106-97 CROSS REFERENCE EXAMINE
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Dec. 1, 1931. A. BOYAJIAN 1,834,898

MAGNETIC CORE

Filed May 21, 1930

Fig. 1

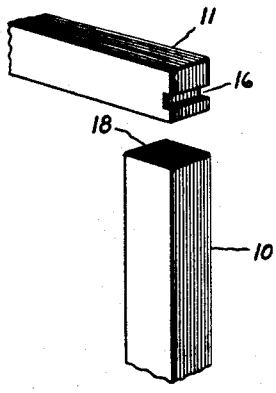
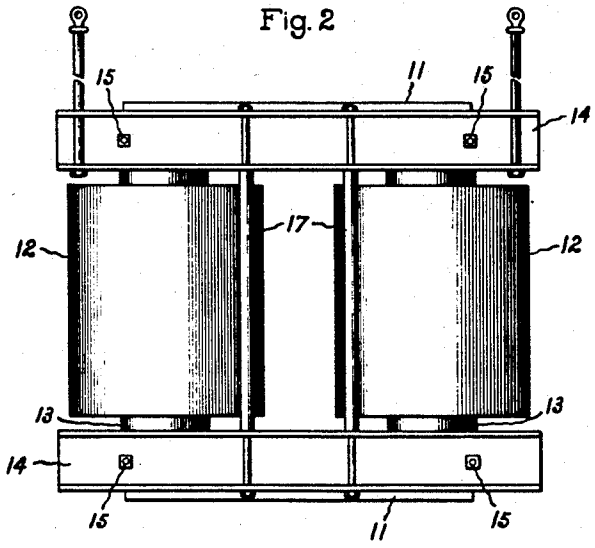


Fig. 2



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UNITED STATES PATENT OFFICE

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MAGNETIC CORE

Application filed May 21, 1930. Serial No. 454,457.

My invention relates to magnetic cores for electrical induction apparatus such as transformers and reactors. A well designed magnetic core is always built up of superposed laminations of magnetic material, the laminations being insulated from each other to prevent excessive eddy current losses. Except in the case of very small cores, each layer or lamination is made in sections so that there are joints between the winding leg and yoke sections or sometimes in other places in the core. This sectional formation of the laminations avoids excessive waste of material and, in many cases, also makes it possible to arrange them so that the magnetic flux will flow through them in the same, or approximately the same, direction in which the material was rolled. The sheets from which core laminations are cut or punched are produced by a rolling process, and it is well known that the magnetic characteristics of a core are best when the magnetic flux flows in the same direction as that in which its laminations were rolled.

It is usually desirable that the reluctance of the magnetic circuit of a core be as low as possible. This requires not only that the material in the core laminations be of good magnetic quality but also that any joints in the magnetic circuit have low reluctance.

At a joint in a laminated core, the lamination sections or any group of them at one side of the joint are arranged in edge to edge relation to the corresponding lamination sections or group of sections at the other side of the joint. It is not practicable to make perfect contact at a joint between the edges of the lamination sections, the edges touching at some points but being slightly separated at other points even with the greatest care and precaution. These slight separations of the lamination sections increase very appreciably the reluctance of the magnetic circuit. The general object of the invention is to provide a laminated magnetic core with an improved form of low reluctance joint in its magnetic circuit.

The invention will be better understood from the following description taken in connection with the accompanying drawings in which Fig. 1 indicates the improved form of low reluctance joint in the magnetic circuit of a core, and Fig. 2 shows a transformer with a core having the form of core joint indicated in Fig. 1.

Like reference characters indicate similar parts in both figures of the drawings.

The invention will be explained in connection with the laminated magnetic core of the transformer shown in Fig. 2. This core has winding legs 10 connected by yokes 11. The winding legs 10 are surrounded by the windings 12 from which they are insulated by insulating cylinders 13. The yokes 11 are provided with clamps 14, each yoke and its clamps being held together by bolts 15. These bolts 15 engage notches 16 in the ends of the yokes 11 to prevent relative displacement between the yokes and their clamps. Tie rods 17 extending between the clamps 14 hold the yokes tightly against the opposite ends of the winding legs 10.

The magnetic core shown in the drawings has a simple form of butt joint in which the edges of the laminations at each side of the joint lie in a single transverse plane and thus form a plane surface. It will be obvious, however, that other forms of joint may be used if desired. It is not practicable to fit together two sections of a laminated core so perfectly as to avoid appreciable reluctance at the joint. The edges of the laminations may be pressed tightly together at some points but they will be slightly separated at other points. The reluctance of these slight spaces in the magnetic circuit of the core is usually undesirable.

The reluctance of the joint or joints in the core is avoided or reduced by providing a small quantity of magnetic material 18 in each joint. This magnetic material may be a cement formed of fine magnetic iron powder or filings mixed with Portland cement and water or alcohol. For the best results, the magnetic iron powder should form as large a proportion as possible of the magnetic mixture used in the joint, only sufficient Portland cement being used in the mixture to hold the iron powder in place in the joint after the cement has hardened. It is preferable,

also, that no more of the magnetic mixture be used than is necessary to fill the slight unavoidable spaces in the joint with the core sections pressed together into as close contact as would be possible without the mixture.

The surfaces forming the joint should be carefully finished to fit together as accurately as is practicable. A very thin layer of the magnetic mixture 18 is spread onto at least one of the joint surfaces as shown in Fig. 1. The joint is then closed with its surfaces pressed tightly together and preferably in actual contact so far as possible by means of the rods 17.

It has been found that a transformer with a core having joints made in accordance with the invention does not require as large a magnetizing current and the magnetic losses in the core are also reduced. The efficiency of the transformer is thus increased.

The invention has been explained by describing and illustrating it as applied in connection with a transformer but various changes and applications may obviously be made without departing from the spirit of the invention or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A laminated magnetic core having a joint in its magnetic circuit, the surfaces forming said joint being pressed tightly together, and a magnetic cement within said joint.

2. A laminated magnetic core having a joint in its magnetic circuit, the surfaces formed by the edges of the laminations at said joint being pressed tightly into contact with each other, and a magnetic cement between portions of said surfaces between their points of contact.

In witness whereof, I have hereunto set my hand this 19th day of May, 1930.

ARAM BOYAJIAN.