June 9, 1931. L. L. JONES 1,808,778

MEANS FOR SUPPORTING MAGNETIC STRUCTURES

Filed Feb. 11, 1927

Fig. 1.

Fig. 1b

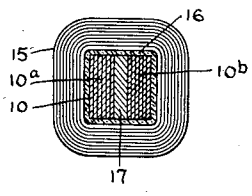


Fig. 1a

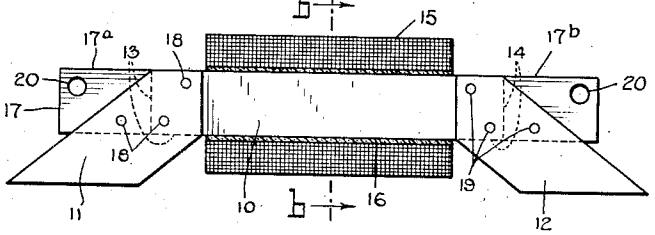


Fig. 2.

Fig. 2b

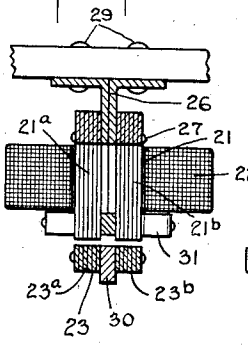


Fig. 2a

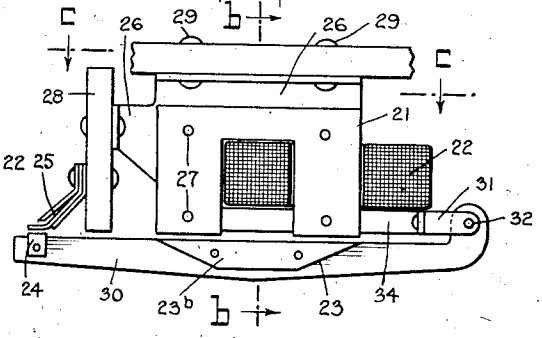
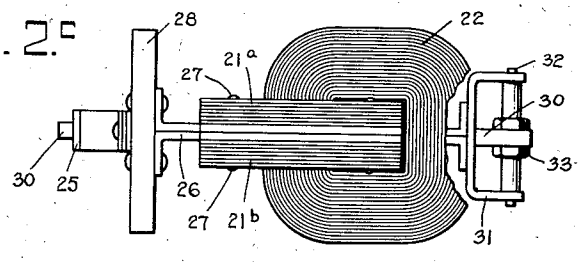


Fig. 2c



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Patented June 9, 1931 1,808,778

UNITED STATES PATENT OFFICE

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MEANS FOR SUPPORTING MAGNETIC STRUCTURES

Application filed February 11, 1927. Serial No. 167,572.

This invention relates to improvements in means for supporting magnetic structures, and relates more particularly to improvements in the means for supporting inductors, relay magnets and like structures.

In the construction of inductors, magnets or other laminated magnetic bodies or systems especially for use with alternating currents, it has always been a difficult problem to support the laminations in such a way as to minimize the eddy current losses due to the stray fields cutting the supporting structure. Various expedients, such as sectionalizing and insulating the metal paths where these link the main or stray fields, or of making the supporting structure of non-magnetic material having a high specific resistance, have been used in the past with more or less success.

My present invention resides in an improved method and the means therefor of supporting magnetic structures having relatively large leakage wherein the complexity of the supporting members is greatly reduced, the eddy current losses due to the stray fields cutting the supporting structure are effectively inhibited and the necessity of having supporting materials of high specific resistance is greatly minimized.

The invention relates more particularly to the provision of magnetic systems in which the supporting apparatus comprises a supporting bar or plate having an area sufficient to give rise to the generation of appreciable eddy currents if the element be cut by lines of flux, this supporting bar or plate being placed in the median plane of the magnetic structure and arranged parallel to the plane in which the magnetic lines of force flow. In magnets of the laminated type this involves dividing the laminations into two substantially equal sections and placing the supporting member between such sections of laminations. The laminations may be bolted or riveted to this central supporting member. By thus arranging the supporting member in the median plane of the laminated structure and parallel to the plane in which the magnetic lines of force flow, I accomplish the very important results of eliminating any supporting structure which would link with the magnetic lines of force, which linkage would produce undesirable eddy current losses in the supporting structure and of further eliminating any metallic bodies from either side of the magnetic structure where such metallic bodies would lie in and intersect flux or leakage paths, which also produces undesirable eddy current losses. There is involved, of course, a small reduction of useful iron cross-section where the supporting member passes through the magnetizing coil of the magnetic system, but the loss due to the additional copper required for this purpose is negligible as compared with the eddy current losses which would otherwise occur in the supporting apparatus.

To the accomplishment of the foregoing and such other objects as will hereinafter appear, my invention consists in the elements and their relation one to the other as hereinafter more particularly described and sought to be defined in the claims; reference being had to the accompanying drawings which show the preferred embodiments of my invention, and in which:

Fig. 1 shows an embodiment of my invention applied to an engine carried inductor for train control purposes, of which:

Fig. 1*a* is a front elevational view of such inductor with parts shown in section and

Fig. 1*b* is a view taken in cross-section on the line *b*—*b* of Fig. 1*a*; and

Fig 2 shows another embodiment of the invention applied to an alternating current relay, of which:

Fig. 2*a* is a front elevational view of the relay with parts broken away, and

Fig. 2*b* is a view thereof taken in cross-section on the line *b*—*b* of Fig. 2*a*, and

Fig. 2*c* is a view taken in cross-section on the line *c*—*c* of Fig. 2*a*.

Referring now more in detail to the drawings, and having reference first to Figs. 1*a* and 1*b* thereof, I show my invention applied to a train control system and particularly to an engine carried inductor of an induction type of train control system. This inductor comprises a main magnetizing core

10 of a laminated construction, as clearly shown in Fig. 1*b* of the drawings, and further comprises terminal or external pole shoes 11 and 12 also of a laminated construction. These pole shoes are desirably separate laminations from the main magnetizing core, as indicated by the dotted lines 13 and 14 representing the terminal edges of the core laminations, the pole shoes being made separate from the core so that the magnetizing coil 15 of the inductor may be wound on a molded insulating form such as 16 which can be slipped over the magnetizing core 10.

For supporting the magnetic structure of the inductor, the laminations of the core and pole pieces are separated or divided into substantially two equal sections such as indicated, 10*a* and 10*b*, and a central bar 17 of non-magnetic material is inserted between the sections of laminations. This central bar is preferably of a tough and strong metal such as aluminum bronze. The laminations may then be bolted to this central bar by means of the two series of bolts such as 18 and 19. For supporting the entire inductor in a casing or the like or for supporting the same to any part of the vehicle on which the inductor is to be mounted, the central supporting bar 17 is provided with projecting portions 17*a* and 17*b* at the opposite ends thereof, these portions projecting beyond the ends of the core 10, and said sections 17*a* and 17*b* are provided with holes or apertures 20, 20 for receiving suitable supporting or securing elements.

By means of this construction it will now be seen that all supporting parts on opposite sides of the laminations such as the core sections 10*a* and 10*b* are eliminated so that no supporting parts are introduced in the flux or leakage paths of the inductor, and so that no supporting structure is used which links with the main magnetic flux of the inductor. As will be understood by those skilled in the art, substantially no flux crosses the median plane in which the supporting bar 17 lies, and all eddy current loss incident to the use of the former supporting structures is therefore eliminated.

In Fig. 2, I show another embodiment of the invention applied to an alternating current relay. This relay comprises a U-shaped core 21 having a magnetizing coil 22 around one leg of the core, the said core and coil cooperating with an armature generally designated as 23 having a movable contact 24 cooperating with fixed contact elements 25. For supporting the relay structure, the core 21 is divided into two sections 21*a* and 21*b*, and a supporting plate 26 is introduced between these sections, the said core sections being secured as by the bolts 27, 27 to the supporting plate 26. In this case the central supporting plate is divided into two parts so as to facilitate the formation of symmetrical flanges for the support of the relay and for the support of the insulating panel 28 carrying the contacts 25 as shown in the drawings. The supporting plate or plates 26 may be secured as by means of the bolts 29, 29 to any part of the relay casing.

The laminations of the armature 23 are also preferably divided into two sections 23*a* and 23*b*, and these sections are mounted on a central supporting member 30 and bolted thereto and arranged in the median plane and in a plane parallel to the plane in which the magnetic lines of force flow. The armature supporting plate 30 may be secured to a U-shaped bracket element 31 journalled in a pivot pin 32 forming part of the pivot structure 33 which may be secured to a projecting portion 34 of the central supporting plate 26 of the core. The contact member 24 is fastened to the supporting plate 30; and the laminations 23*a* and 23*b* are preferably so contoured, as shown in Fig. 2*a* of the drawings, as to reduce the weight to a minimum while efficiently providing for a magnetic flux path. The supporting bar 30 may be made of metal where great strength is desired, or it may be of insulating material where high insulation of the movable contact from the magnetic structure is desired.

It will be apparent that the results attained for the relay structure support are substantially the same as those obtained for the support of the inductor body heretofore described in connection with Figs. 1*a* and 1*b*.

The manner of making and using my apparatus embodying the principles of my present invention and the numerous advantages obtained thereby will in the main be fully apparent from the above detailed description thereof. It will be further apparent that while I have shown and described the preferred forms of my invention, that numerous changes and modifications may be made in the structure disclosed without departing from the spirit of the invention, defined in the following claims.

I claim:

1. A magnetic structure comprising a laminated body and a supporting element therefor, said supporting element having an area sufficient to give rise to the generation of appreciable eddy currents if the element be cut by lines of flux, the laminations of said body being divided into two sections and said supporting element being arranged in a plane between said sections of laminations whereby the flux or leakage paths of said laminated body do not cut or link with the supporting element.

2. A magnetic structure comprising a laminated body having opposite pole re-

gions and a supporting element for the laminated body, said supporting element having an area sufficient to give rise to the generation of appreciable eddy currents if the element be cut by lines of flux, the laminations of said body being divided into two substantially equal sections and said supporting element being arranged in a substantially median plane between said sections of laminations and in a plane parallel to the plane in which the magnetic lines of flux flow whereby the flux or leakage paths of said laminated body do not cut or link with the supporting element.

3. A magnetic structure comprising a laminated body having opposite poles and a supporting plate therefor, said supporting plate having an area sufficient to give rise to the generation of appreciable eddy currents if the plate be cut by lines of flux, the laminations of said body being divided into two substantially equal sections and said supporting plate being arranged to lie in a median plane between said sections of laminations and in a plane parallel to the plane in which the magnetic lines of flux flow whereby the flux or leakage paths of said laminated body do not cut or link with the supporting element, and means joining said sections to said plate, the said supporting plate including parts securable to a support.

4. An inductor for train control systems or the like comprising a magnetic structure having a laminated core and a supporting element therefor, said supporting element having an area sufficient to give rise to the generation of appreciable eddy currents if the element be cut by lines of flux, the laminations of said core being divided into two sections and said supporting element being arranged in a plane between said sections of laminations whereby the flux or leakage paths of said laminated core do not cut or link with the supporting element.

5. An inductor for train control systems or the like comprising a magnetic structure having a coil, a laminated core having polar regions and a flat extended supporting element therefor, said supporting element having an area sufficient to give rise to the generation of appreciable eddy currents if the element be cut by lines of flux, the laminations of said core being divided into two substantially equal sections and said supporting element being arranged in a substantially median plane between said sections of laminations and in a plane parallel to the plane in which the magnetic lines of flux flow whereby the flux or leakage paths of said laminated core do not cut or link with the supporting element.

Signed at New York city in the county of New York and State of New York, this 8th day of February, A. D. 1927.

LESTER L. JONES.