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G. G. SOMERVILLE

2,483,159

MAGNETIC CORE

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Fig. 1.

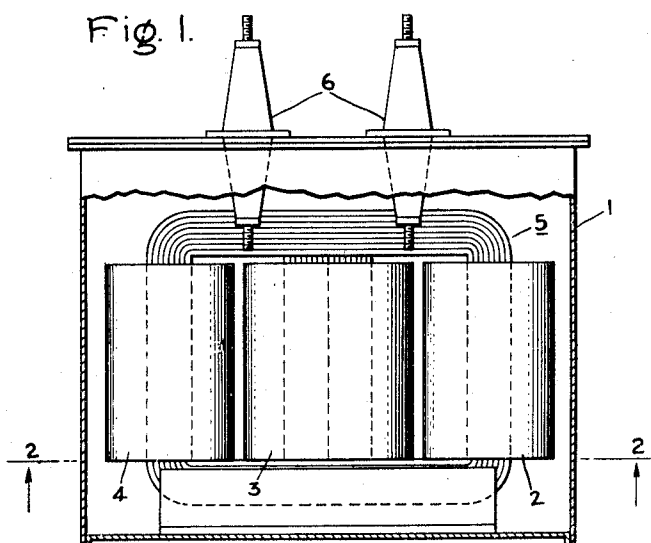


Fig. 2.

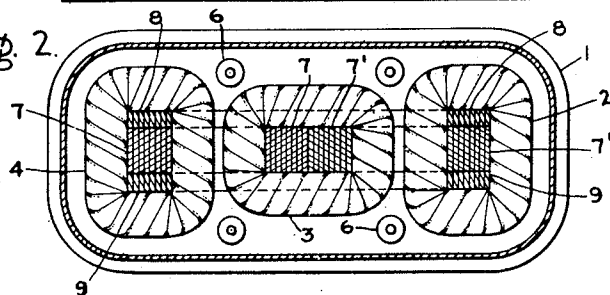


Fig. 3.

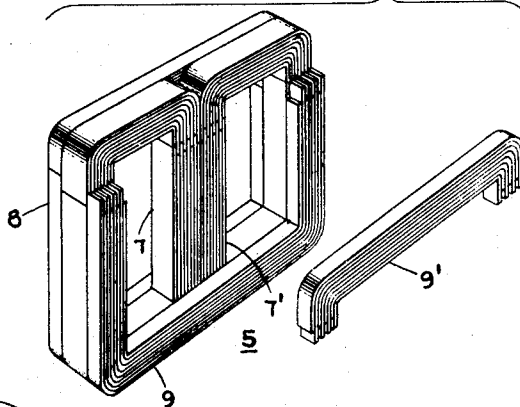
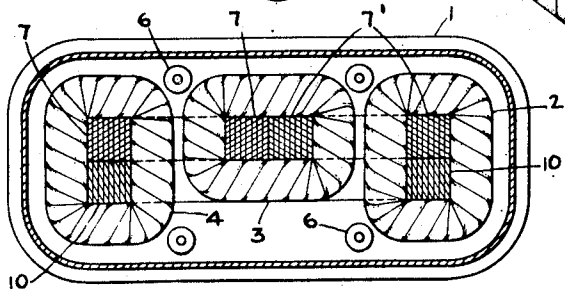


Fig. 4.



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UNITED STATES PATENT OFFICE

2,483,159

MAGNETIC CORE

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Application December 26, 1946, Serial No. 718,354

1 Claim. (Cl. 175—356)

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This invention relates to magnetic cores and, more particularly, to improved three phase magnetic cores of the bent iron type.

This invention is an improvement on the core which forms the subject matter to Evans Patent 2,344,294, granted March 14, 1944, on an application filed December 18, 1940, and assigned to the present assignee. The Evans core comprises a large laminated, flatwise bent magnetic loop surrounding two smaller size laminated flatwise bent magnetic loops which are in effect mounted back to back inside the larger loop. The back to back sides of the smaller loops constitute the center leg of the core while the outer sides of the inner loops and the adjacent sides of the larger loop constitute the two outer legs of the core. In such a core, it is necessary for some of the flux to pass from loop to loop in the yoke portions of the core but this is extremely difficult in the Evans type core because such flux must go perpendicular to the laminations and as the laminations are slightly separated, the reluctance to flux travel in such direction is quite high.

In accordance with this invention, the relationship between the two inner loops on the one hand and the outer loop is a side by side relationship instead of the inside and outside relationship of the Evans patent. By means of this construction, the flux can much more easily cross over from one loop to the other in the yoke portions of the core as such flux will move parallel to the laminations.

An object of this invention is to provide a new and improved magnetic core.

Another object of the invention is to provide an improved three phase core for induction apparatus.

The invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claim.

In the drawing, Fig. 1 is a partly broken away side elevation of a three phase induction apparatus embodying the invention; Fig. 2 is a sectional view taken on line 2—2 of Fig. 1; Fig. 3 is a partly disassembled perspective view of the core of the apparatus shown in Figs. 1 and 2, and Fig. 4 is a view similar to Fig. 2 of a modification.

Referring now to the drawing and more particularly to Fig. 1, there is shown therein a tank or casing 1 which encloses a core and coil assembly comprising three coils 2, 3 and 4 which are mounted on separate legs of a magnetic core 5. Suitable insulating bushings 6 extend through the

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cover of tank 1 for making electrical connections with the coils 2, 3 and 4. As shown most clearly in Fig. 2, the three windings may be identical but the winding 3 is mounted at right angles to the windings 2 and 4.

The core 5, which is shown most clearly in Fig. 3 comprises a pair of relatively small loops 7 and 7¹ which are mounted back to back and a pair of larger loops 8 and 9 which are mounted in side by side relation to the smaller loops 7 and 7¹ on opposite sides thereof. The loops are all provided with joints near one end of their straight leg portions so that the yoke portions thereof, such as the portion 9¹ for the loop 9, may be lifted off for the purpose of slipping the coils over the three straight legs which the core forms. After the coils are in place, the yokes are fitted into position and, as will be seen from the drawing, the joints are staggered butt and lap joints. The individual loops forming the core may be made in any suitable manner such as by cutting the individual laminations to the right length and then stacking them in a machine or jig which bends or forms them into the properly shaped loop after which they are annealed. The details of one such way of forming the loops are described and claimed in my application Serial No. 536,749, filed May 22, 1944, now Patent No. 2,456,458, granted December 14, 1948, and assigned to the present assignee.

In the modification shown in Fig. 4, a single large loop 10 is employed on one side only of the loops 7 and 7¹. In the other words, the loops 8 and 9 of Figs. 1, 2 and 3 are combined into a single loop 10 equal to the combined width of the loops 8 and 9 and mounted on the same side of the loops 7 and 7¹ as is the loop 9 in Fig. 3.

Figs. 2 and 4 show how the amount of iron in the windows of the coils 2, 3 and 4 is exactly the same in each case although the orientation is somewhat different for the coil 3 than for the other two coils. These figures also show how by reason of the different orientation of the coil 3 with respect to the coils 2 and 4, there is a relatively large space available for making the bushing connections inside the tank 1 so that adequate clearances or arcing distances are readily obtained without correspondingly increasing the overall outside dimensions.

While there has been shown and described a particular embodiment of the invention, it will be obvious to those skilled in the art that changes and modifications can be made without departing from the invention and, therefore, it is aimed in the appended claim to cover all such changes and

modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

A three phase induction apparatus comprising in combination, a metallic enclosing casing, two similar generally rectangular closed magnetic core members within said casing in the form of loops arranged back to back in the same plane so that the adjacent sides thereof form the center leg of a three legged three phase core, the cross-sections of said loops being square so that the cross-section of said center leg is rectangular with its long dimension parallel to the plane of said loops and twice that of its short dimension which is perpendicular to the plane of said loops, and a third larger generally rectangular closed magnetic core member in the form of at least one larger loop arranged side by side with the back to back related core members so that adjacent sides of the larger core member and the other two core members form the other two legs of said three legged core, the magnetic cross-section of the larger core member being rectangular and equal in magnetic area to that of each of the back to back related core members so that the cross-sections of said two other legs of the three legged three phase core are the same in area and configuration as the center leg but are so oriented that their long dimension is per-

pendicular to the plane of the back to back related loops, all of said core loops consisting of radially nested flatwise curved lamination layers, rectangular phase windings for each of said core legs, said windings each having similar windows of the same area and configuration as the cross-sections of said legs, insulated electrical lead-in terminals for said induction apparatus, said terminals being positioned between said windings for said outer legs and adjacent to said winding for said center leg, the winding for said center leg being oriented at right angles to the other two windings to provide increased arcing clearances for said terminals without increasing the overall width of said induction apparatus.

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The following references are of record in the file of this patent:

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2,412,914	Seastone et al.	Dec. 17, 1946
2,431,128	Link	Nov. 18, 1947