SWITCH HAVING INSULATING BASES DEFINING SEPARATE COMPARTMENTS FOR MOUNTING A CONTACT CARRYING BRACKET

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This invention relates to electro magnetic devices and particularly to the construction of contact supporting brackets and contacts for relays suitable for general industrial use. Broadly stated, the objects of the invention are to provide a relay having long life, high switching capacity and acceptable manufacturing cost, and of such dimensions and characteristics as to be interchangeable with the largest number of competitive relays intended for use under comparable conditions.

A more specific and very important object of the present invention is to eliminate as far as possible the interconnecting wiring in the relay. Much of the available space inside the relay envelope has, in prior constructions, been occupied by wiring between the terminals of the relay proper and its base or plug-in termination. The wiring which has heretofore required, aside from being space-consuming, is costly, and many solder points are required which are a constant source of trouble, possible breakdown and increased resistance. In the construction of the present invention most of the internal wiring and soldered joints are eliminated. It has thus been possible to utilize the available space in the relay envelope so that, without enlarging over-all dimensions, it has been possible to lengthen the flexible members of the switches, thus permitting a larger cross section for a given spring characteristic. This has made possible reduction of the total contact resistance of the relay, terminal to terminal. This decrease in resistance is in addition to that secured by the elimination of many of the soldered joints required in previous constructions.

An important feature of construction which is preferably embodied in the structure of the present invention is the formation of various parts so as to include within the parts themselves fastening means by which the parts may be assembled. These formations cooperate with formations on other parts and particularly with spring clips by which the parts may be secured. The use of welding or soldering in joining parts is minimized and conventional fastening means such as screws, bolts or rivets are wholly or largely eliminated. Valuable space is thus saved, the expense and nuisance of handling many small parts is reduced and the danger of screws and nuts becoming loosened during use is avoided.

Other objects and advantages of the invention will appear in the course of the following description of a preferred embodiment thereof. One such preferred embodiment is illustrated in the accompanying drawings. These drawings show a double pole double throw electromagnetic relay which may be provided in forms for either A.C. or D.C. operation. Many features of the invention are obviously applicable to other forms of relay and some of the features are useful in connection with other types of electro magnetic or switching apparatus. The applicability of the various inventive features disclosed is therefore not to be taken as limited to the particular type of relay illustrated.

In the drawings:

FIG. 1 is a top plan view of the pin base of the relay; FIGS. 2, 3 and 4 are transverse sections of the pin base taken on lines 2—2, 3—3, and 4—4, respectively, of FIG. 1;

FIG. 5 is a plan view of the terminal pin base with the relay base assembled thereon, and having contact brackets carrying their contact elements constructed in accordance with the invention;

FIG. 6 is a vertical section on line 6—6 of FIG. 5 showing the relay base mounted on the pin base;

FIGS. 7 to 10 are plan views of the contact brackets which are also to be mounted on the pin base and FIG. 11 is a side elevation of a terminal pin for attachment to a contact bracket or terminal bracket, partly broken away.

Referring to the drawings in detail, the illustrated embodiment of the invention is a double pole, double throw relay. The relay embodies a base 50 of insulating material carrying terminal pins 52, 52a and 52b and intended to fit in a conventional socket (not shown). Mounted on the base are a pair of normally open contacts 54 and normally closed contacts 56. These are engaged alternately by movable contacts 58 carried on contact springs 60.

A novel construction of base is provided in which soldered connections are eliminated and also the use of screws and bolts.

The base is made in two pieces of insulating material such as thermo-setting phenolic plastic. The lower of these pieces, 70, comprises a pin base from which the terminals 52, 52a, and 52b project, while the upper piece 72 may be termed the relay base. The pin base is shown as having a guide pin 71 molded integral therewith. On the pin base are mounted the brackets 74 carrying upwardly projecting arms 76 to which are fixed the movable contact springs 60. Also carried by the pin base are the brackets 78 carrying the normally closed contacts 56. The brackets 78 are separated from the brackets 74 by pieces of insulating material 82 (FIG. 6). Mounted on the relay base are brackets 84 carrying the normally open contacts 54. The pin base has a flange or shoulder portion 86 in which lugs 88 on the relay base fit. The pin base 70 and the relay base 72 and brackets 84 are all permanently clamped together by certain of the terminal pins 52, which are provided midway their length with flanges 90 fitting in sockets 92 in the bottom of the pin base and which have shank portions 94 extending through holes in the pin base 70 and up through matching holes in the relay base 72. The upper ends of the shanks are spun or flanged over as indicated at 96. The relay base is narrower than the pin base terminating at the line 98 (FIG. 5) so as to leave a space through which project upwardly the spring-carrying bracket portions 76 and the contact-carrying portions 78 which carry the contacts 56. The brackets 76 are clamped against the insulating pieces 82 which on the bracket 74, these parts being held in firm contact by pins 52a, the shanks 94a of which are shorter than the shanks 94 of pins 52.

The shanks of the terminal pins are of such diameter in relation to the sizes of the holes in the respective terminal brackets mounted thereon that the shanks have to be forced through the holes with substantial pressure. The force fit thus obtained insures good electrical contact without soldering. The shank diameter should be sufficiently larger than the hole diameter to result in substantial stressing of the metal so that a tight contact is maintained under all temperature conditions to which the instrument will be subjected.

The pin base, in addition to having the marginal flange 86, has a central partition wall 100 terminating at its front end in a lug 102, the flange and lug being slightly higher than the marginal flange 86. Also projecting upward
3. from the pin base are cylindrical projections 103 which have tapered sockets 104 therein communicating with holes 106. Hollow pins 52b having flanges 108 are mounted in these holes. The relay base fits on top of the pin base as above described and it has a groove in its lower face which receives the upper edge of the partition 100 so as to seal off the spaces between the bases in which the two contact systems are mounted. The relay base also has two large holes in which the upper edges of the projections 103 are received.

The contact springs 60 are of inverted U shape having legs 126 which are fixed to the arms 76 of the brackets 74. The arms 76 are shown as provided with holes 128 which receive outwardly bent lugs 130 on the lower ends of the spring legs 126. The arms 76 also have tongues 132 (FIGS. 6, 9 and 10) bent inwardly near their upper ends and the spring legs 126 have tongues 134 (FIG. 6) bent outwardly so as to slide behind the tongues 132. The springs are thus held firmly by slipping the tongues 134 into position and the lugs 130 into the holes 128. The long outer legs 136 of the contact springs have fixed to their ends the movable contacts 58.

In devices of the lower ratings where current values are not too great, the mounting of the contact springs by means of the lugs and tongues described, forms a low resistance connection so that no other fastening means between the springs and the arms 76 of the brackets is required. This is advantageous because the assembly is very quickly effected without the use of any special tools and also the contact springs may be readily detached from the brackets for adjustment or replacement. Where high currents are involved, it may be desirable to weld or solder the springs to the brackets. In this case, the lug and tongue connections described facilitate the welding and soldering by holding the springs in proper position during such operations.

The base section comprising the pin base, relay base, pins carried thereby which also secure the base parts together, the fixed contact brackets and movable contact brackets and springs carried thereby, constitute a complete sub-assembly (FIG. 6) which may be put together by spinning over the ends of the pins as above described (and by welding the contact springs to their brackets, where this is needed).

While but one specific embodiment of this invention has been shown and described in detail, it will be understood that many variations may be made in the construction and that many features of the invention are capable of being used without others in different types of devices. It is desired, therefore, to cover the invention in whatever form its principles may be embodied.

I claim:

1. An electro-magnetic switch device, a base of insulating material, a metal contact pin carried by said base having a shank passing through a hole in the base, a metal contact carrying bracket mounted on the base and said bracket having a substantially straight flat wall with a hole through which said pin shank extends, said pin shank being slightly larger in diameter than the hole of said straight flat wall and being forced through said hole without bending said wall so that the metal surrounding said shank is elastically stressed whereby good electrical contact without soldering is secured between said pin shank and said bracket which is maintained through a substantial temperature range.

2. In double pole electrical switch construction, super-imposed first and second bases of insulating material and pairs of electrical contacts mounted between said bases, said first and second bases being formed to provide separate first and second compartments separated by portions of the insulated material of one of said bases, said first compartment receiving brackets for one set of switch poles which are disposed solely within said first compartment, said second compartment receiving brackets for the other set of switch poles, said first base separating said first and second compartments, whereby short circuiting between the respective switch assemblies is prevented.

3. In double pole electrical switch construction, super-imposed first and second bases of insulating material and pairs of electrical contacts mounted between said bases, said first and second bases being formed to provide separate first and second compartments separated by portions of the insulated material of one of said bases, said first compartment receiving brackets for one set of switch poles which are disposed solely within said first compartment, said second compartment receiving brackets for the other set of switch poles, said first base separating said first and second compartments whereby short circuiting between the respective switch assemblies is prevented, and a metal contact pin for each bracket extending through said bases and through respective brackets and being electrically connected to respective ones of said brackets.

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