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Lakin

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[54] **ELECTRIC COIL WITH LEAD LOCKING MEANS**

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[52] **U.S. Cl.** **336/192**, 336/198

[51] **Int. Cl.** **H01f 15/10**

[58] **Field of Search** 336/192, 198, 208

[56] **References Cited**

UNITED STATES PATENTS

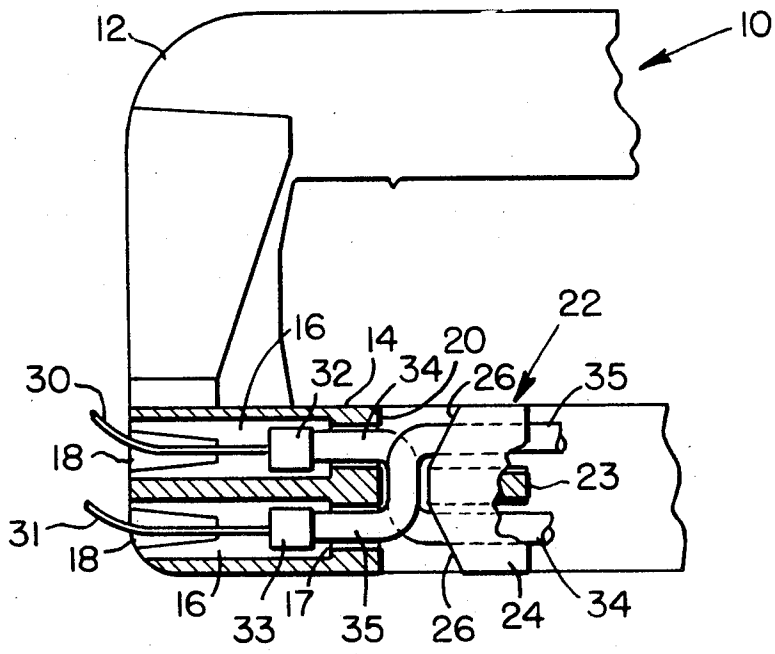
2,999,962	9/1961	Wahl	336/192 X
3,585,450	6/1971	Lane	336/192 X
3,634,878	1/1972	Davis	336/192
3,660,791	5/1972	Davis	336/192
3,259,864	7/1966	Marzolf	336/192
3,663,914	5/1972	Lane	336/192

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Attorney—B. Edward Shlesinger et al.

[57] **ABSTRACT**

A wire coil is wound on a tubular core form having rectangular end flanges. Projecting from one corner of each flange is a lug having therethrough two parallel bores which open on a plane surface formed on the inner end of the lug normal to the associated end flange. A cord lock, which projects from each flange, has a base registering with the space between the bores in the adjacent lug, and a head projecting laterally beyond opposite sides of the base. A pair of wire leads are inserted through the bores of a lug and connected (e.g. by soldering) to opposite ends of the coil, are then drawn back through the bores until the coil and lead wire junctures are housed in these bores, and then are crossed one over the top of the other in the space between this lug and the adjacent cord lock, and are forced beneath the head on the cord lock to secure the junctures against any external strain applied to the leads.

8 Claims, 6 Drawing Figures



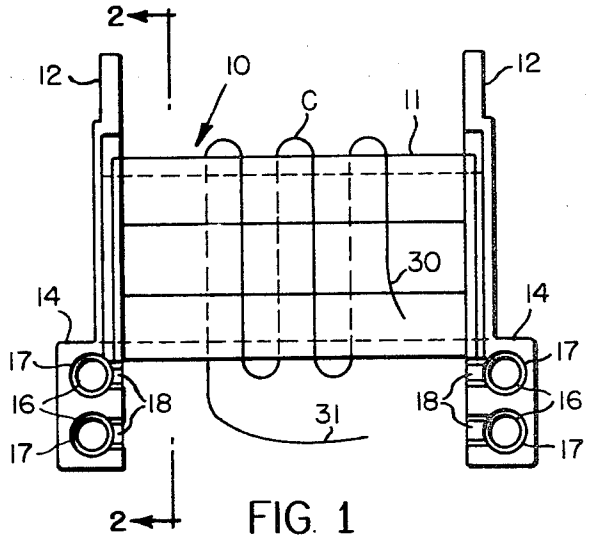


FIG. 1

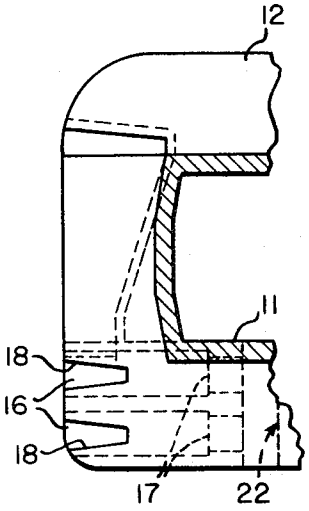


FIG. 2

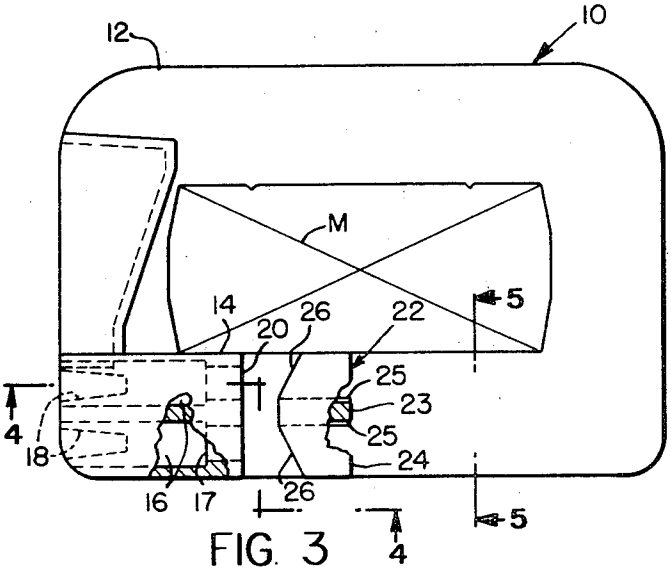


FIG. 3

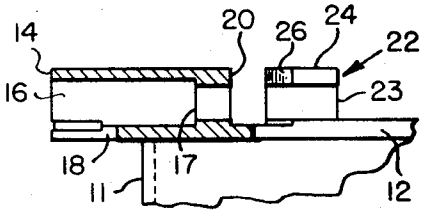


FIG. 4

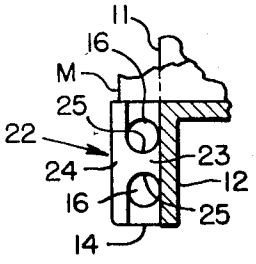


FIG. 5

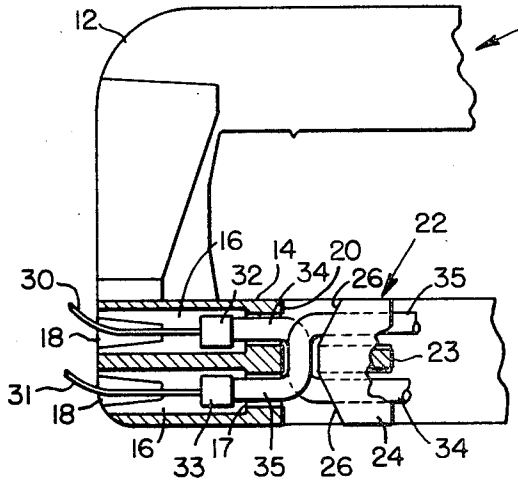


FIG. 6

ELECTRIC COIL WITH LEAD LOCKING MEANS

This invention relates to electric coils for small motors, and other small electrical devices, and more particularly to improved means for securing against movement the connections between the ends of a wire coil, and the wire leads attached thereto.

Electric coils for small motors, solenoids, and other such electrical devices are frequently made by winding a single strand of insulated magnetic wire about a coil form or bobbin, and connecting opposite ends of the strand to flexible, stranded wire leads to connect the coil in an electrical circuit. The junctions between the lead wires and the opposite ends of the wire coil may be formed in any one of variously known manners, for example by soldering.

It is imperative, however, that these junctures be protected against external strain; at times considerable force may be applied to the flexible wire leads. Moreover, when the wire leads are withdrawn from the coil assembly for connection into a circuit, and pushed back into the coil assembly after connection into a circuit, the coil may be loosened or the connections may be shorted out.

Heretofore efforts have been made to incorporate strain relief devices in coils of the type described, but the results have not been satisfactory, either because of the excessive expense or time involved in incorporating the devices in the coil assemblies, or because of a high rate of junction failure despite the presence of the strain relief devices.

One object of the present invention is to provide a strain relief device for the purpose described so constructed that considerable force can be applied to the leads without this force being transmitted through to the electrical connection or to the magnet wire.

Another object of the invention is to provide a strain relief device of such a nature that pushing the lead wires back into the coil assembly will not loosen up the coil or short out the connection.

A further object of the invention is to provide a simple and inexpensive strain relief device which will secure the lead wires in place so that they will not move in either direction.

Another object of this invention is to provide an improved electrical coil, the wire leads of which are readily and securely held at their inner ends against movement relative to the coil bobbin.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims, particularly when read in conjunction with the accompanying drawing.

In the drawing:

FIG. 1 is a side elevation of a coil form or bobbin made in accordance with one embodiment of this invention, portions of the wire coil being shown fragmentarily;

FIG. 2 is a fragmentary sectional view taken along the line 2—2 in FIG. 1 looking in the direction of the arrows;

FIG. 3 is an end view of this form with portions thereof broken away for purposes of illustration;

FIG. 4 is a fragmentary sectional view taken along the line 4—4 in FIG. 3 looking in the direction of the arrows;

FIG. 5 is a fragmentary sectional view taken along the line 5—5 in FIG. 3 looking in the direction of the arrows; and

FIG. 6 is a fragmentary end view somewhat similar to FIG. 3, but illustrating the manner in which the junctions between the coil ends and the associated wire leads are secured against movement on the bobbin.

Referring now to the drawing by numerals of reference, 10 denotes generally a dielectric coil form or bobbin having a tubular central section 11, which is generally rectangular in cross section, and parallel end flanges 12, which also are generally rectangular in configuration. At one of its corners each flange 12 has thereon an integral, lug or boss 14, which projects laterally. As shown more clearly in FIG. 1, these lugs 14 are similar in configuration, and are formed on registering corners of the end flanges 12.

Each lug 14 has therethrough two, spaced parallel bores 16, the axes of which are transverse to the longitudinal center line of the tubular section 11. The outer end of each bore 16 is counterbored to form an internal shoulder 17. The counterbored end of each bore 16 communicates at one point around its periphery with a V-shaped notch 18, which is formed on the inside of the associated flange 12 parallel to the bores 16.

The inner face 20 of each lug 14 is plane and extends normal to the adjacent portion of the associated flange 12, and in spaced, confronting relation to one end face of a lead-wire cordlock 22, which projects from the outer side face of the associated flange 12. Each cordlock 22 has a narrow base section 23, which projects from the associated flange 12 to register with the space between bores 16 in the adjacent lug 14, and an integral, transverse head section 24, which projects laterally beyond opposite sides of the base section. Opposite sides of each base section 23 are rounded, as at 25, (FIGS. 3 and 5) to register with the bores 16 in the adjacent lug 14; and the leading edge of each head section 24 is generally V-shaped as indicated at 26 for purposes to be described hereinafter.

In use, a single strand insulated magnetic wire is wound in conventional manner about the tubular section 11 of the bobbin 10 to form thereon the desired electrical coil C (FIG. 1). Two flexible, stranded lead wires 34 and 35 (FIG. 6) are then inserted through the bores 16 of lug 14 and connected to opposite ends 30 and 31 (FIGS. 1 and 6) of the coil C, for example by skinning the wires and soldering them together, or by use of conventional connectors 32 and 33 (FIG. 6). Then the lead wires and the connected ends of the coil are pulled back into the bores 16 until the connectors 32 and 33 engage the shoulders 17 (FIG. 6) of the bores, thereby assuring that the connectors are fully seated in the bores 16 and completely insulated from the coil winding. Thereafter the lead wire 34 is bent at right angles (downwardly in FIG. 6) to extend through the space between the associated lug 14 and the adjacent cordlock 22, and is then again bent at right angles and is pushed beneath the overhanging part of the head section 24 of the cordlock alongside the curved side of the base section 23. The free end of the other lead wire 35 is then bent at right angles (upwardly in FIG. 6) to extend through the space between the same members 14 and 22 and over the wire 34, and then is bent at right angles backwardly beneath the head section 24 of the cordlock to extend along the side of the base section 23 opposite from the wire 34.

The dimensions of the lead wires 34 and 35, the bores 16 through which the lead wires pass, and the corners around which the lead wires are forced to bend, all con-

tribute to provide a high friction fastening method, which will hold the lead wires in place even when subjected to large external forces. Once the second or upper lead wire 35 has been placed in position on top of lead wire 34, it prevents wire 34 from loosening up. Moreover, wire 35 is held beneath the head 24 of cordlock 22 by an iron core or magnet M (FIGS. 3 and 5) which is assembled into the bore of the bobbin. This iron core is very close to the lead wire retainer head 24, thereby trapping the lead wire 35 in the space provided for it in the cordlock so that the lead wire cannot be pushed back into the coil C nor pulled out of the core assembly. The friction created by the right angle bend in the lead wire 34 between members 14 and 22, and by the pressure of the overlying lead wire 35, provide ample strain relief from either a push or a pull on wire 34. It does not matter whether lead wire 34 remains tightly seated under lead wire retainer head 24 or whether it becomes dislodged through handling, it will still have its strain relief features. The grooves in the cordlock are aligned with the bores 16 of the lug 14 so that the lead wire 35 has to bend twice going over the lead wire 34 from cordlock 24 to bore 17. This applies more pressure to lead wire 34 to hold it frictionally in place.

As illustrated in the drawing, each lug 14 and its aligned lock element 22 are arranged in such a manner that adequate clearance is provided for inserting the leads 34 and 35 in straight lines through passageways or bores 16 thereby allowing for rapid assembly of the wire leads and their proper connection to the coil ends 30 and 31. The reduced-diameter ends of the bores 16 are made just large enough to allow for the passage of the insulated lead wires 34 and 35, while the counterbored outer ends of these bores allow clearance for various types of electrical connections which may in some cases be larger than the outside diameters of the lead wires. When the leads are pulled through the passageways 16 to position the connections 32, 33, it may be possible that a connection will be pulled up against a shoulder 17 but these shoulders are not intended to be used as strain relief devices. It is the aim of this invention to provide a fastening device which will keep the leads from moving in either direction; and it is a further aim to prevent any strain on the leads from being applied to the electrical connections or to the coil. All of the fastening or locking forces are exerted against the insulation of the lead wires.

From the foregoing it will be apparent that the instant invention provides extremely simple and inexpensive means for eliminating coil failure due to external strains on the leads. The wire guides or lugs 14 and the associated locking elements 22 enable rapid and reliable locking of the wire leads 34 and 35 after attachment thereof to the coil ends, without the use of any special instruments. Moreover, the generally V-shaped surfaces 26 on the head sections 24 provide additional spaces for the manipulation of the wires between the members 14 and 22, but do not interfere with the overall locking effect of each head section 24. By providing a lug 14 and cordlock 22 on each end flange 12, the lead wires can be secured selectively to either end of the core form 10. The notches 18 enable the coil ends 30 and 31 to extend into the outer ends of the bores 16 with a minimum amount of bending, and without having to project beyond the outer edge of the associated lug 14 where they could be readily damaged were the form 10 to be dropped, or bumped against a rigid surface.

While the invention has been described in connection with a specific embodiment thereof, and a specific use therefor, it will be understood that it is capable of further modification, and this application is intended to cover any modifications, uses or adaptations of the invention falling within the present disclosure or the limits of the appended claims.

Having thus described my invention, what I claim is:

1. An electric coil, comprising

a bobbin having a flange on one end, and having a central bore extending therethrough,

a wire coil wound about said bobbin,

a lug integral with and projecting laterally from said flange and having two spaced, parallel bores therethrough, and

a cordlock disposed on said flange, behind said lug in spaced relation thereto and having two spaced, parallel grooves aligned respectively, with said bores,

a pair of wire leads connected to opposite ends of said coil and projecting from said bores of said lug across the space between said lug and said cordlock into said grooves,

said leads being crossed one over the top of the other in said space.

2. An electric coil as defined in claim 1, wherein one of said grooves has an open side facing the bore in said bobbin, and a magnet is mounted in said central bore in operative relation to the lead wire in said one groove to lock the last-named lead wire therein.

3. A core form for an electrical coil of the type in which opposite ends of the coil are electrically connected to a pair of wire leads, comprising

a central, tubular section about which a wire coil is adapted to be wound,

a pair of axially spaced end flanges integral with opposite ends, respectively, of said central section, and projecting laterally beyond the perimeter of said central section,

a lug projecting laterally from one of said flanges and having therethrough a pair of spaced, parallel bores for housing the junctions of the coil ends and the attached wire leads, with the wire leads extending from one end of said lug, and

a cordlock projecting laterally from said one flange in spaced, confronting relation to said one end of said lug,

said cordlock having in opposite sides thereof a pair of spaced grooves which register with said bores in said lug,

the space between said lug and said cordlock being just large enough snugly to accommodate said leads when one lead is bent to extend one over the top of the other through said space, and into that groove in the side of said cordlock which is offset laterally from that bore in said lug from which the one lead extends.

4. A core form as defined in claim 3, wherein an internal shoulder is formed on the wall of each of said bores intermediate its ends.

5. A core form as defined in claim 3, wherein said one flange has in its edge a pair of generally V-shaped notches each of which is parallel to one of the bores of said lug and opens at one side on said one bore.

6. An electric coil comprising

a bobbin having a central bore,
a soft iron core in said bore,
an electric wire coil wrapped around said bobbin,
two lead wires,
means connecting the two ends of said coil, respectively, to said two lead wires,
a cordlock on said bobbin,
one of said lead wires being disposed between said cordlock and said core so that said one lead wire is held against strain on its connecting means by said cordlock and said core, and
means including said one lead wire for frictionally holding the other lead wire against strain on its connecting means.

7. An electric coil as claimed in claim **6,** wherein
the bobbin has a lug thereon with two parallel bores to receive the two coil ends, the connecting means, and the connected ends of the respective lead wires,
said cordlock is spaced from said lug and has therein two parallel ducts through which said two lead wires pass,
said ducts are aligned axially with said bores, and
each of said lead wires passes from one of said ducts into the non-aligned bore being bent at right angles twice in the space between the lug and the cordlock for this purpose, and said one lead wire overlies in said space said other lead wire.

8. A bobbin for an electrical coil comprising
a centrally-bored bobbin having a core and a coil wound thereon, and having flanges at opposite ends,
a lug projecting laterally from each flange,
each lug having two parallel bores whose axes are at right angles to the longitudinal center line of the central bore of the bobbin,
the bore of each lug being of larger diameter for a portion of its length than for the remainder thereof so that each bore in each lug has an internal shoulder therein intermediate its ends,
the two lugs being disposed on the two end flanges of the bobbin at the same sides thereof,
a cordlock disposed on each flange behind and spaced from the associated lug but in alignment therewith,
each cordlock having two parallel open-sided grooves therein, aligned, respectively, with the bores in the associated lug,
the central bore of said bobbin being adapted to receive a magnet,
the bores of one of said lugs being adapted to receive the ends of said coil and the ends of lead wires for conducting electrical current thereto, and the connections between said coil ends and said lead wire ends,
each groove being adapted to hold a lead wire that extends from the respective groove into the lug bore non-aligned with that groove, and
the space between each lug and its associated cordlock being sufficiently wide to permit one lead wire to be crossed over the other to allow the lead wire extending from one groove to enter a non-aligned groove,
said magnet being positioned in operative relation to a lead wire in one of said grooves.

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