ends with notches which collectively form circular channels in the ends of the assembled segments, insulating rings in said circular channels, clamping rings engaging said insulating rings, an internal sleeve co-axial with the commutator, there being an annular space between the sleeve and the inner edges of the segments, and a solidified insulating substance which is provided in said annular space so as to support the inner edges of the segments against distortion due to the pressure of the clamping rings.

In testimony whereof I affix my signature in presence of two witnesses.

SEBASTIAN N. SLOAN.

Witnesses:
LOUIS JACOBSON,
LOUIS A. ALEXANDER.