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MAGNETIC CORE AND COIL ASSEMBLY

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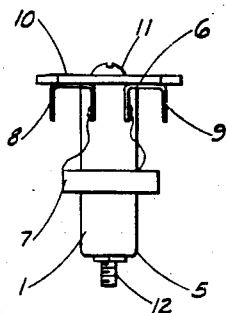


Fig-1

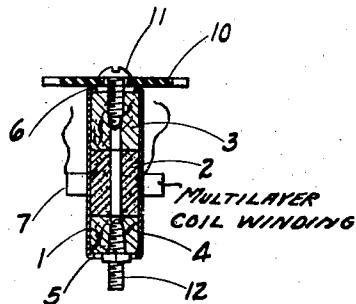


Fig-2

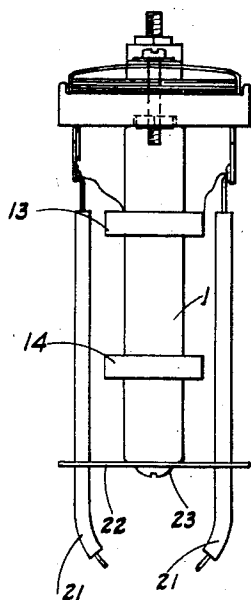


Fig-3

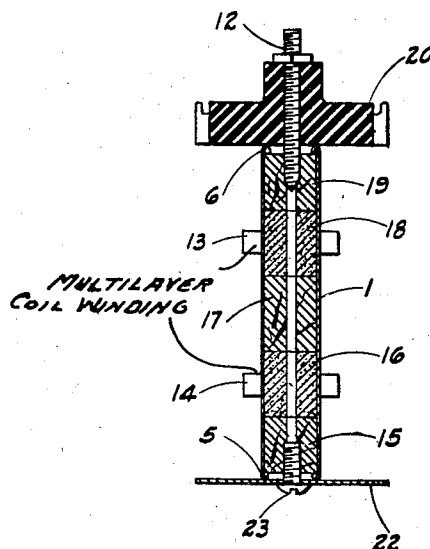


Fig-4

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MAGNETIC CORE AND COIL ASSEMBLY

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8 Claims. (Cl. 175-359)

This invention relates to means and methods of assembling magnetic cores and electrical coils in simple, accurate, predetermined and constant mechanical relationships, so that equally accurate and constant desirable electrical characteristics may be simply and economically obtained. In examples presented here the adaptations are essentially for use in radio receivers but the invention is not restricted thereto.

It is an object of this invention to provide a simple means of associating a magnetic core and electrical coil in a desirably predetermined relationship.

It is a further object of the invention to provide a coupling device which can be made accurately and inexpensively, and which is mechanically sturdy and dependable in use.

It is a further object of the invention to provide a novel method of constructing the coupling device whereby the desired characteristics may be accurately secured with a minimum of labor and skill, and whereby a highly efficient durable structure may be economically produced.

It is a still further object to provide a simple means of mounting the magnetic core and electrical coil assembly to other structural units in desirable relationships.

Other objects and advantages will hereinafter appear.

In the drawing forming part of this specification:

Figure 1 is a view in elevation of one of the assembly units turned on its side, the shield or housing being omitted;

Figure 2 is a cross section of the structure illustrated in Figure 1.

Figure 3 is a view in elevation of a coupling structure involving more than one core and coil.

Figure 4 is a sectional detailed view illustrating the sleeve and coil assembly of Figure 3.

In making the assembly illustrated in Figure 1 and Figure 2, provision is first made of a sleeve 1 of insulating material such as a paper tube. The cylindrical sleeve may be polygonal in cross-section but is preferably of circular cross-section and in any case its transverse dimensions are accurately controlled and it has sufficient rigidity to constitute per se the support for the magnetic cores and associated coils. A magnetic core member 2 is inserted in the sleeve between the insulating spacer members 3 and 4, desirably of wood. The magnetic core member may be of laminated construction but is preferably composed of powdered iron which is united by a suitable insulating binder and molded. The

core member and the spacer members are accurately made to exactly fit within the sleeve 1, and the sum of their lengths is a little less than the length of the sleeve so that they may all be pressed firmly together and in permanently assembled relation by deforming the ends 5 and 6 of the sleeve 1 to provide positioning and retaining shoulders. The end 5 of the paper tube is desirably deformed before the core and spacer members are inserted, and the end 6 is deformed after they have been inserted. Other means than the spacers 3 and 4 and deformed tube ends 5 and 6 may be employed, if desired, for holding the parts together.

The assembly thus provided is placed in a winding jig. The core member 2, due to the accurately determined length of spacer 4, is located longitudinally of the sleeve with reference to the shoulder formed by the end portion 5, and hence a winding machine setting is used which will cause coil 7 to be wound about the middle portion of the core member 2. The ends of the coil winding are preferably of such length that they may be connected directly to the respective terminals 8 and 9. The assembly may then be dipped in an insulating wax which forms a coating over the coil and the adjacent portions of the sleeve 1 to bond the parts together and exclude moisture. The electrical terminals 8 and 9 may be riveted or eyeleted into an insulating terminal strip 10 which is in turn fastened to the assembly of core and coil by the screw 11. Wood screws may be used with wooden spacer blocks 3 but machine screws are preferable when the spacer blocks are formed of other and harder insulating material.

A threaded stem 12 may be screwed into an axial bore of the spacer block 4 and extend outward beyond the end of the sleeve in axial alignment with the sleeve 1 and with the parts mounted in and upon the sleeve. The stem 12 may be used for mounting the complete assembly in a shield can, or to a base plate, or to any associated apparatus.

In Figure 3 is shown an assembly involving the same type of sleeve 1 but with two coils 13 and 14 mounted in spaced relationship, while the cross section of Figure 4 indicates the assembly of the various parts comprising Figure 3. As before, one end of the sleeve 1 is turned over at the end 5 and a spacer block 15 is inserted from the open end. A magnetic core 16, followed by spacer 17, magnetic core 18, and spacer 19 are then inserted. The end 6 is then deformed to hold the components in fixed relationship. If not needed

for mounting purposes, the spacer block 15 and/or the spacer block 19 may be omitted.

Two small adjustable condensers of the compression type are shown mounted upon the insulating block 20, one on either side of the threaded stem 12 which connects the insulating block to the core and coil assembly. The coils may be connected to terminals of the condensers assembled on the insulating block 20. The capacity may be varied so as to adjust the electrical characteristics.

Conductors 21 and 21 are connected respectively to the terminals of the condensers mounted on the insulating block 20 and constitute wires leading to other electrical circuits. An insulating spacer sheet 22, desirably formed of paper, is secured to the spacer block 15 by a screw 23 and serves to hold the conductors 21, 21 in predetermined positions, thus avoiding changes in the magnitudes of the inherent capacitive couplings between the conductors and the coils. Near each of its four corners the sheet 22 has an opening for receiving one of the conductors 21, 21. The spacer plate 22 causes the conductors 21, 21 to extend past the coils in substantially parallel relation to the common axis of the coil and at a uniform distance therefrom. While in the figures thus far shown the coils are mounted centrally with respect to the magnetic cores, this is not a necessary limitation and any desired relation may be used. The essential feature is the use of accurate length cores and spacers inside the sleeve 1 so that any measurable assembly external to the sleeve will have proper relationships to the cores and spacers inside.

The entire assembly thus far described may be inserted into a metallic shielding housing.

The structure shown and described is capable of being made with great accuracy and yet in an economical manner. All the parts are definitely and accurately fixed in predetermined relation and the mechanical arrangement is such that the parts do not get out of place in the course of shipping or ordinary use. A high degree of electrical uniformity may be secured, and this will be maintained indefinitely in the use of the structure.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. In a coupling device for electrical circuits, in combination, an insulating sleeve comprising a relatively rigid paper tube of circular cross-section, a pair of cylindrical core blocks inserted in the sleeve, a spacer block of non-magnetic material in the sleeve and interposed between the core blocks for holding them separated a predetermined distance, coils wound upon the sleeve about the respective core blocks, and means including a second spacer block for mounting the sleeve upon a support, said second spacer block spacing the adjacent core block from one end of the sleeve.

2. The method of making transformers which comprises providing an insulating sleeve having one end formed to provide an internal shoulder, inserting permeable core blocks and insulating spacer blocks in alternation through the opposite end of the sleeve, deforming the last mentioned end of the sleeve to fix the inserted blocks in

place, and winding coils upon the sleeve in desired relations to the respective core blocks.

3. In an inductive device for use at radio frequencies, a substantially rigid tubular sleeve of paper, axially aligned magnetic core and spacer blocks tightly fitted into said sleeve in alternations, said blocks being located entirely within and extending approximately from end to end of said sleeve, means comprising the intumed ends of said sleeve for retaining said blocks in fixed positions within said sleeve, and a coil mechanically supported by and at the exterior of said sleeve, said coil being positioned about a magnetic core block.

4. In a coupling device for radio circuits, an insulating sleeve comprising a cylindrical paper tube of circular cross-section, magnetic core blocks and insulating spacer blocks axially arranged in alternation within and substantially completely filling said sleeve, said core blocks having exterior surfaces conforming to and snugly engaging the interior of said sleeve, the ends of said sleeve being deformed to retain said blocks in place, and a plurality of coils mechanically supported by and at the exterior of said sleeve, said coils being positioned about the respective magnetic core blocks.

5. In a transformer for radio frequency circuits, a tubular insulating sleeve of paper, a pair of magnetic core blocks and a plurality of non-magnetic spacer blocks tightly fitted within and substantially completely filling the interior of said sleeve, said magnetic core blocks and spacer blocks being arranged in alternation with a spacer block at each end of said sleeve, coils supported by said sleeve and surrounding the respective magnetic core blocks, and means including a stem secured to one of said spacer blocks at an end of said sleeve for mounting the assembly.

6. An inductance for use at radio frequencies, said inductance comprising a paper tube, a single core of magnetic material within and having an exterior surface conforming to and snugly engaging the interior surface of the paper tube, a spacer block between said core and one end of said tube, said spacer block being of insulating material and frictionally held in place within said tube, and a coil wound in situ upon said tube after said core and spacer block are positioned within the paper tube.

7. In an inductance for use at radio frequencies, an insulating sleeve, a magnetic core located within and frictionally engaging said sleeve, a non-magnetic spacer member within said sleeve for positioning said core in predetermined axial displacement from one end of said sleeve, a coil supported on and at the exterior of said sleeve to surround said core, and means detachably secured to said spacer member for mechanically supporting said sleeve, core and coil.

8. In the manufacture of radio frequency inductances, the process of forming core assemblies for receiving the windings which comprises providing an insulating sleeve having one end formed to provide an internal shoulder, inserting a plurality of alternately arranged magnetic core and non-magnetic spacer blocks into said sleeve through the other end thereof, and deforming said other end of the insulating sleeve to fix the inserted blocks in predetermined locations within said sleeve.

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