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B. AMES

1,497,469

MAGNETIC CORE AND METHOD OF MAKING SAME

Filed Feb. 10, 1919

Fig. 1.

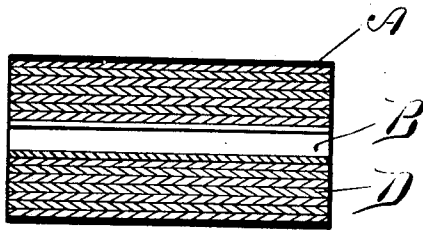


Fig. 2.

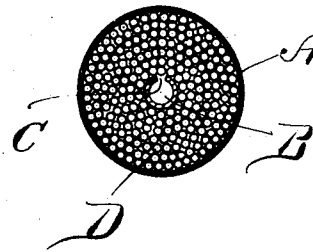


Fig. 3.

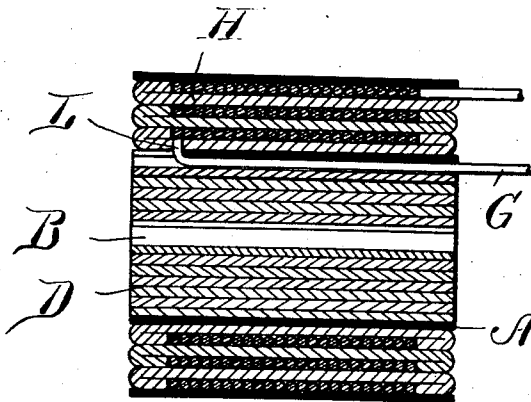
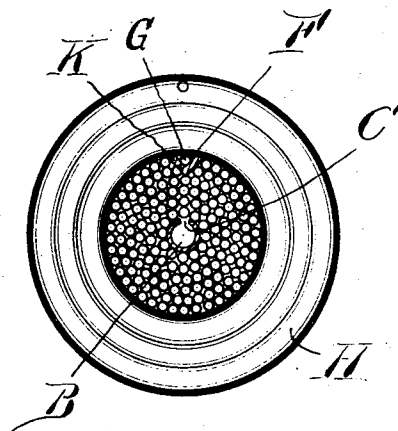


Fig. 4.



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UNITED STATES PATENT OFFICE.

BUTLER AMES, OF LOWELL, MASSACHUSETTS.

MAGNETIC CORE AND METHOD OF MAKING SAME.

Application filed February 10, 1919. Serial No. 276,006.

To all whom it may concern:

Be it known that I, BUTLER AMES, a citizen of the United States, and resident of Lowell, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Magnetic Cores and Methods of Making Same, of which the following is a specification.

This invention relates to magnetic cores and more particularly to magnetic cores comprising bundles of iron wires or other elongate pieces of magnetic material.

The objects of the invention are to make a core which can be assembled both quickly and accurately, which is compact and substantial when assembled, which is peculiarly adapted to be impregnated with binding and insulating material, which has provision for being axially supported, which has provision for extending a conductor longitudinally therethrough, and which possesses any two or more of the aforesaid characteristics in combination.

My improved core comprises a tubular casing, preferably cylindrical and of insulating material, partially or wholly filled with magnetic material, preferably pieces of iron wire extending longitudinally of the tube. When the tubular casing is only partially filled with magnetic material, a smaller tubular member is preferably placed concentrically within the tubular casing, so that the magnetic material is confined in the space between the two tubular parts. While the inner tube may be formed of insulating material it is preferably formed of metal in which case it is divided longitudinally to prevent eddy currents therein. A longitudinal opening may be provided in the core for a purpose which will hereinafter appear, in which case a channel member of metal or other suitable material is preferably provided to separate the pieces of magnetic material from said space.

My improved method of making a core of the character described comprises packing the pieces of iron wire or the like longitudinally in the tubular casing of insulating or other suitable material by inserting the pieces into one end of the casing. If a solid core is desired the casing is entirely filled. If a hollow core is desired a second tubular member is placed concentrically within the tubular casing and held in this position while the space between the two tubes is being filled with magnetic material.

After the casing has been filled with the magnetic material shellac or other insulating and binding material is forced into the interstices between the pieces of magnetic material, the tubular construction lending itself peculiarly to this operation inasmuch as a stream of the shellac or the like may be forced through the tubular casing under pressure to carry away all air bubbles and to fill every crevice between the pieces of magnetic material. After the core has been thoroughly impregnated the shellac or the like is caused to harden, as by baking, to form a rigid and solid structure. If a longitudinal opening is to be provided in the core as above mentioned, a channel member is preferably placed within the tubular casing before the iron wires or the like are packed in to prevent the wires from filling the opening.

In the accompanying drawings—

Fig. 1 is a central longitudinal section of one embodiment of my improved core;

Fig. 2 is an end elevation of the core shown in Fig. 1;

Fig. 3 is a central longitudinal section of a coil comprising a modified form of core; and

Fig. 4 is an end elevation of the coil and core shown in Fig. 3.

The particular embodiment of my invention illustrated in Figures 1 and 2 comprises a cylindrical casing A, preferably formed of fibre board or other hard insulating material, an inner tube B, preferably formed of iron and preferably divided longitudinally as shown at C to prevent the flow of eddy currents, and a bundle of iron wires D or other suitable magnetic material packed into the space between the outer and inner tubes A and B. Before the parts are assembled they are preferably cut to the same length and the iron wires are inserted into the space between the tubes through one of the open ends. While the iron wires are being packed into the space between the tubes the two tubes are held concentric in any suitable manner. After the parts have been assembled shellac or other suitable insulating and binding material is forced into the interstices between the wires. If the core is to be inserted into a magnetic circuit with its ends abutting against opposing faces of the circuit the ends of the core are preferably ground or machined to make them perfectly flat and parallel and to afford good magnetic contacting surfaces.

The shellac or the like is preferably forced through the core by inserting the core into a system of tubing so that a current of the shellac or the like may be caused to flow through the core to drive out all the air and completely fill all of the open spaces between the wires. During this process the central opening may be plugged to prevent the shellac from being shunted from the spaces between the wires through the central opening. When the tube is made solid instead of hollow, that is, when the central tube B is omitted, there would of course be no central opening through which the shellac would tend to be shunted. However, it is preferable to make the core hollow for certain purposes in order to permit the core to be mounted by means of a rod passing through the axial opening. After the interstices between the wires have been filled with shellac or the like the core is baked or otherwise treated to cause the shellac to harden. After the shellac has hardened the wires are bound tightly together and to the outer and inner tubes, thus forming a solid and rigid core.

The embodiment of my invention illustrated in Figs. 3 and 4 is similar to that shown in Figs. 1 and 2 except in that an opening F is provided longitudinally of the core to accommodate one of the leads G of the electric coil H wound around the core. This longitudinal opening is preferably separated from the iron wires by means of a channel member K which is preferably V-shaped in cross-section as illustrated in Fig. 4. The channel member K may be formed of fibre-board or other hard insulating material or, when the lead G of the electric coil is grounded, the channel member may be formed of soft iron or other metal. The channel member K is preferably placed in position before the iron wires are packed into the core so that it is held in position by the iron wires and shellac applied thereto.

When the core is provided with a longitudinal opening, as described, the inner lead of the surrounding coil may be extended therethrough from one end of the core to the opposite end. This is of particular importance when the winding applied to the core has an odd number of layers inasmuch as the inner lead of the coil can be brought out at the same end of the coil as the outer lead without in any way interfering with the winding of the coil. If the coil is wound on the core the wire is inserted through the opening L and thence extended through the opening F before the wire is wound on the coil. If the coil is wound before being applied to the core the lead G is inserted through the opening before the coil is slipped over the core. The opening L is preferably extended to the end of the tube

A in the form of a slot to facilitate the insertion of the lead G. It will of course be understood that the lead G may enter the opening F at the end of the core or at any other suitable point instead of at the particular point shown.

My improved method of making a magnetic core affords a core which is perfectly round, when employing a round outer casing, and which forms a rigid and solid unit when completed. The construction makes it possible to grind or machine the end faces without deforming the core, this being particularly important where the core is to be inserted into a magnetic circuit as for example between the pole pieces of a magnetic rotor as described in my prior application Serial No. 217,468, filed February 16, 1918.

The peculiar construction of the electric coil H is described and claimed in co-pending application, Serial No. 276,007, filed on even date herewith.

I claim:

1. A magnetic core comprising a tube packed with pieces of magnetic material around its inner periphery except for a longitudinal space through which a conductor may extend, and an insulator separating said space from said magnetic material.
 2. A magnetic core comprising a tube of insulating material packed with pieces of iron wire around its inner periphery except for a longitudinal space through which a conductor may be inserted, and means fast within the core for insulating said space from said magnetic material.
 3. A magnetic core comprising a tube packed with pieces of magnetic material around its inner periphery except for a longitudinal space through which a conductor may extend, and a channel member separating the magnetic material from said space.
 4. The method of making a magnetic core which comprises packing pieces of magnetic material in a tubular casing, forcing insulating material into the tubular casing from one end to fill the interstices between the pieces of magnetic material, at the same time forcing the air from the interstices through the other end of the tubular casing, and causing the insulating material to harden.
 5. The method of making a magnetic core which comprises packing pieces of magnetic material in a tubular casing, connecting one end of the tubular casing to a system of tubing and leaving the other end uncovered, and then flowing insulating material through the tubular casing to drive out all the air and to fill all the open spaces between the pieces of magnetic material.
- Signed by me at Boston, Mass., this 23rd day of January, 1919.

BUTLER AMES.