Aug. 7, 1951 H. EPSTEIN 2,563,105

TRANSFORMER CLAMP

Filed Feb. 25, 1948

FIG. 1

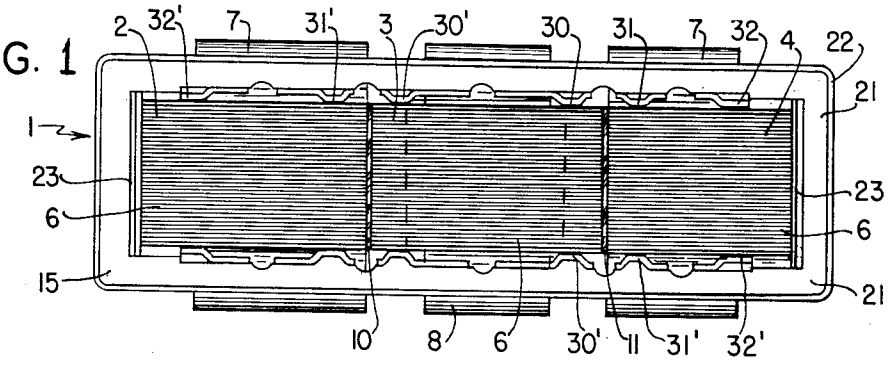


FIG. 2

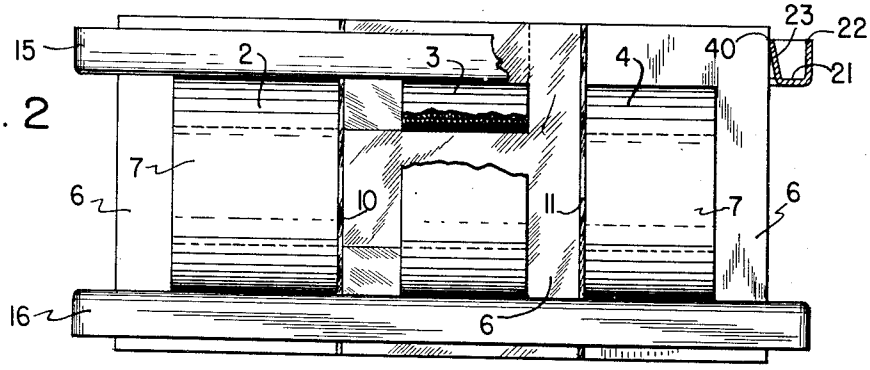


FIG. 3

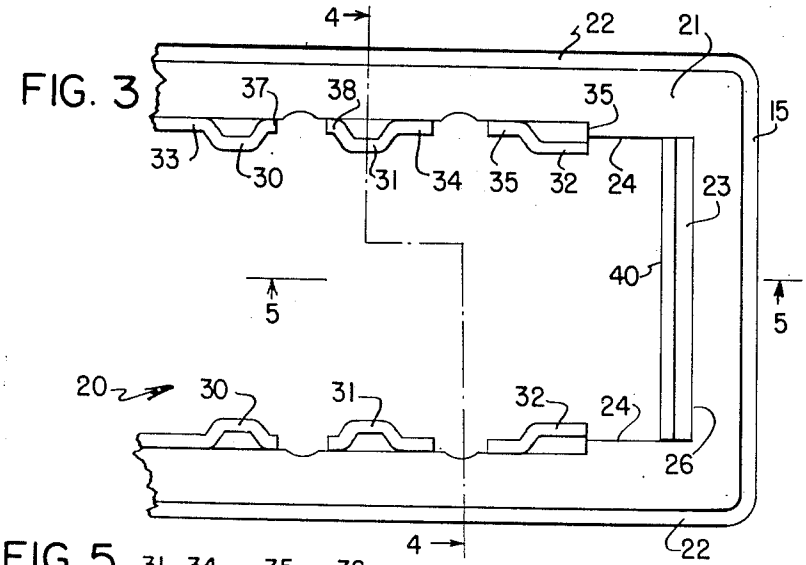


FIG. 4

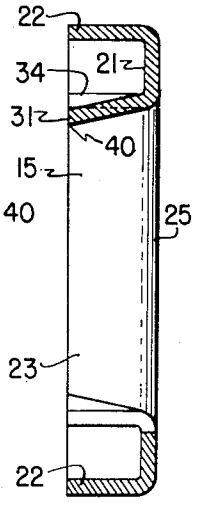
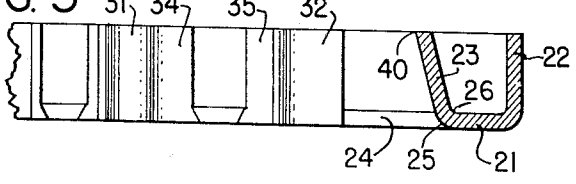


FIG. 5



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TRANSFORMER CLAMP

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3 Claims. (Cl. 175—356)

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This invention relates to improvements in clamping means for clamping together laminated electrical structures.

In the fluorescent lighting field it is customary to use a unit consisting of a laminated core transformer and two laminated core chokes positioned one at each of two opposite ends of the transformer so that the transformer core provides part of the magnetic circuit of the chokes.

It is one of the objects of the present invention to provide an improved clamping means for clamping together two or more of three units comprising the transformer and two chokes so that the units are held firmly together and the outermost laminations of the units are at the same time held against vibration, the improvement consisting essentially in so modifying the clamping structure as to enable the production of a clamping unit of a minimum weight and which can be positioned with great ease.

One ideal means for holding together the laminations of a unit of the above mentioned character is to provide a sheet metal plate having a rectanguluar opening through which the unit may be inserted and which plate has at the inner edges thereof projecting fingers that are adapted to exert spring pressure against the electric unit embraced by the plate. It is one of the objects of the present invention to provide a clamp of the above mentioned character wherein the pressure engaging fingers are so located as to exert their spring pressure at the location of the unit where they will cause a maximum noise reduction of the unit. It is a still further object of the present invention to provide the fingers of such a clamp with means for reenforcing the respective fingers so as to impart a stiffness thereto greater than the stiffness which would result merely from bending of the metal of the clamp to provide the fingers. By this arrangement it is possible to use a clamping plate which is of very thin sheet metal and yet obtain clamping pressures such as are obtainable only by the use of a much thicker clamping plate that lacks the finger stiffening means.

In the clamping of transformer units of the above mentioned character the pressure is needed at spaced apart points along the unit. By providing separate fingers each of which exerts its pressure at the desired location of the unit this desired result is obtained. The fingers are bent at an angle to the base portion of the clamp and it is desirable that the fingers shall be separate from one another at the base portion. This, however, would ordinarily weaken the clamp and

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the base would be easily bent between the fingers. To avoid this difficulty the base is provided with a reenforcing ridge that stiffens the base against bending between adjacent fingers. For the sake of simplicity this reenforcing ridge extends around the entire outer periphery of the base of the clamp. This prevents objectionable deformation or buckling of the base of the clamp between adjacent pressure fingers as the clamp is being pressed into position around the units.

The attainment of the above and further objects of the present invention will be apparent from the following specification taken in conjunction with the accompanying drawing forming a part thereof.

In the drawing:

Figure 1 is a plan view of a preferred embodiment of the present invention;

Figure 2 is a side view thereof with a portion of one of the clamps broken away;

Figure 3 is an enlarged plan view of a fragmentary portion of one of the clamps of Figure 1;

Figure 4 is a sectional view taken along the line 4—4 of Figure 3; and

Figure 5 is a fragmentary sectional view taken along the line 5—5 of Figure 3.

Reference may now be had more particularly to the drawings wherein like reference numerals designate like parts throughout.

A transformer constructed in accordance with the present invention is indicated in general by the reference numeral 1. The transformer consists of three units, namely, a choke 2, an auto transformer 3, and another choke 4. The device consisting of the two chokes and the auto transformer is generally referred to as a brick type ballast, and is used in the circuit of fluorescent lamps in a manner well known in the art. The two chokes are of substantially similar construction each of which includes a stack of identical E-shaped laminations 6 and a coil 7 surrounding the central leg of the stack of laminations. The auto transformer 3 consists of a group of E-shaped laminations and has a coil 8 surrounding the central leg of each lamination. In the case of the coil 8 the laminations are assembled in the coil in interlaced relationship, alternate laminations or groups of laminations having their central legs introduced into the coil from opposite sides thereof, with I laminations abutting the legs of the E laminations, all in a manner known in the art. The open sides of the cores of the chokes 2 and 4 face the core of the auto transformer 3 and, if desired, are separated therefrom by non-magnetic spacers 10 and 11 each

of which consists of a sheet of paper or other suitable non-magnetic material.

The auto transformer 3 and the chokes 2 and 4 are held in assembled relationship by two identical self-locking, self-tensioning clamps 15—16. A description of only one of the clamps 15 and 16 need be given because the clamps are of identical construction. The clamp 15 is made of a single sheet deep drawn steel and consists of a rectangular band having a central rectangular opening 20 through which the ends of the cores of the chokes and of the auto transformer extend. The clamp includes a flat base 21 that lies substantially in one plane to constitute the rectangular band and which base 21 has a peripherally extending flange 22 that stiffens the band and maintains the base 21 entirely in one plane. The inner side of the periphery of the band along the transverse edges thereof has two similar bent up spring projections 23—23 formed therein, as by cutting the base along lines of cut 24—24 and flexing the metal upwardly along the line of curvature 25. The projections 23 are flexible in a direction to the right, as seen in Figure 5, bending along the curved portion 25 about an axis which is substantially along the line 26, that is, about an axis parallel to the plane of the base 21, said flexing being against the natural resiliency of the metal. In addition to the projections 23 at the opposite transverse ends of the clamp the clamp has a series of projections 30, 31 and 32 on one side of the transverse center line of the clamp and a similar series of projecting fingers 30', 31' and 32' on the opposite side of the transverse axis of the clamp. The two opposite longitudinal sides of the clamp are identically constructed. The finger 32 is formed by a line of cut 35 in the base 21 of the metal and by then flexing a portion of the base upwardly so that the finger projects upwardly from the base and somewhat inwardly towards the longitudinal center line of the clamp, as may be seen from Figures 3 and 4. The fingers 30, 31 and 32 are each stiffened along their height by flange portions 33, 34 and 35 which extend upwardly from the base 21 at substantially right angles thereto and thus stiffen the respective fingers if an attempt is made to flex the fingers 30, 31 and 32 in a direction away from the longitudinal center line of the clamp. The flange portions 33, 34 and 35 are substantially parallel to the opposite flange 22 and clear the cores of the transformer and of the chokes when the clamp is in position. The fingers 30 and 31 are also reenforced by narrow vertical flanges 37 and 38, respectively, which are integral with the base 21 and with the respective fingers and extend at right angles to the base 21.

The clamp 15 is a single sheet metal stamping which is suitably die cut to provide the necessary metal for the projections 23—23, the pressure exerting fingers 30, 31 and 32 and the corresponding pressure exerting fingers 30', 31' and 32' and the flanges 33, 34, 35, 37 and 38 that stiffen the respective fingers 30, 31 and 32 and the corresponding flanges that stiffen the corresponding fingers 30', 31' and 32'.

To assemble the clamps in place the chokes 2 and 4 and the auto transformer 3 are held in a suitable fixture and the clamps are pressed in place as, for instance, by means of a hydraulic press. As the clamp 15 is pressed down upon the laminations of the chokes and the auto transformer the projections 23—23 are flexed

apart at their ends and force the chokes 2—4 towards the auto transformer 3, thus holding the assembled unit in compression. At the same time the fingers 30, 31 and 32 and 30', 31' and 32', and the corresponding fingers along the opposite side of the clamp bear against the outer laminations of the chokes and of the auto transformer and are flexed away from the longitudinal center line of the clamp by the action of the transformer and thus compress the laminations towards one another. The fingers 32' compress the laminations of the choke 2 at one end thereof, the fingers 31' compress the opposite ends of the laminations of the choke 2 at the opposite ends thereof, the fingers 30 and 30' compress the opposite ends of the laminations of the auto transformer, and the fingers 31—32 compress the opposite ends of the laminations of the choke 4, all of those fingers having been flexed outwardly by the iron structures of the chokes and auto transformer, respectively.

As the clamp 15 is being pressed downwardly into position the upper inner corners 40 of the projections 23—23 scrape along the laminations and tend to lock the clamp against retraction in the opposite direction because if an attempt is made to remove the clamp 15 from the iron structure the corner 40 along each pressure finger 23 will tend to bite into the metal of the laminations and resist such retraction of the clamp. In the same manner an attempt to retract the clamp 15 from position on the core is resisted by the fingers 30, 31 and 32 and 30', 31' and 32' which will bite into the metal of the laminations along the upper inner corner of those fingers and will thereby prevent removal of the clamp from the iron cores. It is thus apparent that no amount of vibration or shaking of the structure will result in loosening of the clamps from the core structure.

It may be seen that by the present invention there is provided a clamp by which the act of positioning the clamp on the transformers results in a tensioning of the clamp around the transformers and results in a self-locking action of the clamp around the transformers whereby the clamp cannot become loosened after a period of time.

While I have herein illustrated a clamp which may easily be positioned on one or a group of core structures by pressing the clamp in place, that is not the only way in which the clamp may be positioned on the core structures. One alternate way would be to hold the core structure or structures in position in a hydraulic press which compresses the laminations towards one another and also compresses the two chokes towards the central transformer, maintaining the hydraulic pressure at such an amount that the structures are compressed to a degree in excess of the amount of compression desired in the finished product. While the structures are thus held compressed by the hydraulic press the band clamps of the present invention are slipped into position. Thereafter the hydraulic pressure is released. The compressed laminations expand upon release of the hydraulic pressure, the expansion being then limited by the clamps 15—16.

In compliance with the requirements of the patent statutes I have here shown and described a preferred embodiment of my invention. It is, however, to be understood that the invention is not limited to the precise construction here shown, the same being merely illustrative of the

principles of the invention. What I consider new and desire to secure by Letters Patent is:

1. An electric device including a pair of laminated core electromagnetic units and a third laminated core electromagnetic unit between the pair of units and furnishing parts of the magnetic circuit for the units of the pair, means for holding the three units together comprising a self binding looped band adapted to be positioned around the cores of the three units and of a size such that the band loosely embraces the cores, said band having as an integral part thereof separate resilient projecting fingers extending inwardly of the loop of the band for engagement with the respective cores and flexible from the cores by a bending movement about an axis at right angles to the direction of movement of the band onto the cores and substantially parallel to the plane of the adjacent portion of the cores engaged thereby, the axes of bending of the projecting fingers being in advance of the point of engagement of the projecting fingers with the cores as the band is slipped onto the cores whereby the band is tensioned around the cores by the projecting fingers as the band is moved over the cores and the projecting fingers lock the band against retraction from the cores, the adjacent fingers that engage adjacent sides of the different cores being spaced apart thereby permitting independent flexing movement of each thereof to compensate for variations in thickness of the cores, the band including a base from which all of the fingers extend and said base having adjacent each finger a finger reenforcing projection integral with the base and integral with the finger and at an angle to the finger and out of engagement with the core that is engaged by the associated finger.

2. An electromagnetic device including a laminated core and a clamp comprising an endless metal band adapted to be slipped around the core, the band having inner and outer edges, the inner edge of the band having flexible flanges integral with the rest of the band and bent at an angle thereto, a portion of each flange being directed inwardly of the band to constitute a pressure finger engaging the core, and another portion of each flange extending from the inner edge of the band to the end of the flange and constituting a reenforcement for said finger and extending at an angle thereto.

3. A device including a laminated electromagnetic core and a clamp comprising an endless band encircling the core, said band comprising a loop-shaped base portion constituting a planar end surface of the clamp, said base portion having a strengthening projection along an edge thereof, the clamp having a series of fingers integral therewith and extending inwardly of the loop and flexed out of their normal positions by the core around which the clamp is positioned and by their flexing said fingers being caused to exert a pressure against said core, each finger including a core engaging portion and a stiffening portion stiffening the core engaging portion and extending at an angle thereto and at an angle to the base portion and out of engagement with the core.

HIRSCH EPSTEIN.

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