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ELECTRICAL COIL AND LEAD WIRE ASSEMBLY

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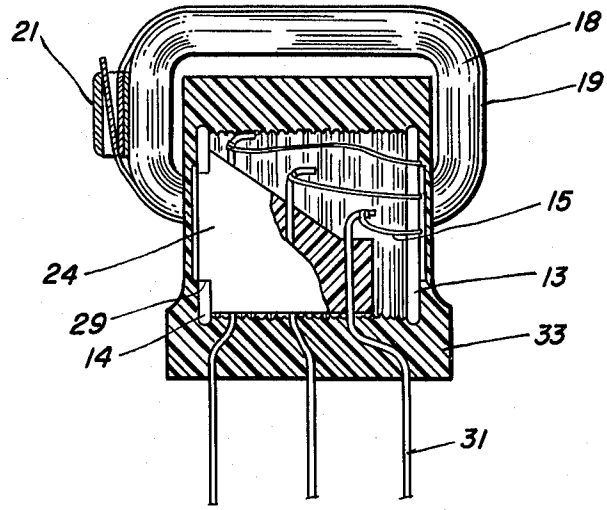


Fig. 1

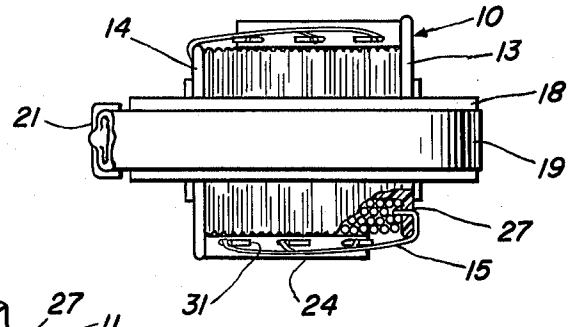


Fig. 2

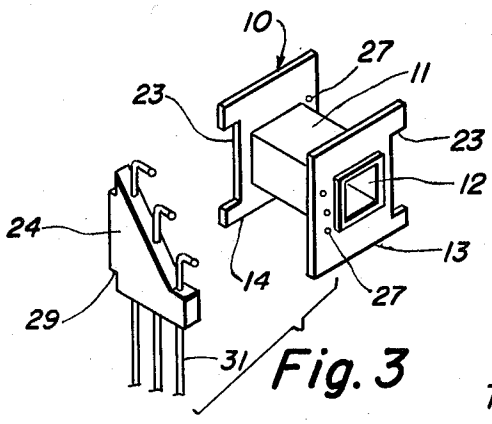


Fig. 3

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ELECTRICAL COIL AND LEAD WIRE ASSEMBLY

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The present invention relates generally to electrical windings and the like, and more particularly to a construction or means for minimizing or preventing breakage of very fine or hair-like wires of said windings.

Electrical windings or coils of the type normally used in transformers, magnetic amplifiers, servo-mechanisms, etc., are normally made up of numerous turns of very fine or hair-like wire, the connecting portions or terminal portions of which are subject to undue breakage during assembly or use. Efforts to overcome this problem by attaching large diameter lead wires to the fine wires or "self-leads" and thereafter encapsulate or pot an assembly have met with limited success due to the difficulty of maintaining these large lead wires in a particular orientation or position such as to prevent their twisting or other movement effecting the breakage of the fragile self-leads.

The present invention aims to overcome or minimize the above-mentioned and other shortcomings or disadvantages by providing a new and improved construction wherein a lead wire assembly with lead wires fixedly oriented in position, cooperates with the relatively fragile self-leads of electrical windings so as to prevent breaking of the self-leads.

An object of the present invention is to provide a construction for minimizing breakage of fine wires of a coil.

Another object of the present invention is to provide a coil assembly with new and improved mounting structure.

Another object of the present invention is to provide an improved construction with particular dispositions of conductors coupled to terminal portions of coil assemblies.

A further object of the present invention is to provide an improved construction for maintaining particular orientation of the terminal portions of coil assemblies.

A still further object of the present invention is to provide encapsulation or potting of coil assemblies and orientation of fragile self-leads of a winding so as to isolate them from objectionable stresses.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description. The preferred embodiment illustrated is not intended to be exhaustive nor to limit the invention to the precise form disclosed. It is chosen and described in order to best explain the principles of the invention and their application in practical use to thereby enable others skilled in the art to best utilize the invention in various embodiments and modifications as are best adapted to the particular use contemplated.

In the accompanying drawing:

FIG. 1 is an enlarged elevational view, encapsulated and partly broken away, of one form of the present invention;

FIG. 2 is a plan view of the FIG. 1 device, partly broken away, and prior to encapsulating; and

FIG. 3 is an exploded and enlarged view showing a preferred bobbin construction with lead wire support.

Referring more particularly to the drawings there is shown a coil of fine wire **15** carried by a form **10** which may be of a generally rectangular configuration having a tubular core **11** (FIG. 3) with passageway **12** extending therethrough. At each end of the tubular core **11** there may be a flange-like end section **13**, **14** which may be formed integral with the core **11** or be attached thereto in any other suitable manner. The flange-like end sections may have portions thereof extending laterally from the core **11** such as to form with the latter a spool for receiving the plurality of turns of fine hair-like wire **15** to provide the windings or coils of the coil assembly. This hair-like wire **15** is generally highly fragile and normally of about 0.004 to about 0.001 of an inch in diameter. Therefore, the relatively large diameter shown for each of the fine wires **15** in the drawing, particularly FIG. 2, is not intended to be indicative of the actual size of the wire but is merely shown as large diameter wire for illustrative purposes. The winding form **10** may be molded or otherwise formed from any suitable electrical insulating material such as a synthetic resin plastic or the like.

The passageway **12** through the form or bobbin may be utilized to house a portion of an annular metallic core **18** shown in FIGS. 1 and 2. This metallic core may be of any suitable material or configuration, such as, for example, a tape core containing three percent silicon grain oriented structures, and may be held in an encircling position about a portion of the fine wire coils by a metal band **19**, the ends of which may be secured in a suitable clamping device **21** by crimping and soldering.

The end section **13** or **14** of the bobbin form may each be provided with an indentation or notch **23** in a peripheral edge that may be formed during the molding of the bobbin or in any other suitable manner. Each notch **23**, the depth of which may account for about half the breadth or width of the end section portion laterally extending from the core **11**, is adapted to receive a portion of and carry a lead wire support member **24** as will be described in detail below. Each end section may also include a plurality of perforations **27** which are preferably disposed through an end section portion located generally opposite to the notch **23** as shown in FIG. 3. The number of perforations in each end section may normally correspond to about half the number of self-leads **15** and may be drilled, punched or otherwise formed in the end section such that they are progressively laterally offset from the core to facilitate the formation of the windings on the core **11** and subsequent electrical connections.

The end sections **13** and **14** are preferably so oriented at opposite ends of the core **11** that the notch **23** in one end section is in alignment with the perforations **27** of the other end section.

Lead wire support members **24** of the bobbin form are each shown in a configuration generally similar to a right angle triangle and may include a tongue-like projection **29** adapted to engage or fit into the notch **23** of end sec-

tion 13 or 14. The dimensions of each support member 24 may be such that its thickness corresponds to about the depth of the notch 23 while its length may be less than the length of the core 11 such that the end of the member 24 remote from the tongue-like projection 29 engaging a notch 23 in one end section terminates at a location adjacent to but spaced from the other end section, thereby enabling the support member 24 to be disposed generally intermediate and end sections and parallel to the core 11.

Each support member 24 may be provided with lead wires 31 which may be embedded in the support member during the molding thereof. The lead wires 31 in each support member, like the perforations 27 in each end section, may correspond to about half the number of self-leads 15 extending from the windings on the core 11 and may range in size from about .015 to about .020 of an inch in diameter. The lead wires 31 are preferably oriented in the support member 24 as to be generally parallel with the end sections 13 and 14 with the ends of each wire penetrating what may be termed the "hypotenuse" of the triangular configuration or, in other words, the ends of the wires 31 extend from the edge or surface of the triangular configuration that tapers or converges in a direction away from the projection 29 and toward an opposite edge on the support member. The distal ends or tips of the lead wires 31 protruding from the tapering surface may be spaced equal distances therefrom as to orient the lead wires in the vertically offset fashion shown in FIG. 1 for facilitating the coupling of the self-leads 15 to the lead wires 31. The portion of the lead wires protruding from this same tapering surface or edge of a support member may be provided with crook or bend which may be at right angles to the embedded portion of the lead wire such that the distal ends of the protruding portion of the lead wires 31 may be disposed toward the perforations 27. The crook or bend in each lead wire aids in preventing twisting or other movement of the lead wire when the coil assembly is encapsulated and facilitates coupling of a self-lead 15 thereto.

Referring more particularly to FIG. 2, the portion of the end sections 13 and 14 having the perforations 27 are shown laterally shorter than the portion of the end sections containing the notch 23. This structure is advantageous in that the shorter end section portion laterally terminates at a location generally in alignment with the lead wire ends extending through the support member 24 as shown. Thus, individual self-leads 15 may be readily passed through individual perforations 27 and around or across the peripheral edge of the end section to align with the lead wires 31 where they may be appropriately joined, such as by wrapping and soldering.

In assembling a typical coil construction the procedure hereinafter set forth may be followed. A suitable number of coils or windings may be provided on the bobbin form 10 by wrapping a desired number of turns of the fine hair-like wire about the core 11. Upon completion of each winding the opposite ends or self-leads 15 may be passed through appropriate perforations 27 and a suitable insulating tape or the like (not shown) wrapped about the winding to isolate it from the other windings and maintain it in place. The support members 24 may be positioned so that they each lie generally flush with the outer surface of the final winding (FIG. 2) with the tongue-like projection 29 extending into the notch 23 (FIG. 1) and thereby properly orienting the supporting member. Each self-lead 15 may then be wrapped and soldered or otherwise coupled to a lead wire 31 at any desirable location such as adjacent the straight end portion or on the curved portion as shown in FIG. 1. Normally the number of self-leads 15 corresponds to twice the number of coils or windings about the core 11, e.g., the six self-leads 15 shown in FIG. 2 may represent three coils or windings.

The assembly may be encapsulated in a suitable synthetic resin or other material in any desired manner. The potting material indicated at 33 (FIG. 1) may preferably be transparent to facilitate inspection of the encased wires. This encapsulation or potting, which is preferably achieved before the attachment of the metallic core 18, provides rigidity to the entire assembly such that twisting or other movement of the exposed ends of the lead wires 31 can not be transmitted to the fragile self-leads 15 and thereby damage or break them.

The encapsulated or potted coil assembly of the present invention may be of any desired size or shape. For example, the coil assembly shown in FIG. 1, less the tape core 18, may be generally cube shaped with the height and width of the cube sides each being about one-half of an inch.

It will be seen that the present invention sets forth novel features and unique advantages in that the highly fragile self-leads of coil assemblies are "isolated" and protected from damaging stresses that may be placed upon the larger lead wires. The particular positioning of the lead wires attained by the support members 24 enables the lead wires to be oriented in particular positional relationships such as to facilitate subsequent attachment of the device to other components. The present invention affords an arrangement wherein the entire device or coil assembly may be readily fabricated with minimal human error and other complications. While the bobbin form in the coil assembly is shown in a generally rectangular configuration with three lead wires in each support member it will be clear that any desired configuration may be utilized, e.g., cylindrical, oval, square, etc. and that the lead wire support member may contain any desired number of lead wires. Also, while the notches 23 are shown in the end sections 13, 14 and the projections 29 on the support members 24, it will appear clear that the positions of the notches and the projections may be reversed.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

We claim:

1. An electrical coil assembly comprising a tubular core having flange means extending laterally therefrom adjacent opposite ends of said core and disposed generally perpendicular to an axis of said core, the flange means adjacent one end of the core having an open sided notch means and the flange means adjacent an opposite end of the core having a plurality of individual perforations therethrough adjacent a peripheral edge of said flange means and disposed oppositely from but in general alignment with said notch means on said core, coil means comprising a plurality of turns of relatively fine wire on said core, a plurality of fine lead wires extending from said coil and through separate of said perforations and over said peripheral edge, a generally triangular support member having a projection at one edge thereof filling said open sided notch and retaining said member and positioning a sloping edge of the member disposed toward said opposite flange and the perforations therein, a plurality of spaced apart lead wires of substantially greater diameter than the coil lead wires fixedly embedded in said support member having exposed connecting portions projecting from an edge generally opposite said sloping edge and having exposed joining portions projecting from said sloping edge with angularly disposed distal portions directed toward and in alignment with said flange perforations, said lead wires of said support member secured to discrete ones of said coil lead wires that extend through said perforations and over said peripheral edge.

2. The assembly of claim 1 in which the distal portions

of the spaced apart lead wires are vertically and laterally offset from each other.

3. The assembly of claim 1 in which the support member extends a distance less than the distance between flanges.

4. The assembly of claim 1 which includes potting means for the exterior of the tubular core, the coil means, the support member, and the lead wires.

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