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Altmann

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[54] **MULTI-CONTACT TERMINAL SUPPORT ASSEMBLY FOR AN ELECTROMAGNETIC RELAY**

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[52] **U.S. Cl.** **335/134,** 335/129

[51] **Int. Cl.** **H01h 63/02**

[58] **Field of Search** ..... 335/134, 135, 112, 335/106, 107, 108, 109, 110, 111, 113, 114, 115, 116, 117, 162, 129, 202; 200/166 J; 317/122

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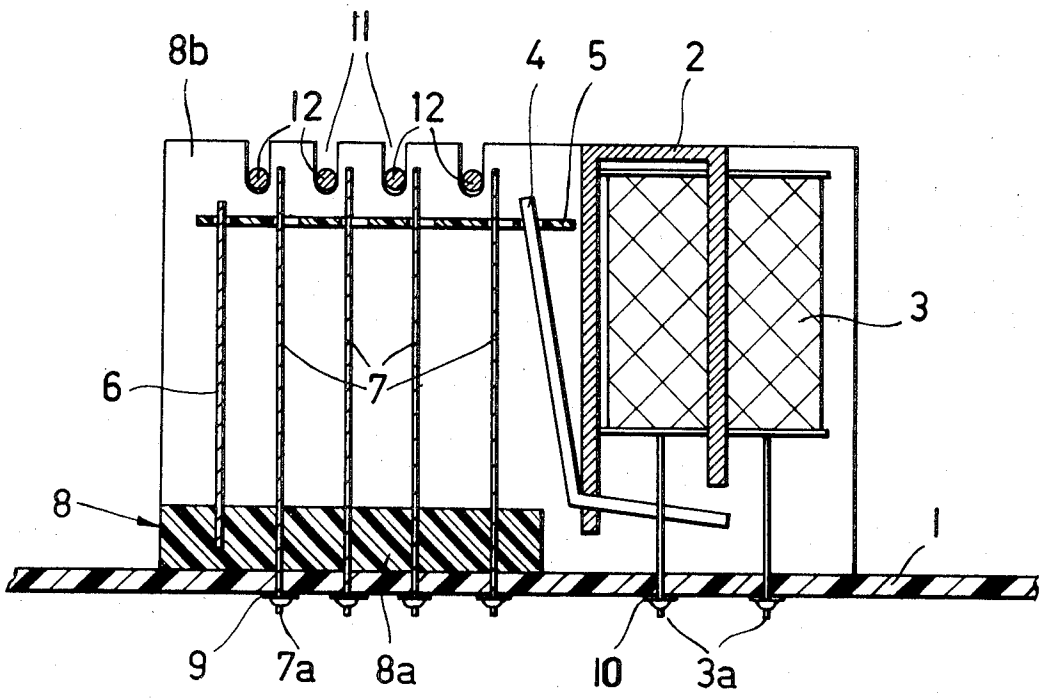
[57] **ABSTRACT**

Disclosed is a switching assembly including a plurality of relay elements arranged on a printed circuit board. Each relay element has a plurality of movable contacts with anchored ends projecting through the circuit board, and an array of parallel wires supported between the movable contacts to form fixed contacts of the relay element. The free ends of the wires are bent towards and projecting through the circuit board to be soldered together with the projecting ends of the movable contacts, to assigned strip conductors of the printed circuit.

7 Claims, 3 Drawing Figures



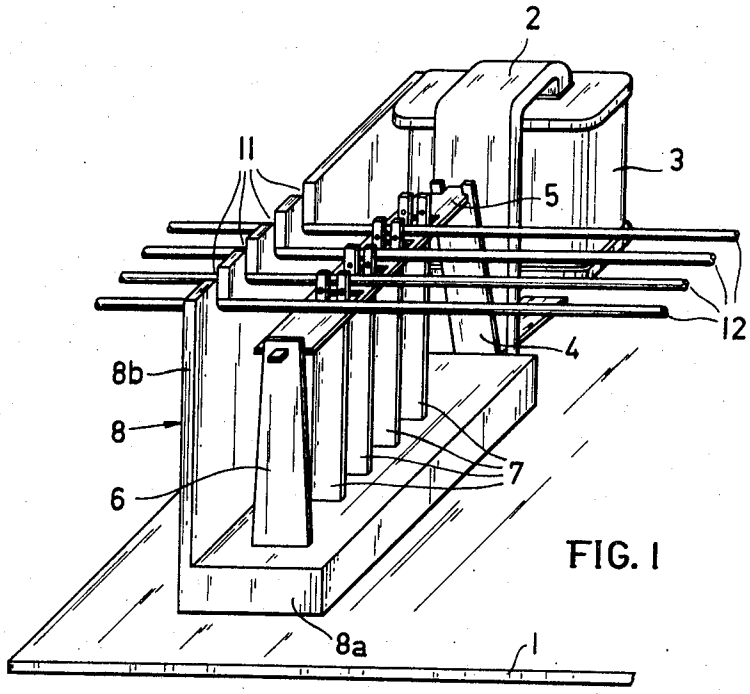
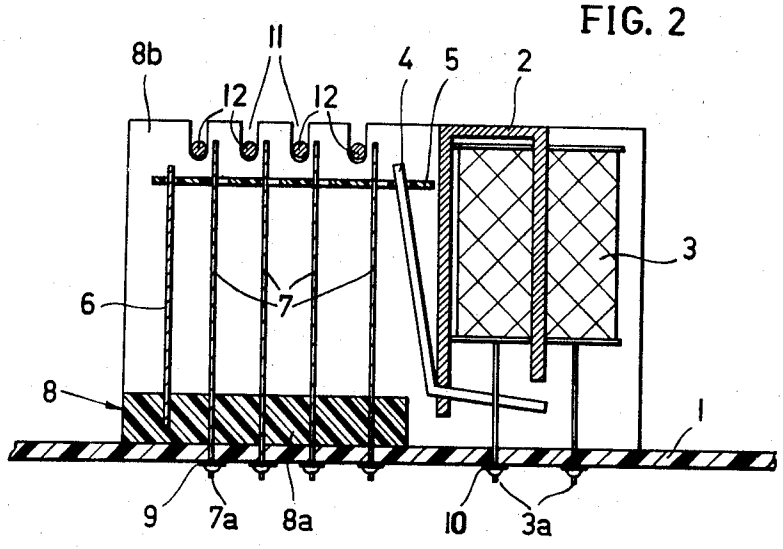


FIG. 1

FIG. 2



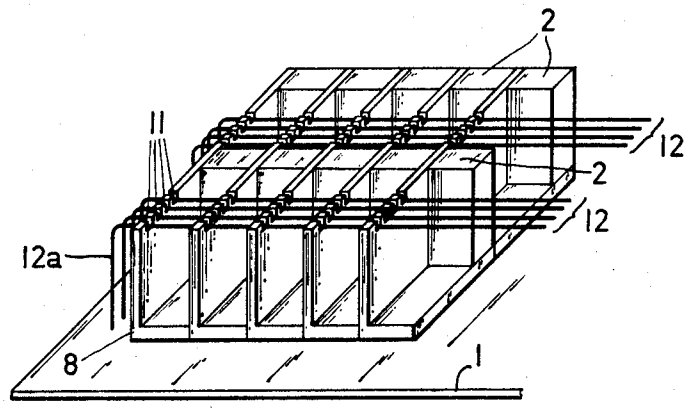


FIG. 3

MULTI-CONTACT TERMINAL SUPPORT ASSEMBLY FOR AN ELECTROMAGNETIC RELAY

This invention relates to a multi-contact terminal support assembly for an electromagnetic relay. In particular the assembly may form part of a coupling panel on a printed circuit board. Coupling panels are used, for example, in telephone technology for interconnecting voice paths and control paths.

In one known coupling panel each set of contacts is actuated by an individual relay. These relays are known to be effective and reliable. After each relay has been mounted on the printed circuit board its contact terminals, including the coil terminals, are connected to the printed circuit conductors on the printed circuit board. One alternative construction uses a co-ordinate system with multiple switches known as "mini-switches." These devices have movable wire contacts permanently bonded to the printed circuit conductors. Fixed contacts are in the form of an array of conductor wires, which are also connected to the printed circuit conductors. Interconnections are obtained by means of transverse, relay actuated co-ordinate system selector bars which selectively engage the movable contacts with the conductor wires of the array.

If individual relays are used, each relay must have all the necessary fixed and movable contacts, each of which must be individually bonded to the printed circuit board. This involves the use of comparatively costly relays, which consume a great deal of space. The wiring process is tedious and time consuming.

The use of mini-switches has the advantage that only the movable contacts need to be bonded individually to the printed circuit. Each conductor in the array of fixed conductor wires will be common to each of the switches in a row and it is therefore only necessary to bond each conductor to the printed circuit. However the mini-switches have the disadvantage that the selection of each individual coupling contact requires two selection processes. This involves movements of comparatively large masses, that is to say the co-ordinate system selector bars themselves together with all the engaged contacts. Consequently the switching is relatively slow. A further disadvantage of the mini-switches is that each mini-switch is constructed for a coupling panel of the specified size. It is not possible to adapt the size of the coupling panel to suit varying requirements.

In accordance with the present invention a multi-contact terminal support assembly for an electromagnetic relay includes an insulating support bracket having a pair of substantially perpendicular arms, a plurality of resiliently movable contacts anchored in a first arm of the bracket with the anchored end projecting through the bracket such that the movable contact terminals are formed beneath the bracket, the second arm of the bracket including a series of notches along its outer edge so arranged that an array of parallel conductors may be supported in the said notches to form fixed contacts for each of the said resiliently movable contacts. In an electromagnetic relay embodying the invention, the movable contacts are linked by an actuator responsive to energization of the relay coil to bring the movable contacts into engagement with the array of parallel conductors when the conductors are supported in the notches.

To construct a coupling panel of any desired size the required number of support brackets are placed side by side on a printed circuit board with the second arm substantially perpendicular to the plane of the board, and the array of conductor wires is then extended over and along the resulting row of brackets. The necessary connections to the printed circuit conductors are then made by soldering the contact terminals to the printed circuit conductors. Preferably the ends of the movable contacts projecting through the first arm of the bracket also project through the printed circuit board before being soldered on the other side of the board to the strip conductors of the printed circuit. Each wire in the array of conductor wires will be common to all the sets of contacts in a complete row so that the fixed contacts need not be individually soldered to the printed circuit board.

Several rows of the support brackets may be mounted parallel to each other so that the movable resilient contacts may be connected together in lines by strip conductors printed on the printed circuit board.

One example will now be described with reference to the accompanying drawings in which:

FIG. 1 is a three-dimensional view of an electromagnetic relay.

FIG. 2 is a longitudinal section through the relay shown in FIG. 1.

FIG. 3 shows diagrammatically a part of a coupling panel, showing two rows of relays mounted parallel to each other on a printed-circuit board.

The relay shown in FIG. 1 and 2 is mounted on a printed-circuit board **1.** The relay consists of a magnet **2,** with a relay coil **3** and a relay armature **4,** the armature acting on an actuator bar **5** which itself actuates a number of spring contacts **7.** The other end of the actuator bar **5** is acted on by a return spring **6.** The entire magnet system is mounted on an insulating L-shaped bracket **8** having a horizontal base **8a** which rests in contact with the printed circuit board **1.** The ends of the spring contacts **7** penetrate through the base **8***a* and have solder contact terminals **7***a* projecting from the lower surface of the printed circuit board **1,** where they are soldered to strip conductors **9** of the printed-circuit. Similarly, the terminal ends **3***a* of the relay coil **3** project below the printed-circuit board **1,** where they are soldered to the strip conductors **10** which carry the energizing current for the relay coil **3.**

The vertical support **8***b* of the L-shaped bracket **8** has a number of notches **11** in its upper edge for supporting an array of conductor wires **12** which act as fixed counter contacts for the spring contacts **7.**

When the relay is de-energized, the spring contacts **7** are held by the return spring **6** away from the array of conductor wires **12,** that is to say the multiple contacts are all held open. As soon as current flows through the relay coil **3** the relay armature **4** rotates, closing the air gap between the armature and the magnet and pushing the actuator bar **5** against the influence of the return spring **6,** so that all the spring contacts **7** are brought into contact with the array of conductor wires **12.**

In the coupling panel illustrated in FIG. 3 several rows of relays are mounted on a printed-circuit board **1.** The contact terminals of the spring contacts and the terminal leads of the relay coils project downwards through the printed-circuit board (as shown in FIG. 2) and are soldered to the strip conductors of the printed-circuit. The several arrays of stationary conductor wires **12** rest in the notches **11** in the upper edges of the vertical supports **8***b* of the L-shaped brackets, the

notches 11 being in line with each other so that the conductor wires 12 form parallel straight lines. The ends 12*a* of the conductor wires 12 are bent downwards and penetrate through the printed-circuit board 1. Each end is then soldered to the appropriate printed strip conductor of the printed circuit. Assuming that there are several parallel rows of relays the spring contacts are conveniently connected together in lines by printed strip conductors. The printed circuit board is preferably doubly printed.

I claim:

1. A coupling panel comprising:

a plurality of insulating support brackets placed side by side on a printed circuit board, each bracket having a pair of substantially perpendicular arms, a first of the said arms of each bracket resting on the printed circuit board

a plurality of resiliently movable contacts anchored in each of said first arms with the anchored ends projecting through said arm and through said printed circuit board and being bonded to strip conductors of the printed circuit,

the second arm of each bracket including a series of notches along its outer edge, an array of parallel conductors supported in the said notches to form fixed contacts for each of the said resiliently movable contacts, and having free ends thereof directed to and projecting through said printed circuit board and being bonded to strip conductors of the printed circuit.

2. A coupling panel according to claim 1 including several parallel rows of the said brackets, the movable contacts of adjacent brackets in different rows being arranged in line with one another such that the movable contact terminals may be interconnected by transverse rows of strip conductors on the printed circuit board.

3. A multi-contact switching assembly

comprising in combination,

a board including a printed electric circuit,

at least one electromagnetic relay element including

an insulating support including two angularly off-set interconnected arms one of said arms resting on said printed circuit board,

a plurality of resiliently movable contacts each having an end portion anchored in said one arm, the ends of said anchored end portions projecting through said one arm and through said board forming a corresponding plurality of contact terminals below said board,

an array of conductors,

the other arm including supporting means operable to support said conductors substantially parallel and spaced above said board,

said conductors forming fixed contacts engageable with respective of said resiliently movable contacts and including ends projecting through said board forming a corresponding array of contact terminals below said board,

said contact terminals being electrically interconnected to said printed circuit.

4. The assembly according to claim 3, wherein said supporting means is a series of notches arranged along the outer edge of said second arm.

5. A switching assembly according to claim 4 further comprising; an electromagnetic relay coil supported on said bracket, the terminals of the relay coil projecting through said first arm in line with said movable contact terminals,

an actuator linking said movable contacts, the actuator being linked to the armature of the said relay such that, with the array of conductors supported in the said notches, the movable contacts engage a respective conductor in response to energization of the relay coil.

6. A coupling device including a row of electromagnetic relay elements and a printed circuit board,

comprising in combination, insulating mounting members resting on said printed circuit board, each of said mounting members supporting all active parts of a relay element such as a relay coil, a relay armature, movable contacts with their actuator bars and biasing means, said active parts including electrical terminals projecting through said mounting member and through said printed circuit board and being bonded to assigned printed conductors of said printed circuit board,

insulating angular arms associated with respective mounting members and each extending at sides of individual relay elements,

a series of recesses defined in an edge portion of each angular arm, said recesses in one relay element being in alignment with corresponding recesses in the remaining relay elements in said row,

an array of transverse wires inserted into said recesses, respectively, the intermediate portion of each wire forming thereby fixed contacts for said movable contacts in respective relay elements and the free end portions of said wires being directed to and projecting through said printed circuit board and being bonded to assigned printed conductors on said board.

7. The coupling device according to claim 6, wherein several rows of said electromagnetic relay elements are arranged parallel to one another on said printed circuit board, whereby electrical terminals of corresponding movable contacts in respective rows are connected by linear printed conductors on said printed circuit board.

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