Aug. 20, 1940. W. KUCHTA, JR 2,211,979

COMMUTATOR

Filed March 21, 1938

Fig. 1.

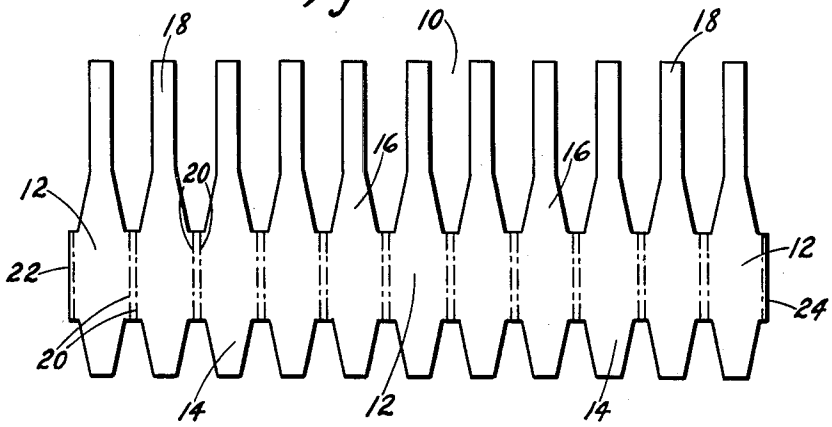


Fig. 2.

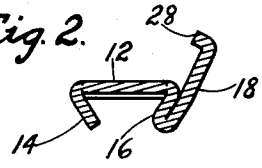


Fig. 3.

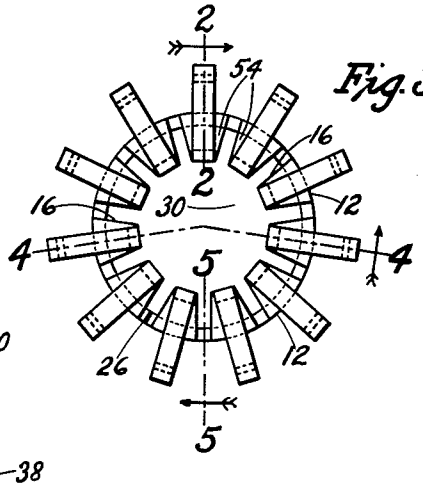


Fig. 4.

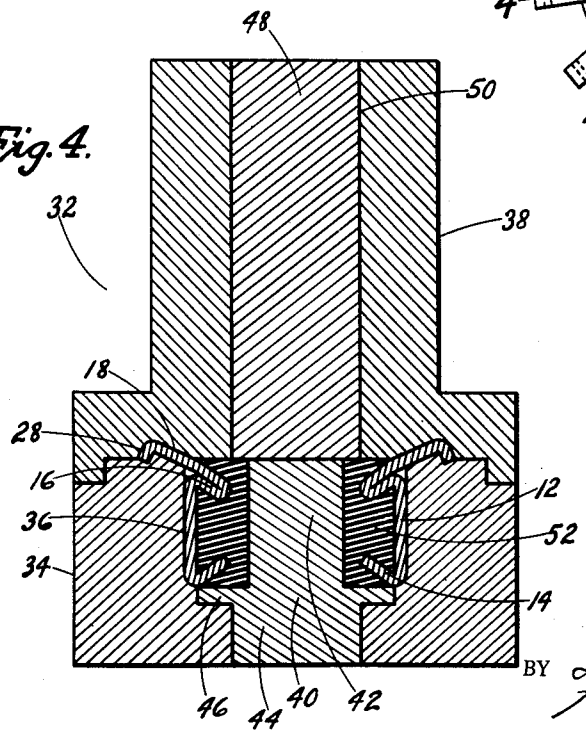
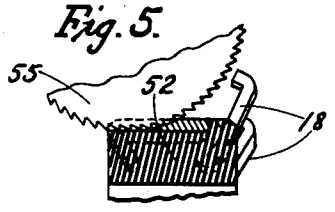


Fig. 5.



INVENTOR.
William Kuchta Jr.
BY Frederick W Cotterman
ATTORNEY.

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2,211,979

COMMUTATOR

William Kuchta, Jr., Cleveland, Ohio, assignor to Homer Commutator Corporation, Cleveland, Ohio

Application March 21, 1938, Serial No. 197,126

2 Claims. (Cl. 171—320)

This invention relates to commutators, and particularly to that type of commutator wherein a plurality of electrically separated metal segments are imbedded in a core of molded thermoplastic insulation.

Still more particularly the invention has reference to a commutator of this class wherein the metal segments comprise axially extending strips of sheet metal circumferentially spaced apart around the periphery of the cylindrical core, both ends of the strips being turned inwardly to provide anchors which are imbedded in the core thereby to hold the strip secured to its surface.

Due to the fact that this type of commutator is used extensively in small motors which operate at exceptionally high speed, it is highly important that the anchors be so made as to provide the greatest security to the segments against the resulting centrifugal force.

The most widely used and the most successful commutator of this type is that shown in Figs. 17, 19, and 21 of Patent No. 1,578,793 to Vincent G. Apple which discloses a structure wherein the anchors formed by inturned ends of the segments are as wide as the segments themselves, thereby holding the segments all the way across each end.

The patented structure above mentioned, however, does not have risers on the segments, and where risers are required, some modification of the structure is necessary. Such modification has been accomplished in several ways, all of which leave much to be desired in the way of security of the segments.

One method of providing a riser on this type of commutator has been to divide the anchor portion at one end of each segment lengthwise, and then turn one part of the divided end inwardly to form the anchor and the other part outwardly to form a riser. This method, however, leaves the riser end of each segment insecurely anchored because the divided part from which the anchor is formed extends only half way across the end of the segment at the point where the anchor enters the insulating core.

Another method of providing a riser in this type of commutator has been to divide the anchor at one end of each segment by two lengthwise cuts into three parts, then turning the middle part outwardly to provide a riser and the two outer parts inwardly to provide anchors. In this way the end of the segment is securely fastened to the core at both outer edges. Such a segment is shown in Fig. 2 of Pat. No. 1,898,929 to Vincent G. Apple.

The last mentioned method of providing a sheet metal segment is satisfactory only when the number of segments in a comparatively large diametered commutator is small, say about seven or less, for then each segment has considerable circumferential width and is capable of having its end divided into the three parts required to provide a riser and a double anchor as before indicated.

By far the greater number of commutators of this type, however, are small, ranging from one half to three quarters inch in diameter, and when a commutator of this small diameter is required to have a large number of segments, each segment has a circumferential width so narrow that its end may not be successfully divided into three strips to provide a riser and double anchor as shown in Fig. 2 of Patent No. 1,898,929.

It is therefore an object of this invention to provide a riser type commutator, and a procedure for producing it, which is applicable to commutators of small diameters with a large number of segments, and which will have the segments anchored in the insulation core in the most approved manner, that is, with an anchor at both ends of each segment, both anchors of each segment extending substantially the full width of the segment, the anchors extending directly from the ends of a segment into the insulating core, then providing a riser for each segment by prolonging the inner end of the anchor at one end of each segment, lapping it back upon itself and bringing it out of the core to a point convenient for attaching armature leads.

It is another object to so shape the end of each riser as to facilitate connection of the armature leads to the commutator risers.

Other objects and meritorious features will become apparent as the invention is described in greater detail and reference is had to the drawing, which for illustrative purposes only, is drawn to a scale of about three times the size in which commutators of this type have their widest application. In this drawing,

Fig. 1 shows a blank punched from sheet metal and containing, in one piece, the desired number of segments for a complete commutator, each segment being provided at both ends with an extension intended to be bent to compose an anchor, the anchor at one end of each segment being further prolonged to provide material from which to form a riser.

Fig. 2 is a section taken at 2—2 of Fig. 3 lengthwise through a single segment to indicate the shape to which all of the segments of the flat

sheet metal blank Fig. 1 are formed in the completed commutator.

Fig. 3 is an end view, looking toward the riser end, of the metal portion of a commutator formed by bending the blank Fig. 1 to cylindrical form and by bending the anchor and riser portions of each segment to the form shown in Fig. 2, the cylinder being, at this stage, not yet divided into separate segments.

Fig. 4 shows a mold in which an insulating core has been molded into a metal cylinder shown in Fig. 3, the mold being shown closed as it appears after the molding of the core is completed.

Fig. 5 shows a saw in the process of separating the metal commutator cylinder into its several segments.

A given numeral employed to designate a given part in any one view will not be used to characterize a different part in any of the views.

Referring particularly to Fig. 1, a commutator blank **10** of electrically conductive material and preferably, but not necessarily, of uniform thickness, comprises, in one piece, a plurality of segments **12**, the segments in the embodiment shown being eleven in number.

Each segment has a tapering tongue **14** at its front end and a similar tapering tongue **16** at its rear end, the tongue **16**, however, being further prolonged as at **18**. The tapering tongues **14** and **16** will subsequently be formed into anchors to hold the segments to the surface of an insulating core while the portions **18** will be bent to comprise risers. The lines **20** indicate the width of material which will later be removed by a saw or similar tool to divide the blank into separate commutator segments.

The blank **10** is next bent to cylindrical form with the ends **22** and **24** brought together as at **26**, Fig. 3, the tongue **14** being bent inwardly as shown in Fig. 2. The tongues **16** are also bent inwardly to the same extent and preferably to approximately the same angle as the tongues **14**. The prolongations **18** are then bent back upon the tongues **16** and extended outwardly to compose risers, the extreme outer ends being bent as at **28** to form hooks. Fig. 2 shows how the anchors and risers are formed on each segment **12**, while Fig. 3 shows the eleven formed segments contained in the single cylinder **30**.

The commutator cylinder **30** is next inserted in a mold **32**, Fig. 4. This mold comprises a body **34** having a cylindrical bore **36** large enough to receive the cylinder **30**. The top surface of the body **34** is properly recessed to admit the risers **18**.

A stock ring **38** is concentrically supported on the body **34** and fashioned on its lower surface to fit closely over the risers and tightly to the body. A center plug **40** has the upper end **42** of a diameter equal to the shaft opening which is desired in the commutator, the lower end **44** being slidably fitted to the body **34**. A flange **46** prevents the plug **40** being pushed downwardly through the body.

A plunger **48** is fitted slidably in the bore **50** of the stock ring **38**. In molding, a preformed slug of plastic molding compound is placed in the bore **50** with its lower end resting on the top of the end **42**, the plunger **48** is inserted and pressure applied thereto. Heat is then applied to flux the molding material and when this fluxes, the pressure on the plunger will force the compound first against the top of the end **42**, then laterally into the inside of the cylinder **30** to form the insulating core **52**.

The core is then baked to harden it before the structure comprising the ring **30** and core **52** is removed from the mold.

When the baked structure is removed from the mold, the commutator is complete except for the fact that the cylinder **30** has not been divided into separate segments. Fig. 5 shows a saw **55** cutting and removing that part of the metal of the cylinder **30** which is contained between lines **20**, Fig. 1, which separates the commutator into its eleven segments. A turning cut is preferably taken over the outside diameter as in common practice.

Referring again to Fig. 3, it may be seen that, due to the fact that the tongues **16** are wider where they join the segments **12** than they are where they join the riser strip **18**, ledges **54** are formed over which the insulating compound extends to hold the anchors secure. The compound further extends over the inner half of the risers which tends further to security. The forwardly turned hooks **28** facilitate connection of armature leads which are preferably drawn into the corner of the hook and given a turn around it and soldered thereto.

Having shown and described one embodiment of my invention it is to be understood that various changes may be made in the anchor and riser configuration, it being preferred that the anchors extend substantially the full width of the segment and enter the insulating core at this full width point, and that the riser portions extend from the inner ends of the anchors within the insulating core, through, to and beyond the outside of the core to a point convenient for connecting leads.

I claim:

1. A commutator comprising a cylindrical core of insulation with a plurality of metal segments circumferentially spaced around its periphery, each segment having an anchor at the front end extending inwardly from the end of the segment toward the axis and wholly imbedded in said core, and an anchor at the rear end extending inwardly from the end of the segment toward the axis and wholly imbedded in said core, the said rear anchor being prolonged at its inner end, lapped back upon itself and extended outwardly through and beyond the surface of said core.

2. A commutator comprising a cylindrical core of insulation with a plurality of metal segments circumferentially spaced around its periphery, each segment having an anchor at the front end which extends directly from the end of the segment inwardly toward the axis and into the core, and an anchor at the rear end which extends first directly from the end of the segment inwardly toward the axis and into the core then outwardly through and beyond the surface of the core to provide a riser.

WILLIAM KUCHTA, JR.