ABSTRACT: A core sheet for a transformer core formed from two complementary sheet parts. Each sheet part comprises a yoke, an end limb and part of a central limb of the whole core sheet, and the two parts are positively locked together to form the sheet by engagement of complementary projections and recesses on abutting edges of the sheet parts.
TWO-PART CORE SHEET FOR TRANSFORMERS

The invention relates to a two-part core sheet for transformers, having a longitudinally divided central limb and consisting of two core sheet parts, each of which has a yoke which abuts against an outer limb of the other core sheet part.

An object of the invention is to construct two-part core sheets of this type in such a way that the core sheet parts can easily be joined together but are difficult, if not impossible, to separate unintentionally from each other. Furthermore, air-gaps between the two core sheet parts must be kept as narrow as possible or avoided altogether, and a sheet packet of such core sheet should have good electrical properties. With this aim in view, the two core sheet parts, in the assembled state, should abut at their edges, under resilient pressure due to their own elasticity, as closely as possible against each other. The core sheets as an entirety, and the sheet packets formed from them, should possess good and suitable electrical properties.

The present invention consists in a core sheet forming member adapted to interfit with another like member to form a core sheet for a transformer, said core sheet forming member comprising an end limb, a yoke and part of a central limb of said core sheet, wherein an edge of said yoke and an edge of said limb are adapted to abut against edges of an end limb and yoke respectively of said like member, one of said edges of said sheet forming member having a projection and the other of said edges a corresponding recess so that when said sheet forming member interfits with said other member, a projection of one member mates with a recess of the other member to prevent relative movement therebetween in the plane of the sheet.

In this way it becomes very difficult to separate the two assembled core sheet parts and, in particular to separate two blocks of laminated core sheet parts which together form a sheet packet so that the interlocking is adequate for practically any stress which may occur. The interlocking achieved by the invention can be so secure that it can be used with success even with core sheets the central limb of which is divided in the direction of the limbs. Application with such core sheets is possible in particular when the side edge of the projection and the abutting edge of the yoke end run obliquely in the sense that the side edge of the projection engages behind the abutting edge of the yoke end.

The invention will now be particularly described by way of example, with reference to the accompanying drawings in which:

FIG. 1 shows a core sheet according to the invention, both core sheet parts of which are assembled together;

FIG. 2 shows the left lower corner of FIG. 1, on a larger scale;

FIG. 3 shows a corner, as in FIG. 2 but with mating edges of the yoke end and the contacting central limb shaped differently;

FIG. 4 shows a further form of said left lower corner; and

FIG. 5 shows a fourth embodiment of the left lower corner.

In FIG. 1, each core sheet part has a yoke 1 or 1a and an outer limb 2 and 2a, as well as a central limb part 3 and 3a. The central limb formed by the central limb parts 3 and 3a is diagonally divided and the two central shank parts 3 and 3a abut against each other along their diagonal edges 4. Their narrow ends have straight edges 5, 6, 7 and in order to obtain a lock with a better hold of the opposite core sheet part, in each case there is a corresponding recess of the opposite core sheet part, i.e. yoke 1 (or 1a). The edge 5 runs in the direction of the central limb, 3, 3a, which is considerably broader than the outer limb 2 or 2a and the yoke 1 or 1a. Each outer limb 2 and 2a carries at its inner edge 8 and 8a a projection 9 and 9a, and abuts with the side edge 10 and 10a of the projection 9 and 9a against an edge 11 and 11a, lying substantially rectangularly to the direction of the limb, of the abutting yoke end. As a result the edges 11 and 11a are arranged between projection and sheet center in such a way that the outer limb end cannot be drawn away in relation to the yoke unless the outer limb is elastically deformed by being bent out in the direction of the arrow 12. The width of the airgap between the edges 14 and between the end edges of the yokes and the ends of the outer limbs 2 and 2a, yoke and the edge 5 is decreased in the drawing as being considerably wider than they actually are or should be, and this has been done to simplify the drawing. The same is true for the width of the airgaps between the narrow ends of the central shank parts 3 and 3a and the corresponding recesses in the yokes 1 and 1a.

It is particularly advantageous if the dividing line of the central limb runs diagonally through the former limb and the narrow end of the central limb sheet parts can be inserted in a corresponding recess of the oppositely lying core sheet part in the direction of the plane of the sheet in such a way that the two central limb sheet parts at their diagonal dividing lines can be firmly pressed in after the insertion of their narrow ends in to the corresponding recesses.

With core sheets having wide central limbs, the obliqueness of the diagonals is frequently no longer self-limiting. There is then the danger that the core sheets, after the core sheet parts have been pressed together, do not hold fast together and slip in relation to each other, so that a narrow airgap occurs, or they may separate entirely from each other. By the occurrence of the airgap, the electrical properties of the core sheet are made worse. With cold rolled core sheets, the cut edge surfaces also have a very low friction coefficient, so that self-limiting can occur only with very steep diagonals. Since, on the other hand, a smooth-cut edge surface is desired in order to keep the airgap between the two core sheet parts as small as possible, self-limiting with cold rolled sheets is possible only with very steep diagonal cut edges.

The insertion or plugging together of the two core sheets, as may be imagined, simple, since the projection 9 reaches the left, upper corner 13 (see the left lower corner in FIG. 1) in the insertion operation, the left, upper core sheet part, as a result of the diagonal arrangement of the gap 3, is still a considerable extent to the left of the end edge of the lower yoke 1a. It is only on insertion, whereon the two diagonal edges 4 slide onto each other, that the projection 9 approaches the end edge of the associated yoke 1a, so that only in the last part of the plugging together does elastic bulging out of the lower end of the outer limb 2 take place. The invariability can be facilitated in addition by oblique surfaces 13.

In order to make it possible to plug the core sheet parts together in the direction of the limbs without permanent deformation, the height of the projection lies in the region of the elastic yieldability of the core sheet part, determined in the main by the length and width of the outer limb.

The amount of elastic deformation the outer limb 2 is able to withstand substantially depends upon the length f and the width b of the outer limb, in which in addition a certain elastic deformation of the left-hand part of the yoke 1 occurs, which is determined in particular by the height h of the yoke. The extent of the bending out of the left-hand outer limb 2 is determined by the height a of the projection and to a certain extent by the distance d of the side edge 10 of the projection from the lower end of the left-hand outer limb 2. If it is desired in the customary way to insert the core sheet parts into each other in the plane of the drawing, the ratios between f, h, b, h on the one hand and a, d on the other hand must be selected such that the bending out of the outer limb 2 on the pushing together of the two core sheet parts lies within the elasticity range of the stressed parts. For instance, this condition is fulfilled with customary core sheet material if the individual dimensions have the following values:

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\begin{align*}
f & = 25 \text{ mm} \\
b & = 5 \text{ mm} \\
h & = 5 \text{ mm} \\
a & = 0.3 \text{ mm} \\
d & = 1.2 \text{ mm}.
\end{align*}
\]
FIG. 3 shows a somewhat differently constructed projection, in which the side edge 20 of the projection and the abutting edge 21 of the yoke end 22 run obliquely in the sense that the side edge 20 of the projection engages behind the abutting edge 21 of the yoke end 22. In this way the locking is further strengthened and moreover a resilient effect in the sense of pressing out of the yoke end 22 onto the end 23 of the outer limb is obtained.

FIG. 4 shows a further variation of the projection. Here, the projection is given the reference number 25, and presses with the surface 26 against a corresponding surface 27 of the yoke end 28. The parts of the yoke end 28 and of the lower end 29 of the left-hand limb end, engaging into each other, engage with somewhat semicircular section surfaces in each other, so that a relative movement in the perpendicular direction is impossible in both directions.

In the embodiment in accordance with FIG. 5, the edges 30 and 31 of the lower limb end 32 and of the left-hand yoke end 33 are arranged obliquely and somewhat diagonally in relation to the core sheet, so that the end edge 31 of each yoke 33 runs somewhat diagonally in relation to the core sheet and abuts against a correspondingly running edge 30 of the associated outer limb end 32 of the other core sheet part. As a result the pushing in or plugging in of the core sheet parts is considerably simplified. The construction of the projection 34 and the nature of the rear engagement of a corresponding bearing surface 35 of the left-hand yoke end corresponds substantially to the embodiment in accordance with FIG. 3.

A bore 36 for accommodating a core sheet packet screw cuts into both the end edge 31 of the yoke and also the abutting edge 30 of the outer limb. When after assembly of the two core sheet parts the block screws are inserted into the bore 36, there results a further security of the two core sheet parts against mutual displacement. Moreover then generally two screws suffice instead of the customary four, in order to hold the two blocks consisting of core sheet parts together.

I claim:

1. A two-piece core sheet assembly for a transformer having two side branches, a center branch, and two spaced yoke branches interconnecting the side and center branches, said core sheet comprising two sheet members adapted to be assembled together, each sheet member integrally including a side branch, a yoke, and a diagonal portion of the center branch, wherein an inner longitudinal edge at the free extremity of each of the side branches and the free edge of each yoke branch forms a matching projection and recess corresponding to said projection, said projections and said associated recesses being disposed closer to the outside edges than the inside edges of said core sheet assembly, whereby when the two sheet members are pushed together in a common plane, a resilient outward deflection of the free extremity of the side branches occurs, followed by engagement of the projections in the recesses with said diagonal portions of the center branch of said two sheet members causing the matched projections and recesses to approach each other such that the resilient deflection of the free extremity of the side branches does not occur until the final stage of the mutual insertion.

2. A two-piece core sheet assembly as defined in claim 1, wherein the narrow extremity of the diagonal central branch portion of one sheet member is insertable into a matching notch in the yoke branch of the opposed sheet member, in the plane of the sheet.

3. A two-piece core sheet assembly as defined in claim 2, wherein said projections are provided on the inner longitudinal edge of the free extremity of each of the side branches and wherein the recesses are provided at the free edge of each yoke branch.

4. A two-piece core sheet assembly as defined in claim 3, wherein said projections and associated recesses are rectangular in shape.

5. A two-piece core sheet assembly as defined in claim 2, wherein said narrow extremity of the diagonal central branch portion insertable into a matching notch in said yoke branch of the opposed sheet member has a predetermined clearance in said notch, and wherein the side edge of each projection and a corresponding edge of each recess are inclined with respect to the abutting edges of the yoke member and the side member.