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Doggart et al.

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[54] **TWO-PART TRANSFORMER LAMINATION OF SLIDINGLY ENGAGEABLE PARTS**

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[52] **U.S. Cl.** **161/49,** 161/111, 336/216

[51] **Int. Cl.** **B32b 3/30,** B32b 3/10, H01f 27/26

[58] **Field of Search** 161/49, 111; 336/216, 210, 336/217

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[57] **ABSTRACT**

A two-part transformer lamination of which the two parts are slidingly engageable and are shaped to define together at least one locking means comprising a tongue and a correspondingly shaped closely fitting portion, of which the tongue has a region that in the plane of the lamination is narrower than a region nearer the tip of the tongue. Each tongue is preferably formed as an extension to a limb of a lamination and narrows towards its tip owing to an oblique side that has a widening step in it.

3 Claims, 6 Drawing Figures

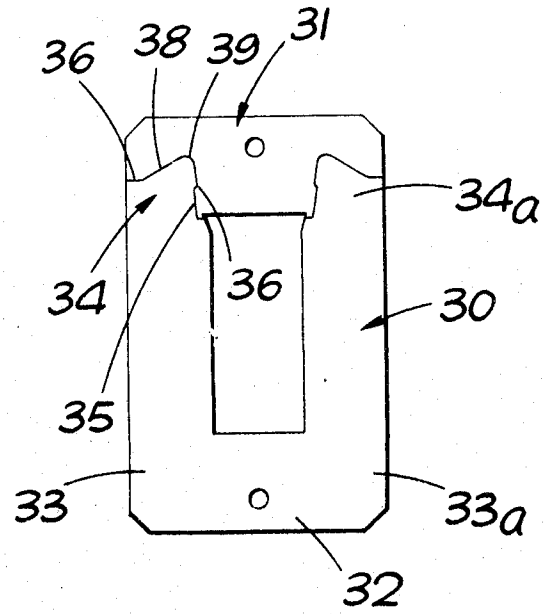


Fig. 1.

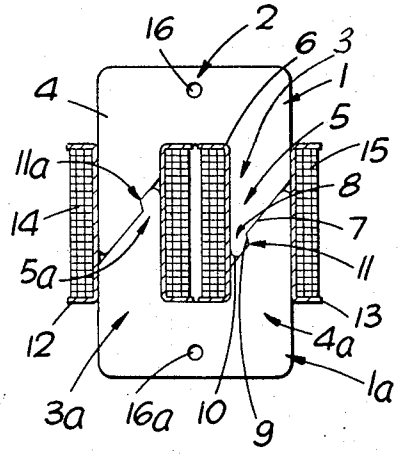


Fig. 2.

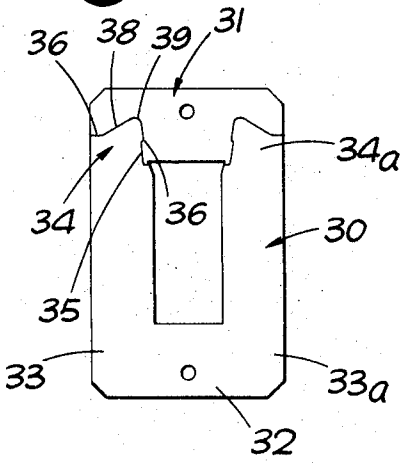
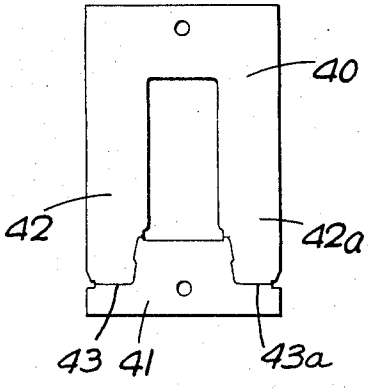


Fig. 3.



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Fig. 4.

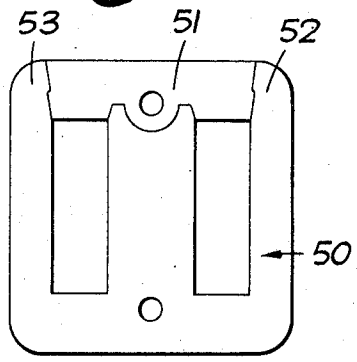


Fig. 5.

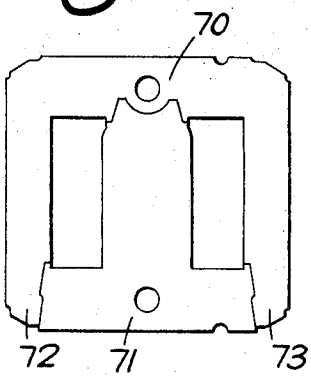
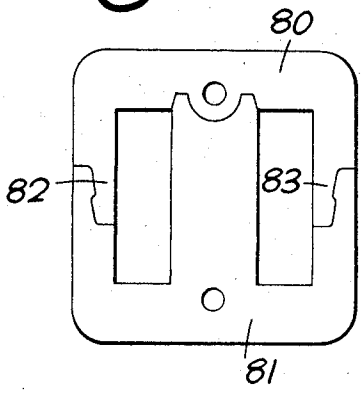


Fig. 6.



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TWO-PART TRANSFORMER LAMINATION OF SLIDINGLY ENGAGEABLE PARTS

This invention relates to two part laminations for transformers, both shell type and core type transformers.

In particular the present invention relates to laminations produced in two parts which can be assembled by sliding them together. This form of lamination is much more convenient than the common form which have to be built up in a stack by insertion of laminations one at a time from alternate sides of the bobbin or bobbins which are to carry the coils of a transformer. For example stacks of one part can be passed through the bobbin simultaneously with the insertion of a stack of corresponding parts from the other side, resulting in easier and more rapid assembly of the laminated core of the transformer.

According to the invention there is provided a two part transformer lamination of which the two parts are slidingly engageable and are shaped to define together at least one, preferably two, locking means each comprising a tongue and a correspondingly shaped recess or other closely fitting portion of which the tongue has a region that in the plane of the lamination is narrower than a region nearer the tip of the tongue.

The two parts may be of the same shape but need not be. In some configurations the recess would engage both sides of the tongue. In alternative configurations the closely fitting portion may engage only one side of the tongue. Preferably each tongue is formed as an extension to a limb of a lamination and narrows towards its tip owing to an oblique side that has a widening step in it.

A number of embodiments of the invention will now be described with reference to the accompanying drawings in which:

FIGS. 1 to 3 illustrate laminations suitable for core type transformers; and

FIGS. 4 to 6 illustrate laminations suitable for shell-type transformers.

Referring to FIG. 1, there is shown in plan view a two part lamination consisting of two slidably engageable parts 1 and 1*a*. These two parts are the same shape and accordingly only one will be described in detail. The part 1 comprises a base limb 2 and two side limbs 3 and 4. At the end of the limb 3 there is formed a tongue 5 between an inner side 6 and an oblique outer side 7 of the limb 3. The tongue 5 tapers to a relatively narrower region 8 and then, owing to a widening step 9 in the outer side 7, tapers out slightly at a small angle from parallelism from the inner edge 6 so that the width of the tongue increases slightly in a region nearer the tip 10 of the tongue than the relatively narrower region 8.

The adjacent limb 4*a* of the part 1*a* is shaped near the regions 8 and 9 in a manner corresponding to the shaping of the edge 7 so that it contains a slight recess 11 receiving the step 9 in the side of the tongue 5.

The other limb 3*a* of the part 1*a* is formed with a tongue 5*a* like the limb 3 of the part 1 and the limb 4 of the part 1 is formed in a manner corresponding to the limb 4*a* of the part 1*a* so that two locking means are provided each with a tongue of which the outer side is engaged by the corresponding recess.

FIG. 1 also illustrates two bobbins 12 and 13 into which, respectively the limbs 3, 4*a* and 3*a*, 4 extend.

The bobbins 12 and 13 will normally carry windings illustrated respectively at 14 and 15. The lamination shown in FIG. 1 partly relies on the bobbins 12 and 13 to hold the parts together but when inserted in the bobbins the parts are effectively self locking.

The base limbs of the two parts each have a hole 16, 16*a* respectively. When a stack of laminations has been inserted in the core of the transformer rods passing through the holes secure the stack in position.

FIG. 2 illustrates an alternative construction in which the two parts of the lamination are not the same shape. In FIG. 2 one part 30 is generally U-shaped with a base limb 32 and two similar side limbs 33 and 33*a*. Each of these limbs ends in a tongue engaged in a corresponding recess of a generally bar-shaped part 31 forming the other part of the lamination. The tongue 34 formed at the end of the limb 33 narrows owing to an oblique inner side 35 that has a step 36 by which the tongue is slightly widened in the region of the step. The tongue 34 is a close fit in a correspondingly shaped recess in the part 31. A tongue 34*a*, which is a mirror image of the tongue 34, fits into a corresponding recess at the other end of the part 31.

In FIG. 2, the end side of the limb 33 has a short part 36 at right angles to the outer side of the limb 33 and an oblique part 38 which meets the side 35 at a rounded tip 39.

FIG. 3 illustrates an alternative construction of lamination in which a symmetrical U-shaped part 40 has its arms bridged by the other part 41 of the lamination. The part 41 engages with one side, the inner side, of each side limb 42 and 42*a* of the U-shaped part 40. The limbs 42 and 42*a* have inner oblique sides similar to those of the tongues 34 and 34*a* in FIG. 2 but terminate at edges 43 and 43*a* that are generally at right angles to the outer sides of the limbs.

FIGS. 4, 5 and 6 illustrate laminations which are suitable for shell type transformers. In these cases the lamination has two side limbs and a central limb. The central limb may be wholly constituted by one of the parts or may be partly constituted by one of the two parts and partly constituted by the other. In all these constructions there are two locking means each formed by a tongue and a correspondingly shaped part; the tongues may be formed in the same part of the lamination or one tongue may be formed in one part and one tongue formed in the other. In each case the tongue has a part which is narrower than a relatively wider portion nearer the tip of the tongue. The adjacent portion of the other part of the lamination is shaped correspondingly. In FIG. 4 the two parts are 50 and 51; the tongues are shown at 52 and 53. In FIG. 5 the two parts of the lamination are the parts 70 and 71 and the two tongues are shown at 72 and 73. In FIG. 6 the two parts of the lamination are parts 80 and 81 and the two tongues which are both on the part 80 are shown at 82 and 83. In FIG. 4, FIG. 5 and FIG. 6 the tongues have oblique sides with widening steps as described earlier.

The two parts of each lamination may, if they are the same, be produced from sheet material using a single stamping tool; otherwise they can be sheared from each other. In some cases however, owing to the slight spreading of metal at right angles to the direction of cutting when the parts are sheared, the two parts will not fit closely enough. If they must fit closely enough to avoid air gaps in a magnetic circuit through the laminations they may be stamped out separately.

The scope of the invention includes individual parts as described and transformers including stacks of laminations as described. The two parts of the lamination must be elastically deformable in order that they may slide together within the confines of the bobbin or bobbins.

We claim:

1. A two part transformer lamination of which the two parts are slidingly and interlockingly engageable to form a lamination having two base limbs and at least two other limbs extending between the base limbs, the two outer limbs of said other limbs each having a straight outer edge, wherein the two parts are shaped to define together at least two locking means, one of each being located in one of said outer limbs and comprising a tongue on one of said parts and a complementary shaped closely fitting portion on the other of said parts, of which the tongue has a first edge at the tip thereof disposed at an oblique angle to the straight outer edge of the respective outer limb, and a second edge parallel to and longitudinally spaced from the first edge, the second edge being offset outwardly from said first edge, said first and second edge being connected by a third edge disposed at an obtuse angle to the first and second edges respectively, the distance from the junction of the first and third edges to the straight outer edge of the respective outer limb being greater than that from the junction of the second and third edges to the same straight outer edge.

2. A lamination according to claim **1** in which the parts define together two locking means and the tongues thereof are similarly shaped.

3. A lamination according to claim **2** in which each tongue is formed as an extension to a limb of a lamination and narrows towards its tip owing to said oblique side that has a widening step in it.

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