Aug. 12, 1941. E. E. FRANZ 2,252,461

METHOD OF MAKING ELECTROMAGNETIC CORES

Filed Jan. 8, 1938

FIG. 1.

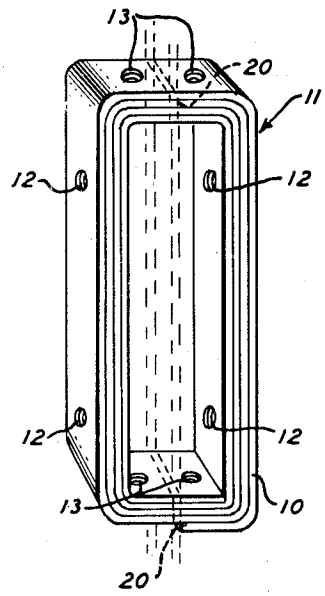


FIG. 3.

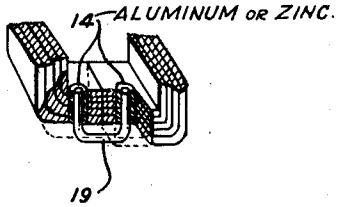
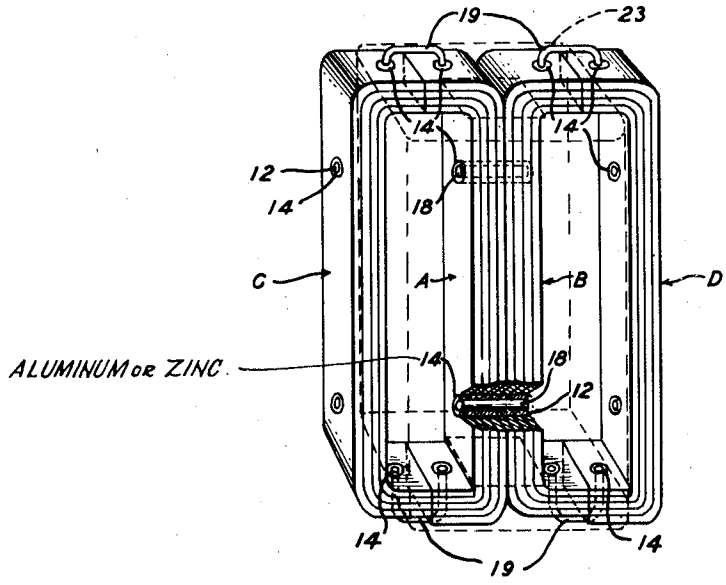


FIG. 2.



INVENTOR
E. E. FRANZ
BY
E. R. Nowlan
ATTORNEY

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METHOD OF MAKING ELECTROMAGNETIC CORES

Erwin E. Franz, Cranford, N. J., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

Application January 8, 1938, Serial No. 183,938

1 Claim. (Cl. 29—155.5)

This invention relates to methods of making electromagnetic cores and more particularly to methods of making laminated electromagnetic cores.

Objects of the invention are to provide a more efficient and practical method of making electromagnetic cores.

With these and other objects in view the invention contemplates a method of making electromagnetic cores wherein strips of magnetic material are wound to form hollow rectangular coils, thereafter severed into pairs of U-shaped members, two of the members secured together back-to-back to form a laminated core, winding wire upon the core and securing another member to each member of the core face-to-face.

Other objects and advantages will be apparent from the following detailed description taken in conjunction with the accompanying drawing, wherein

Fig. 1 is a perspective view of a coil of magnetic material prior to being severed;

Fig. 2 is a perspective view of the completed electromagnet, a portion thereof being broken away to illustrate one of the connecting means; and

Fig. 3 is a fragmentary perspective view illustrating another of the connecting means.

In forming a laminated core coil, as illustrated in Fig. 2, strips of magnetic material 10, such as silicon steel or permalloy, are wound closely about a rectangular arbor, not shown, to form two coils 11 with the desired number of convolutions, as illustrated in Fig. 1. After the coils 11 are wound they are drilled to provide two spaced apertures 12 in each side thereof and two spaced apertures 13 in the ends thereof, these apertures extending through the laminations or convolutions of each coil. Subsequent to the drilling operation the coils are annealed by subjecting them to a suitable temperature and then cooling them. Following this step the coils are placed in suitable dies and provided with suitable cores to cast bushings 14 of non-magnetic material, such as aluminum or zinc, in each of the apertures. The bushings may be cast in any desired manner and it is believed that a specific example need not be shown. The bushings 14 serve to hold the layers of magnetic material 10 against relative movement and to receive connecting members 18 and 19, the purpose of which will be described hereinafter.

Subsequent to the casting of the bushings 14 each coil 11 is severed longitudinally, as indicated at 20, in any desired manner, for example, by sawing, to separate the coil into two substantially U-shaped laminated units. The edges of the units are machined in any suitable manner, such as by grinding, to provide accurate engaging surfaces to minimize the air gap therebetween when disposed in intimate engagement with each other in assembly.

So far the description has applied to two coils of magnetic material conditioned in the succeeding steps of the method to produce substantially U-shaped laminated units. In general practice a multiplicity of such units may be formed and a complete electromagnet, as illustrated in Fig. 2, may be formed with any four units, as they are substantially identical in structure and need not be assembled in selective pairs.

Two of the units represented by letters A and B are placed back-to-back (Fig. 2), in which position they may be held or clamped and connected together by forcing connecting members 18 into the aligned bushings 14. The connecting members 18 also position the units in proper respective alignment. A wire to form an electromagnetic coil 23 is then wound upon the joined units A and B, after which other units C and D may be secured to the units A and B face-to-face by inserting the parallel projections of the connecting members 19 into the bushings 14 of the adjoining units. The connecting members 19, which are U-shaped in general contour, may be formed so as to hold the adjacent machined surfaces of the units in intimate engagement to eliminate as much as possible, any air gap therebetween.

The electromagnetic coil 23 has been shown in dotted lines so that the core structure might be more clearly illustrated, but the coil is to be considered a part of the present invention. Furthermore, the customary sheets of insulating material will be used adjacent the core and between the convolutions of the coil but the necessity of a spool for the coil is eliminated, making possible the formation of a more compact structure.

The units A and B, when secured together, form a laminated core upon which the coil may be wound, the core serving as a mandrel. The units C and D, when added to the units A and B, complete the magnetic circuit, and the entire core assembly is formed of laminations extending in planes perpendicular to the general plane of the core.

The embodiment of the invention herein disclosed is illustrative only and may be widely modified and departed from in many ways without departing from the spirit and scope of the

invention as pointed out in and limited only by the appended claim.

What is claimed is:

A method of manufacturing electromagnets comprising forming rectangular coils of magnetic material, forming apertures in convolutions of the coils, positioning hollow bushings in the apertures to secure the convolutions of each coil together, severing each coil into two substantially U-shaped units with central and leg portions having the bushings therein, joining two of the units together by positioning pins in aligned bushings in the central portions thereof, and securing the leg portions of another unit to the leg portions of each of the joined units by positioning U-shaped pins in the bushings of the respective leg portions.

ERWIN E. FRANZ.