June 23, 1925. 1,543,001

E. G. GAYNOR

MAGNETIC CORE

Filed Sept. 5, 1923

Fig. 1.

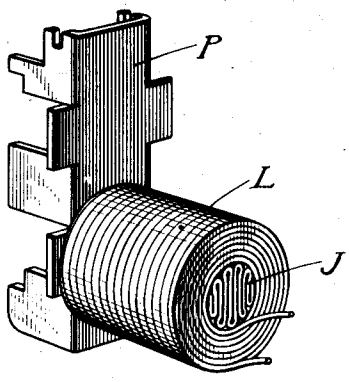


Fig. 2.

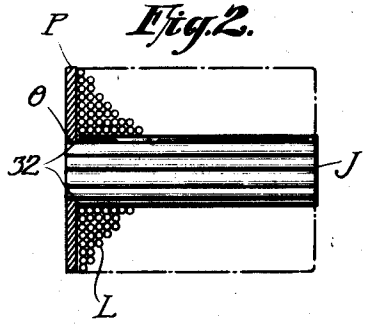


Fig. 3.

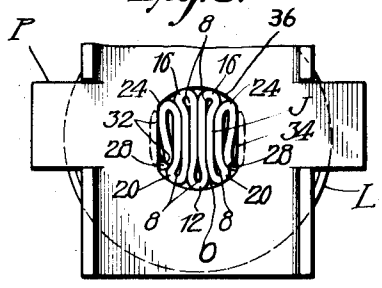
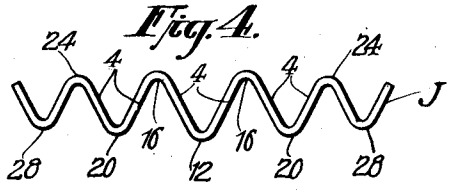


Fig. 4.



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UNITED STATES PATENT OFFICE.

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MAGNETIC CORE.

Application filed September 5, 1923. Serial No. 661,020.

To all whom it may concern:

Be it known that I, EDWIN G. GAYNOR, a citizen of the United States, and a resident of Stratford, county of Fairfield, State of Connecticut, have invented certain new and useful Improvements in Magnetic Cores, of which the following is a specification.

This invention relates to cores for use in electro-magnets or other electric or magnetic apparatus and to a method of forming cores of this type.

Cores for these purposes have been commonly made of a single piece of metal or of a laminated structure built up of plates or rods to form a core of the desired form. Solid cores have the disadvantage that they offer little or no resistance to eddy currents and also provide no suitable ventilation for the interior of the core. It is, moreover, difficult to form such cores of magnetically permeable material because metals having a high permeability are not readily machined and therefore can not readily be brought to the desired form and dimensions. These disadvantages are very largely overcome in laminated cores of metal of high permeability but the cost of assembling the cores is high, particularly in the case of cylindrical cores of small dimensions, and ventilation is difficult to obtain.

These difficulties and disadvantages are obviated in my present invention which provides a core of substantially laminated structure which may be easily and cheaply constructed of a single piece of metal without expensive or troublesome machining.

Another object accomplished by my invention is the provision of a core which permits a thorough and efficient ventilation of the interior of the core.

A further object of the invention is to provide a method of easily and cheaply manufacturing cores for electrical or magnetic purposes.

Other objects of the invention are to provide a core which may be made with equal facility of metals of different permeability, which may be readily and accurately formed to required dimensions, which requires less metal than a solid core of the same dimensions and which has a slight elasticity in a direction at right angles to its length.

With these and other objects in view, the invention comprises the device described and set forth in the following specification and claims.

The various features of the invention are illustrated in the accompanying drawings in which,

Fig. 1 is a perspective view of an apparatus embodying a preferred form of the invention, the core being shown surrounded by a coil of an electromagnet.

Fig. 2 is a longitudinal sectional view through an electromagnet and core embodying the invention, the core being shown in side elevation.

Fig. 3 is an end view of a portion of the apparatus shown in Fig. 1, the core being shown in end elevation, and,

Fig. 4 shows a strip of metal bent to a shape from which it may be pressed to a core of cylindrical shape.

In my present invention the core is formed of a strip of metal bent or folded back and forth and pressed together to form a compact body in which the folds lie closely against and superposed on each other in a position somewhat similar to that of the laminations of a laminated core. In forming the core the strip of metal is folded to a wave like form, the lengths or amplitudes of the waves being larger at the center than at the end portions when a cylindrical core is to be formed. The folds or waves are then pressed together until a core of cylindrical, square or other desired shape is formed and the sides or slopes of the waves are brought together. The folds may be pressed together more or less tightly according to the requirements to be met by the core but in any case there are channels extending longitudinally of the core where the bends occur through which some ventilation may take place, the degree of ventilation depending on the tightness or closeness of the folds.

Referring more particularly to the accompanying drawing, the core is formed of a single strip of metal J bent at 12 to form a furrow or trough extending lengthwise of the core and bent at either side of the furrow 13 to form a series of alternate crests and furrows 16, 20, 24 and 28 and a succession of intermediate slope portions 4 between the crests and furrows. When the core is cylindrical in shape, the lengths of the slope portions between the bends 12 and 16, 16 and 20, 20 and 24, and 24 and 28 are made progressively shorter so that, when the strip is compressed to bring the sides of the portions 4 adjacent or into contact with each other, the bends will lie in a cylindrical plane or

surface of the diameter desired for the core. When the core is square in cross section the portions 4 are all of substantially the same dimensions so that when the strip is compressed until the portions 4 contact, the ridges and furrows of the bends will lie in parallel plane surfaces. When cores of other cross sectional shape are desired, the lengths of the portions 4 are made of suitable dimensions for that purpose.

When the strip J is compressed to form the core, the bends or ridges need not be closed tightly on each other but have a curved or rounded shape that forms longitudinal channels 8 through which air may flow from end to end of the core and thus provide efficient ventilation and cooling of the interior portion of the core. The size of these ventilating channels may be controlled by the tightness with which the strip is compressed and may thus be varied to suit various conditions. This form of the core also provides some resiliency at right angles to the length of the core so that when the end of the core is compressed and fitted snugly into a retaining opening, such as the opening O in a plate P in which the core is to be mounted, the core will expand slightly to firmly grip the edge of the opening. When desired the end portion of the strip J may be notched or stepped as at 32 to form a shoulder abutting the edge of the opening O which may have a straight or chord portion 34 against which the notched end of the core may abut.

The core is compressed to the desired shape in a die of the desired dimensions so that no machining is required to finish the core. When an electromagnet L is wound on the core small lengthwise channels 36 are formed between the folds of the core and the inner layer of wires of the electro-magnet which also increase the ventilating effect of the core.

Inasmuch as the core may be cut from a piece of sheet metal and stamped to the desired form in a small number of operations, or in a single operation, and as no machining is necessary, it will be apparent that the cores may be rapidly and cheaply made of metal of any permeability and having all of the advantages of laminated cores and, in addition, providing efficient ventilation.

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

1. A core of the type described which comprises, a strip of metal folded into folds extending lengthwise of the core.

2. A core of the type described which comprises, a strip of metal folded back and forth and pressed together to form folds extending lengthwise of the core and having channels extending lengthwise at the bent portions of the folds.

3. A core of the type described which comprises, a strip of metal folded back and forth and pressed together to form folds extending lengthwise of the core, the inner folds being wider than the outer folds to give the core a cylindrical shape.

4. A core of the type described which comprises, a strip of magnetically permeable metal folded back and forth lengthwise of the core to form a series of superposed lengthwise folds and pressed together to form a compact core, said core having a substantially cylindrical shape and having channels extending lengthwise of the core within and at the outer surface of the bent portions of said folds.

5. A core of the type described which comprises, a strip folded to form a series of laminations, the folds extending lengthwise of the core and the outer folds being notched to form shoulders at one end of the core.

6. A method of forming cores of the type described which comprises, folding a strip of metal into a series of waves and compressing said waves to bring the slopes of said waves close to each other to form a compact core.

7. A method of forming a core of the type described which comprises, folding a strip of metal into a series of waves lengthwise of the core and compressing said waves to bring the slopes of said waves close to each other to form a compact core.

8. A method of forming cores of the type described which comprises, folding a strip of metal into a series of waves, the amplitude of the waves decreasing from the middle outwardly and compressing said waves to bring them within a substantially cylindrical form.

ED. G. GAYNOR.