Oct. 1, 1963 LE ROY F. McFARLANE 3,105,948

COIL FORM

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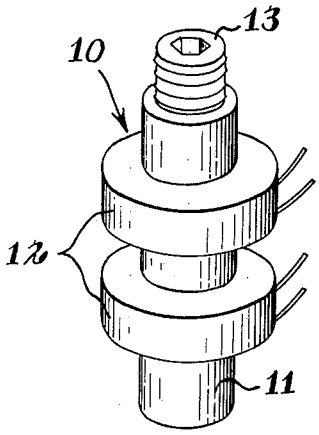


Fig. 1.

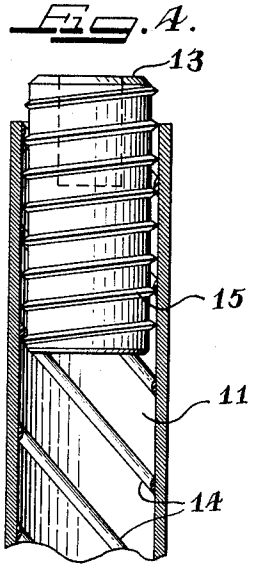


Fig. 4.

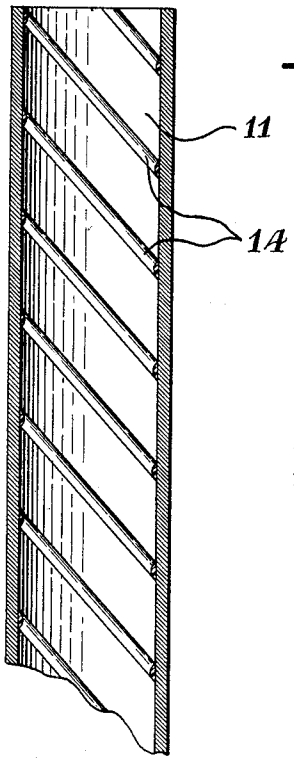


Fig. 3.

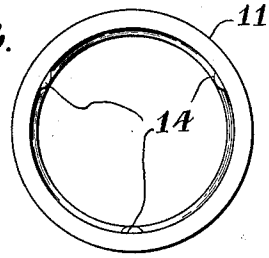


Fig. 2.

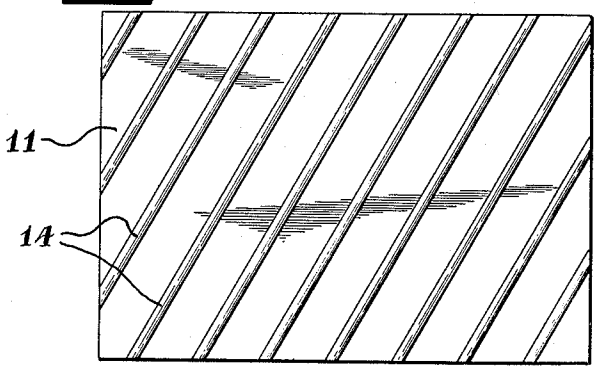


Fig. 5.

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COIL FORM

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The present invention pertains to improvements in variable inductors and is particularly concerned with the construction and assembly of a coil form embodying novel resiliently compressible means adapting the coil form for the reception and fixed adjustment of a core therein.

Coil forms of the type herein disclosed are primarily intended for use in the production of inductors having various types and kinds of windings which when connected in the specific circuitry, such as radio and television circuits, require critical adjustment electrically to a given frequency while current is flowing therethrough. Final alignment of the inductor is accomplished by providing the coil form with an iron core which can be screwed axially therein to establish the necessary final electrical frequency required for satisfactory operation.

Although the coil form may be made of any suitable tubular shaped material capable of withstanding high mechanical stresses without deformation and which is resistant to moisture absorption and fungus growth, applicant has found that a satisfactory coil form or tube made of alpha cellulose paper spirally or convolutely wound and impregnated under vacuum with polyester resin or, one that is molded or built up by spray or lay-up processes upon a basic wire screen frame, has all the requiste characteristics. The resulting coil form or tube is a rigid hard body having an extremely low coefficient of expansion and one that may be slotted, stapled or drilled without fracture.

The coil form or tube of the present invention is formed on its inside surface with a series, in this instance three, of resilient spirally arranged ribs or ridges that are securely bonded to the tube. These ridges, formed in either clockwise or counterclockwise directions relative to the tube, afford means to frictionally and mechanically receive and hold the threaded core in any fixed position of adjustment. To fulfill such purpose, said ridges have substantially coarser pitch than that of the threads of the core and the smallest diameter afforded by the presence of the ridges is less than the outside diameter of the core. This permits the core, whose threads will extend in crossing relation with respect to said ridges upon core movement into the tube, to generate its own thread in the ridges by material displacement as distinguished from cutting. It is therefore another advantage of the present invention to provide a coil form with a resiliently compressible liner capable of material displacement to accommodate the threads of a core threaded thereinto and in a manner to provide mechanical resistance to unintended rotation of the core or axial displacement thereof. Obviously, the amount of torque required to rotate the core can be varied in different coil forms at the time of manufacture by varying the resiliency, width, spacing, number of ridges, and/or thickness of the ridges.

The structure, by means of which the above noted and other advantages of the invention are attained, will be described in the following specification, taken in conjunction with the accompanying drawings, showing a preferred illustrative embodiment of the invention, in which:

FIG. 1 is a perspective view of a variable inductor embodying the invention;

FIG. 2 is an end view, on an enlarged scale, of the coil form;

FIG. 3 is a fragmentary enlarged diametrical sectional view of the coil form;

FIG. 4 is a view similar to FIG. 3, showing the core threaded thereinto; and,

FIG. 5 is a view of the coil form split and laid flat to illustrate a representative pattern of ridge spacing.

In the accompanying drawings, FIG. 1 illustrates an exemplary type of variable inductor **10** which comprises a coil form **11** having a pair of longitudinally spaced coils **12** wound thereon and provided with a frequency adjusting core **13** adapting the coils to be adjusted electrically to a given frequency. Inductors of the type illustrated frequently are enclosed in a metal shield (not shown) to minimize interference with component parts of the electric circuitry in which the inductor is installed.

The coil form **11** is tubular and it is made from suitable dielectric material having shape retaining characteristics adapting it to resist high mechanical stress so as to resist fracture and deformation. The basic material of the coil form may be paper, asbestos, cellulose fibers, or other stress resisting material preferably impregnated with any suitable thermosetting or thermo-plastic material such for example as polyester, epoxy, melamine, phenolic and the like, to make it impervious to moisture and fungus growth. The coil form **11** may be molded or otherwise formed tubular and it may be centerless-ground to provide a smooth outside surface for coil winding.

The coil form **11** is provided with a novel structure integrally attached to its inside circumferential surface to afford mechanical and frictional means for receiving a threaded core therein and holding it in a critical position of adjustment. This is best accomplished by providing the inside surface of the coil form **11** with a plurality of spiral ridges or ribs **14** having coarse pitch (see FIGS. 3 and 4). In the present disclosure applicant has provided three such ribs equally spaced apart circumferentially and having parallel convolutions and preferably extending throughout the length of the coil form. Clearly, the ribs may extend either in clockwise or counter-clockwise directions in the coil form. It should be appreciated that while three ribs are disclosed, a fewer or greater number can be used and that, under certain use requirements, the entire inside circumferential surface of coil form **11** may be coated with a material responding to the material of the ribs. Also, the ribs may be formed as interrupted ridges or the inside surface of the coil form may have random or pattern oriented nodules formed thereon.

The material of the ribs or inside coating may comprise any required substance having the necessary cold flow characteristics rendering the ribs resiliently deformable under compression but at the same time resistant to permanent displacement under the action of the core threads thereon, thereby to impart to the coil form the desirable properties of maximum efficiency and long useful life. For example, the material may be flexible epoxy, flexible polyester, rubber, Buna S, silicone, polyethylene, polyurethane, polypropylene, "nylon" and similar substances resistant to cold flow.

The core **13** whose threads have relatively fine pitch as compared to the pitch of the ridge or ridges (see FIG. 4) may be of any commercially available type including those made of powdered iron, ferrite, brass, aluminum, steel, or other commonly used materials and it is externally threaded, as at **15**, and provided at one end with a tool recess **16** adapting it to be engaged for threading it into one end of coil form **11**. The largest diameter of the threaded core is greater than the smallest diameter of ridges **14** and less than the inside diameter of coil form **11**. Accordingly, when the core is threaded into the coil form, its threads extend or cut across said ridges, and thus the core generates its own threads in the ribs by compressive displacement of the resilient material thereof.

The resiliency of this material, combined with the thickness, width and number of ribs combine to provide a strong mechanical resistance to rotation of the core. The amount of torque required to rotate the core can be varied by

varying the resiliency, width and/or thickness of the ribs or surface coating, or in instances of the spiral ribs, by varying the pitch and number thereof. The core is accordingly compressibly gripped and held firmly by both mechanical and frictional forces against even slight displacement which, if permitted, would result in nonalignment of the frequencies sought to be aligned. By way of example, the torque required to rotate the core preferably falls within the range of .25 in. oz. to 20 in. oz., depending upon the physical size of the inductor and its intended use. The resilient material engagement effected by the herein disclosed structure also provides high resistance to a force applied axially which would tend to push the core into or out of the coil form and thereby cause electrical misalignment.

Because of the resiliency of the material engaged by the threads of the core and the rigidity of coil form 11, the completed assembly is capable of maintaining adequate torque through many adjustments of the core. Should it happen that the torque required to turn the core drops below a predetermined minimum, as a result of repeated cycling, the core may be removed and reinserted at a slightly different starting point radially relative to the entrance end of the coil form. This will restore the original torque characteristics because the crests of the core threads will engage with different areas of the resilient material.

Although I have described in considerable detail, a preferred embodiment of my invention, it will be understood that the description thereof is intended to be illustrative, rather than restrictive, as many details of the structure may be modified or changed without departing from the spirit or scope of the invention. Accordingly, I do not desire to be restricted to the exact construction described.

What I claim and desire to secure by Letters Patent of the United States is:

1. A variable inductor comprising a hard distortion resistant tubular coil form, at least one coil wound on said coil form, at least one resiliently deformable rib spirally arranged on and projecting inwardly from the inside surface of said coil form, and a core threaded into said coil form, said rib having substantially coarser pitch than the threads of said core and said core having an outside diameter greater than the inside diameter defined by said rib whereby the threads of the core cut across said rib and in so doing cause compressive displacement of the material of the ribs engaged by the threads of said core.

2. A variable inductor according to claim 1, wherein said rib is of a different material than that of the coil form and is bonded to the inside surface of said coil form.

3. A variable inductor according to claim 1, wherein said rib is composed of a material which is resistant to permanent displacement under the action of the core threads thereon.

4. A variable inductor according to claim 1, wherein a plurality of said ribs spaced circumferentially about the periphery of the inside surface of said coil form are provided.

5. A variable inductor according to claim 1, wherein the aforesaid engagement of said threads and said rib provide the sole means of securing the core in a predetermined axial position within the tube.

6. As a new article of manufacture, a coil form comprising a tubular member of stress-resistant material having at least one spirally arranged rib projecting inwardly from its inside surface and defining thread-engaging means for a threaded core, said rib having substantially coarser pitch than the threads of said core and being of a material which is resiliently deformable by the threads of said core but being sufficiently resistant to such deformation that said rib is capable of securing the core in a predetermined axial position within said coil form solely by interengagement of the core threads with said rib.

7. A coil form according to claim 6, wherein said rib is of a different material than that of the coil form and is bonded to the inside surface of said coil form.

8. A coil form according to claim 7, wherein a plurality of said ribs spaced circumferentially about the periphery of the inside surface of said coil form are provided.

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