Oct. 25, 1949. D. HALVORSEN 2,485,599

MAGNETIC CORE AND CLAMP

Filed April 9, 1945

Fig. 1.

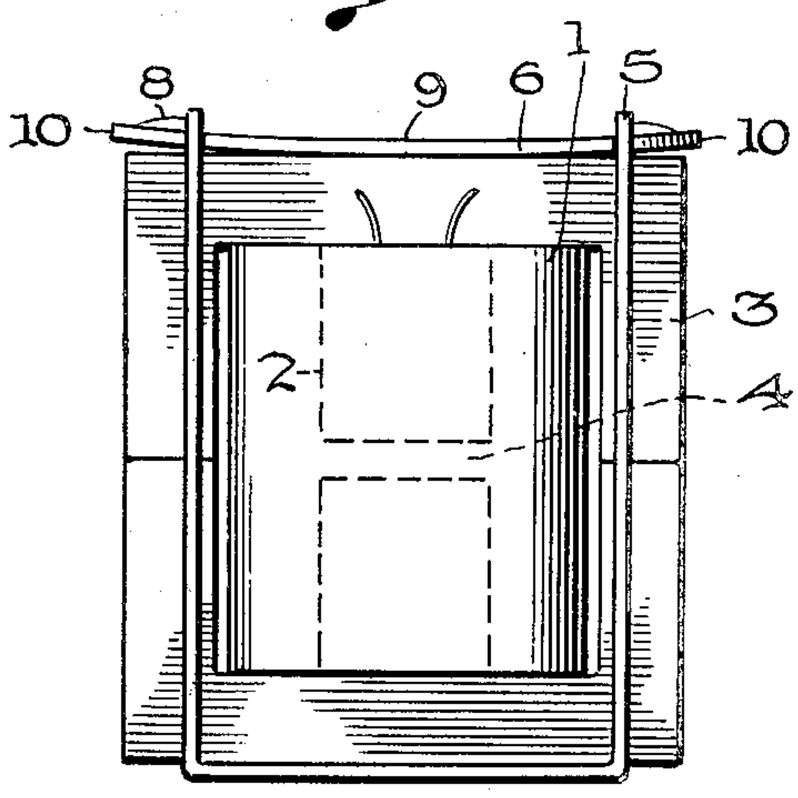


Fig. 4.

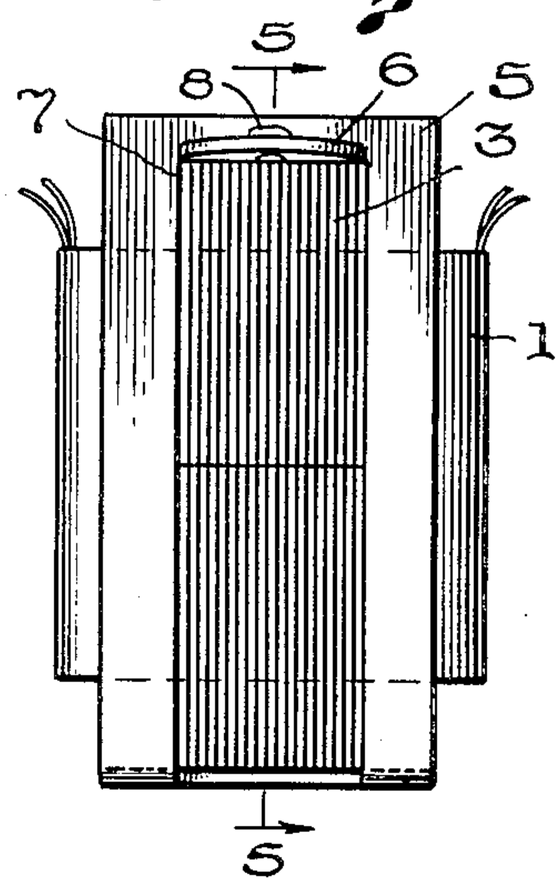
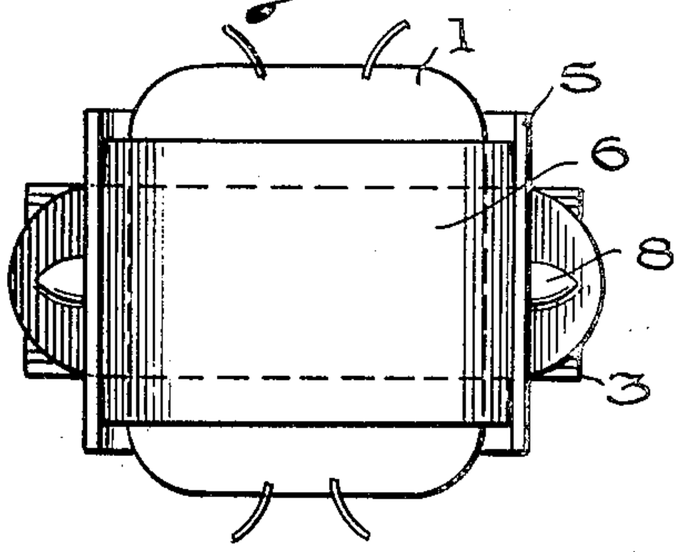


Fig. 2.



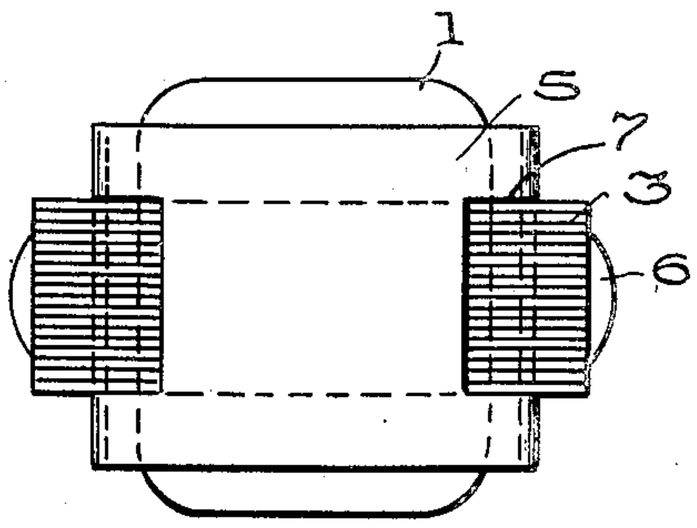


Fig. 3.

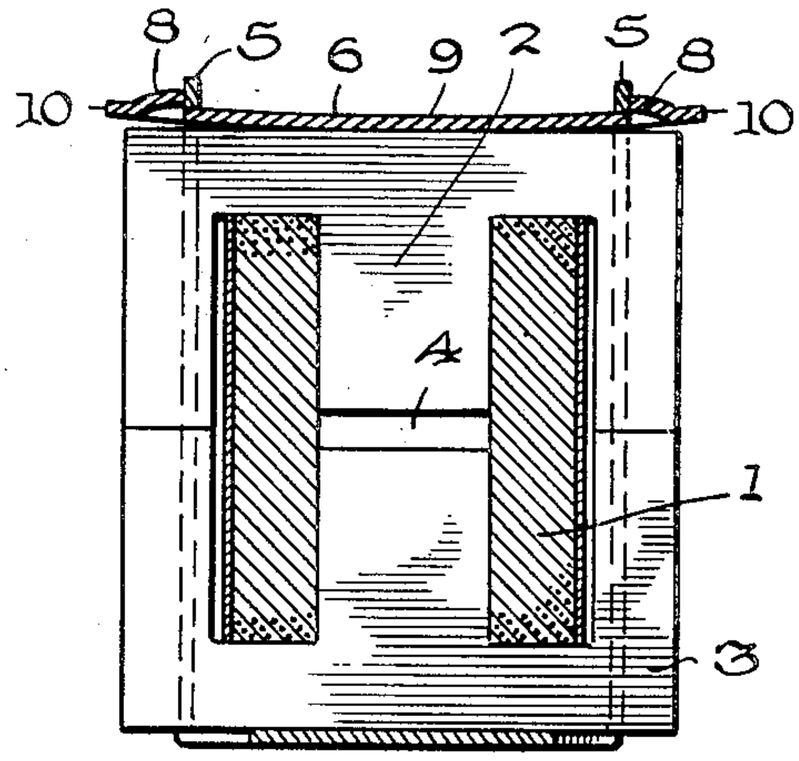


Fig. 5.

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MAGNETIC CORE AND CLAMP

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3 Claims. (Cl. 175—356)

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This invention relates to an inductance device such as a transformer or reactor.

An object of the invention is to obtain an inductance device such as a transformer or reactor which is simple in construction, of relatively few parts and easily assembled.

Another object of the invention is to provide an inductance device in which eddy-current losses are greatly reduced due to the particular clamping means I have devised for holding the laminations together.

A further object is to provide a transformer structure which as a result of its assembly and clamping arrangement will be adapted in its operation to maintain more constant inductance or magnetic reluctance characteristics particularly under the influence of temperature changes.

A further object of my invention is to produce a device which will have a closer tolerance in induction values resulting from its structural form by accurately determining the air gap of the laminated core plates which are centrally divided with their outer legs in abutting relation and with their center legs fitting the opening in the coil with the spacing determined by the outer leg engagement.

The construction in brief comprises a magnetic core member composed of two similar E-shaped structures or laminated sections having their legs in juxtaposition to provide two closed magnetic paths with a common central path formed by the center legs which are slightly shortened to provide an air gap, the spacing of which by maintaining close dimensions is employed to determine the impedance value of the inductor coil. The primary and secondary coils are fitted to surround the center legs of the core members in a special form of U-shaped yoke and a cooperating spring retaining member is employed herewith to retain the parts in assembled position.

The assembly further is designed to effect retaining of the laminated core structures with non-pressure restriction of the plates perpendicular to their faces thereby to avoid pressure variables under conditions of temperature change such as to alter the reluctance characteristics. More constant inductance values are thereby maintained as is important in tuned circuit uses.

Other features and details of construction will appear as the specification proceeds.

In the accompanying drawing and the following description I have illustrated and described in detail some preferred embodiments of my invention.

Fig. 1 is a side view of a preferred form of my inductor coil or magnetic core with the shortened

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center legs shown in dotted lines in order to illustrate the air gap which is provided;

Fig. 2 is a top view of the same device;

Fig. 3 is the bottom view of the same device;

Fig. 4 is an edge view of the same device, and

Fig. 5 is the sectional view taken in the line 5—5 of Fig. 4.

The preferred form of my invention consists of a transformer or reactor having a winding 1 which may comprise a primary and a secondary coil fitted around the shortened center legs 2 of the two similar E-shaped laminated sections 3. The gap 4 formed by the shortened center legs is shown clearly in Figs. 1 and 5. It will be readily seen that by providing the laminated sections having their legs in juxtaposition, two closed magnetic paths with a common center path are formed.

In order to retain the parts so far described in assembled position I have devised a special U-shaped yoke 5 and cooperating spring retaining member or clip 6. This yoke is made from a single piece of flexible metal and may be stamped from a flat piece of metal. It is cut out to provide slot 7 to permit the laminations to extend therethrough. The spring retaining member or clip 6 is thin enough to be resilient and is normally of arcuate form of a lesser radius than that assumed in its assembled position. It may be made of thin sheet spring brass or bronze and has raised portions 8 near its ends which form retaining or locking means. As best shown in Fig. 5 these raised portions 8 are integrally formed by deforming the metal at one side of a transverse cut to provide inwardly directed shoulders with outwardly inclined camming walls adapted to facilitate assembling.

In assembling the parts, the requisite number of E-shaped laminations 3 are placed against each other and with another like group are placed around the winding 1 with their legs in juxtaposition, the ends of the outside legs having been carefully machined. The yoke 5 is then fitted therearound, parts of the laminated sections extending through the slot 7 and the spring clip 6 is then inserted, one end first going under an end wall of one of the slots and the other end then fitting under an end wall of the other slot. The raised parts or projections 8 of the spring clip cooperate with the slots and serve to lock the clip and the yoke together. When the parts are thus assembled the spring is slightly bowed in the center as shown at 9 and raised at 10 in Figs. 1 and 5 whereby pressure is applied along the center legs substantially at right angles to the

surfaces forming the air gaps. The clamp comprising the yoke 5 and the spring clip 6, while holding the laminations together and maintaining the dimensions of the air gap, does not actually exercise a clamping action on the laminations at right angles to the plane of their surface. This reduces the eddy-current losses which arise if the adjacent surfaces of the laminated sections are in too intimate contact.

The described arrangement provides for effectively retaining of parts while avoiding varying compression or pressure application to the core laminations such as produced by prior art structures wherein transversely applied clamping pressures are applied or wherein the core laminations are rigidly connected in a block as by riveting. As is readily appreciated the latter introduce pressure variables between the plates, particularly under temperature changes, such as to alter the reluctance characteristics from the desired constant value. In accordance with present practice the outer surfaces of plates of laminated sections may be coated with an insulating and protective coating such as an insulating lacquer of a character to be non-restrictive of the permissive expansion and contraction as referred to.

By my method of manufacturing the inductance element a tolerance of plus or minus ½% can be maintained. It is my understanding that at the present time manufacturers do not attempt to manufacture similar inductance elements having a tolerance closer than approximately 5% in inductance value. Any closer inductance values are obtained by adjustments during test periods.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is:

1. An inductive element comprising a two part magnetic laminated core composed of a pair of multi-legged elements, the opposed outside legs being in juxtaposition and the opposed center legs separated by an air gap, providing two closed magnetic paths, a clamp for holding the two parts of the core together, comprising a U-shaped yoke of flat flexible metal, a rectangular slot in each end of said yoke to permit the laminations to extend therethrough and a spring retaining member cooperating with said yoke, said yoke and spring being constructed and positioned to provide a parallel relation of the clamp elements and the magnetic path of the core.

2. A magnetic core device comprising two sets of multi-legged laminations held together by a clamp comprising a U-shaped yoke of flat metal, said yoke having a flat middle portion and two arms at right angles to said middle portion, rectangular slots in said arms of said yoke, a bowed shaped spring, raised portions integrally formed near the ends of said spring, the upper horizontal sides of said slots being above the edges of said core and that portion of said arms above said slots engaging said raised portions of said spring so as to lock said spring and yoke when said spring is in position and to form a complete magnetic path parallel to the magnetic path of the core, said laminations extending through said slots so as to be held by said arms.

3. A magnetic core device comprising two sets of multi-legged laminations, said laminations having outside legs in juxtaposition and an opposed pair of center legs, an air gap separating said center legs, a clamp comprising a spring clip and a yoke, said clip having raised end portions and said yoke having rectangular slots formed so as to permit said end portions to pass through and lock said clip and yoke, thus forming a complete magnetic path parallel to the magnetic path of the core, said clip having a bowed section contacting the outer edges of said laminations over the center pair of opposed legs whereby pressure is applied to said set of laminations so as to maintain the dimensions of said air gap, said laminations being formed so as to extend through said slots and be retained therein.

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