United States Patent

[11] 3,618,136

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[21] Appl. No. 6,177
[22] Filed Jan. 27, 1970
[45] Patented Nov. 2, 1971
[32] Priority July 19, 1969
[33] Japan
[31] 44/69002

[54] **ELECTROMAGNETIC RELAY**
3 Claims, 5 Drawing Figs.

[52] U.S. Cl. 335/202
[51] Int. Cl. H01h 50/02
[50] Field of Search ..... 335/135, 202; 200/166 CT

[56] References Cited
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ABSTRACT: An electromagnetic relay so constructed that the internal electrical connection can be attained incident to assembly of the relay, by previously performing a soldering operation at one place for one terminal end of a coil or at a total of two places for both terminal ends of the coil.

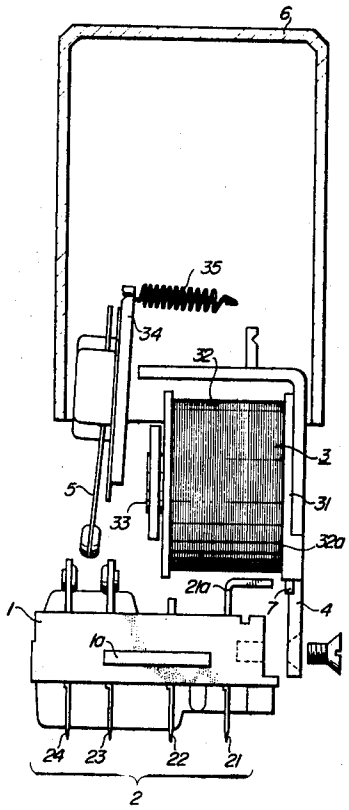


FIG. 1

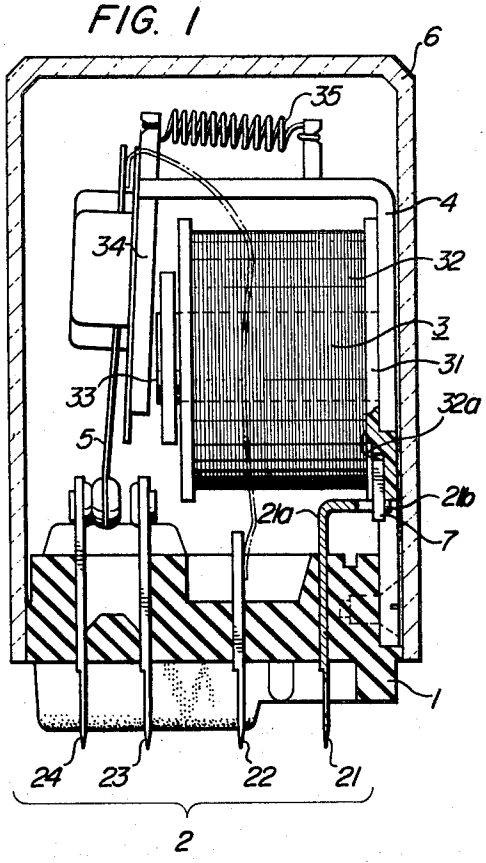
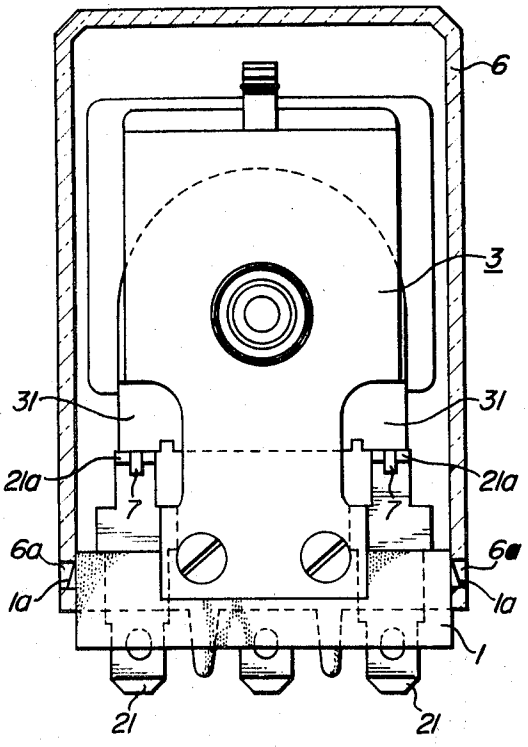


FIG. 2



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FIG. 3

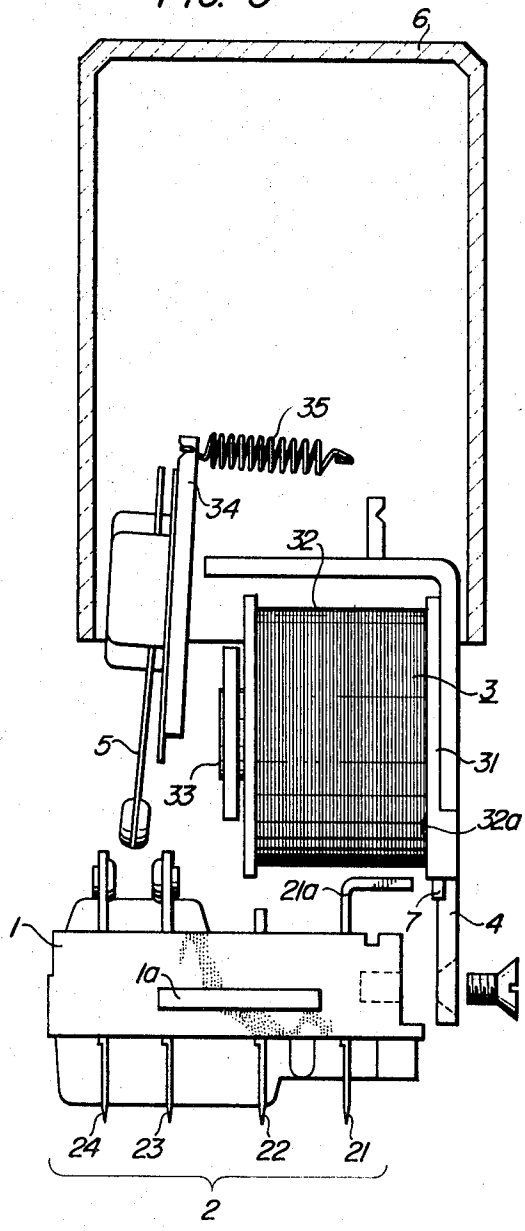


FIG. 4

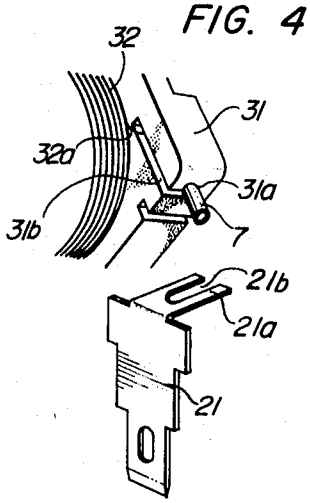
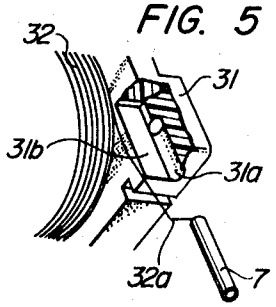


FIG. 5



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ELECTROMAGNETIC RELAY

BACKGROUND OF THE INVENTION

I. Field of the Invention

The present invention relates to an electromagnetic relay and more particularly to such an electromagnetic relay which is so constructed as to facilitate the electrical connection of coil terminals and to simplify the assembling work of the relay.

2. Description of the Prior Art

Electromagnetic relays of this type are generally composed of an electromagnet consisting of a movable core and a fixed core with a coil wound thereon, and a base of an electrically insulating material having a plurality of connecting terminals fixed therethrough, said movable core carrying a movable contact extending into between fixed contacts provided on opening and closing ones of said connecting terminals to open or close the contacts under the action of said electromagnet. All of the above-mentioned elements are usually accommodated in a transparent

In the electromagnetic relays of the type described, the group of connecting terminals is previously fixed in the base, whereas the movable core having the movable contact connected thereto is also previously supported on a supporting frame of the electromagnet in a simple manner of engagement, so that the electromagnetic relay may be assembled simply by the steps of fixing the electromagnet supporting frame to the base, connecting a common terminal of the movable contact and the terminal ends of the coil with the connecting terminals respectively and thereafter enclosing the relay assembly with the transparent casing. Of these steps, the operation of connecting the terminals with each other is most cumbersome and is normally attained by soldering. Supposing it to be true that the soldering operation to connect the common terminal with the connecting terminal is inevitable as a minimum requirement, if it is at all possible to simplify only the operation of soldering the terminal ends of the coil, the assembling work of this type of electromagnetic relay would substantially be simplified.

With reference to the electromagnet portion in particular, a terminal end of the coil is connected by soldering on one end of a terminal member provided adjacent the coil and the other end of said terminal member is used for connection with one of the connecting terminals mounted in the base. Therefore, it is necessary to provide a connecting wire between the terminal member and the connecting terminal, and to connect the opposite ends of said connecting wire to the terminal member and the connecting terminal respectively by soldering. Namely, soldering is required at three places for one terminal end of the coil and at a total of six places for both terminal ends of the coil.

SUMMARY OF THE INVENTION

According to the present invention a soldering operation is required only at one place for connection with one terminal end of the coil or at two places for connection with both terminal ends of the coil, and the rest of the electrical connections can be attained incident to assembly of the electromagnetic relay. Furthermore, a terminal member used for connecting a terminal end of the coil thereto is in the form of a pin so that it can simply be mounted in a coil winding frame, and soldering of the terminal end of the coil to the pin terminal is effected during the manufacture of the electromagnet assembly. After all, the step of soldering the coil terminal end to one of the connecting terminals mounted in the insulating base is eliminated from the assembling operation of the electromagnetic relay and hence the labor required for the assembling operation can substantially be reduced.

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 vertical sectional side view of the electromagnetic relay.

FIG. 3 is an exploded front view of the electromagnetic relay.

FIG. 4 is a perspective view showing the relation between a pin terminal fitted in the coil winding frame and a connecting terminal of the electromagnetic relay.

FIG. 5 is a perspective view showing the relation between the coil winding frame and the pin terminal.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, numeral **1** designates a base of an insulating material having a group of connecting terminals **2** extended therethrough; **3** an electromagnet mounted on a supporting frame **4**; **31** a coil winding frame; **32** a coil; **33** a fixed core; and **34** a movable core supported by one end of the supporting frame **4** and moved toward or away from the fixed core **33** under the biasing force of a spring **35**, said movable core **34** carrying a movable contact **5** connected thereto. Of the group of connecting terminals **2**, numeral **21** designates a connecting terminal for connection with a terminal end of the coil, **22** a common terminal for connection with a root portion of the movable contact **5**, and **23** and **24** a normally opened and a normally closed connecting terminals respectively. Numeral **6** designates a transparent resin casing having formed in the wall adjacent to the open lower end thereof a plurality of holes **6***a*. When the transparent resin casing **6** is mounted on the base **1**, projections **1***a* provided on the sidewalls of said base are received in the holes **6***a* to secure said casing.

In the present invention, a bore **31***a* is drilled vertically from the underside into the end face on each side of the coil winding frame **31**, which end face faces downward when the electromagnet **3** is mounted on the supporting frame **4**. This bore **31***a* opens to the outside not only at the lower end but also at the diametrically opposite portions of the peripheral wall thereof through a slit **31***b* as best shown in FIG. **4**. Numeral **7** designates a pin terminal which can be inserted into the bore **31***a* through the open lower end thereof and has the end of the outgoing wire **32***a* of the coil inserted therein and secured thereto by soldering as shown in FIG. **5**. The pin terminal **7** is inserted into the bore **31***a* of the winding frame **31** from the underside, with a portion thereof extending downwardly of said bore, as shown in FIG. **4**. In this case, the outgoing wire **32***a* of the coil extends within the slit **31***b*.

The connecting terminal **21** extending through the insulating base **1** has its connecting end flexed in an L-shaped configuration to form a horizontal end **21***a*, and a notch **21***b* is formed in said horizontal end **21***a* to hold the pin terminal **7** therein.

Therefore, in assembling the electromagnetic relay according to the present invention, the electromagnet **3** having the outgoing wires **32***a* of the coil previously been connected to the respective pin terminals **7** is mounted on the supporting frame **4** and then the supporting frame **4** is secured to the insulating base **1** from one side thereof. In this case, the lower portion of each pin terminal **7**, projecting downward from the winding frame **31**, is received in the notch **21***b* formed in the horizontal end of the connecting terminal **21**, whereby a circuit connected to the coil is formed. Thereafter, the transparent casing **6** is mounted over the relay and secured thereto by the engagement between the projections **1***a* formed on the sidewalls of the insulating base **1** and the holes **6***a* formed in the wall of said casing adjacent to the lower opening thereof. By this step, the electromagnetic relay is completed.

As described above, according to the present invention connection of the coil circuit is attained during assembly of the electromagnetic relay when the supporting frame **4** is mounted on the base **1** with the electromagnet **3** mounted thereon, only by previously connecting the outgoing wire **32***a* of the coil with the pin **7** during manufacture of the electromagnet **3**. Therefore, the soldering operation as has been necessary heretofore can be eliminated and the assembling of the electromagnetic relay can be accomplished with high efficiency and convenience.

It is to be understood that the pin terminal 7 may be a rod having a hole bored into one end thereof for soldering the outgoing wire 32*a* of the coil therein, or may alternatively be a flat or corrugated sheet material shaped into a tubular configuration for soldering the outgoing wire 32*a* in the axial hollow thereof.

I claim:

1. An electromagnetic relay comprising relay contacts, a magnetic coil adapted to be selectively energized to operate said contacts, said coil comprising an elongated wound conductor having spaced ends, an insulating base, a supporting frame for supporting said coil on said base, said frame having a pair of spaced bores, a pair of pin terminals inserted into said bores respectively, said spaced ends of said coil conductor being connected to said pair of pin terminals respectively at positions within said bores, each of said pin terminals having a portion extending outwardly from its associated bore and projecting outwardly of said frame, a pair of spaced connecting terminals extending through said insulating base, each of said pair of connecting terminals including an interior section extending from one side of said insulating base toward said frame and defining a notch located adjacent one of said outwardly projecting pin terminal portions respectively, said projecting pin terminal portions being seated in said notches in mechanical engagement with the interior sections of said terminals to effect electrical connection between said spaced connecting terminals and said spaced coil ends.

2. The relay of claim 21 wherein each of said interior sections comprises a bifurcated element the bifurcations of which extend transversely to said pin terminals, said notch being defined between the bifurcations of said element.

3. The relay of claim 2 wherein each of said bores comprises an elongated cylindrical recess opening into an end of said frame and adapted to receive one of said pin terminals, and a slot extending laterally from said cylindrical recess through a side of said frame for permitting passage of one of said coil ends through said frame to the pin terminal portion within said cylindrical recess.

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