Sept. 7, 1948. M. D. STAHL 2,449,021

DYNAMOELECTRIC MACHINE

Filed June 8, 1942 2 Sheets-Sheet 1

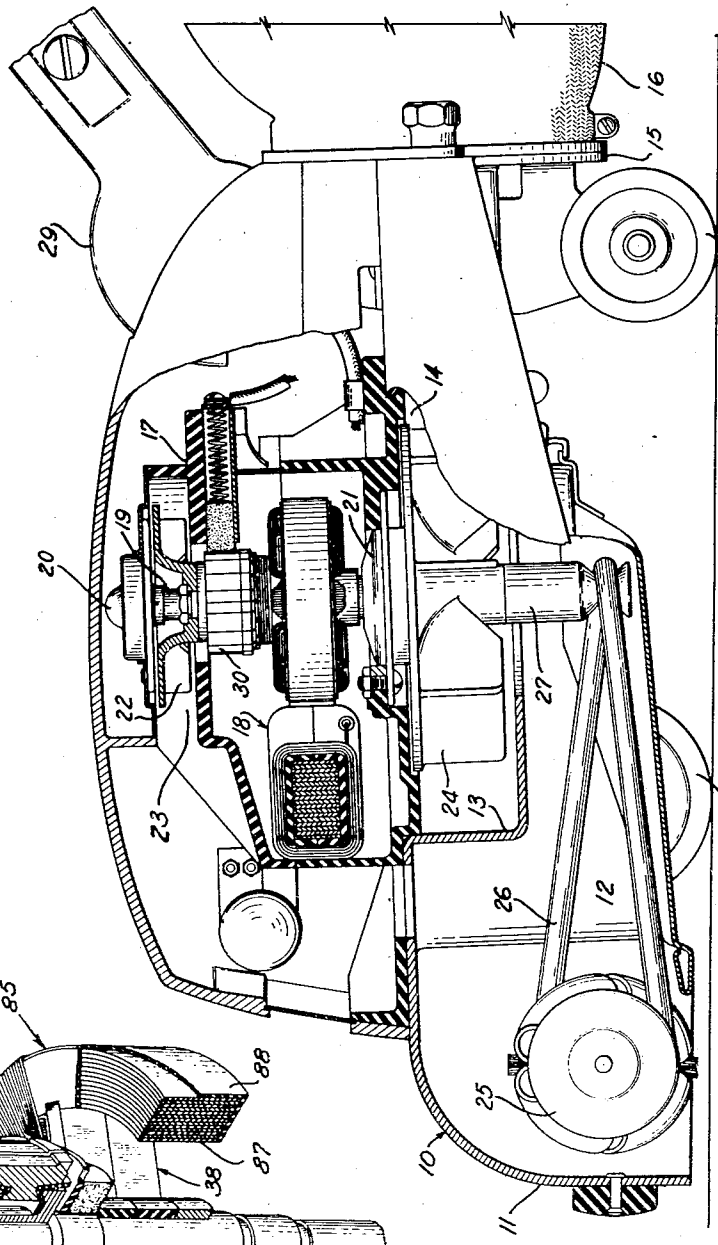


Fig. 1

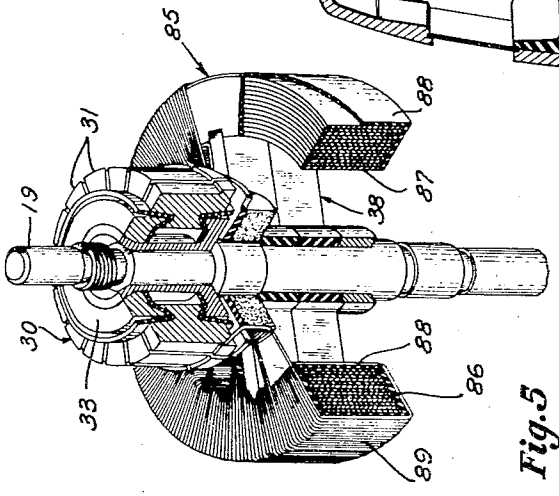


Fig. 5

INVENTOR
Maurice D. Stahl
BY
Harry S. Bruns
ATTORNEY

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DYNAMOELECTRIC MACHINE

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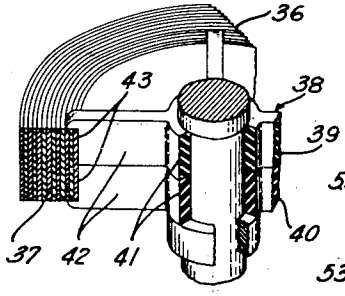


Fig. 3

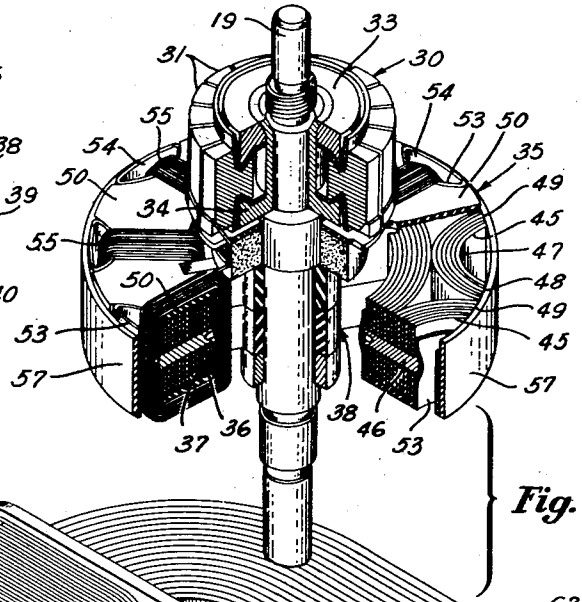
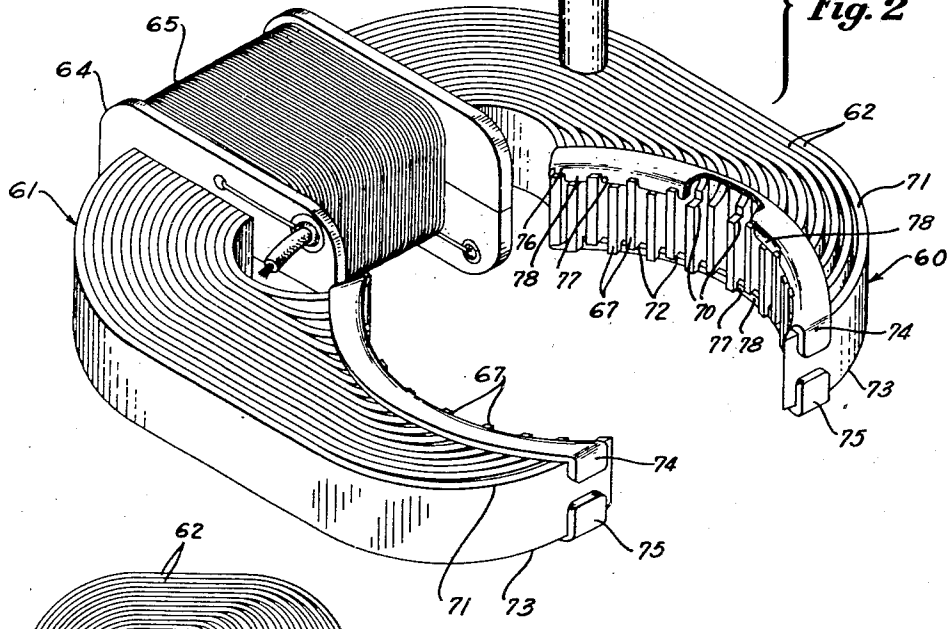


Fig. 2



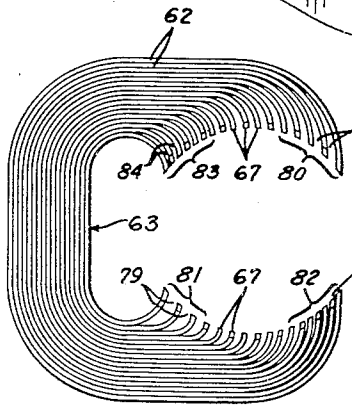


Fig. 4

INVENTOR
Maurice D. Stahl
BY
Harry S. Duncan
ATTORNEY

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DYNAMOELECTRIC MACHINE

Maurice D. Stahl, North Canton, Ohio, assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

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5 Claims. (Cl. 172—36)

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The present invention relates to suction cleaners and more particularly to an electric motor for suction cleaners.

An object of the invention is to provide a new and improved suction cleaner. Another object is to provide a new and improved dynamo-electric machine. A further object is to provide a dynamo-electric machine having an improved field core wherein the magnetic permeability is greater in one direction than in other directions. Still another object is to provide a nested laminated field core for a dynamo-electric machine, wherein the laminations are spaced relatively to each other at the pole faces. Another object is to provide an armature core having greater magnetic permeability in one direction than in other directions. Other objects and advantages of the invention will be apparent from the following description and attached drawings, wherein:

Figure 1 is a suction cleaner partly in section illustrating one embodiment of the invention;

Figure 2 is an exploded perspective view of the armature and field for the suction cleaner motor;

Figure 3 is a fragmentary perspective view of the armature in process of manufacture;

Figure 4 is a top plan view of the field core in process of manufacture, and

Figure 5 is an enlarged fragmentary perspective view of a motor armature illustrating another embodiment of the invention.

The invention is embodied in a suction cleaner comprising a casing 10 having a nozzle 11 communicating by means of a suction air passageway 12 with a fan chamber 13 connected to an exhaust passageway 14 terminating in a flange 15 to which is removably attached a dirt filtering bag 16. Supported on the casing 10 is a motor housing 17 enclosing a motor 18 having its armature shaft 19 mounted in spaced bearings 20 and 21 to rotate a motor cooling fan 22 in a ventilating fan chamber 23 and a suction creating fan 24 in the fan chamber 13. The motor is vertically mounted in the housing 17 and has its field coil arranged above the fan chamber 13 and between the armature and the cleaner nozzle. Rotatably mounted in the nozzle 11 is an agitator 25 driven by a belt 26 connected to a pulley 27 rigidly secured to the lower end of the armature shaft 19. The casing 10 is supported on wheels 28 and is propelled over the surface to be cleaned by a handle 29 pivotally supported on the casing 10.

The motor 18 is disclosed in detail in Figures 2 to 4 and includes a commutator 30 formed of segments 31 having dovetail sections which receive collars 33 and 34 for anchoring the commutator on the armature shaft 19. The armature 35 includes a central ring core 36 formed of a magnetic metal strip 37 wound in a spiral about a spider 38 to form a spiral laminated core with the width of the laminations being disposed substantially parallel to the armature shaft 19. The spider 38 is formed of two complementary sections 39 and 40 of electric insulated material, each section being provided with a hub 41 and arms 42, the latter having a recess 43 at the extreme ends for receiving and anchoring the core 36 to the spider 38.

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A plurality of groups 45 of arcuate magnetic metal strips are spaced about the outer periphery of the central ring core 36 and are secured together and to the latter by means of rivets 46 extending through the central core 36 and the bight portion 47 of the arcuate strips 45. The opposite ends 48 and 49 of each group of arcuate metal strips form the periphery of the armature, and the adjacent free ends 48 and 49 cooperate to form the salient poles of the armature. The central core 36 and arcuate strips 45 have their exterior surfaces covered with insulation 50 and the bight portion 47 covered by the insulation 53 forms recessed winding slots 54 for the armature winding. The armature winding consists of connected separate coils 55 in the recesses 54 wound transversely about the annular section of the central core 36 and in the bight portions 47 of the arcuate metal strips 45. If desired, a cylindrical non-magnetic shell 57 of high electrical resistivity can be pressed about the outer periphery of the armature to strengthen the latter.

The field core 60 forming part of the motor field 61 is formed from a plurality of magnetic metallic laminations 62 nested with respect to each other into a substantially U-shaped configuration, the bight portion 63 supporting a spool 64 for the single field coil 65, and the free ends of the laminations 62 have their widths extending substantially parallel to the armature shaft 19 to form the opposite pole faces 67 for the armature.

In order to space and anchor the ends of the nested laminations forming the pole faces, each alternate lamination is provided with a shoulder 70 along the upper edges 71 and the intermediate laminations with a shoulder 72 at the lower edges 73, and members 74 and 75 are arranged respectively along the upper and lower edges of the laminations and each is provided with an arcuate flange 76 having recesses 77 spaced between projections 78, the recesses 77 and projections 78 in the member 74 being positioned respectively opposite the projections 78 and the recesses 77 in

the member 75. When the laminations are anchored in the members 74 and 75, the recesses 77 in the lower member 75 receive the alternate laminations, and the shoulders 70 of the latter abut the projections 78 on the arcuate flange 76 in the upper member 74, while the shoulders 70 of the intermediate laminations abut the projection 78 on the arcuate flange in the lower member 75, and the recesses 77 in the upper member 74 receive the upper edges of the laminations. If desired, the laminations may be welded to the members 74 and 75.

As shown in Figure 4, the nested laminations are all spaced with respect to each other to provide air gaps between the adjacent laminations at the pole faces 67, and the air gaps 79 between the laminations in the regions 80 and 81 are greater as compared to the air gaps 84 in the regions 82 and 83 of the pole faces. The air gaps between the laminations at the pole faces, introduce a series of air gaps in the path of the cross-magnetizing flux and thus increases the reluctance of this path to thereby reduce the armature reaction. Also the provision of larger air gaps in the regions 80 and 81 of the pole faces compels the distorted flux due to armature reaction to seek other and lower reluctance paths in the region of 82 and 83 to thereby improve the flux distribution. In addition, a slightly wider spacing of the laminations at 81 and 80 as compared to 83 and 82 will compensate for the difference in the reluctance offered to the magnetic flux produced by the field coil 65 due to the considerable differences in path length in the U-shaped field 60. The foregoing effects will be considerably greater in motors designed for high flux density in the magnetic circuit since the flux will be diverted from the more saturated sections to the less saturated sections.

Figure 5 discloses another armature 85 for use with the field 61 and comprises a commutator 30 mounted on a shaft 19 and an armature core 86 supported on the spider 38 rigidly attached to the shaft 19. The core 86 is formed of a magnetic metal strip 87 wound in a spiral and its exterior surfaces are covered with insulation 88, and the width of the strip 87 is arranged substantially parallel to the armature shaft 19. An armature coil 89 is wound transversely about the annular armature core 86 and is connected to the commutator 30.

The magnetic strips of metal forming the spiral armature core 86, nested laminated field core 60, and the central armature core 36 and its arcuate strips 45 forming the armature salient poles is formed of material having its greatest magnetic permeability in one direction, that is lengthwise of the strips, and such magnetic permeability is approximately three times as great lengthwise of the strips as in the other two directions of width and thickness.

I claim:

1. A dynamo-electric machine, comprising an armature, and a laminated field core having ends thereof forming pole faces, and spaced means each having opposed recesses and projections to anchor said ends of said laminations and to space the latter in predetermined relation with respect to each other at said pole faces.

2. A field core for a dynamo-electric machine, and comprising laminations defining a pole face, said laminations at said pole face being spaced from each other to form air gaps, a first group of said laminations at said pole face being spaced a greater distance apart to form relatively large air gaps therebetween, and a second group of laminations at said pole face being spaced apart to form relatively small air gaps therebetween.

3. A field core for a dynamo-elctric machine, and comprising a plurality of substantially U-shaped laminations arranged in nested relation, the opposite ends of said laminations forming a pair of pole faces, a field winding disposed on said laminations substantially centered between the opposite ends of said laminations forming said pole faces, the distances of said laminations between said winding and said pole faces being of varied lengths, said ends of said laminations being spaced with respect to each other to form air gaps therebetween at said pole faces to compensate for the difference in reluctance to the magnetic flux produced by said field winding due to differences in the flux path length from said winding to said pole faces by said varied lengths of said laminations from said winding to said pole faces.

4. An armature for a dynamo-electric machine, and comprising a core having a plurality of arcuate sections provided with a bight portion and opposite ends, said arcuate sections being annularly spaced with their bight portions extending toward the interior of said core and said ends extending outwardly from said bight portions normal to the axis of rotation of said armature, the adjacent ends of each of said arcuate sections cooperating to form the armature teeth and said bight portions forming the winding slots.

5. A dynamo-electric machine, comprising a field core having pole faces, and an armature core interposed between said pole faces, said armature having a central core, and laminated means mounted in spaced relation on said central core and having spaced depressed areas in the outer circumference of said armature to form the armature winding slots and teeth therebetween, said armature being composed of material which is magnetically uniform throughout said armature and has only in one direction greater magnetic permeability throughout said armature than in other directions.

MAURICE D. STAHL.

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