

March 18, 1969

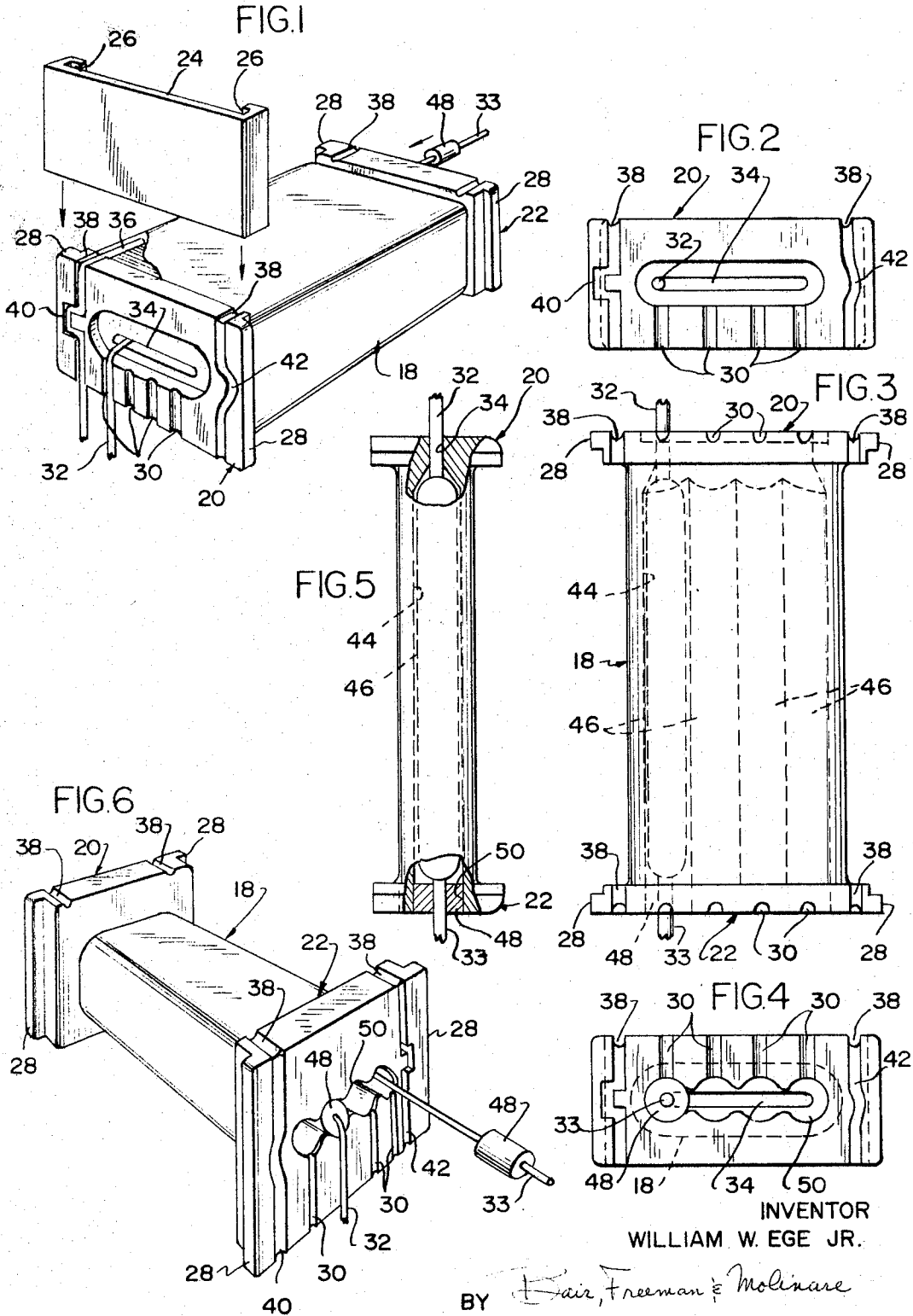
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3,434,079

ENCAPSULATED REED SWITCH RELAY CONSTRUCTION

Filed March 27, 1967

Sheet 1 of 2



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FIG. 7

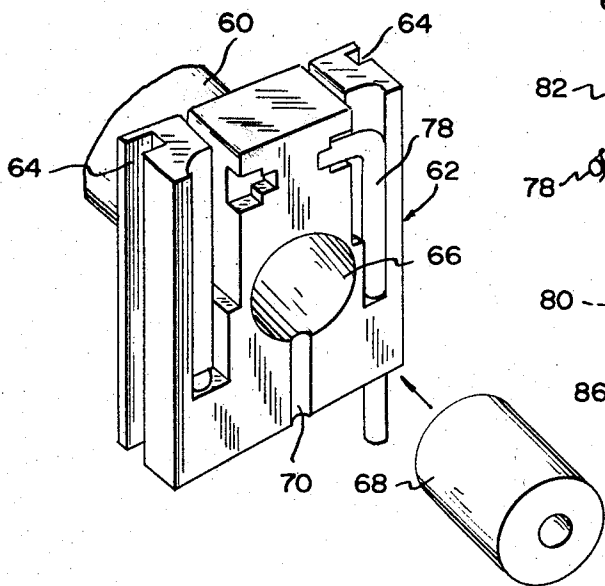


FIG. 8

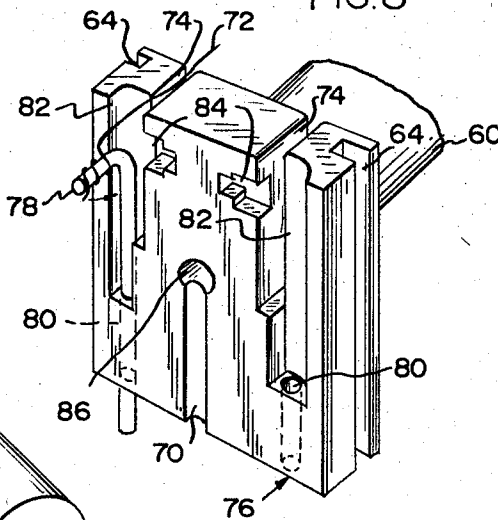


FIG. 9

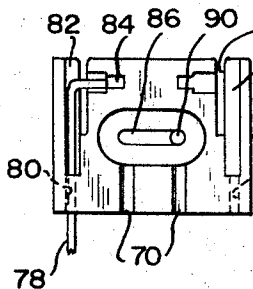


FIG. 10

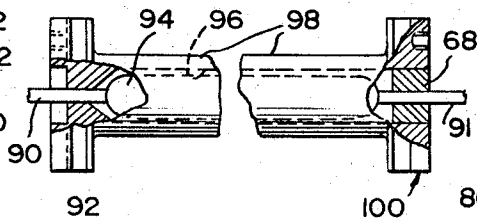


FIG. 11

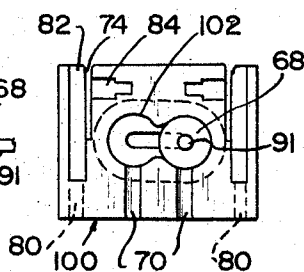
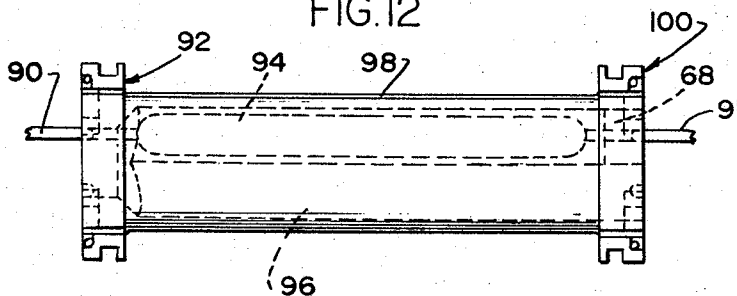


FIG. 12



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3,434,079
**ENCAPSULATED REED SWITCH RELAY
 CONSTRUCTION**

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9 Claims

ABSTRACT OF THE DISCLOSURE

A reed switch relay having a hollow barrel portion flanked at each end by outwardly extending flanges. An elongated reed switch capsule is inserted in the hollow barrel portion and the reed switch leads are fitted into grooves defined in the end flanges. A cover plate is then slidably mounted over each of the flanges to securely hold the lead wires in position. Channels are also defined in the flanges for receiving lead wires from the magnetizing coil wrapped around the hollow barrel. Plugs may be mounted on the capsule lead wires and positioned in the ends of the hollow barrel portion to more securely hold the capsules in position.

Background of the disclosure

This invention relates to a reed switch relay construction and, more particularly, to a reed switch relay adapted to receive single or multiple encapsulated reed switches.

Because of their ability to resist contact contamination, reed switch relays have found wide acceptance in a variety of applications. A switch of this type normally comprises a pair of magnetizable leaf springs or "reeds" sealed within a tubular capsule. The reeds overlap within the capsule such that, when the capsule is subjected to an axial magnetic field, the reeds are pulled into contact with one another to close the circuit path.

Commonly, the reed switch capsule is mounted within the barrel portion of an insulated bobbin upon which a magnetizing coil is wound. The wire leads extending from the ends of the capsule are normally soldered or welded to terminals on the bobbins which provide a convenient mode of connecting the switch to a printed circuit board or the like.

Alternatively, the wire leads themselves may be directly attached to the printed circuit board. Direct attachment of the leads eliminates the extra step of soldering the leads to terminals as well as eliminating the terminals themselves and various other extra parts. However, attachment of the reed switch leads directly to a circuit board has many disadvantages. For example, it is difficult to bend and solder the lead wires to the circuit board. Furthermore, when bending and soldering the lead wires, it is easy to break the glass capsule which surrounds the reeds.

In order to more fully protect the reed switch, bobbin constructions have been devised which facilitate wire lead hookups and protect the reed switch capsule at the same time. Such a prior construction is exemplified by the patent of W. A. Killion, U.S. Patent No. 3,171,918 issued Mar. 2, 1965. Killion discloses the technique of placing the switch capsule and its magnetizing winding in a cavity and then covering the components with an insulating resin which, when cured, forms a durable, protective coating for the reed switch. Although this method provides an excellent means of protecting the reed switch from abrasion and vibration, the device of Killion does not permit the replacement of a single reed switch capsule from a multiple group since the "potted" or resin protected com-

ponents must all be removed in order to replace a single switch. Thus, should any portion of the Killion device fail, the entire device would need to be replaced.

Summary of the invention

In a principal aspect, the present invention takes the form of an improvement in reed switch relays of the class comprising at least one reed switch capsule inserted into the hollow barrel of a coil form, the barrel being flanked at each end by outwardly extending flanges. In accordance with one feature of the invention, grooves are defined in the outer surface of each of the flanges for receiving the electrical switch leads from the capsule. Cover plates adapted to slidably engage with the flanges are employed to overlap and secure the switch leads in these grooves.

Preferably, plugs adapted to fit snugly within openings at the end of the coil form barrel are threaded onto the switch leads to protect the capsule against breakage while the leads are being bent and to securely retain the capsule against axial movement with the barrel.

It is a general object of the present invention to provide an encapsulating assembly for reed switches which assures secure electrical and mechanical connections between the reed switch lead wires and a circuit board.

It is a further object of the present invention to provide an easily assembled encapsulated reed switch suitable for use in conjunction with printed or etched circuit boards.

It is still a further object of the present invention to provide an assembly which facilitates removal and replacement of individual defective reed switches in an assembly comprising a plurality of reed switches.

These and other objects, features and advantages may be more fully understood in the detailed description which follows.

Brief description of the drawings

FIGURE 1 is a front, perspective view of the improved reed switch relay.

FIGURE 2 is a front, elevational view of one end of the bobbin employed in the relay of FIGURE 1.

FIGURE 3 is a top, plan view of the bobbin shown in FIGURE 2.

FIGURE 4 is a back, elevational view of the bobbin in FIGURE 2.

FIGURE 5 is a side, plan view of the bobbin of FIGURE 2.

FIGURE 6 is a perspective view showing the opposite end of the relay of FIGURE 1.

FIGURE 7 is a perspective view of an alternative flange construction for an encapsulated reed switch relay.

FIGURE 8 is a perspective view of the opposite end of the alternative flange construction of FIGURE 7.

FIGURE 9 is a front, elevational view of the bobbin of a reed switch relay having the alternative flange.

FIGURE 10 is a side, elevational view of the bobbin of the alternative reed switch relay.

FIGURE 11 is the back, elevational view of the alternative reed switch relay bobbin.

FIGURE 12 is the top, plan view of the alternative reed switch relay bobbin.

Description of the preferred embodiments

FIGURES 1 through 6 illustrate a first form of the present invention. As shown in FIGURE 1, a hollow barrel shaped coil form 18 has flanges or end plates 20 and 22 attached at either end. The bobbin assembly comprising the barrel coil form and the end plates 20 and 22 is preferably molded as a single, integral unit from an insulating plastic resin such as "Zytel-101." The end plates 20 and 22 are rectangularly shaped in order to fit flush against a circuit board. The side edges of the end

plates 20 and 22 provide outwardly extending ridges 28 which slidably engage with the grooves 26 of the cover plate 24. Preferably, cover plate 24 is likewise molded from an insulating plastic resin.

Each end plate 20 and 22 has grooves 30 for receiving conducting wires 32 from reed switches (not shown) situated within the hollow coil form 18. As shown in FIGURE 1, the conducting wire 32 from one of these reed switches passes out through the slot 34 in the end plate 20. It is then bent at a substantially right angle into the groove 30. The width of the slot 34 is slightly greater than the diameter of the lead wire 32 in order to allow the capsule lead wire 32 to pass through. When bending the lead wire 32, the slot 34, having substantial depth, acts as a support and reduces the strain applied to the fragile reed switch capsule (not shown) as the lead wire 32 is bent.

The conducting lead wire 36 is attached to a switch magnetizing coil (not shown) which is wrapped around the barrel-shaped coil form 18. The lead wire 36 passes through a small groove 38 across the top edge of end plate 20 and is then bent to fit into a square-cornered groove 40 defined in the front face of the end plate 20. The groove 42 in the front face of the end plate 20 illustrates an alternative to the square-cornered groove 40.

As mentioned before, the plate 24 slides down over the end plate 20. When engaged, plate 24 overlays and secures both the magnetizing coil lead wire 36 and any capsule lead wires 32 in a snug relationship within their respective grooves in the end plate.

In FIGURE 3, a reed switch capsule 44 is shown in phantom positioned within the coil form 18. The reed switch capsule 44 is commonly a glass capsule with interior reeds and exterior wire leads extending from either end. The reed switch 44 is mounted in a cylindrically shaped cavity 46. This shape prevents lateral movement of the reed switch and also serves to align the reed switch wire leads 32 which extend from either end of the reed switch capsule 44 through the end plates 20 and 22.

Threaded over the conducting lead wire 33 of the reed capsule 44 is a plug 48. The plug 48 is slidably received into the end plate 22 and prevents the capsule 44 from slipping out of its cavity 46. The plug 48 also serves to protect the capsule 44 when a lead wire 32 is being bent.

In FIGURE 5 the reed switch 44 is once again shown positioned in the cavity 46. The cutaway segment of end plate 20 shows the positioning of the lead wire 32 through the slot 34 as well as illustrating how the capsule 44 is snugly positioned in the cavity 46 to prevent axial movement of the reed switch 44. The cutaway view of end plate 22 shows the lead wire 32 passing through the plug 48 which is situated in the aperture 50 of the end plate 22.

FIGURE 4 illustrates the manner in which the plug 48 is positioned over the lead wire 32 and also positioned within the aperture 50 in the end plate 22. The aperture 50 is sufficiently large so that the reed switch capsule 44 can slide through the aperture 50 to the interior of the hollow coil form 18 so that one lead wire passes through the slot 32 and the other lead wire extends out through the aperture 50 in the end plate 22. The plug 48 is then positioned over the lead wire 32 to hold the reed switch capsule firmly in position within the hollow coil form 18. A cover plate identical to plate 24 shown in FIGURE 1 slips over end plate 22 and holds each capsule, plug, and lead wire in position.

FIGURE 6 more clearly shows in a perspective view the manner in which the plug 48 is positioned on the lead wire 32 and then slid in the direction of the arrow into the aperture 50 in the end plate 22. Once in position, the plug 48 serves as a brace against which the lead wire 32 may be bent to fit into the groove 30.

FIGURE 7 shows another construction used for connecting a magnetizing coil lead wire to an external circuit. A flange or end plate 62 is attached to a hollow coil

form 60 which is barrel shaped to receive a reed switch capsule (not shown). The end plate 62 has side channels 64 which mate with a cover plate (which is identical to the cover plate 24 shown in FIGURE 1) which slides over the outer face of the end plate 62.

A coil form barrel opening 66 passes through the center of the end plate 62 to the interior of the coil form 60. The opening 66 is large enough to receive a reed switch capsule and allow the reed switch capsule to pass into the interior of the coil form 60. A plug 68, like the plug 48 previously discussed, is threaded over a lead wire from the reed switch capsule and into the aperture 66. Since the reed switch relay construction shown in FIGURE 7 is designed to receive a single reed switch capsule, the aperture 66 is likewise designed to receive a single capsule and there is a single groove 70 in the end plate 62 for receiving the lead wire from the capsule.

The end plates depicted in FIGURES 7 and 8 have an alternate means for connecting the magnetizing coil lead wire 72 to an external circuit board. As shown in FIGURE 8, the coil lead wire 72 passes through a slot 74 in the top edge of the end plate 76. The coil wire is then attached to an L-shaped terminal pin 78. The L-shaped pin 78 is slidably mounted in a passageway 80 in the end plate 76 and can be rotated in the direction of the arrow into the secondary channel 84. When rotated into this secondary channel 84, the L-shaped conductor 78 is held against vertical motion. Placing a cover plate of the type described in connection with FIGURE 1 over the end plate 76 assures that the L-shaped conductor 78 will be held in an immovable position in the end plate 76. The lower end of the L-shaped conductor may then be passed through a hole in the circuit board and be soldered to the circuit board.

As seen in FIGURE 8, the end plate 76 has a smaller opening 86 for the passage of a conducting lead wire from a reed switch capsule (not shown). A groove 70 in the end plate 76 leads from the single opening 86 to the bottom edge of the end plate 76. The lead wire from the reed switch capsule situated in this groove and held in position by a cover plate (not shown) is thereby suitably positioned to connect with a circuit board.

FIGURES 9 through 12 show in various plan views a bobbin made to receive two reed switches and employing the end plate construction described in connection with FIGURES 7 and 8. In FIGURE 9 the L-shaped conductor 78 is shown inserted in the passageway 80, channel 82 and the secondary channel 84. A wire from the magnetizing coil would pass through the slot 74 and wrap around the L-shaped conductor 78. A lead wire 90 from the reed switch capsule passes through the opening 86 in the end plate 92 and may be bent to fit in the groove 70 in the end plate 92.

In FIGURE 10 a reed switch 94 is shown inserted into the cavity 96 within the coil form 98. The reed switch leads 90 and 91 are shown in a cutaway view protruding through the end plates 92 and 100. A plug 68 is shown inserted over the lead wire 91 protruding through the end plate 100. The plug 68 serves to hold the reed switch 94 in position within the cavity 96 and also serves to protect the lead 91 and the reed switch capsule 94 against breakage. The plug 68 is again shown in FIGURE 11 inserted in the aperture 102. The aperture 102 is large enough to admit a reed switch capsule 94 to the interior of the coil form 98.

FIGURE 12 is another view of the reed switch capsule 94 as it is inserted in position within the cavity 96 in the coil form 98. The end plates 92 and 100 in conjunction with the plug 68 serve to position the reed switch capsule 94 within the coil form 98 so that the lead wires 90 and 91 from the reed switch capsule 94 may pass through the end plates 92 and 100. The plug 68 is shown inserted over the lead wire 91 passing through the end plate 100 to insure secure positioning of the reed switch capsule 94.

It is to be understood that the foregoing embodiments are merely illustrative of the application of the principles of the invention. Numerous modifications may be made to these embodiments without departing from the true spirit of the invention.

What is claimed is:

1. A reed switch relay comprising a coil form having a hollow barrel portion with an outwardly extending flange at each end, a magnetizing coil wound on said form, at least one elongated reed switch capsule positioned within said hollow barrel, electrical conductors extending from each end of said capsule, and means for connecting said conductors to an external circuit,

recessed grooves defined in the outer surface of each of said flanges receiving said conductors, and cover plates slidably engaging with said flanges to overlay said conductors securing them in said grooves.

2. The reed switch relay as set forth in claim 1 wherein at least one of said cover plates overlaps one end of said barrel in order to retain said capsule within said barrel.

3. The reed switch relay as set forth in claim 1 wherein said flanges have straight edges adapted to be flush mounted against a circuit board, and wherein said grooves extend from said barrel to said straight edges such that said conductors are positioned for insertion into holes in said circuit board.

4. The reed switch relay as set forth in claim 1 including a sleeve plug threaded on one of said conductors and sized to fit snugly within one end of said hollow barrel portion whereby said one conductor is supported as it is bent into its receiving groove.

5. The reed switch relay as set forth in claim 4 wherein one of said cover plates overlays said sleeve plug to retain said plug and said capsule in said barrel.

6. The reed switch relay as set forth in claim 1 including additional recessed grooves defined in the outer surface of said flanges for receiving lead wires from said magnetizing coil.

7. The reed switch relay as set forth in claim 6 wherein said additional recessed grooves are curved to secure said coil lead wires against movement through the length of said additional grooves.

8. The reed switch relay as set forth in claim 3 including an L-shaped pin mounted in one of said flanges and having one leg thereof extending downwardly through said straight edge of said flange, said pin being mounted for pivotal motion about said one leg, and a pin recess in said one flange for receiving said other leg therein, whereby said pin may be electrically connected to a conductor associated with said relay and then pivoted into a secured position within said pin recess.

9. The reed switch relay as set forth in claim 8 wherein the cover plate associated with said one flange is adapted to overlay said pin recess to retain said pin in said secured position.

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3,268,686	8/1966	Wauer	335—154

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