April 21, 1936. F. W. COTTERMAN 2,038,419

BLANK AND METHOD FOR MAKING COMMUTATORS

Filed Jan. 7, 1935

Fig. 1.

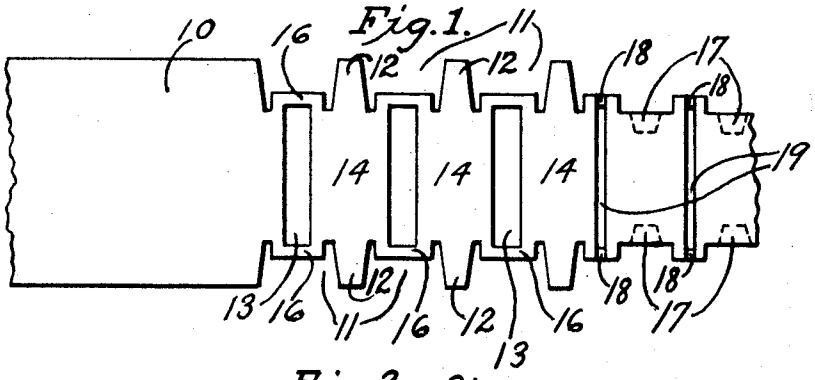


Fig. 2.

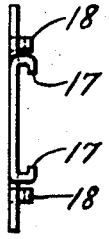


Fig. 3.

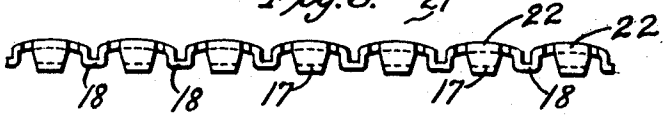


Fig. 4.

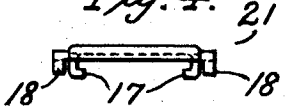


Fig. 5.

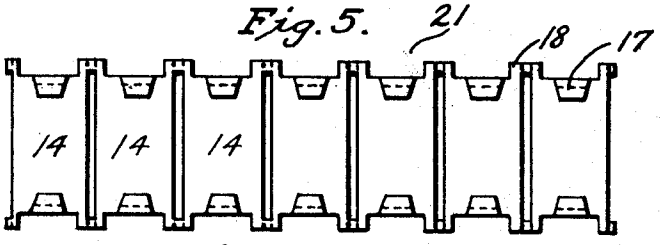


Fig. 6.

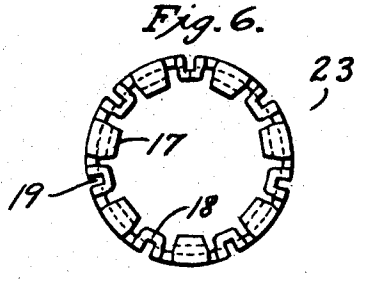


Fig. 8.

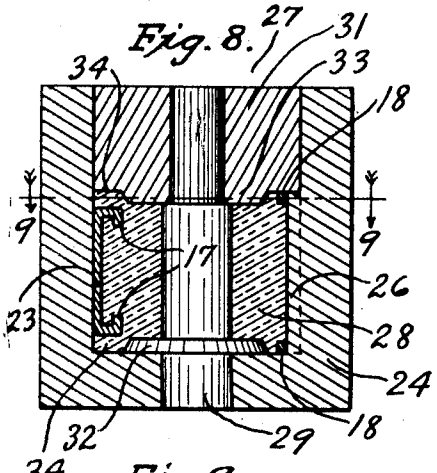


Fig. 7.

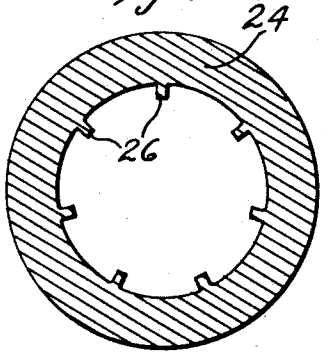


Fig. 9.

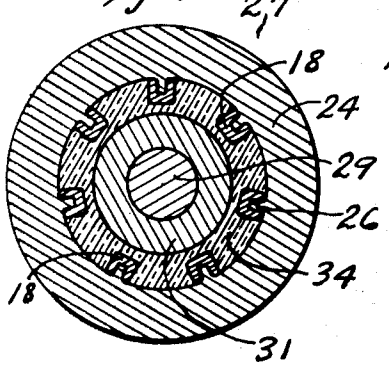
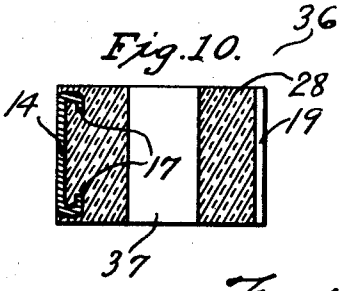


Fig. 10.



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BLANK AND METHOD FOR MAKING COMMUTATORS

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Application January 7, 1935, Serial No. 673

14 Claims. (Cl. 29—155.54)

This invention relates to commutators, and particularly to commutators of the type wherein a plurality of segments of conductive material are imbedded in and circumferentially spaced apart around a core of molded insulation.

An object of the invention is to provide a commutator ring for such a commutator wherein the entire number of segments may be maintained in one piece until after the core is molded into them, then readily divided into separate segments with a minimum expenditure of labor, and with minimum waste of material, all without weakening the core.

Another object is to provide an unique procedure for making such a ring.

Another object is to so construct the ring as to make it equally adaptable to either an undercut commutator or a flush type commutator.

Another object is to provide a method of making a complete commutator from such a ring.

I attain these and other objects by the procedure and in the resulting product hereinafter described, reference being had to the drawing wherein—

Fig. 1 is a plan view of a strip of sheet metal partly fabricated in its process of being made into a series of interconnected commutator segments.

Fig. 2 is an end view of the strip shown in Fig. 1.

Fig. 3 is an edge view of a complete set of the commutator segments as they appear prior to being bent in the form of a commutator cylinder, the said segments being interconnected by a series of integral end bridges.

Fig. 4 is an end view of the strip shown in Fig. 3.

Fig. 5 is a bottom view of the strip shown in Fig. 3.

Fig. 6 shows the strip Figs. 3, 4 and 5 bent to form the commutator cylinder.

Fig. 7 is a transverse section thru a mold body into which the cylinder Fig. 6 is placed.

Fig. 8 shows the commutator cylinder Fig. 6 in a mold after a core of insulation has been molded into it.

Fig. 9 is a transverse section taken at 9—9 of Fig. 8.

Fig. 10 shows the complete commutator resulting from cutting off the ends of the core and with them the bridges connecting the segments.

Similar numerals refer to several parts throughout the several views.

In carrying out my process I may provide a roll of ribbon stock, preferably copper, of uniform width as at 10 and pass it continuously thru a punch press provided with a progressive die. The entire roll is preferably passed thru the progressive die whereby uniformly spaced notches 11 are cut in the edges of the strip leaving oppositely extending anchors 12. Rectangular slots 13 are punched thru the strip at intervals equal to the spacing of the notches 11. This procedure provides a series of commutator segment blanks 14 each having oppositely extending anchors 12, adjacent segment blanks being connected at the ends by the integral bridges 16.

Further steps in the progress of the strip thru the die comprise curling under the anchors 12 as at 17 and bending the bridges 16 downwardly as at 18. The bending of the bridges narrows the rectangular slots 13 to about one-third their original width as at 19 thereby bringing adjacent segment blanks 14 closer together. An entire roll of the strip may be thus punched into a plurality of spaced apart end connected commutator segments.

The strip of interconnected segments is next cut into cylinder-blanks 21 wherein each cylinder-blank contains the proper number of segments desired for the commutator.

The edge, end and bottom views Figs. 3, 4 and 5 respectively show the set of segments, each curved on the outside as at 22 to correspond to the radius of the commutator cylinder, each segment having on its ends the downwardly curled anchors 17, and the adjacent segments being connected by the bent bridges 18.

A blank 21 is next bent into the form of a cylinder as at 23 Fig. 6, both the anchors 17 and the segment connecting bridges 18 extending radially inward toward the axis of the commutator cylinder. It will be seen that, because of the manner in which the bridges 18 are formed, the slots 19 which separate the several segments of the ring 23 extend thruout the length of the ring, so that it may readily be passed axially into a cylindrical mold body 24, Fig. 7, which has the inwardly extending spacing tangs 26.

In Figs. 8 and 9 the complete mold 27 is shown with a core 28 of insulation molded into the commutator ring 23. The mold comprises the body 24 having the inwardly extending spacing tangs 26, a center plug 29 and a plunger 31. The center plug 29 and the lower end of the plunger 31 are formed as at 32 and 33 respectively whereby the ends of the core 28 are depressed, leaving at each of said ends an annulus 34 within which the bridges 18 are contained. It will be observed that the anchors 17 are so imbedded in the core 28 that the annuli 34 may be cut off without disturbing the anchors, and that when the annuli

are so cut off the bridges 18 will be cut off with them, whereby the theretofore one piece commutator-ring becomes a series of electrically and mechanically separated segments 14 imbedded in the insulating core 28.

Fig. 10 shows the completed commutator structure 36 after the annuli 34 containing the bridges 18 have been removed. The core 28 has a central shaft opening 37, left where the center plug 29 was withdrawn, and the segments 14 are securely held to the core by the anchors 17, each segment being separated from the next by the spaces 19 from which the spacers 26 of the mold body 24 were withdrawn.

The commutator 36 belongs to the class which is usually termed undercut, that is, commutators wherein the insulation composing the core does not extend outwardly between the segments to the brush track. In molded commutators having cores containing a high percentage of resin, undercutting is highly essential if a reasonably high voltage is to be permitted, for otherwise the arcing of the brushes converts the resin to carbon and shorting between the segments results. But it will of course be understood that, where voltage and speed conditions permit it, a flush type commutator, that is, one wherein the material comprising the insulation core may extend also outwardly between the segments to the brush track, may be desirable. Such a flush type commutator may be readily produced by my process merely by removing the spacers 26 from the mold body 24, all other steps of the procedure remaining substantially the same.

From the foregoing disclosure it will be apparent that a number of advantages are had by making commutators according to my invention. First, the wide slot 13, Fig. 1, is more easily punched than a narrow slot 19 would be and the punches are less easily broken. Therefore by punching the slot wide as at 13, then narrowing it as at 19, less costly dies and less broken punches will result.

Second, forming the segment-connecting bridges downwardly, as at 18, Fig. 3, not only takes up the surplus length of the bridges, so as to narrow a slot 13 to compose a slot 19, but it provides clearance slots 19, Fig. 6, thru which the spacers 26, Fig. 7, necessary in making an undercut commutator, may slide axially when the cylinder 23 is inserted and removed from the mold.

Third, by providing from a one piece sheet metal stamping, a commutator cylinder 23, Fig. 6, wherein the segment-connecting bridges 18 are axially beyond the inturned anchors 17, the bridges may be removed without cutting into the anchors, with little expenditure of labor and with simple tools.

Believing the procedure and product hereinbefore disclosed to constitute a considerable advancement in the commutator art,

I claim—

1. A commutator cylinder comprising a series of circumferentially spaced apart commutator segments each having an integral portion at each of its ends turned radially inward then axially toward each other to compose anchors, the ends of the several segments being connected at both ends by integral portions comprising bridges located axially beyond the said anchors.

2. A commutator cylinder comprising a series of circumferentially spaced apart commutator segments, the said segments being connected to each other at both of their ends by a series of integral bridges each extending radially from the end of a segment toward the axis, then circumferentially, then radially away from the axis to the adjoining segment.

3. The structure defined in claim 2 wherein each segment has two anchor portions one at each end extending from the segment toward the axis, the said bridges being situated axially beyond the said anchors.

4. The structure defined in claim 2 wherein each segment has an integral part of both of its ends turned radially inward to compose a pair of anchors, the bridges being located axially beyond the said anchors.

5. Steps in the method of making a commutator cylinder blank comprising a series of interconnected commutator segments, which consist of punching the series of segments from sheet metal with relatively wide parallel spaces between adjacent segments, and with bridges at both ends of the said segments extending from each one of said segments across one of said wide spaces to the next said segment, and bending said bridges to take up their length to thereby make said wide parallel spaces narrower.

6. Steps in the method of making a commutator cylinder comprising a series of interconnected commutator segments which consist of taking the steps defined in claim 5, then bending the blank in the form of a cylinder so that the downwardly bent bridges extend radially inward toward the axis of the cylinder.

7. Steps in the method of making a commutator cylinder comprising a series of interconnected commutator segments, which consist of punching from sheet metal a series of segments with open spaces therebetween, said segments having integral bridges connecting adjacent segments at the ends of said open spaces and integral anchors extending from the ends of the segments, bending the anchors downwardly to cause a pair of anchors at opposite ends of a segment to be closer together than a pair of bridges at opposite ends of one of said open spaces, then bending said commutator segments into the form of a cylinder with the downwardly bent anchors extending radially inward toward the cylinder axis.

8. Steps in the method of making a commutator, which consist of providing the commutator cylinder defined in claim 1, molding a core of insulation into the cylinder and about the anchors and bridges, hardening said insulation, then cutting off both ends of the core in planes transverse to the axis and between said anchor and said bridges.

9. Steps in the method of making a commutator, which consist of providing the commutator cylinder defined in claim 2, placing it in a mold having means which will fill the spaces between the segments and between the radially extending portions of the bridges, molding a core of insulation into the cylinder, hardening said insulation, then cutting thru the core in two planes both transverse to the axis and both immediately inside the said bridges.

10. A method of making a commutator which comprises cutting from a strip of sheet metal a series of commutator segments, each segment having a pair of integral anchors extending oppositely from the ends and adjacent segments being connected by integral bridges at the ends of the said wide spaces, a pair of said anchors being closer together than a pair of said bridges, bending the pairs of anchors and the pairs of

bridges downwardly whereby the spaces between the segments are decreased in width, bending the strip to cylindrical form with the anchors and bridges extending radially inward toward the axis of the cylinder, molding a core of insulation into the cylinder and about the anchors and bridges, hardening said insulation, then cutting off the ends of the core containing said bridges.

11. A commutator cylinder comprising a series of segments, inturned anchors at the ends of the segments, and integral bridges connecting said segments, said bridges extending from each segment first axially away from the segment, then radially inward, then circumferentially, then radially outward, then axially toward and to the adjacent segment.

12. The structure defined in claim 11 wherein there are anchors and bridges at both ends of each segment.

13. A commutator cylinder comprising, a series of segments, a pair of anchors on each segment, one at each end thereof, extending from the ends of the segments first radially inward then axially toward each other, and integral bridges at both ends of the cylinder extending from the ends of each segment, first axially away from the end of the segment, then radially inward, then circumferentially, then radially outward, then axially toward and to the next segment.

14. In a punched sheet metal blank for a commutator cylinder, commutator segments separated from each other by parallel spaces, the segments having anchors extending laterally away from the ends, and integral bridges extending first laterally away from the ends, then across at the ends of the parallel spaces then laterally back to the next segment.

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