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CORE CONSTRUCTION

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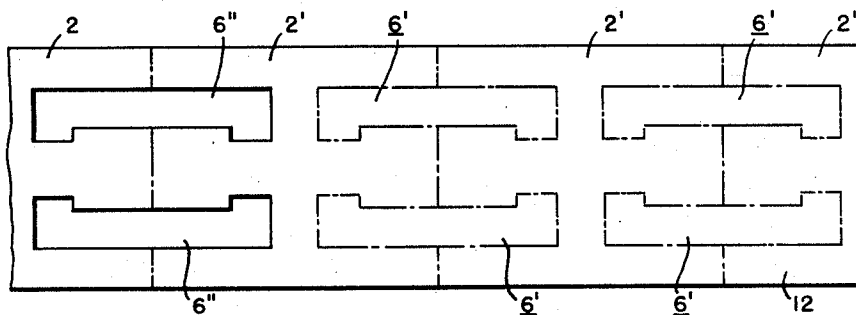


Fig. 1.

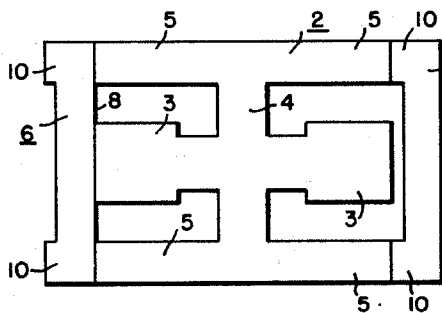


Fig. 2.

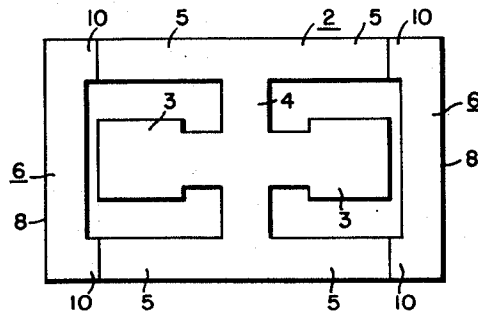


Fig. 3.

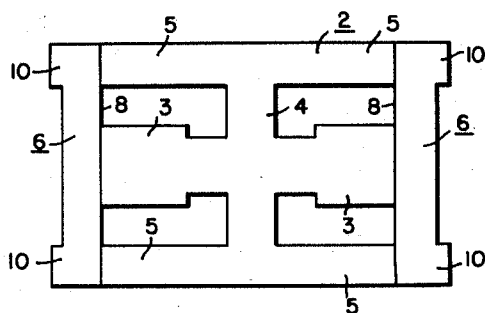


Fig. 4.

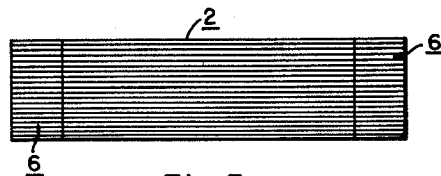


Fig. 5.

WITNESSES

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2,934,727

CORE CONSTRUCTION

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1 Claim. (Cl. 336—212)

My invention relates generally to core constructions and more particularly to core constructions such as are employed for the transformer and ballast coils used for the control of one or more gaseous discharge devices, such as fluorescent lamps.

In constructing transformer cores for controlling gaseous discharge devices, such as fluorescent lamps, it has been common practice to assemble the laminations of each layer of a core from two or more pieces of magnetic sheet material in such a manner so as to obtain the best electrical characteristics in the core for controlling the discharge device. In many instances it has been found desirable to provide an air gap in the core while in other instances it has been found that an air gap is not desirable. Accordingly, it is highly desirable that a core have a structure so that it may be provided with or without an air gap depending on the particular type of electrical control desired with a particular type of discharge device. Also, it is obvious that the cost of the various formed laminations, of each layer of a core, is dependent on the amount of material needed in the blank stage from which the various laminations are formed. Heretofore, numerous arrangements of various types of laminations have been used to reduce the scrap resulting from the forming operation of the lamination. To my knowledge, however, all of such prior core arrangements, except perhaps laminations of a simple geometric form, has entailed some scrap loss during the forming operation.

Accordingly, one object of my invention is to provide new and improved laminations of a form so that no scrap results from the forming operation.

Another object of my invention is to provide a new and improved magnetic core, the laminations of which may be fabricated from a strip or sheet of suitable material without any scrap loss resulting from the forming thereof.

Another object of my invention is to provide new and improved laminations for a magnetic core of a form which may be assembled to provide or to eliminate an air gap.

A more specific object of my invention is to provide new and improved laminations for a magnetic core which are formed by providing a pair of back-to-back E shapes located in tandem, with the material ejected in forming the E shapes being utilized as the end members for the E shapes.

Another more specific object of my invention is to provide new and improved laminations for a magnetic core which are formed by providing a pair of back-to-back E shapes located in tandem, with the material ejected in forming the E shapes being utilized as the end members for the E shapes and which have means for providing either one of the E's of an E shape with or without an air gap.

These and other objects of my invention will become more apparent upon consideration of the following detailed description of preferred embodiments thereof when

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taken in conjunction with the attached drawings, in which:

Figure 1 is a top plan view of a strip of material showing the form of the laminations constructed in accordance with the principles of my invention with respect thereto;

Fig. 2 is a top plan view of a core constructed in accordance with the principles of my invention having a single air gap;

Fig. 3 is a top plan view of a core constructed in accordance with the principles of my invention having a double air gap therein;

Fig. 4 is a top plan view of a core constructed in accordance with the principles of my invention having no air gaps therein; and

Fig. 5 is an end elevation view of a core built up of laminations constructed in accordance with the principles of my invention as shown in Figs. 2, 3 and 4.

Referring initially to Fig. 2, it will be noted that each layer of laminations of the core constructed in accordance with the principles of my invention includes, a middle one-piece, flat punching or lamination 2 having a central leg 4 with three arms extending substantially perpendicularly outward from each side of the central leg 4 so as to form a lamination 2 which is generally of the form of a pair of back-to-back E shapes with the central leg 4 being common to each E shape. Each E shape comprises a central arm 3 and a pair of outer arms 5 which are all of the same length and, as will become more apparent hereinafter, are of a length equal to one-half the width of the lamination 2. Arms 3 and 5 of each lamination 2 are also of a length equal to one-half the width of the strip from which the laminations 2 are fabricated, as the laminations 2 are preferably formed from a strip of suitable magnetic material having a width equal to the width of the laminations 2. Arms 3 and 5 of each E shape of lamination 2 terminate in a straight end edge which, as they are of the same length, lie in a common plane extending perpendicularly to the plane of the drawing. Further, as arms 3 and 5 of each lamination 2 are of the same length, their common end planes at opposite sides of central leg 4 will be equal distances from the center of the central leg 4. With such a configuration, it will be obvious that lamination 2 has a space between each central arm 3 of each E shape and each of its outer adjacent arms 5 which space is of a length equal to one-half the width of the lamination 2 or one-half the width of the strip from which the lamination 2 is fabricated. Further, it will be noted that the outer edges of the outer arms 5 of lamination 2 lie in the same longitudinally extending line at each side so that the double E shape may be readily formed from strip or sheet material.

Fig. 2 also illustrates that identical elongated, generally rectangular end members 6 are located in engagement with the outer ends of the outer arms 5, at the ends of lamination 2, respectively, so that a closed magnetic circuit is formed by each E shape of a lamination 2 and its cooperable end members 6. As shown, each end member 6 extends transversely across the outer ends of the outer arms 5 of its cooperable E shape and, accordingly, each end member 6 is of a length equal to the width of the lamination 2 or the width of the strip from which the laminations are fabricated. Each end member 6 is provided with a straight side 8 so that, as shown on the left side of Fig. 2, the straight side 8 of an end member 6 may be butted against the outer ends of all the arms 3 and 5 of one of the E shapes of a lamination 2. Thus, as straight side 8 of the left member 6 engages the outer edge of the central arm 3 of the left E shape of lamination 2, no air gap will occur between the left member 6 and the left E shape of lamination 2.

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Each end member 6 is also provided at each of its ends with a projection 10 which extends laterally outwardly from the side of the end member 6 opposite side 8. Projections 10 are of a width equal to the width of the outer arms 5 of each of the laminations 2 so that, as shown at the right side of Fig. 2, the projections 10 of the right end member 6 may be butted against the outer ends of the outer arms 5 of the right E shape of lamination 2. Since projections 10 extend outwardly from end member 6, such engagement will cause the portion of the right end member 6 between projections 10 to be spaced outwardly from the outer end of the central arm 3 of lamination 2, a distance equal to the length of the projections 10. In order to obtain a uniform air gap, projections 10 are of the same length. As indicated, end members 6 are identical, and accordingly, the projections 10 on the left end member 6 extend outwardly from the outer edge of the left end member 6. With such construction, the projection 10 on the left end member 6 may be used to space the core from a side of a casing, not shown, in which such cores are often placed.

Figs. 3 and 4 employ the same laminations as described with relation to Fig. 2, and accordingly, the same reference numerals have been employed to identify like parts. It will be noted that Fig. 3 is identical to Fig. 2 except that the left end member 6 has been reversed to provide an air gap at the left end of the core in the same manner as previously described with relation to the right end member 6 of the core of Fig. 2. Similarly, Fig. 4 is identical to Fig. 2 except that the right end member 6 has been reversed to eliminate the air gap between the center arm of the right E shape of lamination 2 and the right end member 6 in the same manner as previously described with relation to the left end member of the core of Fig. 2. Fig. 5 illustrates that such cores are built up of a plurality of layers of laminations 2 and 6 in order to obtain the particular amount of core material desired.

Fig. 1 illustrates a punching layout for forming the laminations 2 and 6 in accordance with the principles of my invention. As will become more apparent hereinafter with the punching layout shown, my core is ideally suited to being formed by a single punching operation employing a multiple die. It is obvious that, if desired, such mass production methods need not be employed to form the laminations 2 and 6 in accordance with the principle of my invention. Fig. 1 illustrates a strip 12 of material from which laminations 2 and 6 are punched which, as indicated, is preferably of a width equal to the width of the lamination 2. Strip 12 should be of a magnetic material having suitable electrical and magnetic properties from which such transformer and ballast laminations are customarily formed. It will further be realized that although laminations 2 and 6 are shown laid out in strip 12, such layout is not preformed prior to the punching operation but is automatically provided by the shape of the punch and die, and the placing of stops which are normally used in punching such laminations.

As indicated previously, the material for the end members 6 is provided by the space between the central arms 3 of a lamination 2 and the adjacent outer arms 5. However, as the arms of an E shape of a lamination 2 are of a length equal to one-half the length of end member 6, it is necessary and essential that the laminations 2 butt each other during the punching operation so that two areas between central arms 3 and the outer arms 5 of two butting laminations 2 are provided, which areas are in alignment with each other. Thus, as shown in the dotted lines in Fig. 1, a pair of longitudinally extending, parallel, laterally spaced and aligned areas 6' are laid out on the strip 12, each of which has a length equal to twice the arm length of the arms of a lamination 2 which length is equal to the width of the strip 12. As areas 6' form end members 6, they obviously must have

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the same configuration of end members 6. Thus, in order to provide projections 10, as described, the material must be provided by one of the arms 3 or 5 of an E shape of a lamination 2. As shown in Figs. 2 to 4, such material is provided by notching the upper and lower edges of the central arms 3 of each lamination adjacent its central leg 4. If desired, such notches could be located in the outer arms 5 of each lamination adjacent each central leg 4.

As also shown in Fig. 1, a second pair of areas 6' is laid out on strip 12 which is longitudinally spaced from the pair previously described. By laterally cutting the strip 12 at the longitudinal center of areas 6', the back-to-back E shapes or laminations 2 may be formed. Thus, as shown the material for laminations 2 is provided by the remaining material 2' of strip 12 between the transverse planes passing through the longitudinal centers of adjacent pairs of areas 6'. It, of course, is essential that areas 6' be punched before cutting strip 12 laterally to form laminations 2. The full line portion of Fig. 1 illustrates that the areas 6 are removed first from the strip 12 before cutting the strip laterally. In view of modern punch and die methods in this art, the areas 6' may be punched and ejected from the strip 12 just prior to the descent of the cutter portion of the punch which cuts the strip laterally at the longitudinal center of the slots 6'' or the lateral cut may be made at a second stage. Thus, it will be noted that a core constructed in accordance with the principles of my invention is completely scrapless.

With my construction it will be realized that the longitudinal spacing of the areas 6' will determine the thickness of the central leg 4 of lamination 2. As areas 6' may easily be moved longitudinally apart or together, leg 4 may have any desired width. Similarly, as areas 6' may be moved together or apart laterally of strip 12, the width of the outer and central arms 3 and 5 of each lamination 2 may be varied. With my invention, if it is desired to have a completely scrapless punching, the width of the outer arms 5 of a lamination 2 cannot be varied without affecting the width of the center arm 3. Further, it is not essential that areas 6' need be spaced equidistant from the longitudinal center line of strip 12, as shown; however, such construction would normally be employed to provide uniform space for the coil on each side of the center arm 3 of an E shape of lamination 2. Further, it will be noted that the laterally adjacent areas 6' may be longitudinally displaced within limits from each other without materially affecting the construction of the core. Thus, I have additionally provided a core construction having two flux paths each of which may be provided with or without an air gap.

Having described a preferred embodiment of my invention in accordance with the patent statutes, it is desired that the invention be not limited to the specific construction shown and described, inasmuch as it is apparent that modifications thereof may be made without departing from the broad spirit and scope of my invention. Accordingly, it is desired that the invention be interpreted as broadly as possible and that it be limited only as required by the prior art.

I claim as my invention:

A magnetic core lamination comprising, a generally rectangular flat member in the form of a pair of integral back-to-back E members having a common base with oppositely disposed outwardly extending parallel arms, each of the arms having the same length, an elongated end member of a length to extend substantially between the outer edges of said outer arms, said end member having one straight side, laterally outwardly extending projections located on the opposite side of said end member engageable with the outer ends of said outer arms of said E members, said end member being formed on each of its sides at each of its ends to closely engage said ends of said outer arms, said end members being reversely en-

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gageable with said back-to-back E members, and said end members being positioned on the center leg of one E member so as to have an air gap, said other E member positioned relative to an end member so as to have no air gap, whereby an E member without an air gap is an autotransformer and the other E member with an air gap is a reactor.

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