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ELECTROMAGNETIC COIL ASSEMBLY

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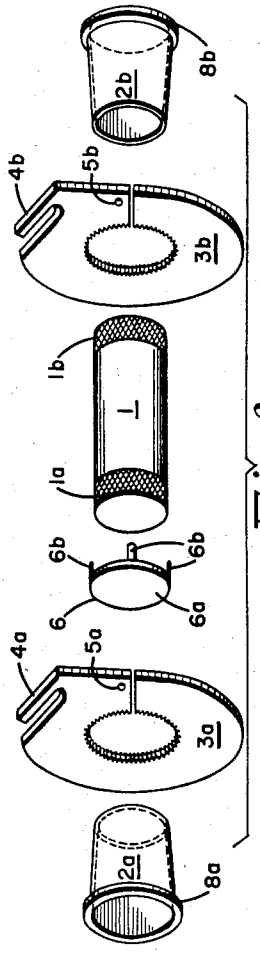


Fig. 2

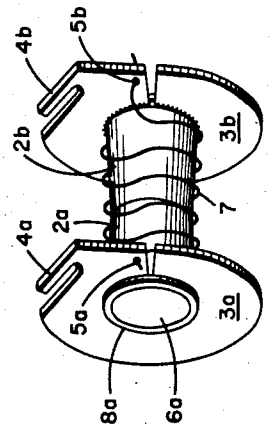


Fig. 1

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ELECTROMAGNETIC COIL ASSEMBLY

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My invention relates to electromagnetic coil assemblies in general and more particularly to core heads fixed on such assemblies.

In the past it has been the practice to provide in an electromagnetic coil assembly, comprising a core on which a length of wire is to be wound, a core head formed of insulating sheet material such as cloth impregnated with phenolic resin. An opening in the core head allows the head to be pressed onto the end of the core and thereafter fixed to the core by staking or other methods, in order to prevent movement between the core and core head. Such assemblies offer several disadvantages including poor heat dissipating capacity through the core head, the necessity of providing separate terminals for connecting the wire wound on the core to external apparatus, and a tendency for the core head to become loose on the core either before or after the wire has been wound on the core.

Accordingly, it is an object of my invention to provide a new and improved coil assembly.

It is another object of my invention to provide a coil assembly which does away with the necessity for providing separate electrical terminals for the coil winding.

Another object of my invention is to provide a coil assembly with improved resistance to loosening between the core and core head.

Another object of my invention is to provide a coil assembly having improved heat dissipating capabilities.

The apparatus by which I accomplish these and other objects is set forth in the description of my invention which follows.

For a better understanding of my invention, reference is made in the following description to the drawings attached to and forming a part of the specification and in which:

Fig. 1 shows an electromagnetic assembly embodying my invention; and

Fig. 2 shows an exploded view of certain parts of the same coil assembly.

The contemplated coil assembly includes core 1 of magnetic material over which wire 7 is wound. The core is uniform in cross section along the length, the preferred embodiment having a circular cross section. Wire 7 is coated with dielectric material in order to prevent shorting between successful turns and layers. Substantially identical sleeves 2*a* and 2*b*, made of resilient insulating material, such as a heat resistant grade of polymethyl methacrylate, surround opposite halves of core 1, the halves being taken along the core's length. Sleeves 2*a* and 2*b* serve to insulate wire 7 from core 1 and to carry core heads 3*a* and 3*b* in the manner to be set forth presently.

The internal surfaces of sleeves 2*a* and 2*b* have cross sections substantially identical with the cross section of core 1 (i.e., the internal surfaces of the preferred embodiment of the sleeves are cylindrical and substantially the same diameter as core 1) so that when the sleeves are introduced over opposite ends of core 1, the internal surfaces substantially engage the side surface of core 1. The external surfaces of sleeves 2*a* and 2*b* are tapering and substantially co-axial with the inner sleeve surfaces and core 1. The sleeves are oriented so that the ends of sleeves 2*a* and 2*b* having the smallest external diameter meet at the midpoint taken along the length of core 1. Anti-freeze shim 6, formed of thin, non-magnetic material, such as brass, having a main surface 6*a* which is substantially identical to and assembled to abut the left-hand end of core 1 also has a depending portion including legs 6*b*. Legs 6*b* are shaped and positioned to conform with the side surface of core 1. Owing to the resilience of the material from which sleeve 2*a* is formed, sleeve 2*a* may be expanded to enclose and retain legs 6*b* between the inner surface of the sleeve and the side of core 1 when sleeve 2*a* is introduced over the left-hand end of core 1.

In order to retain wire 7 on the portion of the assembly overlying core 1, substantially identical core heads 3*a* and 3*b* are located at opposite ends of core 1. The core heads are formed from thin, non-magnetic material, such as brass or aluminum. Making the core heads from metal improves the heat dissipating characteristics of the coil assembly. The metal core heads are finished with a thin coat of dielectric material such as a suitable grade of silicone enamel. Prior to placing sleeves 2*a* and 2*b* on core 1 in the above described manner, each of core heads 3*a* and 3*b* is introduced over the small end of one of sleeves 2*a* and 2*b*, respectively, through an opening provided in each core head, the core head opening being of a diameter intermediate the smallest and largest diameters of the external sleeve surfaces. After the sleeves have been placed on core 1, each of core heads 3*a* and 3*b* is forced along the length of core 1 in the direction of the largest diameter of the external sleeve surface, i.e., toward that end of the core on which the sleeve under consideration is mounted. The external surfaces of sleeves 2*a* and 2*b* terminate at their outer, larger ends in shoulders 8*a* and 8*b*, respectively, which prevent the core heads from being run off the ends of the sleeves.

In order to facilitate the advance of each core head along the corresponding tapered sleeve, a radial slit in each core head allows the core head to be sprung open as the core head is advanced over the tapering surface. The resulting spring action of the core heads tends to compress the sleeves into engagement with the irregular, knurled portions 1*a* and 1*b* on the left- and right-hand ends, respectively, of core 1. Compressing the sleeves into close contact with the knurled portions of the core surface tends to fix the sleeves relative to core 1. Opening the radial slit of each core head prevents the flow of eddy current in the core head when the magnetic flux passing through the coil is changed. Thus the core heads do not operate as "shorted turns" on the finished assembly. In order to prevent radial movement of the core heads 3*a* and 3*b* with respect to the corresponding one of the sleeves, tooth-like projections, formed in each core head at the opening through which the sleeve passes, dig into the exterior surface of the sleeve as the surfaces of the core heads formed at the openings encounter the outer surfaces of the sleeves. These toothed portions, embedded in the resilient material, tend to prevent rotation of the core heads with respect to the sleeves.

After the coil has been assembled in the above described manner, wire 7 is wound over sleeves 2*a* and 2*b*. The previously referred to dielectric coating on the core heads is effective for further insulating those parts of wire 7 abutting a core head from each other, thereby tending to prevent breakdown of the dielectric coating on wire 7 between non-adjacent layers of wire 7. Each of the ends of wire 7 is terminated by being passed through one of openings 5*a* and 5*b* in core heads 3*a* and 3*b*,

respectively, and thereafter secured to the metallic core head by soldering or other suitable means.

In order to effect electrical connections between the terminated ends of wire 7 and external apparatus, lug portions *4a* and *4b* are made integral with each core head. Each of lug portions *4a* and *4b* is in the form of an elongated continuation of the corresponding one of core heads *3a* and *3b*. Each lug is turned to lie substantially parallel to the edge of the core head in order to reduce the mounting space required for the coil assembly.

While I have shown and described a specific embodiment of my invention, other modifications will readily occur to those skilled in the art. I do not, therefore, desire my invention to be limited to the specific arrangement shown and described, and I intend in the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim is:

1. In a coil assembly including a core on which wire is to be wound, the combination comprising: a core head of thin metal for retaining said wire on said assembly, an opening in said core head larger than the cross section of said core, a slit in said core head extending from the opening to the outer edge of said core head, a sleeve of insulating material surrounding at least a part of said core, at least a portion of said sleeve having an external cross section larger than the opening in said core head, said core head being introduced over said sleeve portion and sprung open at the slit, in order to fix said core head relative to said sleeve and said core and to prevent the flow of eddy current in said core head.

2. In a coil assembly including a core on which wire is to be wound, the combination comprising: means including a sleeve of resilient material surrounding at least a part of the wire bearing portion of said core for insulating said core from said wire, the inner surface of said sleeve being substantially in engagement along its length with the surface of said core, said sleeve having a tapered exterior surface substantially concentric with said core, a core head of thin material for retaining said wire on said assembly, said core head having an opening therein smaller than the largest external surface cross-section of said sleeve and being slit from opening to outer edge, said core head being introduced over the small end of said sleeve and forced along the length of said core in the direction of the largest external surface cross-section of said sleeve and being sprung open at the slit, in order to fix said core head relative to said sleeve and said core.

3. The assembly set forth in claim 2 wherein said external sleeve surface terminates in a shoulder of greater

size than the large end of said external sleeve surface in order to prevent said core head from being run off the large end of said sleeve.

4. The assembly set forth in claim 2 wherein the surface of that portion of said core underlying said sleeve is irregular and the advance of said core head over said external sleeve surface is effective for compressing said internal sleeve surface into engagement with said irregular core surface portion.

5. The assembly set forth in claim 2 wherein tooth-like projections are formed in said core head at the opening through which said sleeve passes for digging into the surface of said sleeve as said sleeve is forced along the length of said core in order to fix said core head relative to said sleeve.

6. The assembly set forth in claim 2 and having in addition an anti-freeze shim of thin non-magnetic material, said shim having a main surface substantially identical to and abutting an end surface of said core and a portion depending therefrom conforming to the side surface of said core, said dependent portion being held between the inner surface of said sleeve and the surface of said core.

7. In a coil assembly including a core on which wire is to be wound, the combination comprising: means including a pair of substantially identical sleeves of resilient material passed over opposite ends of said core for insulating said core from said wire, the inner surfaces of said sleeves being substantially in engagement with the side surface of said core, said sleeves having tapered external surfaces substantially concentric with said core and oriented on said core with the small ends of said sleeves in juxtaposition, means including a pair of substantially identical core heads of thin metal for retaining said wire on said assembly, each of said core heads having an opening therein smaller than the largest external surface cross-section of said sleeves and being slit from opening to outer edge, each of said core heads being introduced over the small ends of said sleeves and thereafter forced along the length of said core in the direction of the largest external cross-section of the corresponding one of said sleeves and being sprung open at the slits, in order to fix said core heads relative to said sleeves and said core.

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