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CORE PORTIONS HAVING FUSED BOND JOINT OUTSIDE OF EMBRACE OF COILS THEREON

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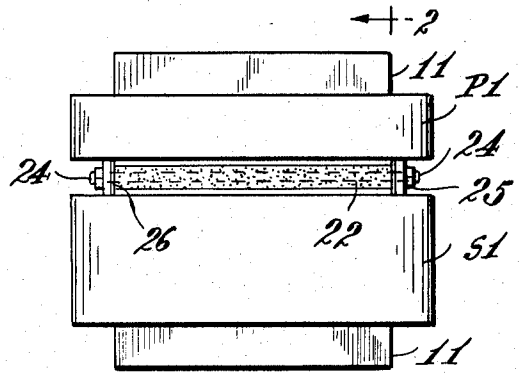



Fig. 1

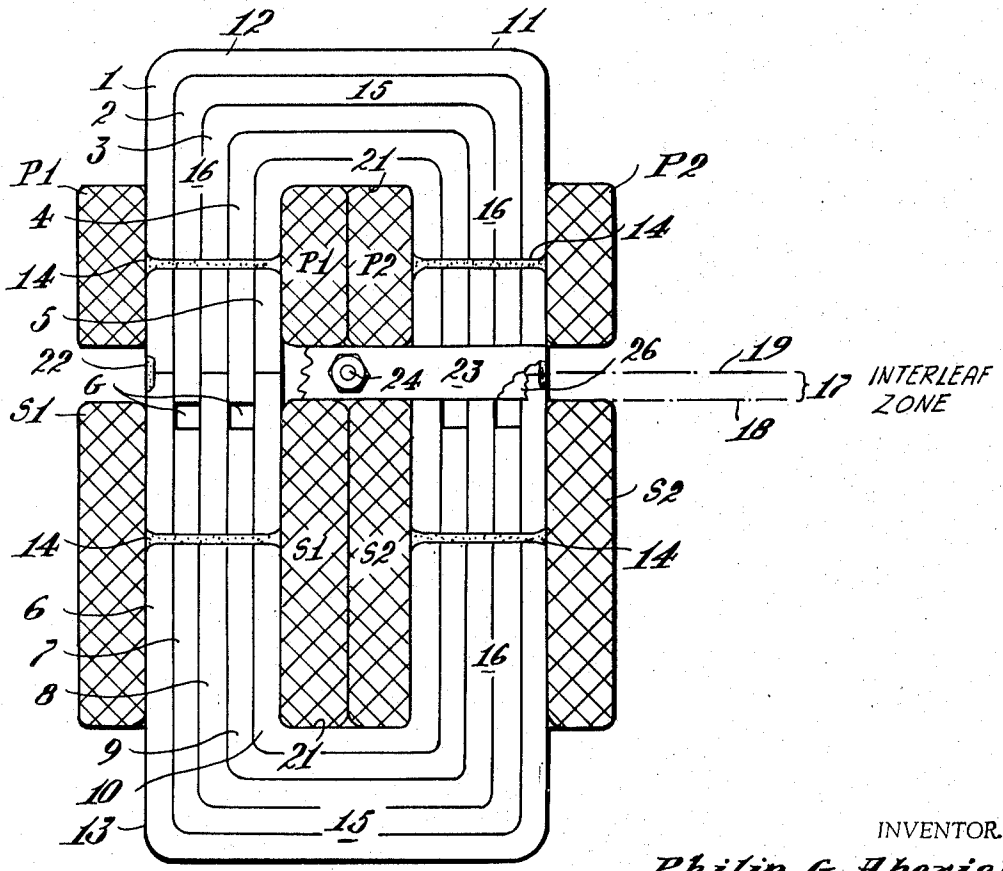



Fig. 2

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# CORE PORTIONS HAVING FUSED BOND JOINT OUTSIDE OF EMBRACE OF COILS THEREON

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## ABSTRACT OF THE DISCLOSURE

An electromagnetic ballast with two three-legged core portions formed of laminated strips interleaved to form an O-shaped core with air gaps between spaced ends of the strips adjacent the interleaf, the core portions being secured together by a fused bond joining outer, butted strips, different sized coils wound around the core legs, and magnetic shunt straps bridging parallel legs of the core in a zone coextensive with the interleaf, the air gaps being located outside said zone.

A typical laminated metal core comprises two generally J- or U-shaped portions each formed of thin strips of ferromagnetic metal. The strips, graduated in length, are bent into J- or U-shape and nested within the outer bent strip to form the core portion. Adjacent ends of the strips of one core portion are staggered for interleafing and butt-engagement with the ends of the strips of the other core portion. When joined, the two core portions form a rectangular, generally O-shaped flux path having two pairs of parallel legs around a coil space. Two or more coils, in the case of a transformer, are wound around legs of the core portions, or preformed and slipped on the core legs, with the coil axes parallel to the core legs, prior to joining the core portions. The two portions are then secured together, and in some cases a magnetic shunt strap is welded to the joined core portions in a zone between two parallel legs. The shunt reforms the single, O-shaped flux path into two flux paths, of figure-8 construction, the shunt being common to both paths.

For many purposes it is desirable that the end of every strip in one core portion tightly butt against every strip end of the other core portion. On the other hand, in some cases there is an advantage in leaving an air gap between opposed strip ends. For example, certain ballasts for fluorescent lamps perform more effectively if the current in their secondary winding leads the voltage across the winding. Such current lead may be produced by providing air gaps in the flux path of the winding between the ends of the core strips. However, with previous laminated strip cores provision of a shunt and air gap has interfered with the selection of desired coil sizes, and it is an object of the present invention to provide an inductor core of improved construction wherein the magnetic shunt may be optimally located for coils of varying size ratios without interfering with the function of the air gaps.

According to the invention, an inductor comprises two U-shaped magnetic metal core portions forming legs joined to surround a coil space, a plurality of coils of different axial lengths embracing at least one leg of each group, and extending through different parts of said coil space, each said core portion comprising at least three U-shaped strips including an outer strip and inner strips nested within said outer strip, the ends of the strips of one portion being staggered for interleafing and butt-engagement with the ends of the strips of the other portion, the outer strips of the two core portions being in butt-engagement and joined by a fused bond to secure the portions together, at least one of the inner strips of one portion being spaced endwise from a strip of the other portion to form an air gap therebetween, and a magnetic shunt body extending between parallel legs of said core portions in a zone coextensive with the interleafing ends of the strips, said air gap being located outside said zone.



For the purpose of illustration a typical embodiment of the invention is shown in the accompanying drawing in which:

FIG. 1 is a side elevation of a transformer according to the invention;

FIG. 2 is a section on line 2—2 of FIG. 1.

As shown in the figures a fluorescent lamp ballast comprises a core **11** shaped like a rectangular O and formed by two interengaging U-shaped core portions **12** and **13**. The upper core portion **12** is formed by symmetrical U-shaped, ferromagnetic strips of which five strips, an outer strip **1** and inner strips **2**, **3**, **4** and **5** are shown for clarity, although forty-one or more are commonly used. Similarly the lower core portion **13** is formed of five strips, an outer strip **6** and inner strips **7**, **8**, **9** and **10**. The two ends of the strips are staggered in length so that the core portions may be joined with the strip ends in interleafing and butt-engagement. Thus strips **1**, **3** and **5** are longer than strips **2** and **4**, and are in butt-engagement with strips **6**, **8** and **10**, while interleafing with strips **7** and **9**. The interleaf zone **17** is defined by two planes **18** and **19** respectively, at the spaced ends of strips **7** and **9** and the butting ends of strips **1**, **3** and **5**. To improve the performance (crest factor) of the ballast two spaced inner strips **2** and **4** are foreshortened to leave air gaps G between their ends and the ends of strips **7** and **9**.

The strips of each core portion are secured together by welds **14** so that each portion comprises two parallel legs **16** and a connecting leg **15**. When the core portions are joined the connecting legs **15** and parallel legs **16** surround a space **21** occupied by the windings of primary coils P1 and P2 and secondary coils S1 and S2. The coils embrace one leg **16** of each core portion with the axis through the coil parallel to the leg **16**.

In a ballast numbers of turns and the diameter of the wire in the primary and secondary depend upon the requirements of the lamp which it supplies. Thus the axial lengths of the primary and secondary coils parallel to the legs **16** vary relatively.

With coils P1, P2, S1 and S2 located in the coil space of the two joined core portions **12** and **13**, the outer core strips **1** and **6** are connected by welds **22** along the line of butt-engagement of strips **1** and **6** thereby securing the upper and lower portions **12** and **13** of each core **11** together. Magnetic shunt straps **23** are then secured at opposite sides of the core **11** with a bolt **24** and nuts **25**, so as to bridge the parallel legs **16** of the core.

As is known in the art the shunt straps are slightly spaced from the core **11** by insulating strips **26** so as to have a high reluctance relative to the closed iron path around the core **11**. When a lamp is started the shunt is ineffective and full voltage appears across each secondary which is parallel with the fluorescent lamp supplied. But once the arc is established in the lamp, high current in the secondary brings the core **11** toward saturation and flux is shunted through the insulating strips **26** and straps **25** reducing the voltage across the secondary during normal operation.

By locating the air gaps G outside the shunt zone, covering the butt joints in plane **19** and the interleaf zone **17**, the ballast is most efficient. The exposed butting ends of strips **1** and **6** can be easily welded after assembly of the coils and core portions, and the previously used connecting straps may be omited. With the relative location of air gaps, butt joints and shunt, a wide range of primary and secondary coil sizes may be used on the core without loss of efficiency.

While one desirable embodiment of the invention has herein been disclosed by way of example, it is to be understood that the invention is broadly inclusive of any and all modifications falling within the terms of the appended claims.

I claim:

1. An inductor comprising two U-shaped magnetic metal core portions forming legs joined to surround a coil space, a plurality of coils of different axial lengths embracing at least one leg of each core portion, and extending through different parts of said coil space, each said core portion comprising at least three U-shaped strips including an outer strip and inner strips nested within said outer strip, the ends of the strips of one portion being staggered for interleafing and butt-engagement with the ends of the strips of the other portion, the outer strips of the two core portions being in butt-engagement outside the embrace of said coils and joined by a fused bond to secure the portions together, at least one of the inner strips of one portion being spaced endwise from a strip of the other portion to form an air gap therebetween, and a magnetic shunt body extending between parallel legs of said core portions in a zone coextensive with the interleafing ends of the strips, said air gap being located outside said zone.



2. An inductor according to claim 1 wherein said coils and shunt substantially entirely cover said coil space.

3. An inductor according to claim 1 wherein said strips are of symmetrical U-shape.

4. An inductor according to claim 1 wherein said air gaps are disposed in a common zone under one of said coils.

5. An inductor according to claim 1 wherein the butting ends and the spaced ends of said strips lie in respective planes.

6. An inductor according to claim 5 wherein said interleafing zone lies between said planes.

7. An inductor according to claim 6 wherein said coils are located outside said zone.

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