No. 781,957. PATENTED FEB. 7, 1905.

K. KISHI.

FIELD MAGNET CORE FOR DYNAMOS AND MOTORS.

APPLICATION FILED AUG. 25, 1902.

FIG. 1.

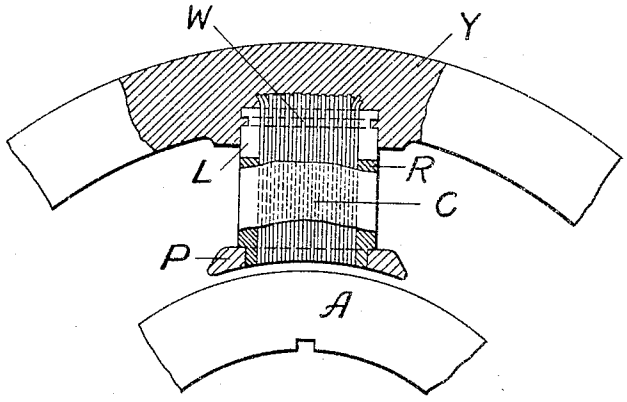


FIG. 2.

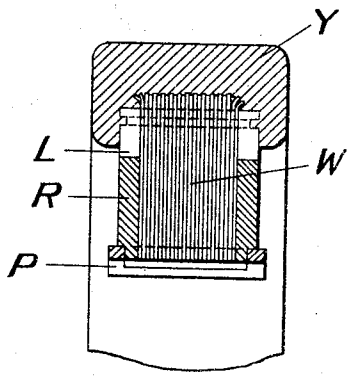


FIG. 3.

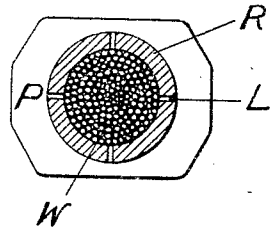
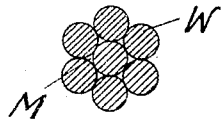


FIG. 4.



WITNESSES

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No. 781,957. Patented February 7, 1905.

UNITED STATES PATENT OFFICE.

KEIJIRO KISHI, OF TOKIO, JAPAN.

FIELD-MAGNET CORE FOR DYNAMOS AND MOTORS.

SPECIFICATION forming part of Letters Patent No. 781,957, dated February 7, 1905.

Application filed August 25, 1902. Serial No. 120,901.

To all whom it may concern:

Be it known that I, KEIJIRO KISHI, a subject of the Emperor of Japan, residing at No. 2 Shikoku-Machi, Mita, Shiba-Ku, Tokio, Japan, have invented certain new and useful Improvements in Field-Magnet Cores for Dynamos and Motors, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to improvements in field-magnet cores of electric machines; and its object is to provide an improved construction of the cores by which eddy-currents and armature reactions can be minimized, securing at the same time the best and largest contact-surfaces between the field-casting and the magnet-cores and otherwise to facilitate the economic construction of these parts without sacrificing any beneficial result obtained by laminated cores of the ordinary construction.

Other features of the invention will be pointed out and claimed in the specification.

To these ends I construct my field-cores with wrought-iron or steel wires and cast them into the yoke, as shown in the accompanying drawings, which show one embodiment of my present invention, and in which—

Figure 1 is an elevation of such portion of an electric machine embodying my invention as is sufficient for the purpose of explanation and shows a longitudinal section of the field-magnet core and its pole-piece. Fig. 2 is a section through the yoke and field core, taken on the plane passing through the center line of the magnet-core and including the axis of the armature. Fig. 3 is a cross-section of a bundle of wires, showing the manner in which they are assembled to form the core. Fig. 4 is a cross-section of round iron wires composing field-magnet cores to show interstices existing between the wires.

Throughout the drawings similar letters refer to similar parts.

The field-magnet core C consists of an assemblage or bundle of wires of a circular cross-section made of wrought-iron, steel, or other suitable magnetic metal securely and tightly packed in a cylindrical casing R, which may be of wrought or cast iron or steel. At one end of the field-magnet core C a pole-piece P is secured to the casing R as usual, the other end of the core being cast into the yoke Y, as shown, and firmly held in proper position in relation to the armature A.

On account of the above construction the lamination of the core is thoroughly and efficiently effected, not only without impairing the unbroken continuity of circuit along the path of the magnetic lines, but reducing the eddy-currents in the core C to a minimum. The lamination above referred to of the core of my invention is effected not only in one direction, as in the ordinary construction, but in every direction parallel to the lines of force of magnetism through the core. In fact, the interstices M between the wires of the core produce the effect of so many air-gaps, which are specially provided in certain dynamos to prevent the cross-magnetization effect. One of the most important results obtained, therefore, by my construction is the prevention of cross-magnetization due to the armature-currents. The wires W of the core are cut sufficiently long so that their ends which are cast into the yoke protrude beyond the cast-in end of the cylindrical casing R, and each protruding end of the wire W is bent toward the periphery of the casing R, as shown in Fig. 1. The object of this construction of the core is to permit the metal forming the yoke to readily flow and penetrate into the interstices M between the ends of the wires W during the process of casting, so that the core C is secured to the yoke with a sufficiently large contact-surface, thus reducing the magnetic resistance of the iron circuit. In the casing R one or more longitudinal slits L are provided, extending from its cast-in end down to a suitable distance along the wall of the casing. As the yoke cools down the mass of metal forming the yoke contracts and hugs the casing, which on account of the slits L provided therein yields under the pressure and in turn compresses the wires W contained therein. Thus by the above construction the entire core structure is held securely together in position in the yoke.

In the laminated field-magnet cores as heretofore constructed the lamination is effected by assembling a number of thin iron or steel

sheets of desired size and shape, which are held together by means of a suitable holding or clamping device, such as bolts and nuts. However, such construction attains the object of lamination at the expense of an increased magnetic resistance of the field structure as a whole, as is well known to those who are experienced in the practice of the art, for a good contact between the core and the yoke cannot be expected with this construction on account of the air-bubbles or holes which are liable to develop wherever the surfaces of these two parts meet. I have ascertained from my observation that the formation of these air-bubbles or blow-holes is the result of the moisture present at the time of casting on the face of the parts above mentioned. During the casting process the moisture on the surface of the core is vaporized by the high temperature of the molten metal constituting the yoke, and having no means of escape the vapor is imprisoned in the mass of the metal, giving rise to the blow-holes at or in the vicinity of the contact-surface of the core and the yoke. To avoid the occurrence of the blow-holes, I provide vent-passages for any vapor that may form on the core. These passages are formed on account of the circular cross-section of the wire used and are substantially of triangular cross-section, as clearly shown in Fig. 4. These passages run the entire length of the field-core. Hence at the time of casting any vapor that may form about the cast-in end of the core will find exit through the interstices or vent-passages between the wires and escape from the other end of the core to the open air. The field-core of my invention is therefore freed from the vapor confined at the points of contact with the yoke, and the consequent defect of casting above pointed out is easily and perfectly avoided, insuring a most reliable contact between the two parts of the field structure mentioned. Besides, on account of the particular construction set forth the field-magnet cores of my invention can be manufactured with less labor and expense as compared with those of the ordinary form.

In the accompanying drawings I have shown the casing R of circular cross-section; but it may be of any other shape, and, if desired, the pole-piece P may be dispensed with. The magnet-core is shown as built up of round wires; but I have found that equally satisfactory results are obtained by using wires of other cross-sections, and I do not desire to limit my invention to any particular cross-section of wires to be used for the core.

In the foregoing description the field-magnet core of an electric machine has been selected as being suited for purposes of illustration; but it is to be understood that the construction above explained may be applied in many varied forms to cores of any other apparatus or machinery in which it is desired to obtain the beneficial results attained by my invention.

Having thus particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, what I claim as new, and desire to secure by Letters Patent of the United States of America, is—

1. In electric machines, magnet-cores cast into the yoke of the field-magnet, each of which consists of a bundle of iron wires held tightly together by an iron casing and leaving longitudinal interstices between the iron wires which reach to the face of the pole, substantially as and for the purpose described.

2. In electric machines, magnet-cores cast into the yoke of the field-magnet, each of which consists of a bundle of iron wires held tightly together by an iron casing, at the free end of which a pole-piece is securely attached; and leaving intact longitudinal interstices between the iron wires, which reach to the face of the pole, substantially as and for the purpose described.

3. In electric machines, magnet-cores cast into the yoke of the field-magnet, each of which consists of a bundle of iron wires held tightly together by an iron casing, at the free end of which a pole-piece is attached, and leaving intact longitudinal interstices between the iron wires, which reach to the face of the pole, the cast-in ends of the iron wires being projected somewhat longer than the casing and bent toward the periphery of the casing, as and for the purpose described.

4. In electric machines, magnet-cores cast into the yoke of the field-magnet, each of which consists of a bundle of iron wires held tightly together by an iron casing, at the free end of which a pole-piece is attached, and leaving intact longitudinal interstices between the iron wires, which reach to the face of the pole, the cast-in ends of the iron wires being projected somewhat longer than the casing and bent toward the periphery of the casing; the casing having one or more slits extending from the cast-in end to a suitable distance along the wall, as and for the purpose described.

KEIJIRO KISHI.

Witnesses:
SEÜCHI KISHI,
KIUBEI TOYODA.