

Nov. 16, 1965

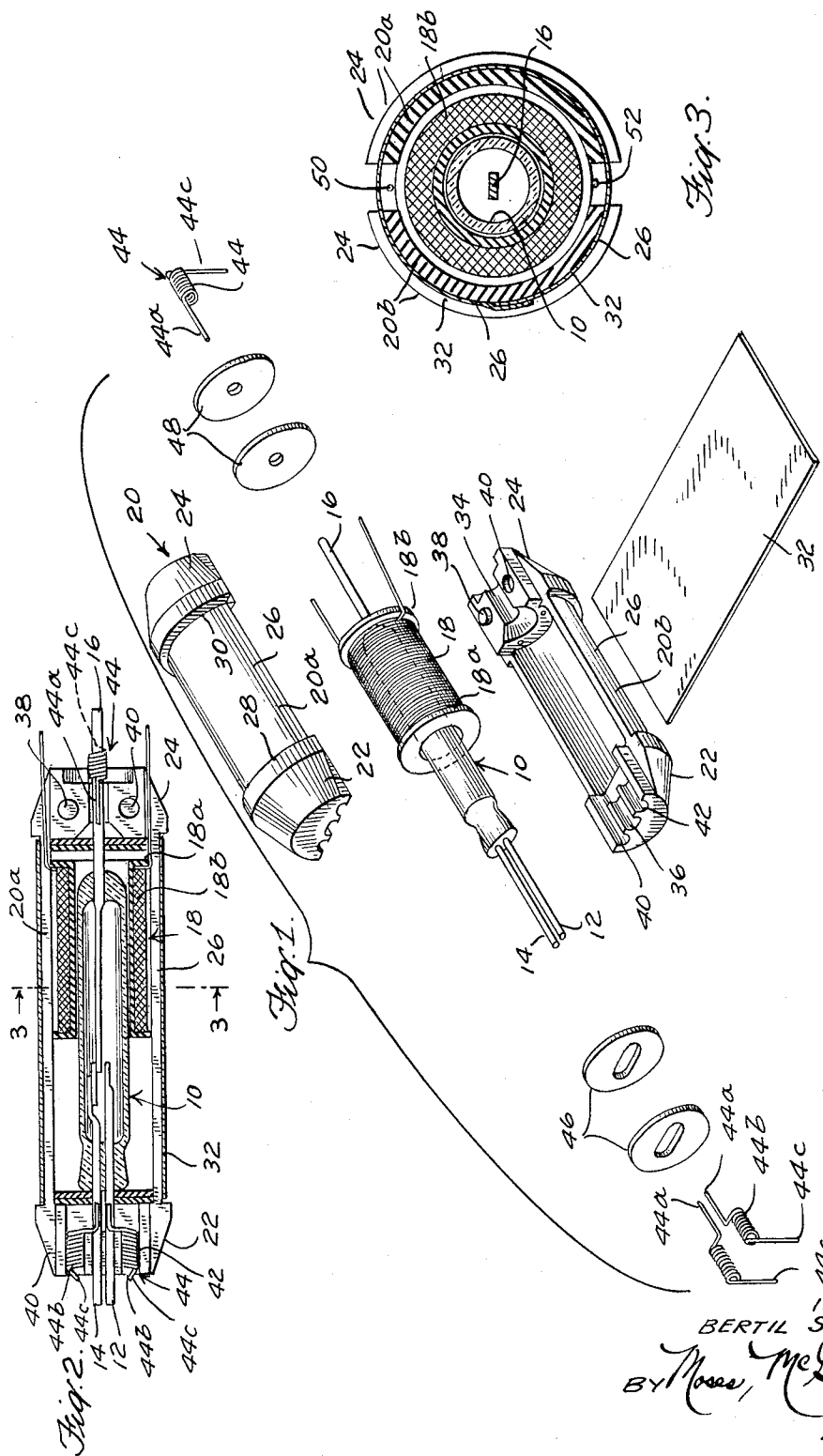
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3,218,407

CIRCUIT CONTROL DEVICE

Filed May 16, 1963

2 Sheets-Sheet 1



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Fig. 4.

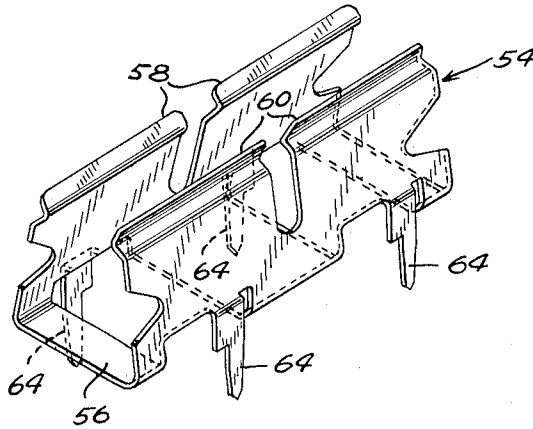


Fig. 5.

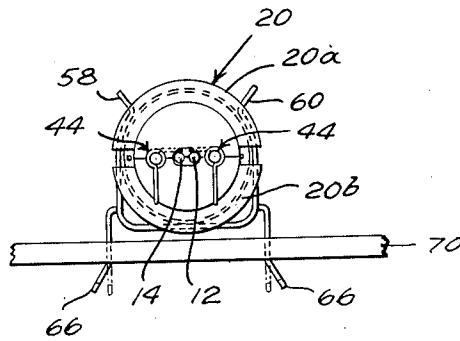
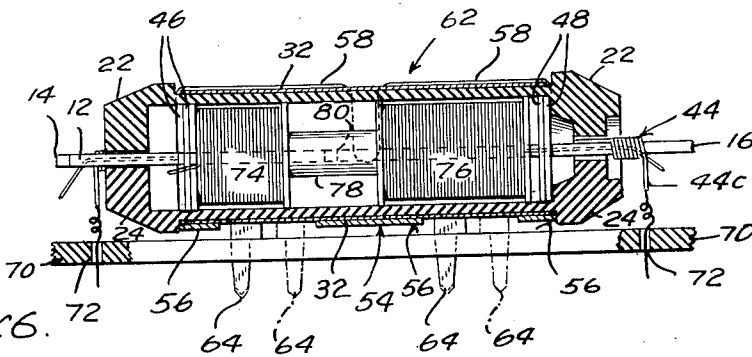


Fig. 6.



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CIRCUIT CONTROL DEVICE

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17 Claims. (Cl. 200-87)

This application is a continuation-in-part application of applicant's forfeited application Ser. No. 170,088 filed Jan. 31, 1962.

This invention relates, in general, to circuit control devices and in particular to magnetically actuated circuit control devices such as relays, utilizing switching members enclosed in hermetically sealed envelopes.

The present invention is particularly directed to an improved construction of relay which includes contact elements which are centrally arranged in a sealed housing and which are influenced by a surrounding magnetic coil. A feature of the present invention is that the coil is movably mounted around switch elements which are advantageously hermetically sealed in a housing such as a glass envelope. The coil may be adjusted axially in respect to the contact ends of the switch elements for the purpose of influencing their actuation in accordance with electrical circuit requirements.

In accordance with a preferred arrangement of the invention, one or more coils surrounding the switch elements may be adjusted within a cover, or a housing member, for the purpose of changing the characteristics of the operation of the switch so that a high degree of uniformity may be secured in relation to similar relays of the same type. Any inaccuracy of manufacture or assembly may be easily compensated by properly positioning the coil longitudinally of the switch tube which contains the switch elements, or reed contacts. A particular advantage in a construction of this nature is that switches, particularly reed-type switches which may be purchased in bulk without special selection, may have their electrical characteristics adjusted by manipulating the coil. This is easily done with the result that the cost is much less than the cost of preselected matched units. In addition, the adjustable coil permits the user to adjust the accuracy of the characteristics of the units to the degree required for any particular installation.

In accordance with a further feature of the invention, there is provided a novel housing construction for housing the switch elements and the coil which includes separable housing shell portions having openings at each end for the leads from the contact elements and from the coil, and which include interengaging projecting and recessed portions facilitating assembly and insuring proper alignment of the parts after assembly. The separable shell portions of the housing may advantageously be held together in a simple manner by an encircling wrapping such as a label which may be pasted around the assembled housing shell portions after they are placed around the contact elements and coil.

In accordance with a further feature of the invention, the relay includes novel connecting terminal elements comprising a first contact end which is adapted to be welded to one of the contacts of the switch, a coiled intermediate portion and an opposite end which may be directed in a manner for easily connecting this terminal into a printed or other circuit.

The coil portion provides a resilient connection for the reed contacts and prevents their being damaged, and the orientation of the ends of the coil permits simple arrangements of the relay and changes of position with a minimum of labor and effort.

A further feature of the invention is an improved mounting clip for the relay which includes a substantially

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trough-shaped body portion within inwardly directed resilient sides adapted to engage around the outer circular housing of the relay. The clip includes depending legs or supporting elements which may be plugged directly into a panel board. The securing clip permits suspension of the switch assembly over a panel board having a printed circuit, and the connections for the coil and the reed contact elements may be made easily through the resilient connecting terminals. In addition, the metal of the clip provides a magnetic shielding to avoid undesirable influences on the relay operation when connected in a circuit with other electrical operating elements.

Accordingly, it is an object of this invention to provide an improved relay construction.

A further object of the invention is to provide an improved relay construction which includes means holding contact elements in a central position and a coil or coils adjustably mounted over said means for axial adjustment in respect to the contact elements.

A further object of the invention is to provide an improved housing, particularly for a reed-type magnetically influenced relay which includes separable housing shell elements having openings at each end for permitting the passage of the ends of the contacts out of the housing, and encircling means for holding the elements together in an assembled position.

A further object of the invention is to provide improved connecting terminals for switch elements and the like, which includes substantially straight portions adapted to be connected to a contact such as by welding, an intermediate resilient or coiled portion, and an extending portion for connecting the contact into circuit adapted to be oriented in accordance with the last turn of the coiled portion.

A further object of the invention is to provide a clip for clamping and supporting a magnetic reed relay or the like including side members for resiliently engaging the relay housing with depending legs for permitting the anchoring of the relay at a fixed location on a panel board.

A further object of the invention is to provide a relay which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

In the drawings:

FIG. 1 is an exploded perspective view of a magnetic reed relay constructed in accordance with the invention;

FIG. 2 is a longitudinal section through the assembled reed relay of FIG. 1 on an enlarged scale;

FIG. 3 is a transverse section taken on the line 3-3 of FIG. 2 on an enlarged scale;

FIG. 4 is a perspective view of a relay mounting clip constructed in accordance with the invention;

FIG. 5 is a partial section through a panel board and an end elevation of a relay mounted on the panel board; and

FIG. 6 is a longitudinal section of another embodiment of the reed relay.

Referring to the drawings in detail, the invention as illustrated therein, particularly as shown in FIGS. 1 to 3, includes a sealed tube 10 made of glass or similar material into one end of which there extend spaced contact reeds 12 and 14 and into the other end of which there extends a single contact reed 16. The glass tube 10 is advan-

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tageously hermetically sealed and pressurized with an inert gas such as hydrogen or nitrogen. As indicated, the ends of the contacts 12 and 14 which are inside of the glass tube 10 are relatively stiff, while the enclosed portion of the contact 16 is long and relatively flexible. In some forms of these switch elements, only a single contact is provided at each end. For example, a single pole, single throw switch may have two flexible long reeds, or one contact may be stiff as in the present embodiment. The contacts or reeds 12, 14 and 16 are made of a magnetic material or a magnetic element such as iron and are preferably coated with a highly conductive, non-tarnishing metal such as gold or silver.

In accordance with the invention, a coil generally designated 18 is slidably mounted on the exterior of the tube 10 and is of a length shorter than the tube 10 so that it may be adjusted axially in respect to the contacts within the tube. The coil includes a bobbin portion 18a carrying a winding 18b.

In accordance with a further feature of the invention, the coil 18 is adjusted along the glass tube 10 and the assembly is enclosed in an enclosure tube or housing generally designated 20, which comprises separable shell portions 20a and 20b. The housing 20 is made of a more-or-less flexible plastic such as pre-molded nylon with the semi-cylindrical shell portions 20a and 20b including frusto-conical ends 22 and 24 and cylindrical central portions 26. The ends 22 and 24 form abutments 28 and 30 defining a zone on the cylindrical area 26 for receiving a securing wrapper or label 32 which is wrapped around the shell elements 20a and 20b after they are assembled around the glass tube 10 and the coil 18. A feature of the construction is that the label 32 is secured to the shell portions around the cylindrical areas 26 and this is sufficient to hold the entire assembly together. The shell portions 20a and 20b are slightly flexible so that pressure of the wrapper 32 causes the coil to be gripped and firmly held in an adjusted position.

In the embodiment illustrated in FIGS. 1 to 3, the cylindrical shell portions 20a and 20b include complementary grooves 34 at one end, provided for receiving the contact 16 and complementary grooves 36 at the opposite end for receiving the two contacts 12 and 14. Each frusto-conical end 24 is provided with a projecting tongue or raised section 38 which is received in a recess 40 of the complementary shell portion 20a or 20b. The shell portions are also provided with end grooves 40 and 42 for accommodating flexible terminal elements generally designated 44.

In accordance with a further feature of the invention, the flexible terminal elements 44 include a substantially straight or axially extending contact connecting end 44a, a resilient or flexible coil portion 44b and a panel connecting end 44c.

As indicated in the drawings, after the coil 18 is assembled over the glass tube 10, washer elements 46 are positioned over the ends of the contacts 12 and 14 and washer elements 48 are positioned over the end of the contact 16. The washers 46 and 48 are of elastic material such as plastic or rubber and a sufficient number may be used to hold the glass tube firmly. The number of washers necessary may vary considerably as the glass tube may not be of uniform length. The shell portion 20a is assembled to the shell portion 20b and the two are locked together by the encircling label 32. When the flexible terminals 44 are employed, the portion 44a is welded to respective contacts 12 and 14 and the resilient portions are carried in the grooves 40 and 42. The panel connecting portion 44c is oriented downwardly in the embodiment shown for connection into a panel located below the assembled switch.

As indicated in FIG. 3, the parts 20a and 20b are spaced apart at least at their ends to accommodate terminals 50 and 52 from the coil winding 18b. A cavity 53 which is defined centrally between the two shell mem-

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bers 20a and 20b is just large enough to accommodate the coil 18, which coil becomes tightly engaged after the label 32 is applied. In the assembled position, edge 55 of shell portion 20b is spaced from the edge 55' to accommodate the terminals 50 and 52.

In FIG. 4 there is indicated a perspective view of a mounting clip generally designated 54 for the reed relay assembly. The mounting clip advantageously includes a base or bottom portion 56 and resilient side portions 58 and 60 which are sprung inwardly for resiliently engaging around the relay assembly generally designated 62. The securing clip advantageously includes offset leg elements 64 two of which depend downwardly from each side of the bottom 56 and are adapted to connect into openings 66 of a panel board 70. When the assembly 62 is positioned on the clip 54 and the clip is mounted on the panel 70, the flexible terminals 44 are advantageously oriented so that the panel connecting portion 44c extends into a receptacle 72 of the panel for electrical connection. The clip is made of a material to provide magnetic shielding so that the influence of the coil 18 on the contacts will not be varied by other operating elements connected to the panel 70.

In the embodiment indicated in FIG. 6, the assembly 62 advantageously includes two coils generally designated 74 and 76 of different longitudinal dimensions which may be shifted over a glass envelope 78 for the purpose of positioning the coils in respect to the contacts 80 within the glass envelope for varying the electrical conditions required for their closing.

Thus, the invention provides a simple construction of switch elements in which the coil or coils may be shifted along a glass tube carrying the movable contacts. The entire assembly of elements may be easily positioned together and secured in an operating relationship by a simple wrapper or label element 32. The characteristics of the operation of the contacts may be easily adjusted by shifting the position of the coil either before the assembly is made or after assembly by simply removing the label to make such adjustment. The split cover design makes rapid assembly possible and also makes this assembly relatively simple. The formation of the shell portions which make up the housing so that they are spaced apart to accommodate the coil leads permits adjustment of the coil from the exterior of the housing by manipulating the terminal elements whenever desired.

The mounting clip of the invention, in addition to supporting the relay, provides a magnetic shielding as well as an electrostatic shielding.

The resilient connecting terminals of the invention provide a sure means for connecting the contacts of the switch in a manner resiliently protecting them against damage. In addition, the flexible terminals permit orientation of the leads so that they may be easily connected. When the assembly of the relay elements is completed and placed in the mounting clip, the clip may be easily attached to a panel board and the flexible connections may be oriented so that they may also be plugged in as desired. The depending supporting legs for the securing clip are advantageously spaced apart by amounts to comply with established standards for printed circuit boards or panels. They are also staggered to allow relays to be mounted more closely. The device may function equally as well with single or multiple pole relays and the mounting clips will be of the same basic design for any number of poles with only a variation in the dimensions thereof. The overall construction insures that the panel area required for connecting the device will be at a minimum which is important for devices of this character.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A reed relay comprising a tube, reed contacts sealed therein, a coil surrounding said tube and slidable lengthwise thereon to adjust the operating characteristics of the contacts, and a casing surrounding said tube and coil, said casing being split longitudinally to permit expansion of the casing so as to allow limited longitudinal adjustment of the coil on the tube, and means for binding the casing on the switch so as to hold the coil in adjusted position.

2. A reed relay comprising a tube, reed contacts sealed therein, a coil surrounding said tube and slidable lengthwise thereon to adjust the operating characteristics of the contacts, and a casing surrounding said tube and coil, said casing being formed of yieldable plastic so as to allow limited longitudinal adjustment of the coil on the tube, and a binding strip applied over the casing after adjustment of the coil, so as to retain the coil in adjusted position.

3. A reed relay comprising a tube, reed contacts sealed therein, a coil surrounding said tube and slidable lengthwise thereon to adjust the operating characteristics of the contacts, and a casing surrounding said tube and coil, said casing being formed of yieldable plastic material and comprising a longitudinally split side wall so as to allow limited longitudinal adjustment of the coil on the tube, and a binder applied to the casing after adjustment of the coil, so as to hold the coil in adjusted position.

4. A reed relay as claimed in claim 3, in which said casing comprises two separable shell portions held together along diametrically opposite longitudinal seams, said seams being spaced apart adjacent one end, said coil having a pair of terminals, respective ones of which extend through the spaced-apart shell portions at respective sides thereof.

5. A reed relay comprising a tube, reed contacts sealed therein, a coil surrounding said tube and slidable lengthwise thereon to adjust the operating characteristics of the contacts, and a casing surrounding said tube and coil, said casing being formed of a plastic cylinder split longitudinally on opposite sides thereof, forming two substantially semi-cylindrical sections, said semi-cylindrical sections being separable sufficiently to allow limited longitudinal adjustment of the coil on the tube, and a binder for application around the casing after adjustment has been made, so as to hold the coil in adjusted position.

6. A reed relay construction as claimed in claim 1, in which a plurality of coils are mounted on the tube and separately adjustable longitudinally thereof.

7. A reed relay construction as claimed in claim 5, including a spacer washer surrounding one of said reed contacts and disposed between said tube and said casing to accommodate tubes of varying size within said casing.

8. A reed relay construction as claimed in claim 3, in which longitudinal recesses are formed in the ends of said semi-cylindrical casing sections to permit passage of said contacts through said casing.

9. A relay comprising a tube, a plurality of cooperating contacts therein, a plurality of coils surrounding the tube, at least one of which is slidable lengthwise thereon to adjust the operating characteristics of the contacts, and gripping means fixed longitudinally relative to said tube, and operable to embrace the adjusted ones of said coils for locking the adjusted coil or coils in adjusted position on the tube.

10. A relay comprising a tube, a plurality of cooperat-

ing contacts therein, a coil surrounding said tube, a flexible envelope surrounding the tube and coil, said coil being slidable lengthwise on the tube within the limits permitted by the envelope to adjust the operative characteristics of the contacts, and means for compressing said envelope against said coil for locking the coil in adjusted position on the tube.

11. A relay comprising a plurality of cooperating contacts, housing means holding said contacts in spaced relation, a coil surrounding said housing means and movable therealong to adjust the operating characteristics of the contacts, and an enclosing casing surrounding said coil and holding it in a fixed position in relation to said contacts.

12. A relay comprising a tube, a plurality of cooperating contacts in said tube, at least one coil surrounding said tube being slidable thereon to adjust the operating characteristics of the contacts, and housing means surrounding said coil and said tube and holding said coil in an adjusted position on the tube.

13. A relay according to claim 12, wherein said housing means includes separable shell portions having a central enlarged cavity for receiving said tube and said coil and including cooperable recesses defined at each end for the passage of said contacts.

14. A relay according to claim 12, wherein said housing means includes separable shell members and an encircling wrapper holding said shell members together.

15. A relay according to claim 14, wherein said coil includes connecting terminals which extend out of said housing means at the connection between said separable shell members.

16. A relay according to claim 12, wherein said housing means includes separable shell portions surrounding said coil, and a clip member having inwardly turned resilient side portions resiliently engaging said shell portions and including depending legs for mounting said clip member onto a panel board.

17. A relay according to claim 12, including a flexible terminal element connected to at least one of said contacts, said flexible terminal element comprising a portion adapted to be welded to said contact, an intermediate resilient portion and a panel connecting end portion extending from said intermediate resilient portion in a direction for connection to an electrical circuit.

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