United States Patent

[11] **3,581,260**

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[21] Appl. No. **865,700**
[22] Filed **Oct. 13, 1969**
[45] Patented **May 25, 1971**

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[32] Priority **Oct. 14, 1968**
[33] **Italy**
[31] **22469**

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[54] **FLANGE FOR ELECTROMAGNETIC COIL**
10 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **336/192, 335/297**
[51] **Int. Cl.** **H01f 15/10**
[50] **Field of Search** 335/297, 281; 336/192

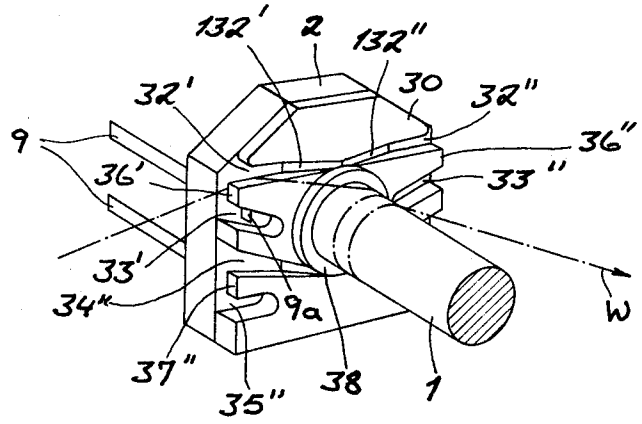
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ABSTRACT: A spool body for a relay coil is formed from a ferromagnetic core bounded by two nonconductive flange plates; at least one of these plates has a pair of notches, tangential to the core, for the ends of each winding to be wound thereon and a pair of depressions adjacent these notches on the outer plate surface remote from the core to receive these wire ends for soldering to respective terminals at locations sheltered from the coil winding or windings.



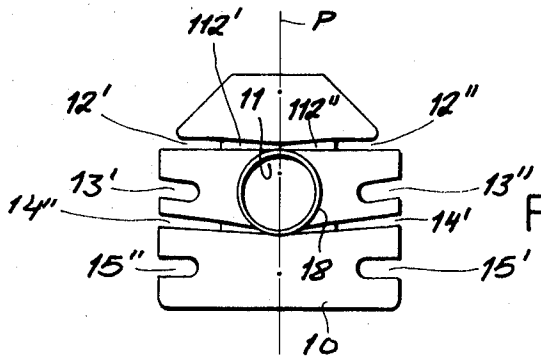


Fig.1a

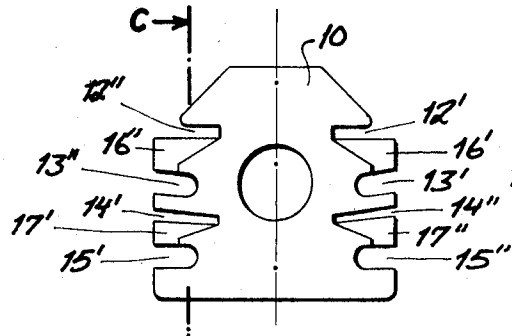


Fig.1b

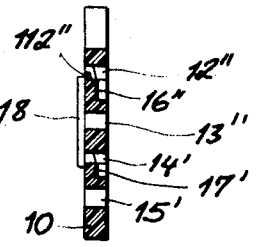


Fig.1c

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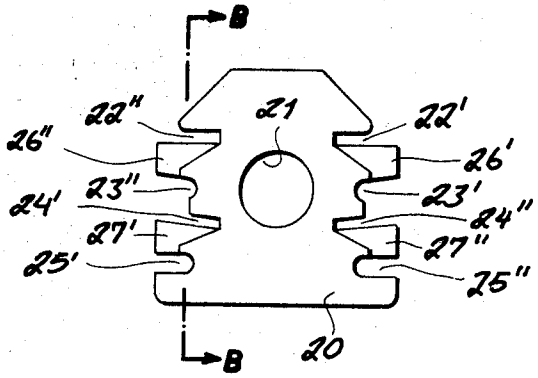


Fig. 2a

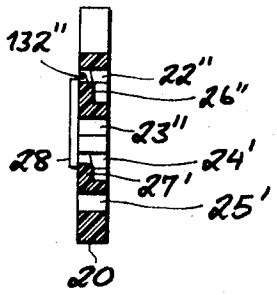


Fig. 2b

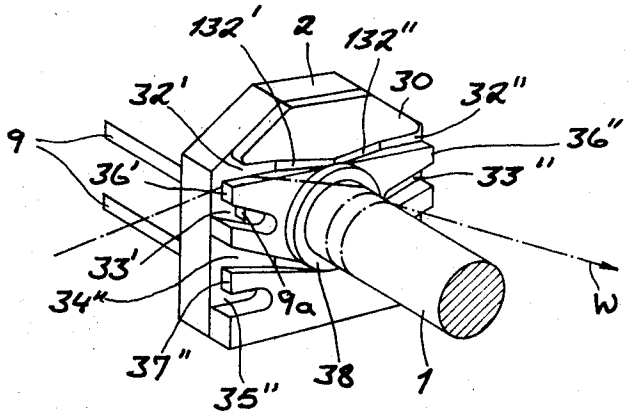


Fig. 3

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FLANGE FOR ELECTROMAGNETIC COIL

My present invention relates to a spool body for an electromagnetic coil, especially a coil for a multiwinding relay.

The usual relay coil comprises a ferromagnetic core provided with a pair of end flanges which form the cheeks of a generally spool-shaped body, the relay winding or windings being wound on the stem of that body constituted by the ferromagnetic core. If the coil is provided with two or more windings, the ends of each winding must be carefully insulated from each other as well as from the ends of all other windings. This is generally accomplished with the aid of dielectric tubes fitted onto the wire ends and extending to the respective terminals to which these ends are connected. Apart from preventing the short circuiting of any winding and the flow of leakage current between adjoining windings, these tubular insulators also protect the wire ends against chafing during the coiling of subsequent windings.

The presence of such insulators, however, interferes with the formation of the coils by automatic or semiautomatic coil-winding machines and is therefore disadvantageous from a mass production point of view.

In commonly assigned application Ser. No. 839,529 filed July 7, 1969 by V. Spataro, there has been disclosed a coil which obviates the aforestated disadvantages by the provision of a spool body of the aforedescribed construction wherein, however, either or both flanges are insulating plates with notches extending inwardly from the periphery of the plate, at least one of these notches being formed with an extension which terminates in the immediate vicinity of an aperture designed to receive the corresponding core whereby a wire inserted into that notch can be wound directly onto the core as the innermost layer of the first one of the several nested windings. In an advantageous embodiment, the several notches (whose number corresponds to the number of wire ends to be accommodated, being thus generally equal to twice the number of windings) are formed by a crenellated edge of a flange plate and have a depth sufficient to let each of the other wire ends be led out in a generally axial direction even if the innermost winding is very shallow.

The general object of my present invention is to provide an improved spool body of this type, having at least one peripherally notched flange plate, wherein the wire ends of one or more windings are to be soldered or otherwise joined to tabs, pins or other terminal members in the immediate vicinity of the rear or outer surface (i.e. the face averted from the core) of the flange plate. Thus, my invention aims particularly at protecting the joints between the wire ends and the terminal members from possible contact with one another and/or with the body of any windings forming part of the coil supported by the core.

In accordance with this invention, a flange plate having a front face adjoining the ferromagnetic core is formed with at least one pair of notches extending inwardly that front face from opposite plate edges along lines (or a common line) substantially tangent to the core to receive respective wire ends from a winding carried on the core, each of these notches completely penetrating the flange plate at the respective edge thereof and decreasing in depth toward the core so as to penetrate the flange plate only partially in the vicinity of that core. The opposite or rear face of the flange plate is formed with at least one pair of depressions adjacent the aforementioned plate edges, these depressions communicating with the penetrating portions of the associated notches for sheltering the corresponding wire ends from contact with the windings of the coil. At these sheltered locations, the tips of the wire ends can be secured to respective terminal members without danger of any short circuit; to facilitate the establishment of such a connection, I prefer to provide the flange plate with at least one pair of peripheral incisions which may be somewhat shorter than the aforedescribed notches and which adjoin the corresponding depressions to make the tips of the wire ends accessible from the front face. The terminal members are advantageously carried on a supporting plate, adjoining the rear face of the flange plate, and project rearwardly from the supporting plate while having forward extremities accessible through the incisions of the flange plate.

The above and other features of my invention will become more fully apparent from the following description of the accompanying drawing in which:

FIG. 1*a* is a front view of a flange plate according to the invention;

FIG. 1*b* is a rear view of the flange plate of FIG. 1*a*;

FIG. 1*c* is a cross-sectional view taken on the line C–C of FIG. 1*b*;

FIG. 2*a* is a view similar to FIG. 1*b*, showing a slightly modified flange plate;

FIG. 2*b* is a cross-sectional view taken on the line B–B of FIG. 2*a*; and

FIG. 3 is an isometric view of part of a spool body including a flange plate similar to those shown in the preceding Figures.

In FIGS. 1*a*, 1*b* and 1*c* I have shown a flange plate **10** of insulating material (e.g. molded synthetic resin) provided with a socket for receiving a ferromagnetic core **1** (FIG. 3), this socket including a central hole **11** framed by a circular collar **18** which preferably is integral with the plate **10**. It will be understood that a second, similar plate (not shown) may be secured to the opposite end of the core **1** to help confine a wire coil wound around that core in the manner described hereinafter.

Flange plate **10** has a pair of notches **12'**, **12''** extending inwardly from opposite edges along a line tangent to the collar **18**, and thereby substantially tangent to the core **1** when the latter is seated in the hole **11**, these notches extending completely through the plate in the region of its edges but decreasing in depth toward the collar **18** in whose vicinity they penetrate only partly into the plate from the front face thereof seen in FIG. 1*a*. Thus, the body of plate **10** forms generally wedge-shaped rear walls **112'**, **112''** for these notches, these walls starting about midway between the plate periphery and the plane of symmetry P whereby each notch completely penetrates the plate over approximately half its length. The wedge shape of these rear walls is best seen in FIG. 3 for the corresponding walls **132'**, **132''**.

The rear face of plate **10** is formed in its upper half with a pair of depressed lands **16'**, **16''** adjoining the throughgoing portions of notches **12'** and **12''** as well as two further, shorter peripheral incisions **13'**, **13''**. Similar notches **14'**, **14''**, depressions **17'**, **17''** and incisions **15'**, **15''** are provided in the other, lower half of the plate.

In this description, primed numerals are used to designate formations coacting with the leading ends of the wires wound around the core **1**, double-primed numerals having the same significance in regard to the trailing ends. Thus, notch **12'** is designed to receive the leading end of a first winding whose trailing end exists at notch **12''**; similarly, notch **14'** (diametrically opposite notch **12'**) receives the leading end of a second winding whose trailing end exits at notch **14''** (diametrically opposite notch **12''**). In FIGS. 2*a* and 2*b*, the same reference numerals are used as in the preceding Figures with substitution of a "2" for the "1" in the position of the tens digit. Plate **20** is slightly modified in that the edge portions separating the cuts **13'** and **14''** as well as **13''** and **14'** of plate **10** have been partly broken away.

In FIG. 3, where a "3" has been used in the position of the tens digit to designate elements similar to those shown in the preceding Figures, flange plate **30** has been further modified by outwardly flaring the notches **32'**, **32''**, **34'**, **34''** and foreshortening the flange portions which form the lands **36'**, **36''** as well as **37'**, **37''**.

FIG. 3 also shows a supporting plate **2** adjoining the rear face of flange plate **30**, this supporting plate being also made of dielectric material and carrying a set of four terminal members **9** (only two shown) whose forward extremities, traversing the plate **2**, are accessible through respective incisions **33'**, **33''**, **35'**, **35''**; one of these forward extremities is visible at **9***a*.

In building the coil, a conventionally insulated wire *w* (FIG. 3) is placed in notch **32'** so that its leading end is sheltered by the land **36'** from the contact with any coil portion lying forwardly of plate **30**. The wire is then wound on the core **1** after a coating of adhesive tape, not shown, has been placed on that core in such a way as to envelope the collar **38** (as well as the corresponding collar on the nonillustrated opposite flange plate). After the winding of the wire, which can be accomplished by automatic machinery known per se, its trailing end is led out through notch **32''** where it may be temporarily secured by adhesive tape or the like. Next, the leading end of the wire, partly hidden behind land **36'**, is brought into registry with terminal portion **9*a*** so that its blanked tip is accessible through incision **33'** for soldering thereto. In an analogous manner, the trailing end of the wire is secured to the corresponding terminal member. A second winding is then coiled around the first one, its leading wire end passing through notch **34'** while its trailing end exits at notch **34''**; these ends are again fastened to the corresponding terminal members in the manner described above. These terminal members **9** may be, for example, tubular pins into which the tips of the wire ends are threaded before being soldered thereto.

It will be noted that the two pairs of notches (e.g., **32'**, **33''** and **34'**, **34''**) terminate close to diametrically opposite points of the core **1**, thus ensuring a maximum separation of the wire ends received therein. Even where the notches of one or both pairs lie in a straight line, as particularly illustrated for the upper pair (e.g. **32'**, **32''**), their blanked wire ends are held apart by the wedge-shaped wall surfaces (e.g. **132'**, **132''**) converging at or near the front face of the flange plate.

I claim:

1. A spool body for an electromagnetic coil, comprising a ferromagnetic core and a flange plate of insulating material with a front face adjoining said core at one end thereof, said flange plate being formed with at least one pair of notches extending inwardly along said front face from opposite plate edges along at least one line substantially tangent to said core to receive respective wire ends from a winding on said core, each of said notches completely penetrating said flange plate at the respective plate edge and decreasing in depth toward said core with only partial penetration thereof in the vicinity of said core, said flange plate having a rear face formed with at least one pair of depressions adjacent said plate edges and communicating with the penetrating portions of said notches for sheltering said wire ends from contact with the body of said winding.

2. A spool body as defined in claim **1** wherein said flange plate is further provided with at least one pair of peripheral incisions adjoining said depressions to make the tips of said wire ends accessible from said front face.

3. A spool body as defined in claim **2** wherein said incisions are shorter than said notches.

4. A spool body as defined in claim **2**, further comprising a supporting plate adjoining the rear face of said flange plate and at least one pair of terminal members projecting rearwardly from said supporting plate while having forward extremities accessible through said incisions for soldering to said tips.

5. A spool body as defined in claim **1** wherein said notches completely penetrate said flange plate over substantially half their length.

6. A spool body as defined in claim **1** wherein said flange plate is formed with a socket for said core, said socket including an insulating collar on said front plate surrounding said core.

7. A spool body as defined in claim **6** wherein said collar is integral with said flange plate.

8. A spool body as defined in claim **1** wherein said flange plate is formed on said front face with a second pair of notches similar to the first pair but spaced therefrom by substantially the diameter of said core, said rear face being formed with a second pair of depressions adjacent the penetrating portions of said second pair of notches for sheltering the wire ends of a second winding on said core.

9. A spool body as defined in claim **8** wherein the notches of said pairs terminate close to diametrically opposite points of said core.

10. A spool body as defined in claim **1** wherein said notches are rearwardly closed, in the vicinity of said core, by forwardly converging wall surfaces.