Jan. 9, 1923. 1,441,522

H. R. PATTERSON.
ELECTROMAGNETIC CORE.
FILED JUNE 25, 1917.

2 SHEETS-SHEET 1

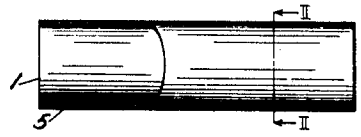


FIG. I.

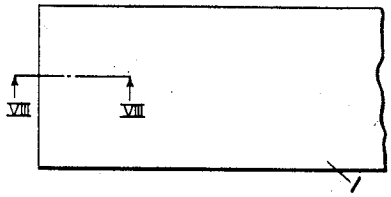


FIG. VII.

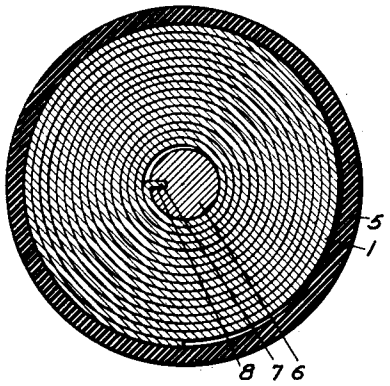


FIG. II.

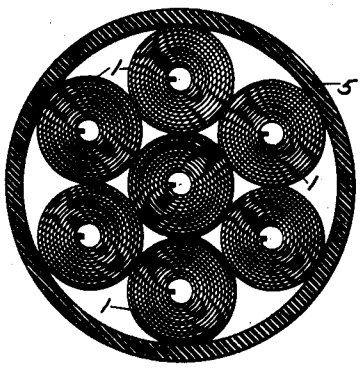


FIG. III.

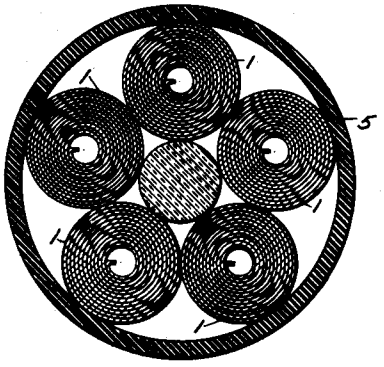


FIG. IV.

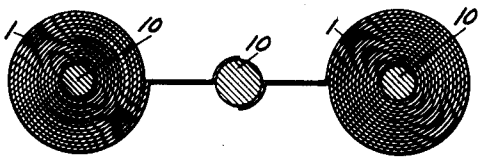


FIG. V.

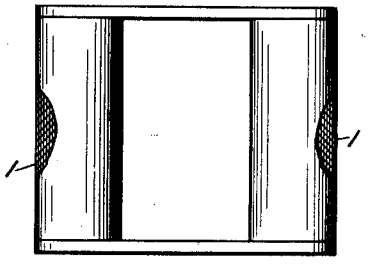


FIG. VI.



FIG. VIII.

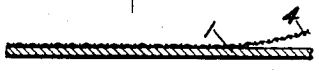


FIG. IX.

By

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Jan. 9, 1923.

1,441,522

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2 SHEETS-SHEET 2

Fig. X.

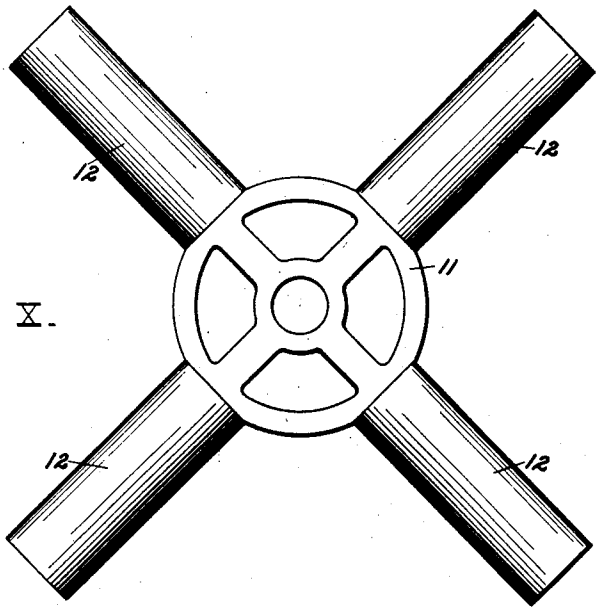


Fig. XI.

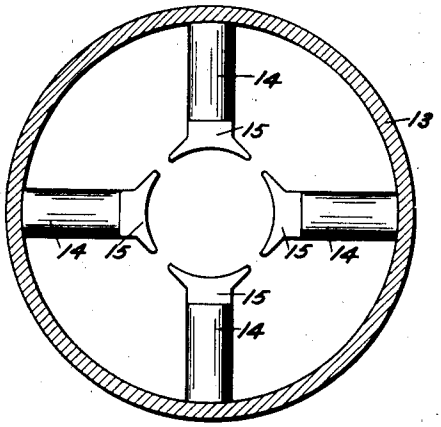
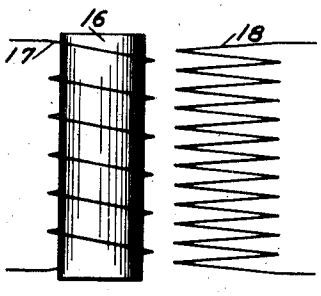


Fig. XII.



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Patented Jan. 9, 1923. 1,441,522

UNITED STATES PATENT OFFICE.

HARRY R. PATTERSON, OF TOLEDO, OHIO, ASSIGNOR TO ELECTRIC AUTO-LITE CORPORATION, OF TOLEDO, OHIO, A CORPORATION OF DELAWARE.

ELECTROMAGNETIC CORE.

Application filed June 25, 1917. Serial No. 176,795.

To all whom it may concern:

Be it known that I, HARRY R. PATTERSON, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Electromagnetic Cores, of which I declare the following to be a full, clear, and exact description.

This invention relates to improvements in cores for electro-magnetic machines, such as induction coils, transformers, dynamo-electric machines and similar devices.

The principal object of this invention is to provide a simple and effective core employing a coiled strip of metal. A further object is to provide an improved core construction, in which the effective volume of a solid metal core will be approximated, with a marked reduction in the corresponding heat losses due to eddy currents. Still a further object of my invention is to provide a core structure, which may be manufactured and assembled with great facility and economy.

Further objects, and objects relating to details of manufacture and economies of construction, will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification.

A structure constituting a preferred embodiment of my invention is illustrated in the accompanying drawings, forming a part of this specification, in which—

Figure I is a view, in side elevation, of a core constructed in accordance with my invention, a part of the side being broken away to show the core construction;

Figure II is an enlarged, sectional view, taken substantially on the line II—II of Figure I;

Figure III is an enlarged, transverse, sectional view, showing one manner in which a number of cores constructed in accordance with my invention can be grouped together in actual use.

Figure IV is a sectional view, similar to Figure III, showing another grouping of a number of cores constructed in accordance with my invention.

Figure V is a sectional view, showing one method by which a pair of cores constructed in accordance with my invention may be connected together.

Figure VI is a view, in side elevation, of a construction suitable for transformers.

Figure VII is a plan view of a portion of the metal strip used in forming the core.

Figure VIII is an enlarged, detail, sectional view taken on the line VIII—VIII of Fig. VII.

Figure IX is a view, similar to Figure VIII, but showing an insulating fabric applied to the surface of the blank.

Figure X is a view showing the application of a core constructed in accordance with my invention to a rotating armature.

Figure XI is a similar view showing field poles embodying my core.

Figure XII is a view showing my invention embodied in a transformer.

In the drawings, similar reference numerals refer to similar parts throughout the several views, and the sectional views are taken looking in the direction of the arrows at the ends of the section lines.

Considering the numbered parts of the drawings, the blank 1 is formed of a thin strip of metal possessing high permeability and relatively low retentivity, such as soft steel. As is well known in this art, in order to heighten the magnetic intensity of the given elements, the material density should be as high as the substance will readily permit. In order to accomplish this end, the strip is preferably coiled upon itself, as shown in Figures I and II. In order to insulate the contiguous surfaces of the adjacent convolutions of the coiled strip, I preferably shellac the same, as shown in Figure VIII, before coiling the strip, although I may depend for my insulation upon the oxidized surfaces of the strip. In the modification, shown in Figure IX, I provide a layer of insulating fabric 4 on the strip, which, when the strip is wound into a coil, serves to insulate the contiguous surfaces of the adjacent convolutions of the coil from each other. The core comprised by this coiled metal strip is preferably mounted in an insulating tube 5, but this is not at all essential.

It will be apparent from the above description that the magnetic conductivity of the core is not affected longitudinally, and that, at the same time, by virtue of the

coiling of the metal strip, the transversely insulated contiguous sections prevent any cross currents arising from the variation of the electro-magnetic flux from developing to any considerable extent. Since the material density of the core is as great as possible under the circumstances, it will be apparent that the magnetic intensity per unit of volume approaches that of a solid magnetic core, while, at the same time, the heat losses due to eddy currents are cut down to a minimum, because the development of such eddy currents is prevented by the interposition of the insulating surfaces between the convolutions of the coil.

In Figure II, I have illustrated the means of attachment of a core to a rod 6. The inner end 7 of the coil is bent toward the center thereof, and inserted in a slot 8 formed in the rod thereby preventing relative motion of the rod and coil. This figure also illustrates the method of attachment of the strip to a rod for the purpose of winding the strip in the coil form. The slot in that case extends completely to the end of the rod, so that the completed coil core may be readily removed from the rod.

In Figure III, I show a core formed of a series of coils, arranged parallel to each other, and grouped within an insulating tube 5.

In Figure IV, I have shown a series of coils, grouped around a solid central core, which may be formed of a material having a different permeability from that of the coils, as would be the case where a series of groups of coils are mounted on a central rotating shaft.

In Figure V, I have shown my invention applied to the armature of a rotating electro-magnetic machine. The separate coils are independently wound and inserted upon the framework 10 of a rotatable drum or ring.

In Figure VI, I show my invention utilized to provide cores for transforming apparatus.

In Figure X, I show a rotating armature comprising a central frame 11 carrying a plurality of cores 12 made in accordance with my invention.

In Figure XI, I show a casing 13 carrying a plurality of cores 14 made in accordance with my invention and having pole pieces 15 at their inner ends.

In Figure XII, I show a core 16 constructed in accordance with my invention and having a winding 17 forming part of a primary circuit, the secondary or induced circuit being shown at 18.

Other modifications and uses of my invention will be apparent to those skilled in the art to which it relates, and I wish, therefore, to claim my invention broadly as well as specifically, as will be evident from the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A core for an electro-magnetic apparatus, comprising a spirally coiled strip of magnetic material, the adjacent convolutions of said spiral being separated by insulating material, and a rod on which said strip is rigidly wound, said rod terminating between the ends of said core.

2. In a core construction for an electro-magnet, a rod having a slot formed therein, a sheet of metallic material extending into said slot and rigidly wound on said rod in spiral form, and insulating material interposed between the adjacent convolutions of said spiral.

3. A core structure comprising a solid supporting rod, a plurality of independent spirally wound strips of relatively high permeability surrounding said rod and an enclosing casing for said rod and spirally wound strips.

4. A core for an electro-magnetic apparatus, comprising a rod, and a series of spirally wound independently coiled strips of magnetic metal disposed about the rod with their centers in spaced relation.

In testimony whereof I affix my signature.

HARRY R. PATTERSON.