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(54) Magnetic lamination core for monophasic low-power Transformers

(57) From a continuous strip of plate (1) by stamping are obtained the parts (2-2'), which are identical in shape and size to each other, and which form two longitudinal and marginal alignments in which said parts are opposite each other, each part adopting an asymmetrical E-shape with its outer legs (3-4) having equal widths and also equal to the width of the common leg (2), but half the length of its middle leg (5), and with said legs (3-4) having clearly different lengths while the middle leg (5) has an intermediate length, and with the separation between said middle leg (5) and the outer legs (3-4) equal to the width of the latter legs.

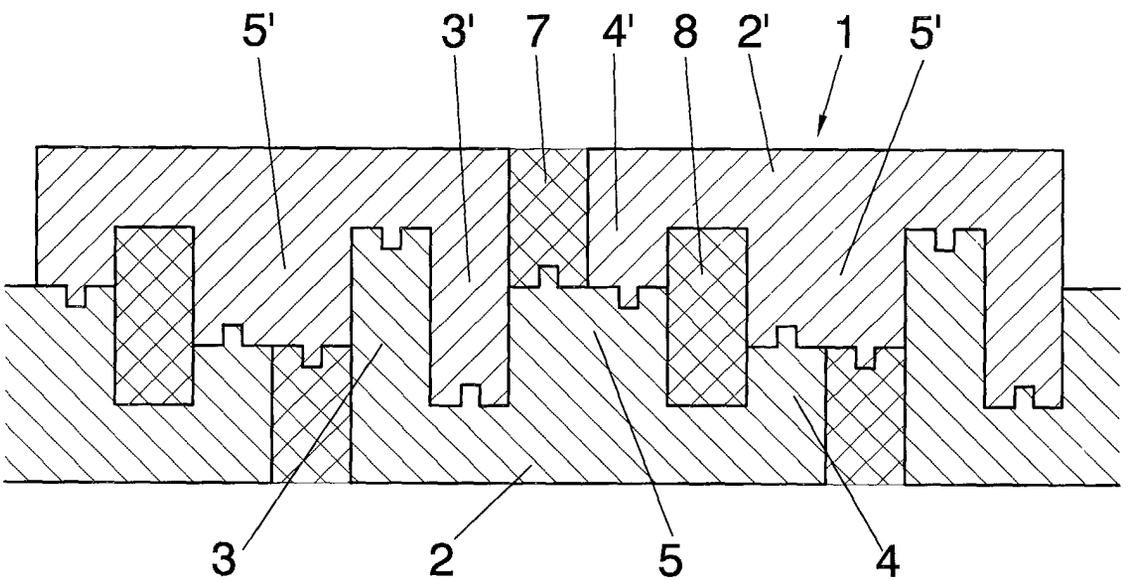

FIG. 1

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Description

OBJECT OF THE INVENTION

[0001] The present invention relates to a core of the type used as magnetic circuits in monophasic low-power transformers, comprising several stacked laminations of magnetic steel on which are mounted the various coils or electric circuits which correspond to the input voltage (primary coil) and the output voltage (secondary coil) of the transformer.

[0002] The object of the invention is to achieve a construction of the core from two half-cores which are identical in size and shape, formed by the aforementioned stack and which are created in the same stage of the stamping process and with the stack configuration required for each case, with an ideal use made of the materials in order on one hand to facilitate the assembly of the core on the transformer and in addition, essentially, to obtain a uniform electrical response.

BACKGROUND OF THE INVENTION

[0003] It is known that a low-power monophasic transformer comprises a core made from magnetic steel formed by a number of superimposed laminations which configure a single or double ring, generally rectangular, on the sides of which are established the corresponding coils, so that the inducing current which passes through one of them becomes an induced current in the other, with the same or different voltage.

[0004] Obviously, these rings must be initially open so that the coils can be inserted inside them, with each layer of the core formed by engaging two laminations, so that stacking of several layers produces the transformer core.

[0005] Specifically in the scope of armoured cores in which two adjacent rings are defined, a common solution is to begin from a rectangular lamination in which two long rectangular openings are stamped, which have a length equal to that of the width of the base lamination so that in the same process as the openings are made two I-shaped strips are obtained which are later used, after breaking the base lamination into two halves, each half having an E shape that is later closed by one of the I-strips, forming the required double ring, and thereby making an optimal use of the material, with 100% of the metal plate being used.

[0006] Along this line can be mentioned, with differences in detail but having the same basic structure, European Patent 671,750, Japanese Patent 61-35.505 and US Patent 4,827,237.

[0007] All of these patents have as an objective a maximum use of the available material, but however have two basic drawbacks mainly centred on the following aspects:

- The different configuration of the parts which form the armoured core makes the electrical response not uniform.

- The presence in each armoured core of two types of parts with different configuration and size requires a selection and matching of these parts as each half-core is different, with a resulting cost in time and lower productivity in assemblies using both manual or automatic machinery.

[0008] In addition, English Patent 1543567 and standard E-I type configurations have the following problem:

- The transformer core must be made by the transformer manufacturer, stacking the laminations one by one and alternating E's and I's on either side of the coil, resulting in longer times and a slower manufacturing process, and thereby greater production costs.

[0009] In addition to this most common solution which uses E-shaped and I-shaped parts there are others such as that of European Patent 196,406, in which C-shaped and T-shaped half-cores are obtained, but which still have the object of making a full use of the material and in which the same aforementioned drawbacks are present in the same sense as described.

DESCRIPTION OF THE INVENTION

[0010] The core for low-power monophasic transformers disclosed solves the aforementioned problems in a fully satisfactory manner, so that in exchange for a small waste of material which has little relevance each layer of the armoured core is formed by laminations identical in size and shape, and thus naturally stacking several layers will give rise to two also identical half-cores, which on one hand considerably simplifies their assembly process as no part selection and pairing is required, and in addition and more importantly a uniform electrical response is achieved and a greater speed in constructing the core, as the corresponding half-cores are obtained with the required dimensions from the stamping process.

[0011] For this purpose and more specifically, as is conventional a continuous strip of a given width is stamped, also as is conventional, obtaining two longitudinal and marginal alignments of identical parts, each of which is approximately E-shaped, with the middle leg being twice the width of the outer legs, which outer legs are unequal in length with one shorter and one longer than the middle leg and with a common leg having the same width as the outer legs, which are in turn separated from the middle leg by a distance equal to their width.

[0012] In this manner and using as mentioned above a continuous strip of a suitable width opposing parts are obtained, longitudinally out of phase, in which the larger outer leg of each is obtained from the empty space left

in the opposite part between its own larger outer leg and its middle leg, and where the middle leg of each part is obtained from the space left in turn by the shorter outer leg of the opposite part.

[0013] This allows to obtain parts which are identical in size and shape to each other, with a minimal waste of material which can be perfectly assumed in view of the advantages obtained from a functional and assembly point of view by this new arrangement.

[0014] In addition, and as is also conventional, the aforementioned outer and middle legs of this single asymmetrical E-shaped part can be provided on their ends with complementary recesses and protuberances which facilitate and ensure the engagement of the two half-cores.

DESCRIPTION OF THE DRAWINGS

[0015] The characteristics of the present description will be better understood in view of the accompanying drawings of a preferred embodiment which are an integral part of the description and where for purposes of illustration only and in a non-limiting sense the following is shown:

Figure 1 shows a plan schematic view of a continuous plate strip duly marked for stamping, from which is obtained a core in accordance with the object of the present invention, where the various lines show the different laminations obtained from said stamping and the wasted material.

Figure 2 shows an isolated plan view of one of the laminations which form part of the core obtained from the continuous plate of the previous figure.

Figure 3 shows, finally, two plates such as those of the previous figure, suitably interlocked to form part of the transformer core.

PREFERRED EMBODIMENT OF THE INVENTION

[0016] In view of the above described figures it can be seen that a lamination core for low-power monophasic transformers is obtained, in accordance with the invention, from a continuous strip (1) from which are stamped a number of parts (2-2') which will create two longitudinal and marginal alignments from the continuous strip (1), longitudinally out of phase and interlocked in order to make a better use of the material, with each part (2-2') having an asymmetrical E-shape with one of the outer legs (3) considerably longer than the other outer leg (4) but with the same width, with a middle leg (5) having a length in between those of the outer legs but with double the width, and having between said middle leg (5) and the outer legs (3-4) spaces (6) of a width equal to that of the outer legs (3-4), so that each greater outer leg (3) of these parts is obtained from the empty space (6) defined in the opposite part (2'), between its greater outer leg (3') and the middle leg (5'), while the shorter outer leg (4) is simultaneously obtained opposite the middle leg (5') of the opposite part (2'), as can be seen clearly in Figure 1, so that small rectangular sectors (7) and (8) are left as waste material, one between each two marginally aligned parts (2-2') and the other when obtaining the space (9), joint, defined between the smaller outer leg (4) and the middle leg (5) and the legs (4'-5') of the transversely opposite part (2').

[0017] As the common leg of each part (2-2'), labelled with the same numbers, has the same width as the outer legs (3-4), it is obvious that in order to obtain these parts one must begin with a continuous strip (1) with the same width as the sum of the length of one of the greater legs (3) and the width of the common leg (2) of these parts.

[0018] In addition, in the stamping process, on the free end of the greater leg (3-3') of these parts are obtained corresponding centred grooves (10), similar corresponding widenings (11), also centred, and on the free end of the middle leg (5-5') are obtained a groove (10) and a projection (11) so that when engaging any of these parts, as shown in Figure 3, a male-female engagement is obtained between them which improves the stability of the armoured core.

[0019] In this manner the circuit obtained by joining two half-circuits (asymmetrical E's), fully corresponds to the dimensions and proportions of the transformer circuits in accordance with the applicable regulations for E-I types.

Claims

1. Magnetic lamination core for monophasic low-power transformers, of the armoured type in which two half-cores are defined, which after receiving the corresponding coils are interlocked to form a double ring, **characterised in that** said half-cores are formed from parts (2-2') which are identical in size and shape to each other, embodied as an E-shaped asymmetrical lamination with its outer legs (3-4) identical in width and having the same width as the common leg (2), but being clearly unequal in length, while the middle leg (5) has a length which is in between those of the aforementioned legs, and a width twice as large as theirs, with said middle leg (5) separated from the outer legs (3-4) by a distance which is equal to the width of the latter legs.

2. Magnetic lamination core for monophasic low-power transformers, as claimed in claim 1, **characterised in that** said laminations or parts (2-2') obtained by stamping of a continuous strip of plate (1) are positioned on said plate such that the greater outer leg (3) of one part is contained in the space (6) defined between the greater outer leg (3') of the part (2') which is laterally opposite and its middle leg (5'),

while said middle leg (5) of either part (2) is left opposite the shorter outer leg (4') of the laterally opposite part (2'), defining two marginal alignments of parts (2-2') which are partially interlocked, with said parts longitudinally out of phase and separated from each other in the alignment by small discardable segments (7) which have the same size as the smaller outer leg (4) of one of such parts, while between two such parts (2-2') that are laterally adjacent is defined another rectangular waste segment (8) which is slightly greater than the previous one.

3. Magnetic lamination core for monophasic low-power transformers, as claimed in above claims, **characterised in that** both the outer legs (3-4) and the middle leg (5) of the aforementioned parts (2-2') incorporate on their free end grooves (10) and projections (11) which allow a male-female coupling of the half-cores in order to obtain the final armoured core.

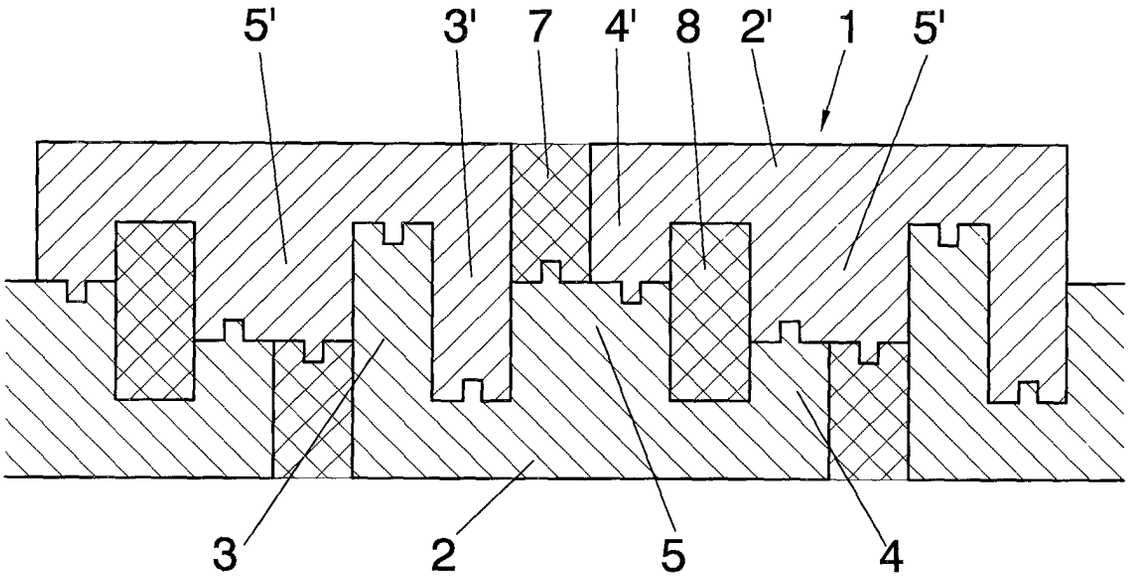

FIG. 1

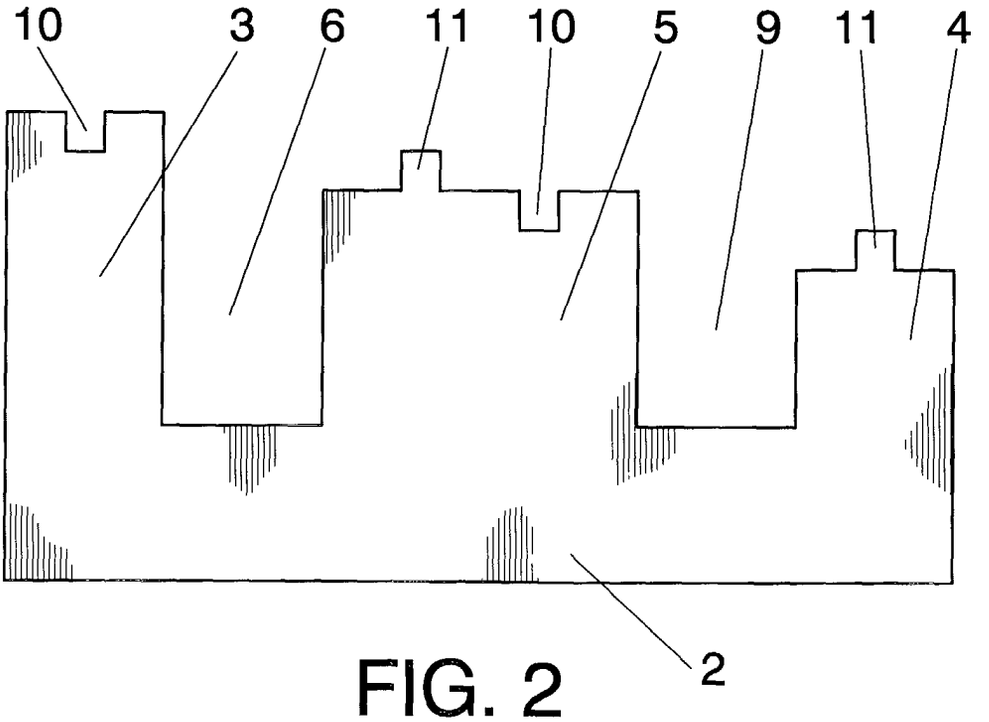

FIG. 2

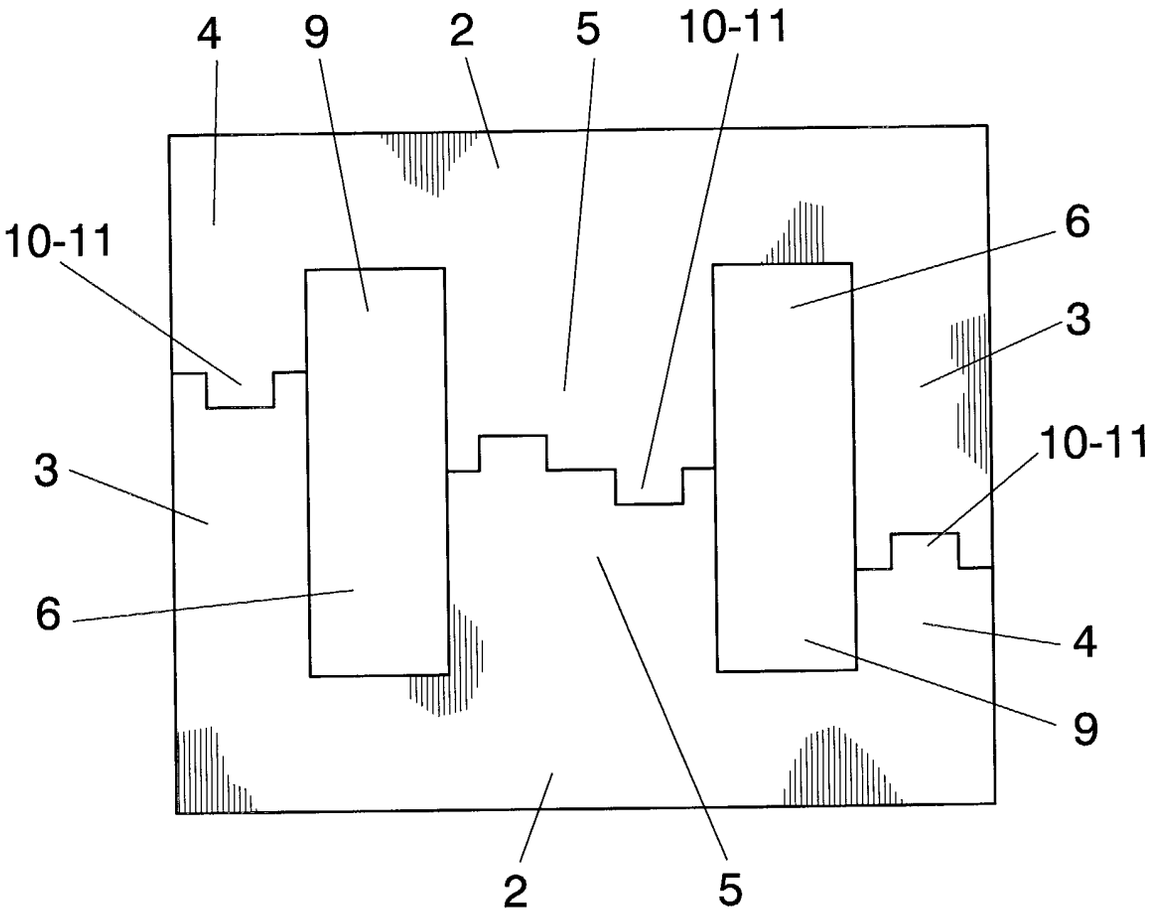

FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 38 0016

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.7)
X	WO 90 07782 A (LINTON & HIRST LTD) 12 July 1990 (1990-07-12) * figure 11 *	1	H01F27/245 H01F41/02
A	DE 26 38 780 A (LEUENBERGER H) 17 March 1977 (1977-03-17) * figure 4 *	2	
A	DE 19 29 566 A (IZUMI DENKI) 18 June 1970 (1970-06-18) * figure 1A *	3	
A	GB 680 577 A (N G N ELECTRICAL LTD) 8 October 1952 (1952-10-08)		
A	FR 944 829 A (TRANSFO STANDARD) 15 April 1949 (1949-04-15)		
A	DE 159 059 C (CHARLES LE GEYT FORTESCUE)		
A	GB 1 591 131 A (JOSEPH B C;JOSEPH R L) 17 June 1981 (1981-06-17)		TECHNICAL FIELDS SEARCHED (Int.Cl.7) H01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25 June 2002	Vanhulle, R

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 38 0016

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25-06-2002

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9007782 A	12-07-1990	GB 2226459 A	27-06-1990
		AT 137051 T	15-05-1996
		DE 68926309 D1	23-05-1996
		DE 68926309 T2	19-09-1996
		EP 0449931 A1	09-10-1991
		ES 2086398 T3	01-07-1996
		WO 9007782 A1	12-07-1990
		JP 4504029 T	16-07-1992
		US 5406243 A	11-04-1995
DE 2638780 A	17-03-1977	CH 596648 A5	15-03-1978
		CH 596649 A5	15-03-1978
		DE 2638780 A1	17-03-1977
		FI 762494 A	04-03-1977
DE 1929566 A	18-06-1970	DE 1929566 A1	18-06-1970
GB 680577 A	08-10-1952	NONE	
FR 944829 A	15-04-1949	NONE	
DE 159059 C		NONE	
GB 1591131 A	17-06-1981	AT 365848 B	25-02-1982
		AT 720377 A	15-06-1981
		AU 2958577 A	26-04-1979
		CH 624791 A5	14-08-1981
		DE 2745570 A1	13-04-1978
		FR 2367337 A1	05-05-1978
		IE 45707 B1	03-11-1982
		NL 7711094 A	13-04-1978
		SE 7711261 A	12-04-1978
		ZA 7705941 A	30-05-1978

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82