# United States Patent [19]

**Abrams**

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[54] **REED RELAY CONSTRUCTION**


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[73] Assignee: **Coto-Coil Co., Inc.,** Providence, R.I.



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[52] **U.S. Cl.** ..... **335/151;** 335/154

[51] **Int. Cl.**[2] ..... **H01H 51/28**

[58] **Field of Search** ..... 335/151, 152, 153, 154



[56] **References Cited**

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*Primary Examiner*—Harold Broome

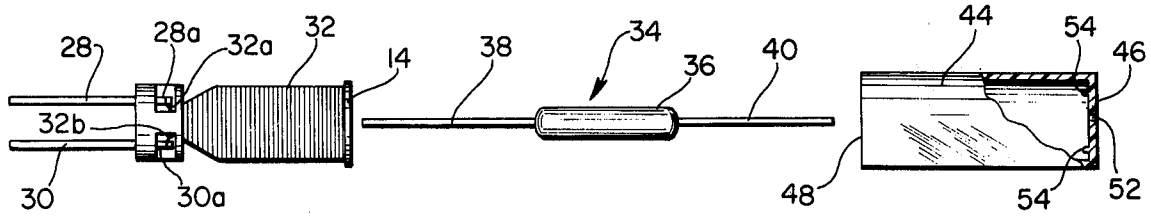
*Attorney, Agent, or Firm*—Salter & Michaelson



[57] **ABSTRACT**

A reed relay, the essential novelty of which resides in the provision of a novel and unique bobbin assembly, said assembly comprising a bobbin constructed of electrically insulating material and having a hollow, elongated central core with an outwardly extending circular flange at one end thereof and an enlarged cylindrical body portion at the opposite end, said enlarged body portion having a pair of spaced circumferentially extending recesses therein, each of said recesses having a further recessed portion extending through said enlarged body into communication with the exterior of said core, and a pair of spaced leads extending axially from outside said bobbin through said enlarged body into said recesses, said leads having inner portions bent outwardly with respect to said enlarged body, said outwardly bent portions being diametrically opposed from each other and each being adapted to receive one of the ends of a drive coil that is wound around said central core.


**6 Claims, 8 Drawing Figures**



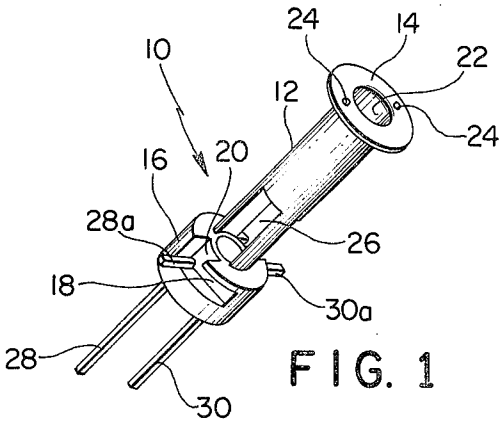



FIG. 1

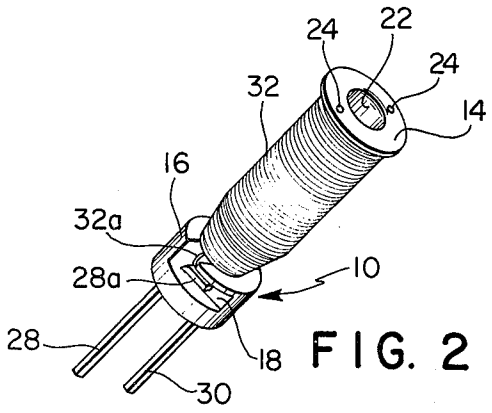



FIG. 2

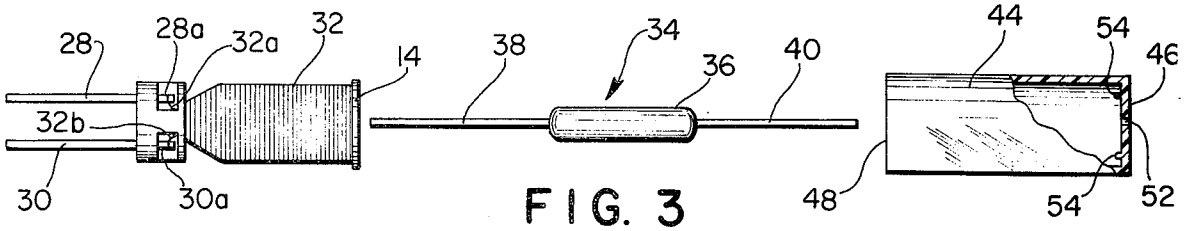



FIG. 3

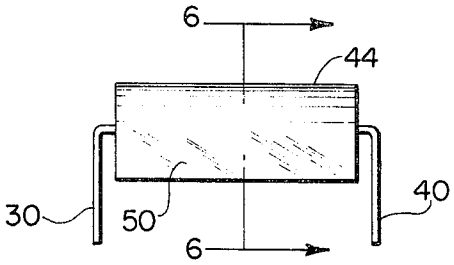



FIG. 5

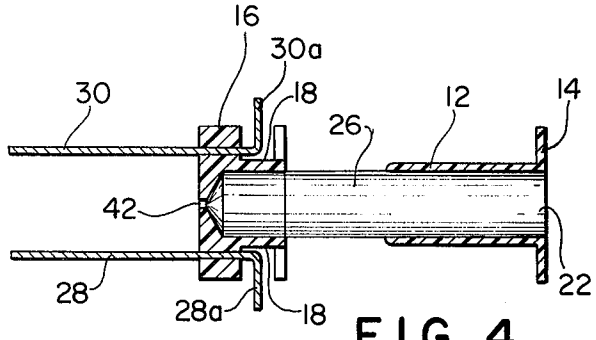



FIG. 4

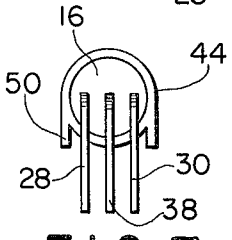



FIG. 7

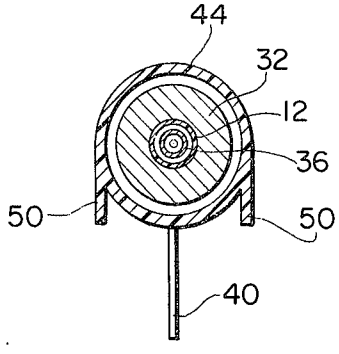



FIG. 6

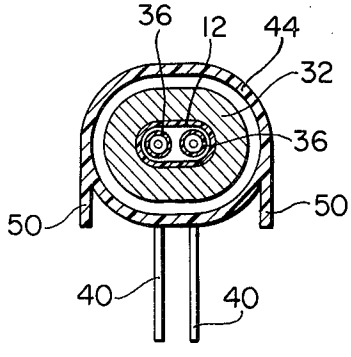



FIG. 8

# REED RELAY CONSTRUCTION

## BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates generally to a reed relay construction and is more particularly concerned with the provision of a novel and improved bobbin assembly utilized therein.

The usual reed relay comprises a bobbin having a hollow central core, said core being adapted to receive therein an encapsulated reed switch, the leads of which extend outwardly through opposite ends of the bobbin. A drive coil is wound around the outside of the bobbin core with the opposite ends of the drive coil connected to suitable electrical leads whereby energization of the coil by the passage of a current therethrough electromagnetically operates the reed switch. Examples of reed relays of this general type are shown in Becker et al. U.S. Pat. No. 3,456,216 dated July 15, 1969, and Campbell U.S. Pat. No. 3,701,960 dated Oct. 31, 1972.

One of the problems that has been found to exist in reed relays of this type is the time and labor required to connect the opposite ends of the drive coil to their respective leads while at the same time maintaining proper electrical insulation between said leads and the non-insulated ends of the coil to which the leads are connected. Since these assemblies are usually quite small in size, extreme care must be taken to insure proper spacing or insulation between said terminals, and it is frequently necessary to wrap insulating tapes around the outside of the coil to insure proper insulation between the coil ends and their respective leads. As stated, this has proven to be a laborious assembly operation and one which adds significantly to the overall cost of the relay.

It is therefore a primary object of the present invention to provide a unique and specially constructed bobbin which greatly facilitates and expedites the connection of the coil ends to their respective leads while at the same time automatically providing and maintaining proper insulation between said terminals. This objective is accomplished by providing a bobbin constructed of an electrically insulating material, such as nylon, polypropylene, or any other suitable plastic material, having an elongate hollow central core with a circular flange at one end and an enlarged cylindrical body portion at its opposite end. The enlarged body portion is provided with a pair of spaced, circumferentially extending recesses, each of which has a further recessed portion communicating with the exterior of the core. A pair of spaced leads extend axially from outside the bobbin through said enlarged body portion with one of the leads going into one of the recesses, and the other lead going into the other recess. The innermost portions of the leads are then bent outwardly from their respective recesses whereby the pair of leads extend radially outward from the bobbin in diametrically opposed relation. Thus, it will be seen that the enlarged body portion of the bobbin receives the two leads and maintains them insulated with respect to each other. After the drive coil has been wound around the core of the bobbin, one end of the coil is extended through the adjacent communicating recess and electrically connected to one of the leads while the other end of the coil is passed through the other communicating recess and is electrically connected to the other lead. This can easily be accomplished without any danger of shorting



taking place between the coil ends. The outwardly extending lead portions are then bent downwardly so that they are received within their respective circumferentially extending recess whereupon the bobbin and coil assembly is completed. A conventional reed switch is then slidably inserted within the hollow central core, one end of the bobbin being open to receive the switch, and the other end being closed with the exception of a small opening for receiving the lead from the reed switch. The assembly may then be completed by sliding the bobbin and reed switch into a cylindrical case or shell which acts as a cover for the relay.

Other objects, features and advantages of the invention will become apparent as the description thereof proceeds when considered in connection with the accompanying illustrative drawings.

## DESCRIPTION OF THE DRAWINGS

In the drawings which illustrate the best mode presently contemplated for carrying out the present invention:

FIG. **1** is a perspective view of the bobbin and lead assembly which forms an important part of the present invention;

FIG. **2** is a perspective view showing the assembly of FIG. **1** after a drive coil has been wound therearound and electrically connected;

FIG. **3** is an exploded elevational view, partially in section, showing the wound bobbin, the reed switch, and the outer shell prior to assembly with each other;

FIG. **4** is a sectional view of the bobbin and lead assembly shown in FIG. **1**;

FIG. **5** is an side elevational view of the completely assembled relay;

FIG. **6** is a section taken on line **6—6** of FIG. **5**;

FIG. **7** is a left-end view of the assembly of FIG. **5**; and

FIG. **8** is a sectional view similar to FIG. **6** showing a slightly modified form of the present invention wherein two reed switches are utilized.

## DESCRIPTION OF THE INVENTION

Referring now to the drawings, and more particularly to FIGS. **1** and **4**, there is shown generally at **10** a bobbin and lead assembly, the bobbin comprising a hollow central core **12** with a marginal outwardly extending circular flange **14** at one end thereof. At the opposite end of the core **12**, there is provided an enlarged cylindrical body portion **16**, it being understood that the outer diameter of portion **16** is substantially the same as the outer diameter of flange **14**. The body portion **16** is provided with a pair of identical, oppositely disposed and circumferentially extending recesses **18**, each of which has a further recessed portion **20** extending perpendicularly from one end thereof, said recessed portions communicating with the exterior of core **12**, the bottom surfaces of said recessed portions **20** being substantially flush with the outer surface of said core. As will be noted, flange **14** has a central opening **22** communicating with the interior of hollow core **12**, the diameter of the opening **22** being substantially the same as the inner diameter of core **12**. A pair of oppositely disposed small openings **24** are provided in flange **14** for purposes which will hereinafter become apparently. Also, the core **12** is provided with an elongated opening **26** extending therethrough, said opening being located adjacent cylindrical body portion **16**, again for reasons hereinafter to be made apparent.

The above-described bobbin is constructed of an electrically insulating material, such as nylon, polypropylene, or any other suitable plastic material, plastic being preferred since it has been found economically feasible to injection mold said bobbin. In practice, a glass-filled nylon has been used in the manufacture of said bobbin with good results.

A pair of spaced wire leads **28, 30** extend in an axial direction from outside of the bobbin through enlarged cylindrical portion **16.** More specifically, the leads **28** and **30** each extend into one of the recesses **18** in alignment with the further recessed portions **20.** The inner ends of the leads **28, 30** are bent outwardly in diametrically opposite directions, as shown at **28***a* and **30***a*. It will thus be seen that the leads **28** and **30** and their bent ends **28***a* and **30***a* are electrically insulated from each other by virtue of their spaced positions in cylindrical portion **16.** The opening **26** has been provided in core **12** to permit and facilitate the insertion of automatic tools for use in connection with the automatic assembly of leads **28** and **30** with the bobbin and for automatically effecting the outward bending of the inner ends of said leads.

The bobbin assembly **10** is adapted to receive a drive coil **32** normally comprising a very fine insulated copper wire that is wound around the exterior of core **12,** as shown most clearly in FIGS. **2** and **3.** The coil **32** is preferably wound as evenly and symmetrically as possible around core **12** to provide for even dissipation of heat throughout its surface, and it will be understood that the voltage rating and number of turns of coil **32** is such as to electromagnetically actuate reed switch **34** which is subsequently positioned within the interior of hollow core **12.** The opposite ends of coil **32** are shown in FIG. **3** at **32***a* and **32***b*, said ends each extending through one of the recessed portions **20,** after which the ends **32***a* and **32***b* are connected to lead portions **28***a* and **30***a* such as by being soldered thereto, or by any other suitable means so as to effect an electrical junction between said wires and said leads. After this electrical connection has been made, the lead portions **28***a* and **30***a* are then bent inwardly so that they each are positioned within their respective recess **18,** as illustrated most clearly in FIG. **2.** It is important to note that the lead portions **28***a* and **30***a* are bent downwardly in the same direction as that in which coil **32** is wound. This provides for an automatic strain relief when the leads **28***a* and **30***a* are bent downwardly, whereby there is less likelihood of the coil ends tearing away from their respective leads when the latter are bent downwardly.

As previously stated, reed switch **34,** which is of conventional construction, is positioned within the interior of hollow core **12.** More specifically, reed switch **34** comprises an encapsulated switch **36** having leads **38, 40** extending from opposite ends thereof. The switch **34** is adapted to be inserted through the opening **22** in flange **14** whereby it is freely received within the hollow interior of core **12.** As will be seen most clearly in FIG. **4,** the end of enlarged cylindrical portion **16** is substantially closed with the exception of a small central aperture **42,** the function of which is to receive lead **38** of switch **34** so that said lead may extend therethrough. After the reed switch **34** has been positioned within the bobbin assembly **10,** an outer shell or cover **44,** preferably of molded plastic, although it could be of metallic construction, is provided for receiving the bobbin assembly. More specifically, the shell or cover **44** comprises a hollow cylinder closed at one end as at **46** and open at its opposite end **48.** A pair of downwardly extending legs **50** extend tangentially from opposite sides of shell **44,** as shown most clearly in FIG. **6.** End wall **46** is provided with a small central aperture **52** and with a pair of diametrically opposed lugs **54** extending inwardly from the inner surface of wall **46.** The inner diameter of shell **44** is such as to snugly receive the assembly **10,** with switch **34** positioned therein, through open end **48,** it being understood that lead **40** of reed switch **34** will pass through the opening **52** in wall **46,** whereby the entire bobbin and reed switch assembly is housed within shell **44** with the exception of the outwardly extending leads. In order to secure the cover **44** over the bobbin and reed switch assembly, the outer edge of enlarged cylindrical portion **16,** which is positioned at open end **48,** is epoxied to surrounding shell **44.** The three outwardly extending leads located adjacent the end **48** of shell **44,** namely leads **28, 30** and **38,** are then bent downwardly, as is lead **40** extending from the opposite end of shell **44,** as shown most clearly in FIGS. **5, 6** and **7.**

It will be noted that when the bobbin and reed switch assembly is slid into shell **44,** the outer surface of flange **14** will engage the inner surface of wall **46.** By properly orienting the bobbin within shell **44,** it will be seen that lugs **44** will engage within openings **22,** in which position the bobbin and reed switch assembly will be properly aligned with shell **44** so that leads **28, 30** and **38** are horizontally aligned in generally parallel relation with the bottom of shell **44,** it being understood that the depending legs **50** define the bottom of said shell. Thus, the lugs **54** in openings **22** actually function as cooperating detents for properly positioning the bobbin assembly within outer shell or cover **44.**

It will be understood that the interior of hollow bobbin core **12** is of sufficient size to receive different-size reed switches; and, if desired, the bobbin and core may be configured, as illustrated in FIG. **8,** so as to receive a pair of side-by-side reed switches therein. It will be understood that the assembly shown in FIG. **8** is identical in all respects to that of FIGS. **1** through **7** with the single exception that a pair of reed switches are received within the bobbin.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claims.

What is claimed is:

**1.** A reed relay bobbin constructed of electrically insulating material and comprising a hollow elongate central core, an outwardly extending marginal flange at one end of said core, an enlarged cylindrical body at the other end thereof, a pair of spaced circumferentially extending recesses in said body located intermediate the ends thereof, each of said recesses having a further recessed portion at one end thereof extending through said body and communicating with the exterior of said core, and a pair of spaced leads extending axially from outside said bobbin through said body into said recesses, one lead extending into one of said recesses and the other lead into the other of said recesses, the inner ends of said leads being bent so as to be posi-

tioned in said circumferentially extending recesses, one end of said bobbin having an opening of substantially the same size as the interior of said core, and the other end of said bobbin being substantially closed but having an opening therethrough of substantially smaller size than the interior of said core.

**2.** In combination with the bobbin of claim **1,** an electrically conductive coil wound around said core, one end of said coil extending through one of said further recessed portions and making electrical connection with one of said lead inner portions, and the other end of said coil extending through the other of said further recessed portions and making electrical contact with the other of said lead inner portions.

**3.** The combination of claim **2** further comprising an encapsulated reed switch having wire leads extending from opposite ends of the capsule, said reed switch being positioned within said hollow bobbin core with one of said wire leads extending outwardly through the open end of said bobbin and the other wire lead extending through said smaller opening at the substantially closed end of said bobbin.

**4.** The combination of claim **3** further comprising an outer cylindrical shell snugly receiving said bobbin therein, said shell having one open end positioned adjacent the substantially closed end of said bobbin, and a closed end positioned adjacent said bobbin open end, said closed shell end having an opening therethrough of substantially the same size and in general alignment with said smaller opening in said bobbin closed end.

**5.** In the combination of claim **5,** said shell and said bobbin having cooperating detent means for insuring proper orientation therebetween.

**6.** In the combination of claim **2,** said leads being bent in the same direction as the direction in which their respective coil end is wound.

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