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(54) **Cost-reduced transformer manufacture**

(57) A transformer (111) and its body (100) are made by molding a unitary transformer body with slots (101) that define a transformer core (102), and then cleaving the unitary body into a pair of "E"-shaped structures (104, 105) to facilitate mounting of transformer windings (110) in the slots around the core. Cleaving of the unitary body results in surfaces (108, 109) of the structures that abut each other being substantially perfectly matched to each other. Hence, costly polishing of those surfaces to ensure a substantially perfect fit between them is eliminated. After the windings are mounted, the pair of structures are attached together to re-form the transformer body and form the transformer.

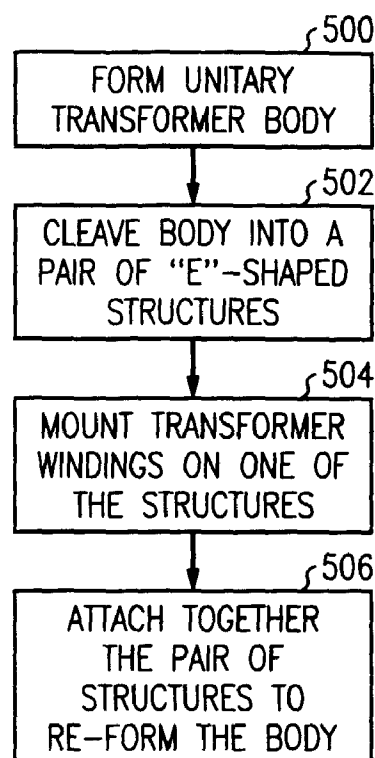


FIG. 5

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Description

Technical Field

[0001] This invention relates generally to electrical transformers, and specifically to the manufacture and assembly of transformer bodies.

Background of the Invention

[0002] An electrical transformer typically comprises two "E"-shaped ferrite structures and a set of coiled wires (e.g., one primary coil and at least one secondary coil). The sets of coils are wound around the center leg of one of the E-shaped structures, after which the two E-shaped ferrite structures are bonded together to form the transformer. In conventional transformer manufacture, each "E"-shaped structure is produced separately in a mold. The surfaces of the legs of the "E"-shaped structure that are perpendicular to the "E"-shape are subsequently polished smooth and flat. The reason for it is to ensure full and even contact between mating surfaces of the two "E"-shaped structures when they are attached to each other to form the transformer body in the transformer assembly. The full and even contact is necessary to ensure that the permeability of the transformer is not diminished. However, the polishing step adds a significant cost to the transformer assembly.

Summary of the Invention

[0003] This invention is directed to meeting these and other needs of the prior art. Generally according to the invention, a transformer body is made by forming (e.g., molding) a unitary transformer body, cleaving the unitary transformer body into a pair of transformer body structures (e.g., the pair of "E"-shaped structures) to facilitate mounting of the transformer windings on the transformer body, and --after the mounting of the windings-- attaching together the transformer body structures to re-form the transformer body. More specifically according to the invention, a transformer is made by forming a unitary transformer body having a pair of slots therethrough defining a transformer core, cleaving the unitary transformer body into a pair of transformer body structures each defining a portion of the pair of slots and the core, mounting transformer windings into the pair of slots around the core on at least one of the structures, and attaching together the pair of structures with the windings mounted thereon to re-form the transformer body and to form the transformer. Another aspect of the invention comprises a transformer body and a transformer made according to the above-characterized procedures.

[0004] Cleaving of the unitary transformer body results in the surfaces of the pair of transformer body structures that abut each other being substantially perfectly matched to each other. Hence, those surfaces

need not be polished to ensure a substantially perfect fit between them. Hence, the polishing step and its attendant cost are eliminated.

[0005] These and other features and advantages of the present invention will become more apparent from the following description of an illustrative embodiment of the invention considered together with the drawing.

Brief Description of the Drawing

[0006]

FIG. 1 is a perspective view of an illustrative transformer body;

FIG. 2 is a perspective view of a first illustrative arrangement for cleaving the body of FIG. 1 according to this invention;

FIG. 3 is a perspective view of a second illustrative arrangement for cleaving the body of FIG. 1 according to this invention;

FIG. 4 is a perspective view of the transformer body yielded by cleaving the body of FIG. 1;

FIG. 5 is a functional flow diagram of the steps involved in making a transformer according to this invention; and

FIG. 6 is a perspective view of a transformer made according to the steps of FIG. 5.

Detailed Description

[0007] FIG. 1 shows an illustrative example of a transformer body 100. Body 100 is typically made of ferromagnetic material, and defines a pair of slots 101 therethrough which define a core 102 between them. In a fully-assembled transformer 111, shown in FIG. 6, the transformer windings 110 are wound through slots 101 around core 102. Typically, the windings are wound on a spool that is then mounted on core 102 in slots 101. Unlike the aforementioned conventional transformer bodies, body 100 is molded in one piece. During the molding process, a pair of score marks 103 is molded into, and fully across, a pair of surfaces of body 100 so that they bisect slots 101 and core 102. Alternatively, score marks 103 are cut into the pair of surfaces of body 100 after body 100 has been molded.

[0008] As shown in FIG. 2, score marks 103 are used to cleave body 100 into two E-shaped structures 104 and 105 by a cleaver 106. Score marks 103 define the weakest plane through body 100 and thus ensure that body 100 splits into structures 104 and 105 along that plane. Score marks 103 also serve to properly position the cleaving mechanism on body 100.

[0009] A preferred cleaving mechanism is shown in FIG. 3. It also comprises a cleaver 106 positioned in one score mark 103, and further comprises a pressure plate 107 that is positioned over the surface of body 100 which defines the other score mark 103. Pressure plate 107 is concave along its surface that faces body 100, so

that it contacts body 100 along outer edges that are parallel to score mark 103. While pressing body 100 against cleaver 106, pressure plate 107 also exerts an outward force on body 100 that tends to pull the two E-shaped structures 104 and 105 apart from each other.

[0010] The result of cleaving body 100 is shown in FIG. 4. Body 100 is split into the two E-shaped structures 104 and 105. Surfaces 108 and 109 of structures 104 and 105, respectively, that abut each other are substantially perfectly matched to each other, because no material has been removed from them (unlike what would happen if they had been sawed apart). Hence, surfaces 108 and 109 do not need to be polished to ensure a substantially perfect fit between them. Hence, the polishing step and its attendant cost are eliminated.

[0011] FIG. 5 lists the steps involved in making a transformer 111, and a transformer body 100, according to the invention. First, a unitary transformer body 100, as shown in FIG. 1, is formed (e.g., molded), at step 500. The unitary body 100 is then cleaved, as shown in FIG. 2 or 3, into a pair of "E"-shaped structures 104 and 105, as shown in FIG. 4, at step 502. The transformer windings 110 are then mounted on one of the structures 104 and 105, at step 504, and the structures 104 and 105 are attached (e.g., glued or clipped) together to re-form the body 100 and form the transformer 111, shown in FIG. 6, at step 506.

[0012] Of course, various changes and modifications to the illustrative embodiment described above will be apparent to those skilled in the art. For example, cleaving, as the term is used herein, may constitute any manner of separating the transformer body into two portions that does not involve removal of material from, or other geometric distortion of, the surfaces of separation. Such changes and modifications can be made without departing from the spirit and the scope of the invention and without diminishing its attendant advantages. It is therefore intended that such changes and modifications be covered by the following claims.

Claims

1. A method of making a transformer body, CHARACTERISED BY the steps of:

forming (500) a unitary transformer body (100);
cleaving (502) the unitary transformer body into a pair of transformer body structures (104, 105) to facilitate mounting of transformer windings (110) on the transformer body; and
attaching (506) together the transformer body structures to re-form the transformer body.

2. The method of claim 1 wherein:

the step of forming comprises the step of forming a score mark (103) in the unitary transformer body to define a line for cleaving the

body.

3. The method of claim 1 wherein:

the step of forming comprises the step of forming score marks (103, 103) on opposite sides of the unitary transformer body to define a plane for cleaving the body.

4. A transformer body made by the method of claim 1.

5. The method of claim 1 further comprising the step of:

mounting (504) the transformer windings on at least one of the transformer body structures prior to the step of attaching.

6. A transformer made by the method of claim 5.

7. A method of making a transformer (111), CHARACTERISED BY the steps of:

forming (500) a unitary transformer body (100) having a pair of slots (101) therethrough defining a transformer core;
cleaving (502) the unitary transformer body into a pair of structures (104, 105) each defining a portion of the pair of slots and the core;
mounting (504) transformer windings (110) into the pair of slots around the core on at least one of the structures; and
attaching (506) together the pair of structures with the windings mounted thereon to re-form the transformer body and to form the transformer.

8. The method of claim 7 wherein:

the step of forming comprises the step of forming a score mark (103) in the unitary transformer body crossing openings of the pair of slots and the core to define a line for cleaving the body.

9. The method of claim 7 wherein:

the step of forming comprises the step of forming score marks (103, 103) on opposite sides of the unitary transformer body, each score mark crossing openings of the pair of slots and the core, to define a plane for cleaving the body.

10. A transformer (111) made by the method of claim 7.

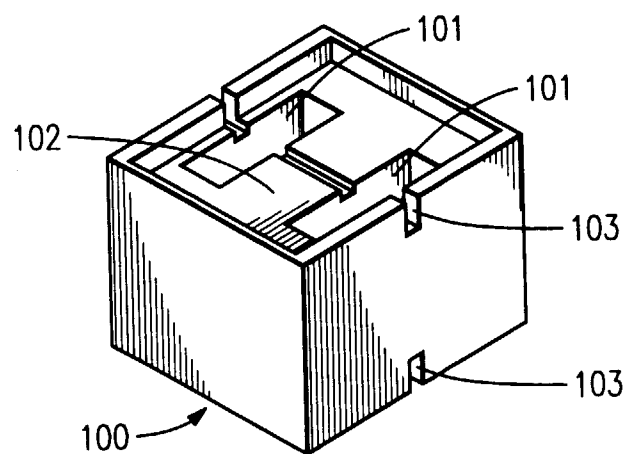


FIG. 1

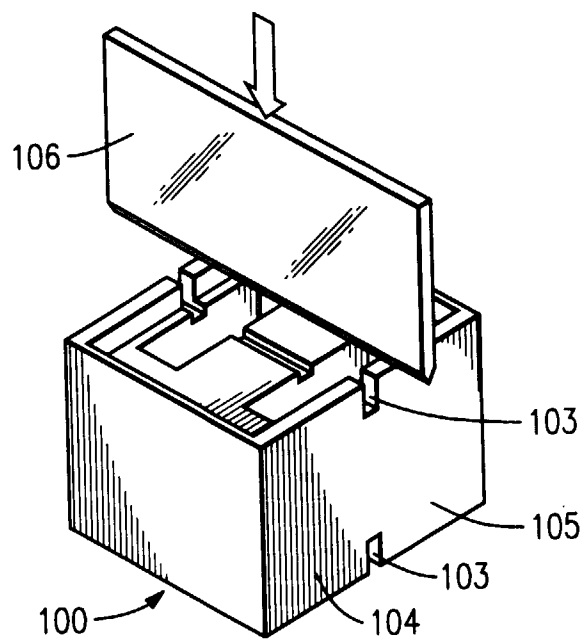


FIG. 2

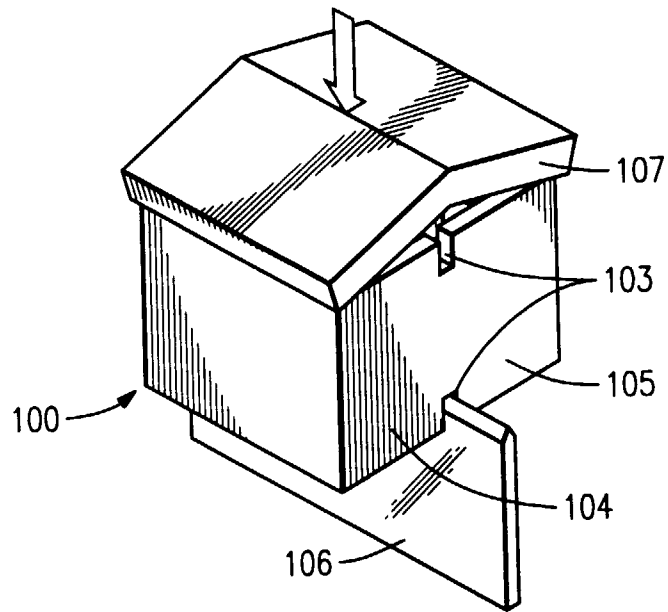


FIG. 3

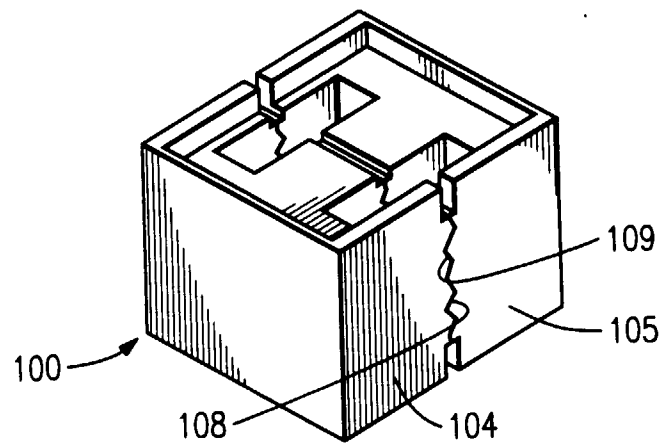


FIG. 4

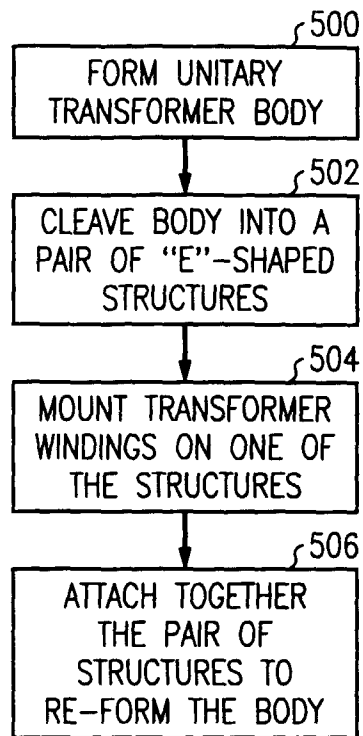


FIG. 5

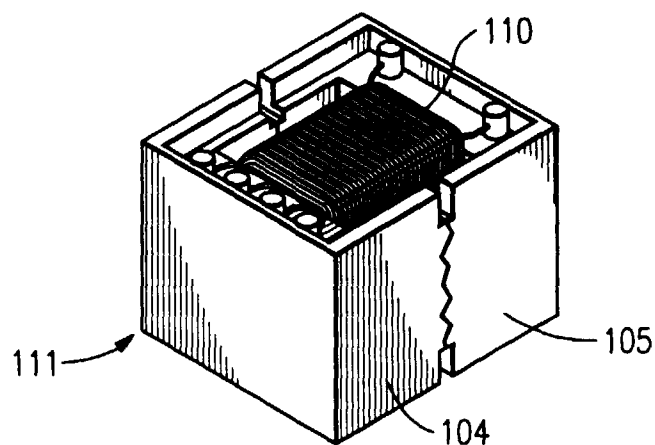


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 98 31 0167

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	PATENT ABSTRACTS OF JAPAN vol. 096, no. 010, 31 October 1996 & JP 08 148361 A (SONY CORP), 7 June 1996 * abstract * -----	1-10	H01F41/02
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		15 April 1999	Vanhulle, R
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