Aug. 30, 1932. V. G. APPLE 1,875,203

SELF VENTILATING HIGH SPEED ARMATURE

Filed Aug. 31, 1927

Fig. 1.

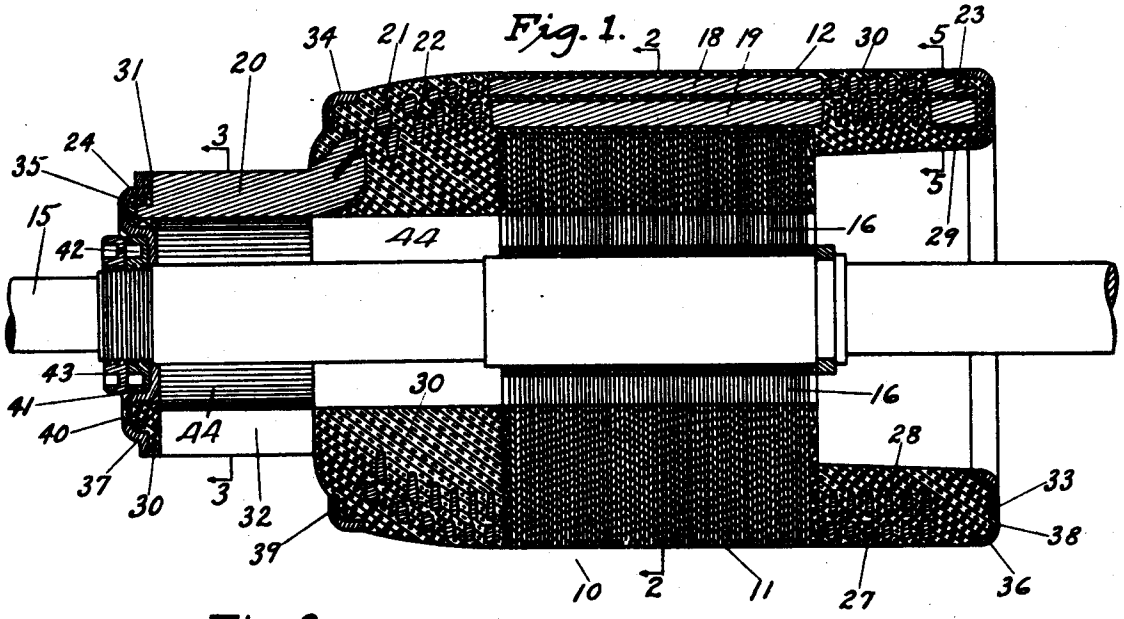


Fig. 2.

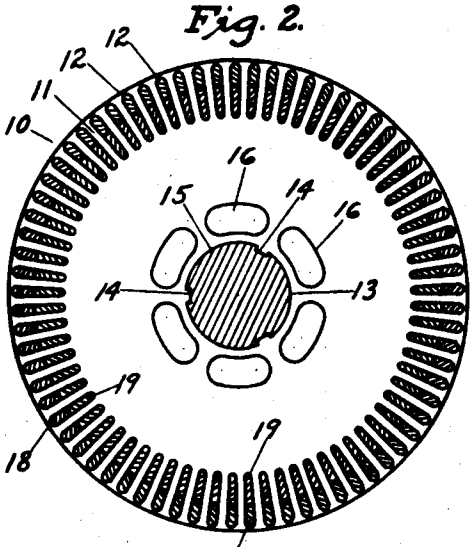


Fig. 3.

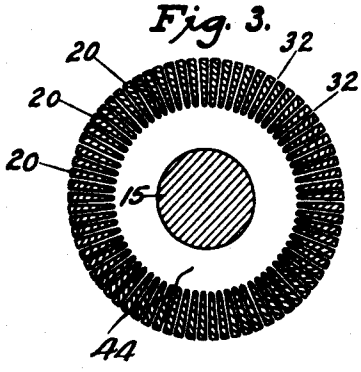


Fig. 6.

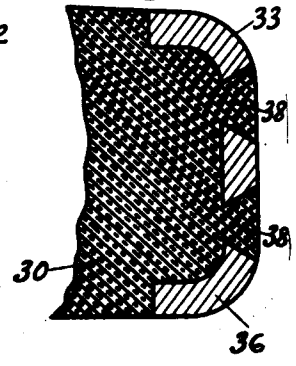


Fig. 4.

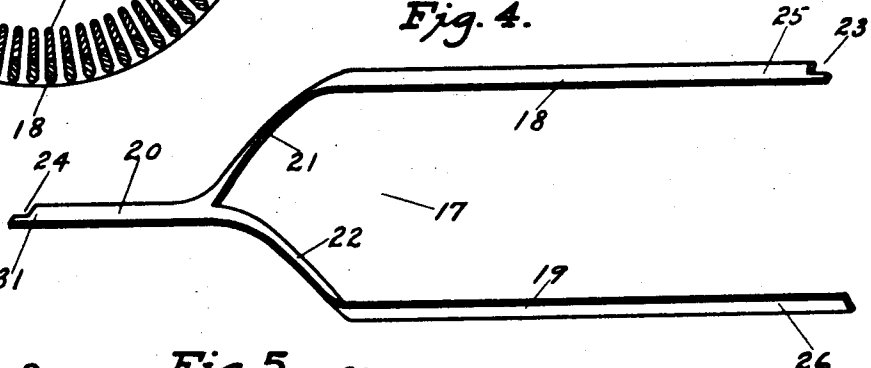


Fig. 7.

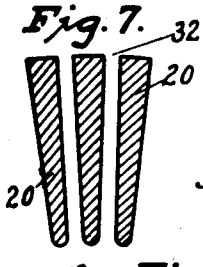


Fig. 8.

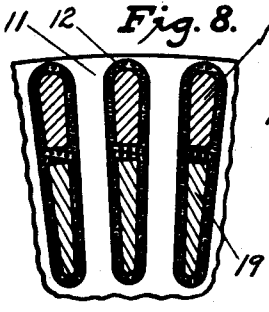
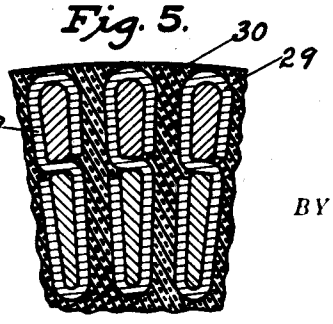


Fig. 5.



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UNITED STATES PATENT OFFICE

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SELF VENTILATING HIGH SPEED ARMATURE

Application filed August 31, 1927. Serial No. 216,749.

My invention relates to armatures for dynamo electric machines and more particularly to those having bar windings.

An object of my invention is to provide an armature having its commutator and winding integral, means for holding the commutator bars spaced apart to form a blower therefrom and air ducts thru the core cooperating with said blower to keep the core, windings, commutator and brushes which may bear thereon at a relatively low temperature, all with substantially no increase in the number of parts or amount of material used.

Another object is to secure the parts of the commutator and winding together as to render the finished armature capable of withstanding a higher rotative speed than when made as in common practice.

These and other objects are attained by the structure shown in the accompanying drawing wherein—

Fig. 1 is a longitudinal section thru my improved armature.

Fig. 2 is a cross section taken at 2—2 Fig. 1.

Fig. 3 is a cross section taken at 3—3 Fig. 1.

Fig. 4 is a perspective view of one of the winding loops.

Fig. 5 is a part section taken to a larger scale at 5—5 of Fig. 1.

Fig. 6 is an enlargement of a portion of Fig. 1.

Fig. 7 is an enlargement of a portion of Fig. 3.

Fig. 8 is an enlargement of a portion of Fig. 2.

Similar numerals refer to similar parts thruout the several views.

Referring to the drawing, the core 10 is composed of a plurality of laminæ 11 of magnetic material. Suitable winding apertures 12 are disposed near the periphery of the laminæ. An aperture 13 having inwardly extending keyways 14 is adapted to receive the armature shaft 15. Other apertures form tunnels 16 thru which air may be drawn to cool the armature in operation.

The winding is composed of a plurality of integral loops 17 of conductive material. (See Fig. 4). Each loop is made of a single piece of metal comprising a conductor bar 18 adapted to occupy a position in the outer layer of the winding, a conductor bar 19 adapted to occupy a position in the inner layer of the winding, and a commutator segment 20, the leads 21 and 22 being suitably bent to locate the commutator segment considerably closer to the armature axis than the conductor bars are located. Conductor bar 18 and commutator segment 20 are notched as at 23 and 24 respectively for purposes hereinafter set forth. The free ends 25 and 26 of bars 18 and 19 are bent to form suitable leads 27 and 28 (see Fig. 1) to complete the winding after the conductor bars 18 and 19 have been endwise entered into apertures 12 according to my process Patent No. 1,224,518 whereby closed or semi-closed apertures may be employed, an armature having its conductors held in such apertures being adapted to much higher rotative speed than one having its conductors held in open slots. A connector 29 of conductive material may be used to assist in maintaining the joint between each pair of ends 25 and 26 (see Figs. 1 and 5).

Molded insulating material 30 extends between and about leads 21 and 22, leads 27 and 28 and ends 31 to hold them in their respective positions and insulate them one from another. Insulation also surrounds and separates conductor bars 18 and 19 where they extend thru the core as in common practice. (See Figs. 2 and 8). But no insulating material extends between segments 20, except at their ends 31, so that spaces 32 are left between the segments, as shown in full in Fig. 3 and in part, to an enlarged scale in Fig. 7. A cylindrical passage 44 is left vacant immediately surrounding shaft 15, and this passage connects spaces 32 with tunnels 16. (See Fig. 1). It is obvious, that at high rotative speed considerable air will be drawn thru tunnels 16 and moved radially outward thru spaces 32 by reason of segments 20 acting as do the blades of a conventional blower, which serves not only to maintain a lower temperature in the core but to prevent accumulations of dust on and between the segments of the commutator, and to lower the brush temperature by directing a current of

air against the working surfaces of the brushes themselves.

Rings 33, 34 and 35 are provided at suitable places to protect the armature against physical injury and to take the strain due to centrifugal force at high rotative speeds. Ring 33 is turned over at 36 so as to surround but not touch, the notched ends 23 of the conductor bars. Ring 35 is turned over at 37 and surrounds, but does not touch, the notched ends 24 of the commutator bars. Ring 34 is of angle section and occupies a spaced apart position surrounding leads 21 and 22. These rings may be made of any material having sufficient strength and hardness for the purposes set forth, and accordingly, to be of value must be of a material harder and stronger than insulation material 30. They may be secured in place in any manner desired, a simple method of attachment being to provide tapered holes as at 38, 39, 40, etc., then suitably supporting the rings in proper location within the mold in which the insulating material 30 is to be molded, thus permitting said material to extend thru the tapered holes 38, 39, 40, etc., to firmly bind the ring in place. An enlarged section Fig. 6 shows more clearly how the insulation extends thru tapered holes 38 to hold ring 33 in place.

By reference to the drawing it is obvious that rings 33, 34 and 35 afford considerable protection to the armature against physical injury, and that the permissible rotative speed of the armature is considerably increased thereby, since the centrifugal force must either crush the insulating material between the winding and the rings, or must burst the rings in order to destroy the armature.

By depressing ring 35 as at 41 to receive nuts 42 and 43 the overall length of the structure is decreased.

Having described my invention, I claim—

1. A high speed armature comprising a core, ventilating tunnels therethru, a bar winding thereon, diagonal leads extending from the winding beyond the core, spaced apart commutator segments integral with said diagonal leads, rings of insulating material molded between and around said diagonal leads and between and around the free ends of said segments leaving the greater portion of said segments separated from each other by air spaces only, reinforcing rings imbedded in said insulating rings at their outer exposed ends and an air passage connecting said tunnels and said air spaces.

2. In combination, an armature core structure with closed winding apertures near its periphery and axially extending ventilating tunnels near its shaft, integral winding loops composed of pieces of metal split and spread apart and inserted in the said winding apertures with unsplit portions arranged in spaced apart cylindrical formation at the ends of the loops, an insulation ring molded between and about the outer ends of the unsplit portions concentrically supported on the shaft, an insulation ring molded between and about the inner ends of the unsplit portions, and between and about the split portions adjacent the core and concentrically surrounding said shaft radially beyond said tunnels, an insulation ring at the opposite end of the core molded between and about the split ends of the loops, and metal protecting rings surrounding and imbedded in said insulation rings at their exposed ends.

In testimony whereof I hereunto subscribe my name.

VINCENT G. APPLE.