(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 396 098 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90108259.4**

(51) Int. Cl.5: **H01H 49/00, H01H 50/02**

(22) Date of filing: **30.04.90**

(30) Priority: **02.05.89 JP 113226/89**

(43) Date of publication of application:
07.11.90 Bulletin 90/45

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI NL SE

(71) Applicant: **OMRON CORPORATION**
10, Tsuchido-cho Hanazono Ukyo-ku
Kyoto 616(JP)

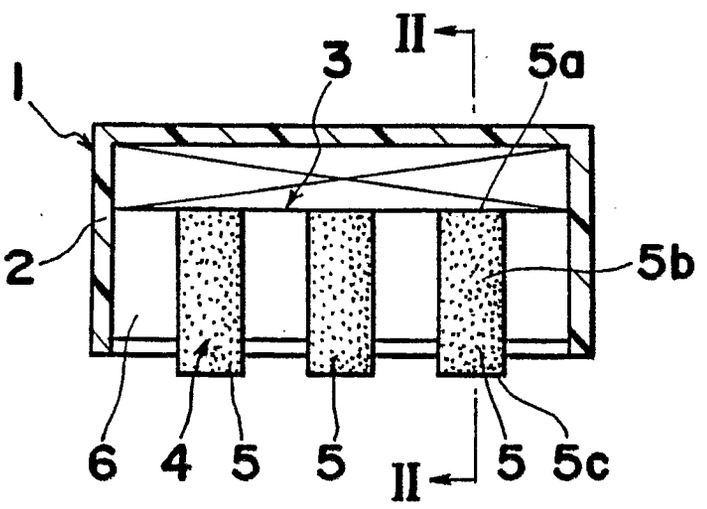
(72) Inventor: **Kawashima, Katsumi**
687, Kawanami, Gokasho-cho
Kanzaki-gun, Shiga-Ken(JP)

(74) Representative: **WILHELMS, KILIAN &**
PARTNER Patentanwälte
Eduard-Schmid-Strasse 2
D-8000 München 90(DE)

(54) Method of manufacturing base of electromagnetic relay.

(57) A method of manufacturing a base (3) of an electromagnetic relay, comprising the steps of: treating a surface of a resinous molded item (4) to a state enabling plating on the surface of the resinous molded item (4) such that the resinous molded item (4) has an upper terminal portion (5a), a lower terminal portion (5c) and a side terminal portion (5b) connecting the upper terminal portion (5a) and the lower terminal portion (5c); molding integrally with the resinous molded item (4), resin disabling platirlg thereon such that at least surfaces of the upper terminal portion (5a), the lower terminal portion (5c) and the side terminal portion (5b) are exposed outwardly; and plating an electrically conductive film on only the surfaces of the upper terminal portion (5a), the lower terminal portion (5c) and the side terminal portion (5b).

Fig. 1



EP 0 396 098 A2

METHOD OF MANUFACTURING BASE OF ELECTROMAGNETIC RELAY

BACKGROUND OF THE INVENTION

The present invention relates to a method of manufacturing a base of an electromagnetic relay.

Conventionally, when a plurality of terminals are attached to a base of an electromagnetic relay to be mounted on a printed circuit board or the like, the terminals are press fitted into holes formed on the base or are integrally molded with the base so as to be fixed to the base.

However, in the known electromagnetic relay, it is necessary to secure space for operating a jig for press fitting the terminals into the holes of the base or holding the terminals to be molded integrally with the base, which hinders reduction of distance between the terminals. Especially, as construction of the base or arrangement of the terminals is further complicated, it becomes more difficult to reduce the distance between the terminals.

Meanwhile, in the case where the terminals are press fitted into the holes of the base, contact portions between the terminals and the base are sealed by sealing compound. However, when the terminals are connected to the base by soldering, heat of molten solder is transferred to the terminals so as to fuse the sealing compound around the terminals, so that the terminals are not supported in the holes by the sealing compound and thus, the terminals laterally deviate in the holes from their predetermined positions, thereby resulting in disruption of sealing of the sealing compound.

SUMMARY OF THE INVENTION

Accordingly, an essential object of the present invention is to provide, with a view to eliminating the above mentioned disadvantages inherent in the conventional electromagnetic relays, a method of manufacturing a base of an electromagnetic relay.

In order to accomplish this object of the present invention, a method of manufacturing a base of an electromagnetic relay, embodying the present invention comprises the step of: treating a surface of a resinous molded item to a state enabling plating on the surface of the resinous molded item such that the resinous molded item has an upper terminal portion, a lower terminal portion and a side terminal portion connecting the upper terminal portion and the lower terminal portion; molding integrally with the resinous molded item, resin disabling plating thereon such that at least surfaces of the upper terminal portion, the lower terminal portion and the side terminal portion are exposed outwardly; and plating an electrically conductive film on only the surfaces of the upper terminal portion, the lower terminal portion and the side terminal portion.

In the thus obtained base, since electric parts mounted on the upper portion of the base are electrically connected to the upper terminal portion and the lower terminal portion is electrically connected to a connecting portion of a substrate, etc., whereby the electric parts are electrically connected to the connecting portion of the substrate, etc. by the side terminal portion.

BRIEF DESCRIPTION OF THE DRAWINGS

This object and features of the present invention will become apparent from the following description taken in conjunction with the preferred embodiments thereof with reference to the accompanying drawings, in which:

Figs. 1 and 2 are schematic sectional views of an electromagnetic relay manufactured by a method according to a first embodiment of the present invention, which are taken along the line I-I in Fig. 2 and the line II-II in Fig. 1, respectively;

Fig. 3 is a fragmentary top plan view of an electromagnetic relay manufactured by a method according to a second embodiment of the present invention;

Fig. 4 is a front elevational view of the electromagnetic relay of Fig. 3;

Fig. 5 is a fragmentary left side elevational view of the electromagnetic relay of Fig. 3; and

Fig. 6 is a fragmentary bottom plan view of the electromagnetic relay of Fig. 3.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, there is shown in Figs. 1 and 2, an outer member 1 of an electromagnetic relay manufactured by a method according to a first embodiment of the present invention. The outer member 1 is constituted by a cover 2 and a base 3. The cover 2 is made of electrically nonconductive resin. Meanwhile, the base 3 is constituted by a terminal frame 4 and a base body 6. The terminal frame 4 includes a plurality of terminal supports 5 which are integrally coupled with each other. In order to obtain the terminal frame 4, liquid crystal polymer having excellent plating characteristics, for example, "VECTRA C810" (name used in trade and manufactured by POLY PLASTICS CO, LTD of Japan) is integrally molded in a mold.

Then, a molded item taken out of the mold is subjected to various treatment processes such as degreasing by degreaser of surface-active agent, etching by aqueous solution of potassium hydroxide, catalytic treatment by palladium series colloidal catalyst, etc., whereby it becomes possible to plate on surface of the molded item.

Subsequently, in order to obtain the base body 6, resin having ordinary heat resistance and disabling plating thereon, for example, "VECTRA C130" (name used in trade and manufactured by POLY PLASTICS CO, LTD of Japan) is molded integrally with the surface treated terminal frame 4 so as to form the base body 6 integrally with the terminal frame 4. This integral molding is performed such that only an upper face 5a, an outer side face 5b and a lower face 5c of each of the terminal supports 5 are exposed outwardly.

Thereafter, the terminal frame 4 having the base body 6 attached thereto is dipped in electroless copper plating solution such that an electrically conductive film is formed only on the exposed upper face 5a, outer side face 5b and lower face 5c of each of the terminal supports 5. Thus, the electrically conductive film formed on the upper face 5a, the outer side face 5b and the lower face 5c of each of the terminal supports acts as a terminal.

Then, inner electric parts of the electromagnetic relay are disposed at predetermined positions of the base body 6 and electric connectors such as an electromagnetic coil, a contact member, etc. are electrically connected to the electrically conductive film on the upper face 5a.

Meanwhile, the base 3 having the inner electric parts mounted thereon is covered by the cover 2 and contact portions between the base 3 and the cover 2 are sealed by sealing compound (not shown) such that inner space of the cover 2 is filled with the sealing compound.

Subsequently, the electromagnetic relay is placed on a substrate and the electrically conductive film on the lower face 5c of the base 3 is connected to electric connectors on the substrate by using electrically conductive bonding agent or by soldering. In the case of soldering, even if heat of molten solder is transferred to the electrically conductive film so as to fuse the sealing compound held in contact with the electrically conductive film, the cover 2 and the base 3 are held immovably through contact of the base body 6 of the base 3 with the cover 2 and thus, sealing of the sealing compound is not disrupted.

Figs. 3 to 6 show an electromagnetic relay manufactured by a method according to a second embodiment of the present invention. The electromagnetic relay includes a base 13, a terminal frame 14 and a plurality of terminal supports 15 each having an upper face 15a, an outer side face 15b and a lower face 15c and a base body 16. In the base 13, a recess 17 is formed on the upper face 15a. A connecting portion of an inner electric part is press fitted into the recess 17 so as to be electrically connected to the electrically conductive film on the upper face 15a. Since other constructions of the electromagnetic relay of Figs. 3 to 6 are similar to those of the electromagnetic relay of Figs. 1 and 2, description thereof is abbreviated for the sake of brevity.

As is clear from the foregoing description, in the method of manufacturing the base of the electromagnetic relay, according to the present invention, electrical connection between the inner electric parts and outer electric parts is performed through the electrical conductive film provided integrally with the base. Accordingly, in accordance with the present invention, terminal members are not required to be press fitted into the base or insert molded integrally with the base. Consequently, the terminal members are not required to be formed, thereby resulting in improvement of consistency of quality of the electromagnetic relay.

Meanwhile, in accordance with the present invention, since a jig for press fitting the terminals into the base or holding the terminals to be molded integrally with the base is not required to be used, space for operating the jig is not required to be secured and thus, the electromagnetic relay can be made compact in size.

Furthermore, in accordance with the present invention, since such a phenomenon can be prevented that the terminals are displaced by soldering or sealing of the inner space of the electromagnetic relay is not disrupted by soldering, the sealed electromagnetic relay can preserve satisfactory performance for a long period.

Although the present invention has been fully described by way of example with reference to the accompanying drawings, it is to be noted here that various changes and modifications will be apparent to those skilled in the art. Therefore, unless otherwise such changes and modifications depart from the scope of the present invention, they should be construed as being included therein.

Claims

1. A method of manufacturing a base (3) of an electromagnetic relay, comprising the steps of:
treating a surface of a resinous molded item (4) to a state enabling plating on the surface of said resinous molded item (4) such that said resinous molded item (4) has an upper terminal portion (5a), a lower terminal portion (5c) and a side terminal portion (5b) connecting said upper terminal portion

(5a) and said lower terminal portion (5c);
molding integrally with said resinous molded item (4), resin disabling plating thereon such that at least surfaces of said upper terminal portion (5a), said lower terminal portion (5c) and said side terminal portion (5b) are exposed outwardly; and
plating an electrically conductive film on only the surfaces of said upper terminal portion (5a), said lower terminal portion (5c) and said side terminal portion (5b).

2. A method as claimed in Claim 1, further comprising the step of forming a recess (17) on said upper terminal portion (15a).

Fig. 1

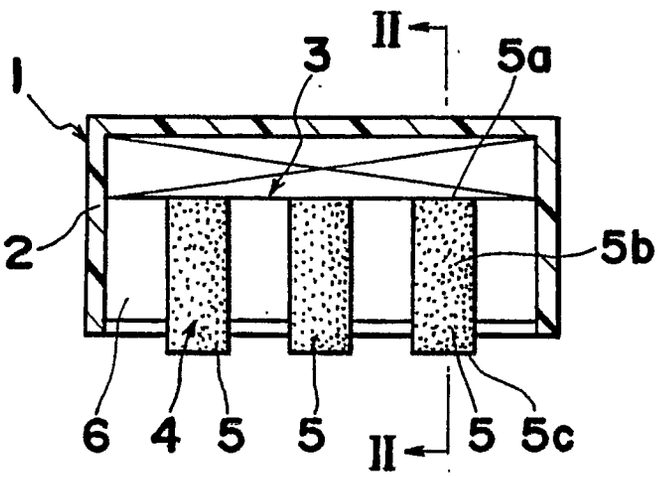


Fig. 2

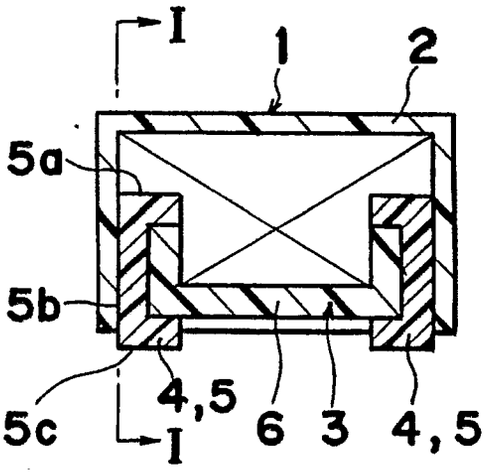


Fig. 3

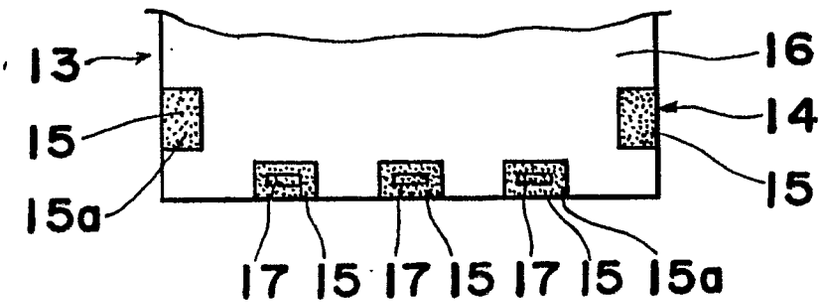


Fig. 5

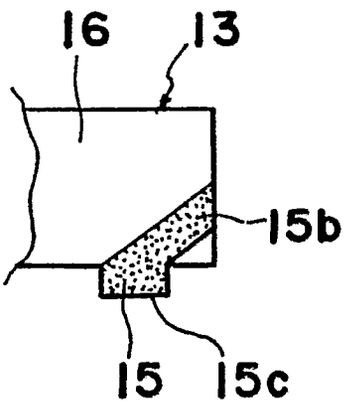


Fig. 4

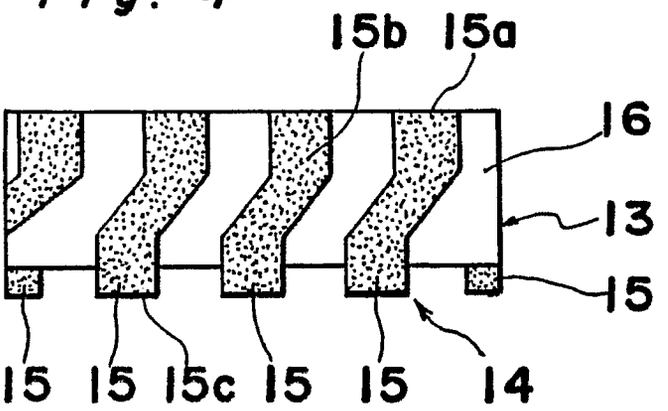


Fig. 6