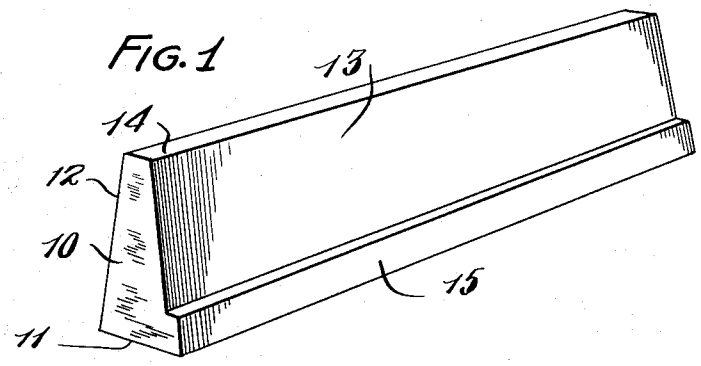
Sept. 15, 1953 J. KLYM 2,651,834

COMMUTATOR BLANK AND METHOD OF MAKING COMMUTATORS

Filed Oct. 19, 1950

FIG. 1



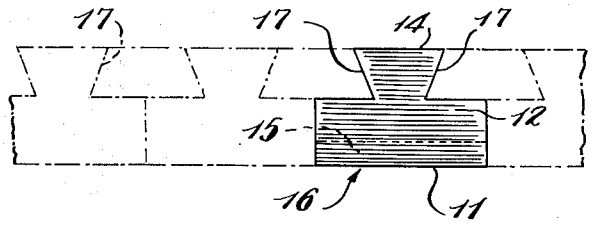


FIG. 2

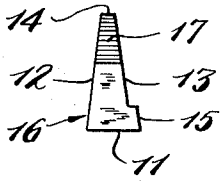


FIG. 3

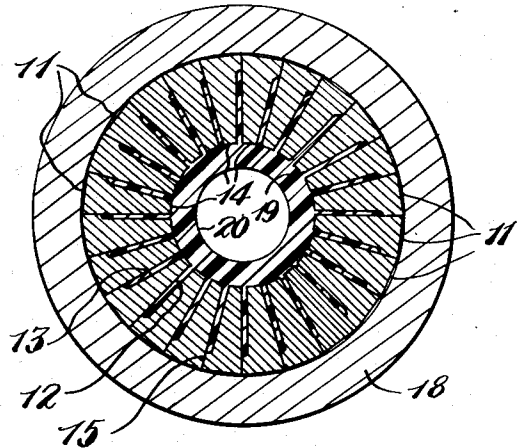


FIG. 4

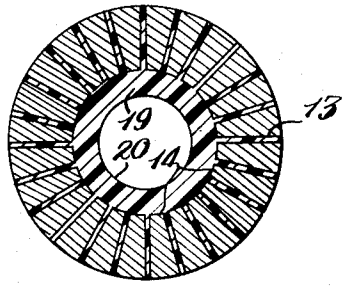


FIG. 5

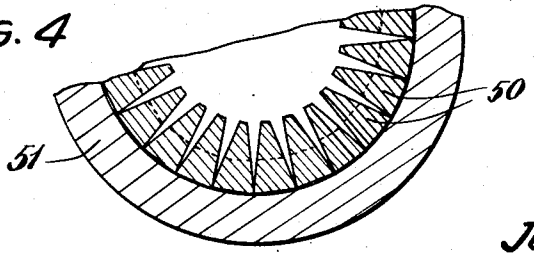


FIG. 8

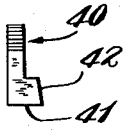


FIG. 7

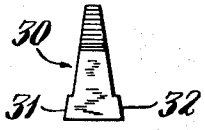


FIG. 6

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COMMUTATOR BLANK AND METHOD OF MAKING COMMUTATORS

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Application October 19, 1950, Serial No. 190,977

7 Claims. (Cl. 29—155.54)

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This invention relates to commutators, particularly to a new type of a commutator blank and to a method of making commutators.

Heretofore one widely used method of producing commutators for electric motors and generators and other similar uses, has been to produce a large number of relatively elongate commutator blanks, which usually are made from a strip of copper that is punched or blanked in order to form a large number of similarly shaped commuator segments from the copper bar. To make a commutator from such commutator blanks, a worker takes a commutator blank and positions a strip of insulating material, such as mica, adjacent one side of the commutator blank, then next positions another commutator blank against a side of the mica insulation strip, then proceeds to complete the annular assembly of alternate strips of insulation and commutator blanks which are wedged fairly tightly together. The associated commutator segments and insulation strips are then completed to commutator form. This completion of the commutator has comprised either embedding the assembled commutator pieces in a plastic insulation medium, such as Bakelite, by a molding operation, or else the loose assembly of commutator segments has been bound permanently together by the use of an iron or other type of metal mounting sleeve which is inserted through the commutator segments and peened over or otherwise brought into engagement with opposite end portions of the commutator segments to retain them in a desired fixed relation to each other.

While the previous methods for producing commutators has yielded desirable types of commutators, such commutators and methods of assembly have been objectionable because of the relatively high cost of such commutators and particularly of the specific type of insulation normally used in commutator manufacture i. e. mica and because of the large amount of hand assembly labor required.

At least one previous effort has been made to eliminate the use of mica strips in forming commutators and such previous method is disclosed in British Patent No. 584,867. This previous British patent, in general, provides a commutator which is formed from a relatively thick metallic strip. The metal strip is provided with a plurality of parallel transversely extending slots formed in one surface thereof so as to form a plurality of lugs, or projections that extend from one side of the continuous metal strip. In some instances, longitudinally extending slots are also

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formed in the projecting portions provided in the metal strip by the transversely extending slots. Then to form a commutator from such specially shaped metal piece, the correct length of the preformed metal bar is bent into annular form after which a suitable plastic material is molded into and around the metal strip segment, which now is in annular form and has the different lugs provided therein extending radially inwardly from the continuous base portion thereof. Individual commutator segments are then provided by turning off the peripheral portion of the metal strip until the continuous base portion of the strip has been completely removed so that only the individual transversely extending segments of the original metal piece remain embedded in the molded plastic material. This type of production of commutators has involved the use of several different pieces of apparatus for preforming the metal strips to desired shape for forming the different commutator segments therefrom, and several cutting or shaping operations.

The general object of the present invention is to provide a novel type of commutator which is made by a new method that is characterized by the efficiency of operations in such commutator forming method and by the low cost of the commutator and its assembly.

Yet another object of the invention is to provide a commutator the individual segments of which are insulated from each other by the material in which the commutator segments are embedded.

A further object of the invention is to provide a commutator making method wherein specially shaped segments are used in producing the commutator and wherein such specially shaped segments reduce the number of operations required to assemble the commutator segments in condition for a molding operation to deposit an insulating and binding plastic material into and around such segments.

Another object of the invention is to provide a commutator producing method which uses only a minimum of procedural steps in the production of commutators.

Another object of the invention is to provide a novel type of a commutator segment wherein the commutator segment has generally triangularly shaped sectional contour and wherein a longitudinally directed laterally offset portion is provided on the commutator segment at the base thereof.

Still another object of the invention is to provide commutator segments which are adapted

to be positioned in a commutator assembly ring in which relationship to each other only the base portion of the commutator segments contact each other.

The foregoing and other objects and advantages of the invention will be made more apparent as the specification proceeds.

For a better understanding of the invention, reference is directed to the accompanying drawings, wherein:

Fig. 1 is a perspective view of a metal bar used in forming commutator blanks or segments of the invention;

Fig. 2 is a side elevation of a commutator blank of the invention with other blanks being indicated adjacent such blank to indicate how the bar shown in Fig. 1 would be severed to produce the commutator blanks;

Fig. 3 is an end elevation of the commutator blanks of Fig. 2;

Fig. 4 is a section through a commutator in the process of manufacture in accordance with the principles of the present invention;

Fig. 5 is a section similar to Fig. 4 of a completed commutator of the invention;

Figs. 6 and 7 are end elevations of modifications of the commutator blanks of the invention; and

Fig. 8 is a fragmentary elevation of yet a further modified type of commutator segments showing them in assembly in a confining ring.

The present invention, in a broad sense, relates to the provision of a new type of commutator blanks which has a laterally offset portion in a base section of the blank whereby a plurality of blanks can be assembled in annular form in a retaining ring and be wedged thereinto with only the base portions of the commutator blanks contacting and with the radially inner portions thereof being circumferentially spaced from each other. Next the commutator segments would be embedded in a moldable insulation material by a suitable molding operation while the segments are retained in their annular form, after which the peripheral portion of the so formed commutator blank would be turned off or otherwise removed to cut away the peripheral portion of the molding material and the base portions of the commutator segment to leave only the portions of the commutator segments which are in spaced relationship to each other.

Reference now is directed to the details of the figures shown in the drawings and Fig. 1 illustrates an elongate metal bar 10 that is of generally frusto-triangular shape in cross section and which bar is made from some good electrical conductor, such as copper or silver or alloys or such material. The metal bar 10 is shown as having a base 11, a pair of sides 12 and 13 and an apex 14. Figs. 1 and 3 best show that the metal bar 10 also has a longitudinally extending, laterally outwardly offset section 15 extending the length thereof formed at the base portion of the side 13.

In order to form a plurality of commutator blanks, or segments, or bars from the metal bar 10, the metal bar 10 is fed into a punch press or similar device by which a plurality of commutator segments or blanks generally indicated by the numeral 16 are produced. The sections of the blanks 16 are identified by the numerals 12, 13, 14 and 15, used to refer to the corresponding portions of the metal bars 10, and the base 11 is also so identified in the segments 16. It will be seen that a plurality of similarly shaped blanks can easily be formed from the metal bar 10 with a minimum of waste of the material comprising this metal bar.

Preferably in forming the commutator blanks 16 a tang 17 is formed in the commutator blank at the apex 14 thereof and this facilitates embedding the commutator blanks in a commutator, as hereinafter described.

After a plurality of the commutator blanks 16 are provided, these blanks are then, usually manually, positioned within a confining or retaining ring 18. The original size and shape of the metal bar 10 and the commutator blanks 16 formed therefrom are predetermined with relation to the diameter of the ring 18 so that the commutator blanks 16 can be abutted against each other in the ring 18 and can be wedged into position therein with a predetermined number of blanks 16 being positioned within the ring 18 with only the offset sections 15 of the commutator blank contacting each other whereas the remainder of the sides 12 and 13 of the blanks will be in circumferentially spaced relation to each other, insofar as adjacent surfaces of adjacent commutator blanks are concerned.

Fig. 4 of the drawings shows that an insulation material 19 is positioned intermediate the adjacent side surfaces of the commutator blanks 16 and also is positioned radially inwardly therefrom. Usually the end portions of the commutator blanks 16 are also embedded in the insulation material. Any desired type of moldable insulation material normally can be used so as to embed the commutator blanks 16 in the resultant molded product which comprises a rough commutator.

The rough commutator, or commutator blank, shown in Fig. 4 is suitably removed from the ring 18 after which it usually is positioned by a chuck or equivalent device which engages with a bore 20 of the rough commutator, and the commutator rotated in a lathe or other equivalent device so that a suitable cutting or grinding tool can be brought into engagement with the periphery of the commutator in order to turn off the base portions of the commutator blanks 16 and completely remove the offset sections 15. Hence only the circumferentially spaced portions of the original commutator blanks 16 are left in the resultant commutator. It will be noted that some of the insulation material 19 adjacent the bases of the blanks will also be removed in the same operation.

It will be appreciated that the offset portions of the commutator segments or blanks 16 may be of any desired size and that they need not be continuous over the length of the blank.

Fig. 6 of the drawings shows a modified form of commutator blank 30 therein. In this instance the blank is of generally the same shape as the blank 16 only it is provided with offset portions 31 and 32 one of which is on each side surface of the blanks 30.

Fig. 7 shows yet another type of a commutator forming blank 40 which is provided with an offset 41 on only one side of the blank 40. It should be noted that the laterally outer edge 42 of the offset 41 is preferably tapered inwardly of the blank 40 from the outer edge thereof but that in this instance the main body portion of the commutator blank comprises parallel side portions whereas usually the other blanks of the invention have inwardly tapered side surfaces. It should be noted that a projection of the sur-

face 42 will not intersect the commutator blank 40 so that when a plurality of such commutator blanks are positioned within a retaining ring in side by side relation, only the offset portion thereof will contact the adjacent commutator blank.

Still another modified type of commutator blank is shown in Fig. 8. In this instance, a commutator blank 50 is shown wherein the sides of such blank 50 are converging toward each other more sharply than do radially extending lines in the commutator into which such blanks are to be assembled. In this instance also, the sides of the blank 50 are shown as coming to a sharp point on the radially inner ends thereof although normally the commutator blanks are of frusto-triangular shape since it is not real desirable in many instances to have sharp inner surfaces on the commutator blanks. These commutator blanks 50 are shown in assembled relationship in a retaining ring 51 into which a plurality of the blanks 50 can be wedged.

It will be seen from the foregoing that in assembling a commutator in accordance with the invention, the worker does not have to assemble any insulation strips or sheets between the different commutator blanks so that this operation is avoided. The removal of the base portions of the commutator blanks does not actually require much additional time over the normal rough cut that is taken on the periphery of a commutator by the manufacturer thereof prior to shipping same to the person who will assemble such commutator in an electrical device. Hence it is submitted that the objects of the invention have been achieved and that a novel type of commutator segment and commutator forming method have been provided.

While several complete embodiments of the invention have been disclosed herein, it will be appreciated that modifications of these particular embodiments of the invention may be resorted to without departing from the scope of the invention as defined by the appended claims.

Having thus described my invention, what I claim is:

1. That method of making a commutator comprising the steps of forming an elongate metal bar of substantially triangular cross sectional contour, which bar has a laterally offset section at its base, blanking a plurality of commutator segments from the metal bar, arranging a plurality of commutator segments in annular form with their side edges abutting each other at least at their offset sections and with their apices extending inwardly of the ring and being spaced circumferentially thereof, encompassing the positioned commutator segments in a plastic insulation material that is positioned intermediate the adjacent side edges of the segments except at the offset sections thereof to form a commutator blank, and removing the peripheral portion of the commutator blank including the offset sections of the commutators segments to form a commutator.

2. That method of making a commutator comprising the steps of forming a plurality of commutator segments of substantially triangular cross sectional contour, which segments have laterally offset sections at their bases, arranging a plurality of the commutator segments in annular form in side by side relation with their side edges abutting each other only adjacent their bases and with their apices extending inwardly of the ring and being spaced circumferentially thereof, encompassing the positioned commutator segments in a plastic insulation material that is positioned intermediate the spaced adjacent side edges of the segments to form an annular commutator blank, rotating the commutator blank about its axis, and cutting off the peripheral portion of the commutator blank including the offset sections of the commutator segments to form a commutator.

3. That method of making a commutator comprising the steps of confining a plurality of commutator segments of substantially triangular cross sectional contour, which segments each have a laterally offset section at its base in annular form with their side edges abutting each other only at their offset sections and with their apices extending inwardly of the ring, molding insulation material around the positioned commutator segments, and removing the peripheral portions of the molded commutator segments including the offset sections of the commutator segments to form a commutator.

4. That commutator making method comprising assembling a plurality of tapered commutator bars having base and side edges and an apex with their base edges in contact in annular form with at least the radially inner portions of their side edges spaced circumferentially from each other and with their apices being radially inwardly of the so-formed ring, embedding the commutator bars in a moldable insulating material, and cutting away the contacting base portions of the commutator bars and any insulation material radially therebeyond to leave a plurality of spaced commutator bars embedded in the insulation material.

5. That commutator making method comprising assembling a plurality of commutator bars having base and side edges with their base edges in contact in annular form with at least the radially inner portions of their side edges being spaced circumferentially from each other, embedding the commutator bars in an insulating material, and removing the contacting base portions of the commutator and any insulation material radially therebeyond to leave a plurality of spaced commutator bars embedded in the insulation material.

6. That commutator making method comprising wedging a plurality of commutator bars having base and side edges and an apex in a ring form with the radially inner portions of their side edges spaced circumferentially from each other and with their base edges being in contact to retain the bars in their given positions, embedding the commutator bars in a moldable insulating material, and removing the contacting base portions of the commutator and any insulation material radially therebeyond to leave a plurality of spaced commutator bars embedded in the insulation material.

7. That commutator making method comprising wedging a plurality of commutator bars having base and side edges and an apex in a ring form with the radially inner portions of their side edges spaced circumferentially from each other and with their base portions being in contact to retain the bars in their given positions, embedding at least the radially inner portions of the commutator bars in a moldable insulating material, and removing the contacting base portions of the commutator bars to leave a plurality

of spaced commutator bars embedded in the insulation material.

JULIUS KLYM.

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