United States Patent

[11] **3,611,218**

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[33] **Japan**
[31] **44/69003**

[54] **ELECTROMAGNETIC RELAY**
3 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **335/202**
[51] **Int. Cl.** **H01h 50/02**
[50] **Field of Search** ..... 335/202, 135, 275; 337/26, 113; 339/275, 176 L, 144, 145, 221; 200/166 CT

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Attorney—Hall, Pollock & Vande Sande

ABSTRACT: An electromagnetic relay which is so designed that the connecting terminals which have heretofore been mounted on an insulating mounting plate can be directly mounted on an insulating baseplate to which pin-shaped bayonet terminals are fixed.

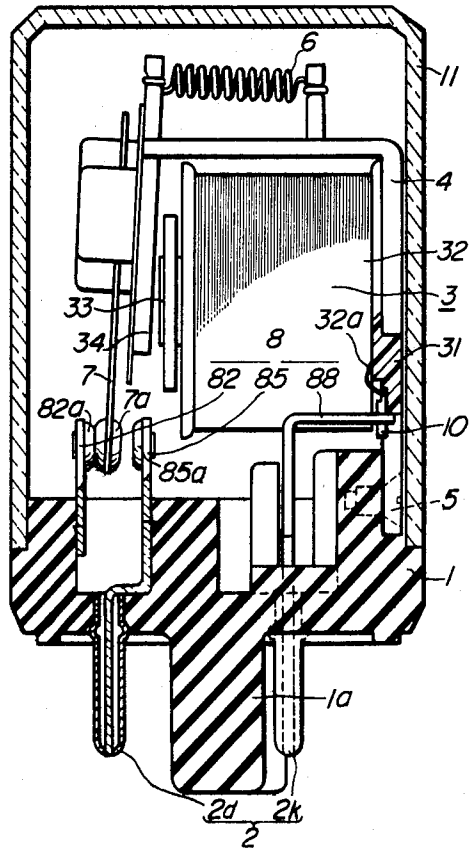


FIG. 1

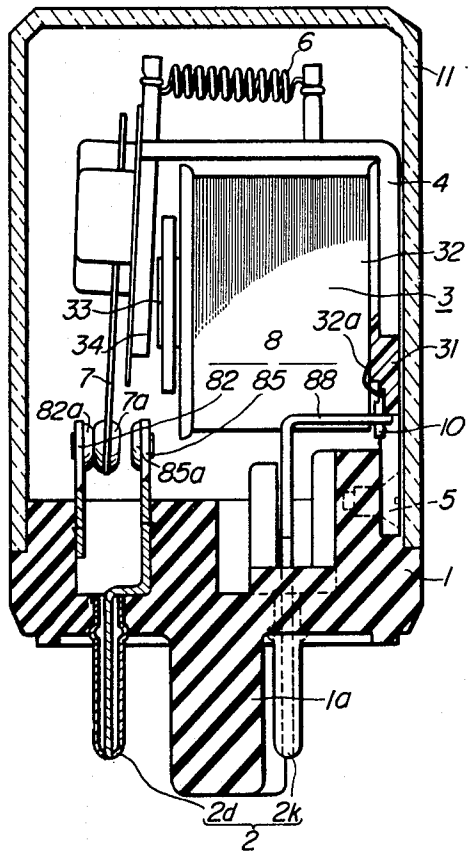


FIG. 2

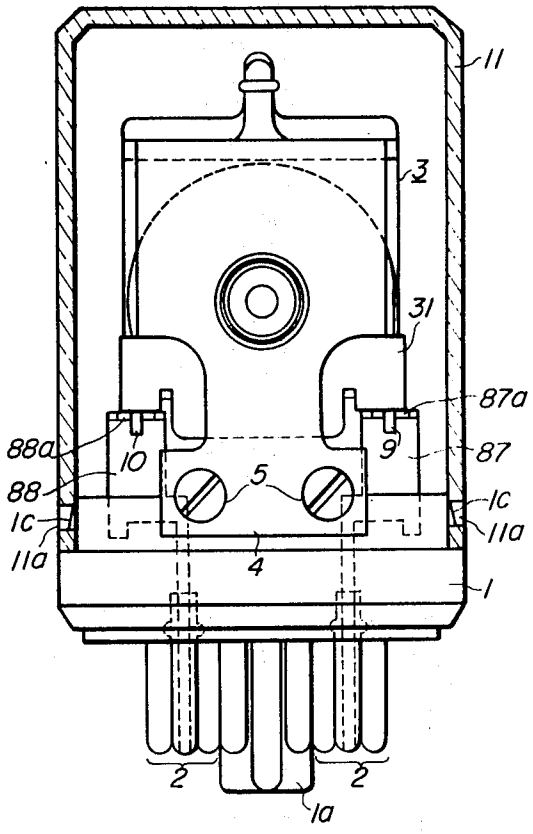


FIG. 3

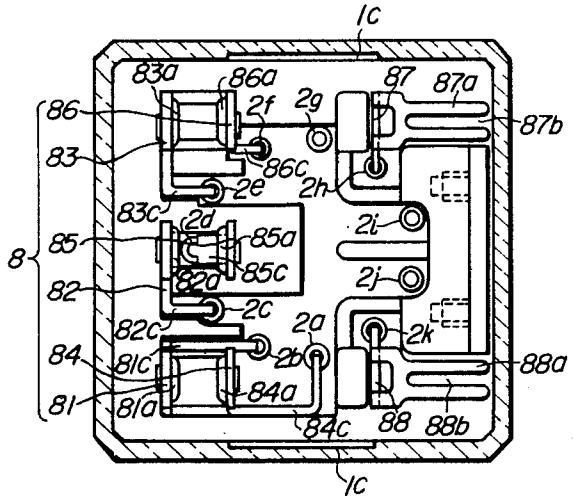
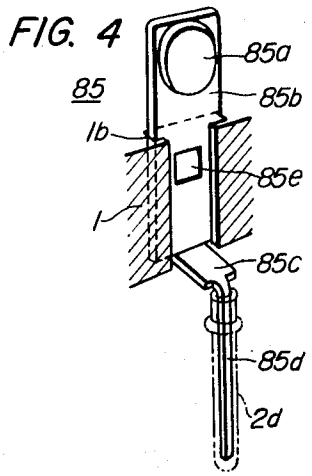


FIG. 4



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ELECTROMAGNETIC RELAY

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electromagnetic relay and more particularly to a plug-in type electromagnetic relay which is simple in construction and easy to assemble.

2. Description of the Prior Art

This type of electromagnetic relay generally comprises an electromagnet composed of a coil, a fixed core and a movable core; a mounting plate made of electrically insulating material and having fixed thereto connecting terminals connected with both ends of the coil, normally opened and normally closed connecting terminals each having a fixed contact thereon and common connecting terminals; said electromagnet being mounted on said baseplate movable contactors connected to the movable core of said electromagnet and each having a movable contact located between the opposed fixed contacts of said normally opened and normally closed connecting terminals; a baseplate made of an electrically insulating material and having pin-shaped bayonet terminals fixed thereto in an annular shape; said mounting plate being fixedly mounted on said baseplate with said electromagnet thereon; and a transparent cover enclosing the assembly of the aforesaid elements; each of said connecting terminals being connected to the corresponding one of said bayonet terminals on said baseplate through a connecting wire which is soldered to said connecting terminals and said bayonet terminal at both ends thereof respectively.

Because of such construction, the assembly of the conventional electromagnetic relay of the type described involves the step of connecting the coil ends and the common terminals with the connecting terminals on the insulating mounting plate and also the step of soldering the opposite ends of each connecting wire to the connecting terminal and the bayonet terminal on the insulating baseplate Namely, the assembling operation becomes more cumbersome as the number of terminals increases.

SUMMARY OF THE INVENTION

The present invention has been achieved to obviate the foregoing disadvantage of the conventional electromagnetic relay. Namely, the object of the present invention is to provide an electromagnetic relay of the type described at a low cost by extremely simplifying the construction and simplifying the assembling operation thereof by designing such that the connecting terminals which have heretofore been provided on the insulating mounting plate are directly mounted on the insulating baseplate to which the pin-shaped bayonet terminals are fixed, and directly connected with said pin-shaped bayonet terminals, to eliminate the insulating mounting plate and to further eliminate the step of connecting the connecting terminals to the bayonet terminals through the connecting wires.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional front view of the electromagnetic relay according to the present invention.

FIG. 2 is a side view of the electromagnetic relay.

FIG. 3 is a plan view of the electromagnetic relay with the electromagnet portion being removed.

FIG. 4 is a perspective view of a connecting terminal portion.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, numeral 1 designates a baseplate made of an electrically insulating material and having a guide stem 1*a* projecting from the center of the underside thereof. Numeral 2 designates a group of hollow pin-shaped bayonet terminals arranged in an annular shape around the guide stem 1*a* and connected at their roots to the base plate 1, and numeral 3 designates an electromagnet fixedly mounted on a supporting frame 4 which is secured at its roots to the insulating baseplate 1 by means of screws 5.

Numeral 31 designates a winding frame of a coil 32, 33 a fixed core and 34 a movable core supported by the supporting frame 4 in such a manner that it makes a reciprocatory movement relative to the fixed core 33 under the biasing force of a spring 6. Numeral 7 designates a movable contactor connected to the movable core 34 at one end and provided with a movable contact 7*a* at the other end extremity. Numeral 8 generally designates a group of connecting terminals, of which those indicated by numerals 81, 82, 83 and those indicated by numerals 84, 85, 86 are normally closed and normally opened connecting terminals respectively, and those indicated by numerals 87, 88 are connecting terminals connected to the opposite ends of the coil 32 respectively. Numerals 81*a*, 82*a*, 83*a* and 84*a*, 85*a*, 86*a* designate fixed contacts provided on the connecting terminals 81, 82, 83 and 84, 85, 86 respectively.

The construction of the connecting terminals, generally indicated by numeral 8, will be explained hereunder with reference to the connecting terminal 85 shown in FIG. 4. The connecting terminal 85 consists of a main body portion 85*b* extending upright from the upper surface of the baseplate 1, an intermediate portion 85*c* extending from the lower end of said main body portion and a rod portion 85*d* extending vertically downwardly from the end extremity of said intermediate portion which will be received in the bayonet terminal 2*d* fixed to the baseplate 1. The main body portion 85*b* can be inserted into guide groove 1*b* formed in the baseplate 1, from the upper-side thereof. Similarly, the main body portions of the other connecting terminals are inserted into respective guide grooves which are formed at the mounting positions of the respective connecting terminals to meet the conditions of said positions, as shown in FIG. 3. The intermediate portion 85*c* is required to be of such length and shape which enable the rod portion 85*d* to be inserted into the bayonet terminal 2 *d* concurrently with the insertion of the main body portion 85*b* into the guide groove 1*b*. The connecting terminals are arranged longitudinally and transversely of the baseplate 1, whereas the bayonet terminals are arranged in an annular shape as shown in FIG. 3. It will, therefore, be understood that the intermediate portions of the respective connecting terminals are different from each other in length and shape, and some of them are bent.

Referring to FIG. 3, numerals 81*a* 82*c* 83*c* and 84*c* 85*c* 86*c* designate the intermediate portions of the connecting terminals 81, 82, 83 and 84, 85, 86 respectively, and numerals 2*b*, 2*c*, 2*e*, and 2*a* 2*d*, 2*f* and 2*h*, 2*k* designate the bayonet terminals respectively into which the vertically downwardly extending rod portions of the respective connecting terminals are inserted. Numerals 2*g*, 2*i*, 2*j*, designate bayonet terminals respectively connected to the common terminals.

As shown in FIG. 4, the connecting terminal 85 is provided at the main body portion 85 thereof with a cut-bent lug 85*e* for engagement with the wall of the guide groove 1*b* when the main body portion 85*b* is inserted into said guide groove, whereby said main body portion is securely held in said guide groove and prevented from moving out of said groove. A corresponding cut-bent lug is of course provided on each connecting terminal.

On the other hand, the connecting terminals 87, 88, unlike those provided with a fixed contact at the top end thereof, each have the top end portion thereof being bent to form horizontal portions 87*a*, 88*a* and slots 87*b* 88are formed in said horizontal portions 87*a*, 88*a* respectively as shown in FIG. 3. Pin terminals 9, 10 to be received in the slots 87*b*, 88*b* are fixed to the lower end surface of the winding frame 31, with the opposite ends of the coil 32 connected thereto respectively. The arrangement is such that when the supporting frame 4 with the electromagnet 3 mounted thereon is secured to one side of the baseplate 1 by means of the screws 5, the pin terminals 9, 10 are received in the slots 87*b*, 88*b*, of the connecting terminals 87, 88 respectively in engagement therewith and thus electrical connection with the coil is established.

In the drawings numeral 11 designates a cover made of a transparent resin material, which is secured to the baseplate 1 by engaging holes 11*a*, formed in the walls thereof adjacent to

the lower open end, with projections 1*c* provided on the sidewalls of said baseplate, after the assembling and the internal electrical connection of the electromagnetic relay have been accomplished.

According to the present invention, as described above, the rod portions of the respective connecting terminals **8** are inserted into the bayonet terminals **2** concurrently with the mounting of the connecting terminals in the baseplate **1**. Therefore, the assembling of the electromagnetic relay can be accomplished very simply, only by soldering the rod portions of the connecting terminals to the bayonet terminals upon insertion of the former into the latter.

Furthermore, as stated at the beginning, the mounting plate for mounting the bayonet terminals therein and the connecting wires for connecting said bayonet terminals with the connecting terminals, which have been necessary in the conventional electromagnetic relay of this type, are not required in the present invention. This decreases the labor required for the connecting operation accordingly and also simplifies the construction of the entire electromagnetic relay. Thus, the present invention is of great advantage.

I claim:

1. An electromagnetic relay comprising a plurality of relay switches, each including a movable contact actuated by magnetic means and at least one fixed contact, an insulating baseplate having a guide stem projecting downwards at the center portion thereof, a plurality of hollow pin-shaped bayonet terminals fixed to said baseplate surrounding said guide stem, a plurality of connecting terminals each of which carries a fixed contact, each of said connecting terminals being slidably and tightly inserted into a slot provided in said baseplate, each of said connecting terminals having an integral portion extending into the interior of one of said hollow pin-shaped bayonet terminals, when said connecting terminal has been slid to a predetermined position in its corresponding slot.

2. The relay of claim **2** wherein each of said slots comprises an elongated groove in said baseplate extending in a direction generally parallel to the directions of extension of said pin-shaped bayonet terminals one side of each said groove including exterior boundary edges spaced from one another by a distance less than the width of said groove and defining an open face for said groove, each of said connecting terminals having an elongated main body portion having a width substantially equal to that of said groove, each connecting terminal having an intermediate portion integral with its main body portion and extending transversely to said main body portion, said intermediate portion being smaller in width than said main body portion and extending between said boundary edges outwardly of said groove, and each connecting terminal having an elongated rod portion integral with said intermediate portion and extending transverse to said intermediate portion in a direction substantially parallel to said elongated main body portion, whereby slidable insertion of said main body portion into one end whereby slidable insertion of said main body portion into one end of its associated groove effects slidable insertion of said rod portion into one of said hollow bayonet terminals via said transverse intermediate portion extending from said main body portion outwardly of said groove to said rod portion.

3. The relay of claim **3** wherein said main body portion includes an outwardly extending lug positioned to bear on the interior wall of said groove opposite to the open face of said groove, for holding said main body portion firmly within said groove when it has been slidably inserted into said groove.