(No Model.)

H. LEMP.

ARMATURE FOR DYNAMO ELECTRIC MACHINES OR MOTORS.

No. 532,795. Patented Jan. 22, 1895.

Fig. 1.

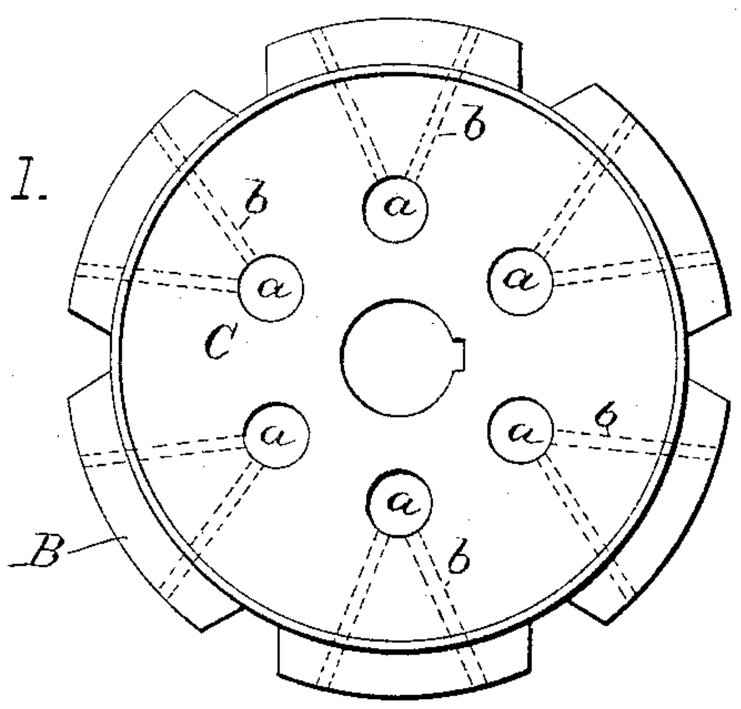


Fig. 2.

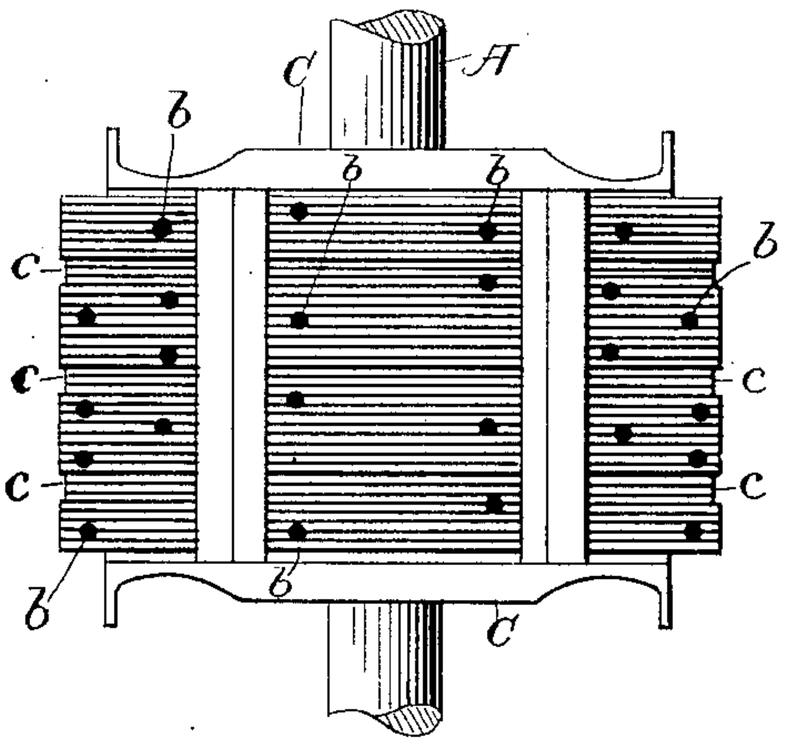
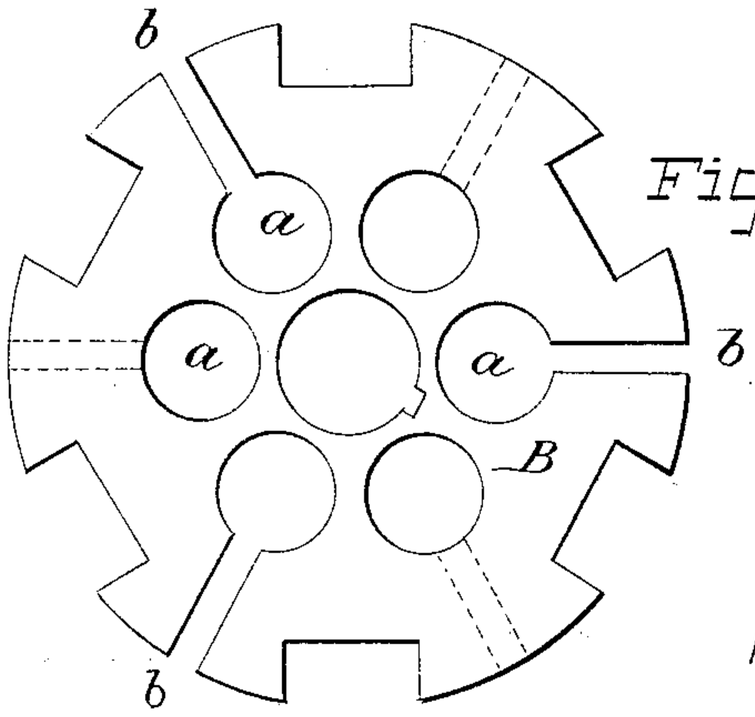


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ARMATURE FOR DYNAMO-ELECTRIC MACHINES OR MOTORS.

SPECIFICATION forming part of Letters Patent No. 532,795, dated January 22, 1895.

Application filed March 29, 1890. Serial No. 345,840. (No model.)

To all whom it may concern:

Be it known that I, HERMANN LEMP, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Armatures for Dynamo-Electric Machines or Motors, of which the following is a specification.

My invention relates to the construction of armatures in dynamo machines and motors wherein it is desired to make provision for the circulation of cooling currents of air or other fluid in the armature itself, and applies particularly to those armatures wherein the armature core is a practically solid core built up from a number of sheet iron plates strung upon the armature shaft and fastened solidly together by clamping devices exerting end pressures.

My invention consists essentially in building up the laminated armature core from a series of plates or laminæ of iron each provided with one or more holes or perforations to one side of the center, all such plates being assembled together and fastened together upon the armature shaft in such manner that the said holes or perforations shall register with one another so as to form air-ducts or passages parallel to the armature shaft. Connection is made with such longitudinal air ducts by radial air ducts extending out to the periphery of the armature preferably through the pole pieces and formed either by drilling from the circumference of the armature down to the longitudinal air passages or constituted by building up the armature from disks or plates each provided with a radial slot connecting with the hole or perforation which forms a part of the longitudinal duct.

My invention consists further in providing a laminated armature with circumferential grooves adapted to receive the circumferential bands which hold the winding in place by constructing such armature from disks or plates of different diameters, a number of such disks or plates of smaller diameter being assembled at the part where the groove is to be located.

In the accompanying drawings: Figure 1, is an end elevation of the armature, and shows the shape of one of the disks or plates making up the armature, the location of the radial passages being indicated in dotted lines. Fig. 2, is a plan of an armature constructed in accordance with my invention. Fig. 3, is a plan of a preferred form of sheet iron disk or plate adapted to be used in constructing an armature in accordance with my invention.

Referring to Fig. 1, B, indicates one of the sheet iron disks or plates used in building up the laminated armature and having the usual polar projections between which the armature wires may be wound over the periphery and across the ends of the completed structure. The disk or plate B, shown, is provided with one or more perforations or holes *a*, which may be formed in stamping out the disks from sheet metal plates. A number of such disks or plates are assembled opposite one another on an armature shaft A, and held in place between suitable heads C, C, or other clamping devices to make a complete armature structure. In assembling the disks, they are bunched so that the perforations or openings *a*, of adjoining disks will register with one another, so that when the armature is complete there shall be one or more longitudinal passages through the solid laminated structure from end to end thereof.

It will of course be understood that in building up the armature the usual provision is made for the insulation of the plates or sheets electrically and magnetically from one another. If the electrical or magnetic insulation consists of separate plates, they are preferably provided with similar openings or perforations *a*, arranged to register with those of the sheet iron plates, though it would be possible to use imperforate insulating plates, especially if they were rather thin and of fragile material, and to perforate such plates after the construction of the armature core from the laminated sheet iron.

After formation of the armature as just described, the grooves or passages *b*, may be formed by drilling from the circumference through to the longitudinal passages at the points indicated in the plan view Fig. 2.

To form grooves as at *c*, adapted to receive the wire bands that shall hold the armature windings in place, I make some of the disks

or plates of which the laminated structure is formed slightly smaller in diameter in their polar projecting portions than others and use a number of such plates of smaller diameter at the points *c*, or if desired, such grooves might be formed by turning after the construction of the armature core from plates or disks all of the same circumference. The way of providing such grooves first described is, however, the preferred one and is claimed herein. When the grooves are thus formed by making the polar projecting portions of some of the disks or plates slightly smaller in a diametrical line than the others, it will be seen that the bottoms of the circumferential grooves thus formed will be farther removed from the shaft than the bottoms of the transverse grooves shown in which the armature windings are disposed, and that hence the binding wire will have a bearing on the bottom of the said circumferential grooves and will not rest entirely upon the armature winding as would be the case if the grooves were made by employing plain disks without any projection at all.

Instead of drilling openings or passages *b*, I may construct the armature disks or plates of the form shown in Fig. 3, wherein one or more of the holes or perforations *a*, connect by longitudinal slots *b*, extending to the periphery of the disk and formed in the operation of punching the plate or at any rate previously to the assembling of the disks in a laminated structure. Where a large number of perforations *a*, are employed, as in Fig. 3, it is preferable to punch out a limited number of slots, as shown by the full lines, in any one disk and to form other disks with slots extending into the perforations at other points as indicated by the dotted lines. The objection to providing slots for all the perforations in each disk is that it would unduly weaken the structure. When the armature is built up a number of disks or plates having the slots formed at positions indicated by the full lines Fig. 3, are laid together until a hole of sufficient width is made after which a number of disks or plates without radial holes are put in place, and these in turn are followed by plates having slots arranged as indicated by the dotted lines, Fig. 3, so that all of the longitudinal ducts will be provided with radial passages through which the air may circulate by centrifugal action. This operation may be repeated until an armature of sufficient length is produced.

It will of course be understood that the heads C, C, are provided with radial openings through which air may enter the longitudinal ducts *a*, at the ends of the armature for circulation through such ducts and out by the radial ducts *b*, and that in winding the armature suitable provision is made either by proper construction of the head C, or by a disposition of the wires whereby spaces may be left for the air to reach the openings leading to the ducts *a*.

It is obvious that my construction of armature is not limited to the particular form shown, but applies likewise to any laminated magnetic structure designed for rotation but in which it is desirable to provided for circulation of a cooling fluid through longitudinal and radial ducts.

What I claim as my invention is—

1. In a dynamo electric machine or motor, a laminated armature constructed from sheet iron disks or plates provided with ventilating holes or perforations merging or connecting with slots extending out to the periphery, said plates being assembled with the holes and slots of adjoining plates registering with one another and forming free passages independent of the armature windings, as and for the purpose described.

2. A sheet iron disk or plate B, adapted for use in building up a laminated armature core and provided with one or more perforations *a*, within the circumference embraced by the armature windings, and one or more slots *b*, connected with such perforations and extending outward to the edge of the disk.

3. A laminated armature core having grooves *c*, adapted to receive the circumferential bands for holding the armature windings down against centrifugal action and formed by assembled sheet iron plates of slightly less diameter on their polar projecting portion than those forming adjoining portions of the structure.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 26th day of March, A. D. 1890.

HERMANN LEMP.

Witnesses:
JOHN W. GIBBONEY,
E. W. RICE, Jr.