

[54] **MATRIX-MOUNTING FRAME FOR
MULTI-CONTACT ELECTRICAL
COMPONENTS**

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[57] **ABSTRACT**

A molded frame assembly for mounting a matrix of electrical components, such as miniature multicontact relays. The frame assembly has an upper and lower section, each with central and peripheral socket portions between which the relays and the terminal assemblies for these relays are clamped, respectively. Provisions are made so that relays can be individually removed from the frame assembly by merely loosening the screws which hold the two sections together and laterally displacing the corresponding individual relay retaining members. Each of the various terminal assemblies which are disposed along the edges of the frame assembly has a pair of molded, axially aligned, cooperating terminal-receiving members with inner shoulders engaging opposite shoulders formed on the terminals, and with outer shoulders engaged, in turn, by the above peripheral socket portions in the upper and lower sections, respectively of the frame assembly. The use of terminal receiving members separate from the mounting frame reduces the precision that would otherwise be required of the mounting frame and lowers the capital cost of the molding equipment.

2 Claims, 4 Drawing Figures

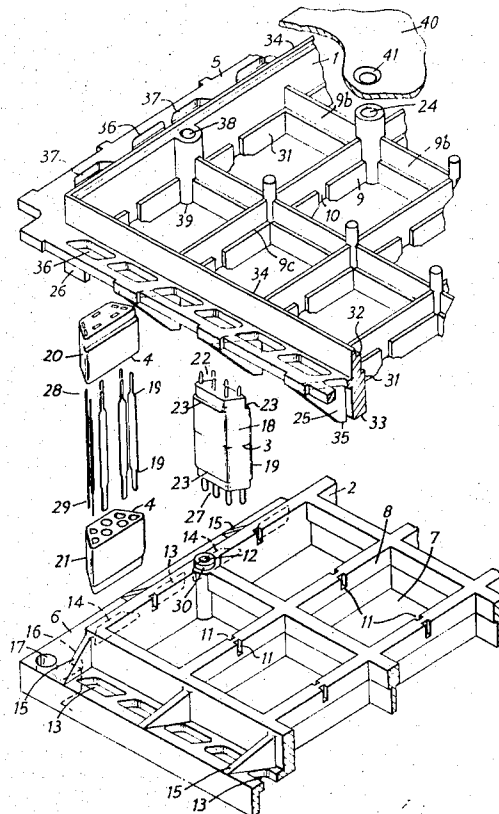
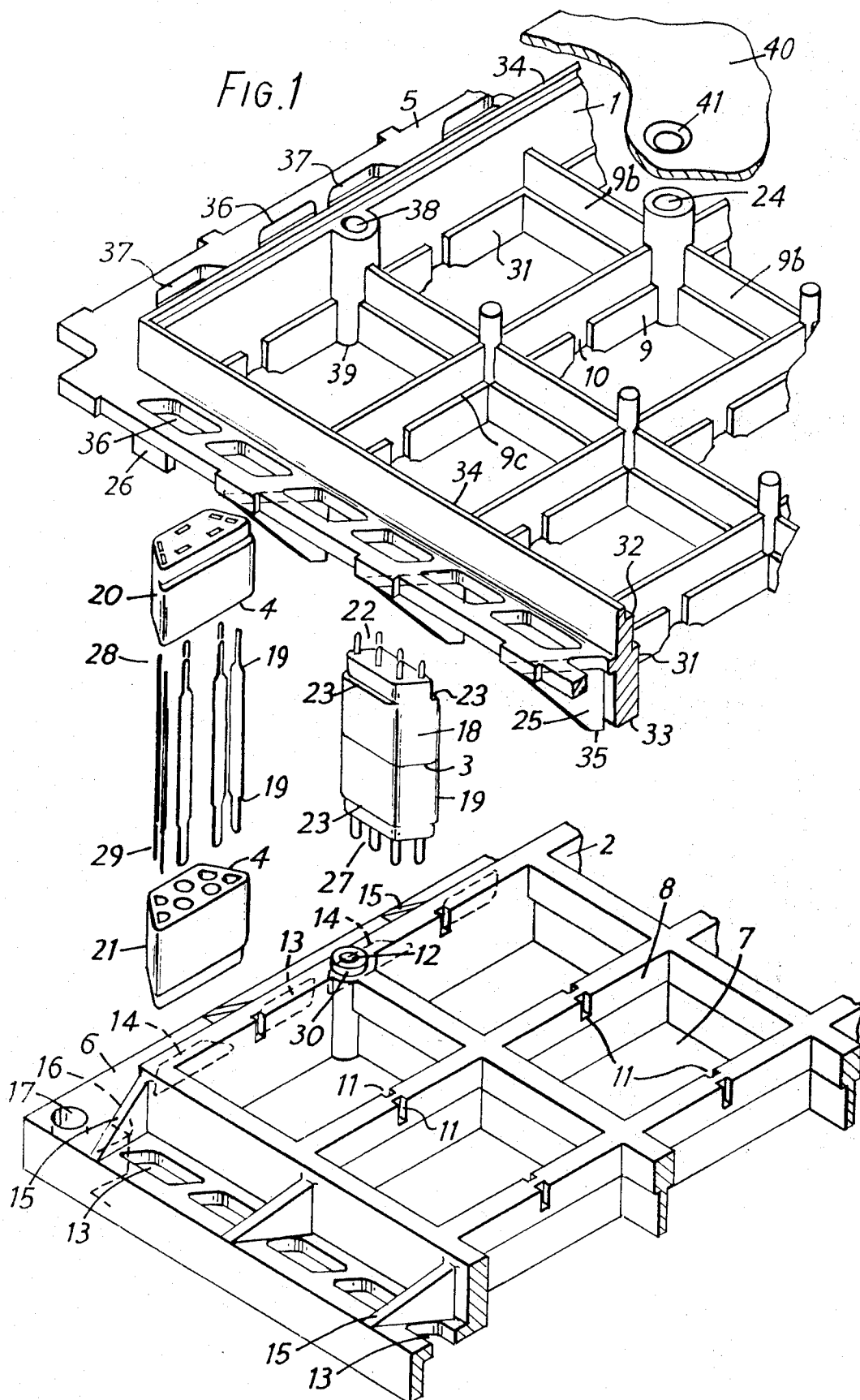
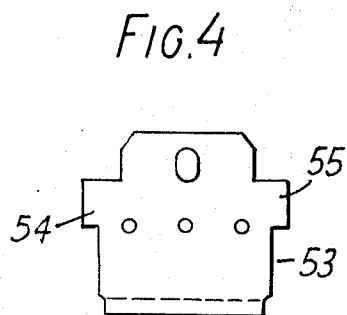
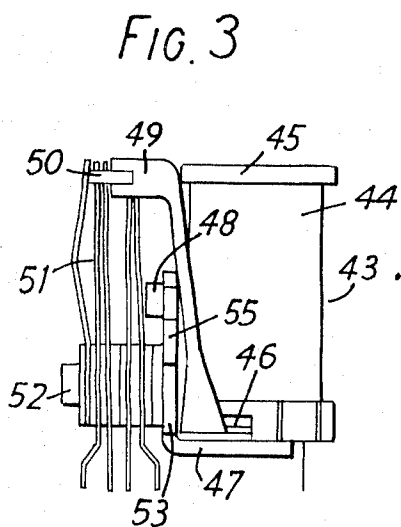
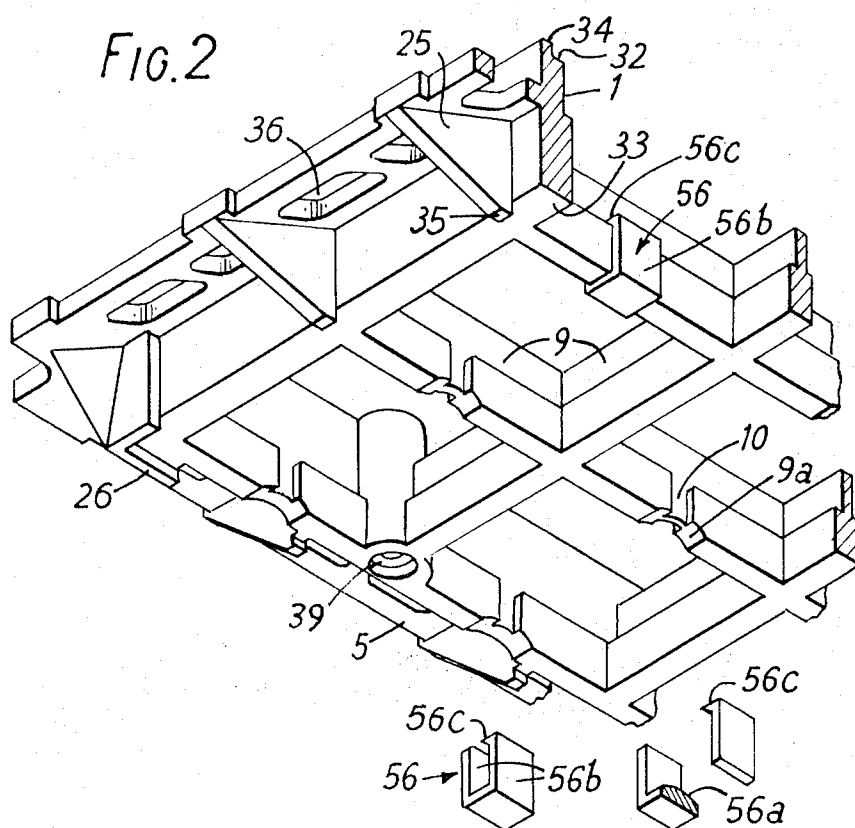


FIG. 1





MATRIX-MOUNTING FRAME FOR MULTI-CONTACT ELECTRICAL COMPONENTS

The present invention relates to mounting arrangements for electromagnetic relays, and particularly to the mounting of such relays in row and column formation to form relay switching matrices.

The relays with which this invention is concerned are multicontact relays of conventional type, that is which employ a single electromagnetically operated armature in conjunction with a multicontact spring set. U.S. patent application Ser. No. 317,312 (H-1561) filed by B. J. Warman et al. on Dec. 21, 1972, on Improvements in Data Processing Apparatus and assigned to the assignee of the present application describes the application of miniature multicontact relays of this type to form a multioutlet switch for use as a selecting switch in a telephone exchange switching system, and it is with such applications in mind that the present invention has been devised.

Thus, the main object of the invention is to provide a compact and economical arrangement for the mounting of miniature electromagnetic relays of the kind described above to form separately mountable relay matrix units. Another main object of the invention is to provide a moulded frame assembly within which the relays forming a relay switching matrix may be located and which has terminal pins suitably located at its periphery for the termination of the relay matrix wiring internal to the frame and the connection thereto of external wiring.

The present invention provides a mounting frame intended to receive a plurality of relays or other multicontact electrical components and to provide at accurately predetermined points on said frame a large number of electrical terminals providing a means of connection to the contacts of said components, said frame comprising two or more parts of moulded synthetic plastics material arranged to be secured in superposed relationship, and a plurality of moulded members each accommodating a relatively small number of terminal pins which extend from opposite ends of said members, one of said parts of the frame comprising a generally plate shaped member defining in a central area thereof a plurality of sockets for receiving said relays or other components, and in a peripheral area thereof a plurality of apertures for receiving said terminal pin containing members, and a second one of said parts being shaped to fit over said one part and to overlap the latter at least in the peripheral area thereof, said second part having peripheral apertures registering with the peripheral apertures of the first part and the arrangement being such that said terminal pin containing members can be clamped between the overlapping peripheral areas of said first and second frame parts with the said members located in said registering peripheral apertures and the terminal pins projecting therefrom.

Advantageously each of said terminal pin containing members is formed in two parts, being divided between its opposite ends, and each part has a plurality of apertures in which said terminal pins are a sliding fit, the arrangement being such that by assembly of said two parts over opposite ends of the terminal pins the latter become located axially within said apertures by shoulders thereof engaging corresponding shoulders of the apertures, and further being such that the two parts of

said members are held in their assembled condition when clamped between said frame parts.

This enables the terminal pin containing members to be constructed and assembled in a simple manner. Although precision moulding of the terminal pin containing members is required, the fact that these are formed separately from the mounting frame reduces the size and capital cost of the moulding equipment required for these members and also reduces the precision that would otherwise be required of the main mounting frame.

According to one embodiment of the invention, each of said first and second frame parts is in the form of a plate shaped member having a central portion in the form of a lattice frame defining rows and columns of apertures, and a marginal flange projecting from the outer rim of said lattice frame and containing the said peripheral apertures, the arrangement being such that when said two frame parts are assembled to clamp the terminal pin containing members the apertures of the two lattice frames cooperate to define cells for receiving and laterally enclosing said relays or other components. In this case one of said frame parts may have a recess arranged to receive the outer edge of the lattice frame of the other part to locate the two parts in registering alignment. The mouldings of the two parts may also incorporate sockets for fastenings by which they may be secured together.

The mounting frame may further include a third part in the form of a cover member arranged to be secured in superposed relation to the second part.

According to a further, preferred feature of the embodiment of the invention referred to above a complete assembly of electrical components may include the mounting frame and a plurality of electrical components adapted to fit within the cells defined by said lattice frames, said components each having lugs projecting outwardly from opposite sides of a mounting shaped to seat in an aperture of one lattice frame, and opposite walls of the apertures of the corresponding lattice frame having recesses extending normal to the plane of the frame to receive said lugs, the arrangement being such that the said other lattice frame serves to retain said lugs in said recesses. Said other lattice frame then preferably has, extending normally along the walls of apertures therein, grooves arranged to register with said recesses of the said one lattice frame whereby the said lugs of a component may be inserted through the grooves of the other lattice frame and into the recesses of the one lattice frame, the said other lattice frame being provided with means for masking said grooves in the assembled condition of the mounting frame and said masking means serving to clamp the lugs of a component into their corresponding recesses. This facilitates assembly of the mounting frame and the electrical components with the two parts of the mounting frame arranged in register. Preferably the masking means comprise members arranged to fit over those edges of walls of said other lattice frame that, in the assembled condition of the mounting frame, face the said one lattice frame, the said masking members being longitudinally slidable on said walls from first positions in which the said grooves are free to second positions in which said grooves are masked. In this case the two frame parts may be arranged to be secured together by fastenings which are releasable to allow limited movement of said lattice frames apart from one another, the said

other lattice frame having, in said edges thereof at said second positions, notches for receiving the masking members, and the arrangement being such that in the assembled condition of the mounting frame said masking members are clamped in said notches, whereas upon limited release of said fastenings the masking members are freed to slide between said first and second positions. This has the considerable advantage that selected components may be easily removed from a complete assembly for repair or replacement.

The invention is illustrated by way of example in the accompanying diagrams, in which:

FIG. 1 is an exploded perspective view from above one corner of a relay matrix mounting frame assembly according to the invention;

FIG. 2 is a similar view of a detail of the upper frame part shown in FIG. 1, taken from below;

FIG. 3 illustrates a relay of the kind to which the invention pertains; and

FIG. 4 is a plan view of a mounting plate of the relay, modified to render the relay suitable for use with the relay mounting arrangements shown in FIG. 1.

Referring to FIG. 1, the frame assembly comprises upper and lower frame parts 1 and 2 together with a number of terminal pin packets 3, 4, adapted to be clamped between flanges 5 and 6 on the frame parts 1 and 2, respectively, masking members 56 (FIG. 2) associated with the upper part 1, and an upper cover plate 40. The frame parts 1 and 2 are both generally plate-shaped single piece mouldings of plastics material, for example, polycarbonate, and to permit the use of a relatively large scale illustration, only one corner of each frame part is shown. However, since the frames are of symmetrical rectangular form, the construction of the complete frame parts can be readily visualized.

Each frame part has a central area defining a lattice frame having lattice apertures 7 in regular row and column formation. Each lattice aperture of the lower frame part 2 is designed to accommodate the spring set carrying end of a miniature multicontact relay such as shown in FIG. 3 of the drawings. The lattice apertures are oblong in form and are bounded by side walls, the longer side walls 8 having recesses 11, formed midway along their length and extending part way down each side wall. The upper frame part 1 has corresponding side walls bounding its lattice apertures and has longer walls 9 which register with the walls 8. The walls 9 have grooves 10 extending through the frame part 1 and registering with the recesses 11. The purpose of these grooves 10 and recesses 11 is described later below. At spaced points around the periphery of the frame 2, and within the lattice frame, screw holes 12, formed through raised locating bosses 30, are provided, the holes 12 being stepped and including as a push fit therein from the lower end, threaded bushes (not shown) for receiving fixing screws. The frame part 2 also has a flange 6 of L-shaped section so that it provides a hollow plinth like part which projects laterally from the lower edge of the frame part 2. The laterally projecting part of the flange 6 is formed with a number of apertures 13, 14, through which the terminal pins carried by the terminal packets 3 and 4 project, as described later below, and the flange is strengthened by ribs 15 formed between each pair of apertures. Beneath the flange 6, corner pieces are formed as indicated at

16 and these have through apertures 17 for the passage of mounting bolts or screws, not shown.

For the co-ordinate wiring of the particular relay matrix of this embodiment the portions of the flange 6 adjacent the ends of each laterally extending row of matrix relays each have two apertures 13, 14, one of which, 13, is formed to accommodate a six terminal packet 3, while the other, 14, is formed to accommodate a seven terminal packet 4, thus providing for thirteen terminals adjacent the ends of each row of matrix relays. Similarly, the portions of the flange 6 which lie adjacent the ends of each longitudinally extending column of matrix relays each have two apertures 13, each of which accommodates a six terminal packet 3, thus providing for twelve terminals adjacent the ends of each column of matrix relays. This terminal arrangement is necessary because the matrix relays employed are single coil relays each providing twelve crosspoint contacts.

The terminal packets 3 each comprise two identical half mouldings 18, and have the general form shown, the front and rear faces of the mouldings being stepped inwardly at 23 to provide shoulders which engage the edges of corresponding apertures 13 in the flanges 5 and 6 of the upper and lower frame mouldings, as further described below. Each half moulding is formed with six apertures for the location of the six terminal pins carried by the terminal packets 3. The six apertures are arranged in two rows each of three apertures, the apertures in each row being uniformly spaced and the rows being displaced relative to one another, as permitted by the parallelopiped form so that when viewed in elevation, corresponding apertures do not lie directly in line with one another. The terminal pins extend through the apertures in both mouldings to provide upper and lower sets of terminals 22 and 27. These terminal pins each have a central portion, located within the mouldings, whose width is greater than that of the protruding terminals so that the terminal pins have shoulders 19, and the apertures in the moulding are correspondingly formed with internal shoulders so that the terminal pins can be assembled in one half moulding and the assembly secured by fitting the other half moulding.

The terminal packets 4 have the same general construction as that described above, except that the half mouldings 20, 21, comprising these terminal packets have a dovetail form and accommodate seven terminal pins to form the terminal sets 28, 29.

As shown in FIG. 1, the upper frame moulding 1 is a frame part having a lattice frame of generally similar shape to the part 2 and comprising side walls 31 having upper and lower end faces 32, 33. A rib 34 projects from the outer edge of the upper end face 32 to form a recess for receiving the cover plate 40. The frame part 1 has a flange 5 which projects laterally outwards from a point intermediate the upper and lower end faces 32, 33 of the frame, such that, when assembled, the terminal pins 22, 28 do not project above the upper level of the matrix assembly, and flange 5 extends around the exterior of the frame. The flange is also formed with apertures 36 and 37, which respectively correspond in shape and location to the apertures 13 and 14 formed in the lower moulding flange 6, and has on its under side strengthening ribs 25, corresponding to the ribs 15 on the lower frame moulding but formed on the under face of the flange 5. The roots of the ribs

25 project slightly beyond the lower end face 33, as shown at 35, and also at the corners of the lower end face 33 of the side walls 31 an L-shaped rib 26 shown in more detail in FIG. 2 projects from the outer edge of the end face 31. The projecting parts 35 of the ribs 25 and the L-shaped ribs 26 together form a recess arranged to receive and locate the outer edge of the lattice frame of the part 2. Screw holes 38 are formed at points around the upper frame part, corresponding to the screw holes 12 formed in the lower frame moulding. The screw holes 38 are located within cylindrical buttresses, the lower end faces of which are recessed, as indicated at 39 (FIG. 2), to accept the bosses 30 which project from the lower frame moulding, and the upper faces of which are similarly recessed to receive the heads of fixing screws. The cover plate 40 is a substantially plane sheet designed to form a protective cover for the matrix relays, and to be located upon the recessed end face 32 of the upper frame moulding. Screw holes 41 are provided at spaced intervals around the periphery of the cover, to correspond with screw holes 24 in the upper frame part which are of similar form to the screw holes 12 of the lower frame part, but without the bosses 30.

FIG. 2 of the drawings shows a perspective view of the underside of the frame part 1 and associated masking members 56. As already described above, the frame part 1 has a central lattice frame including walls 9 in which are formed grooves 10. Each wall 9 has in the lower edge thereof, in the region corresponding to the grooves 10, an arcuate notch 9a. This notch corresponds in shape to a base part 56a of the U-shaped masking member 56, the arrangement being such that in the assembled condition this part 56a lies in the notch 9a to mask the grooves 10 for the purpose described below. As seen more clearly from FIG. 1, the walls of the lattice frame of the part 1, are of reduced thickness at their upper edges 9b. The members 56 have limbs 56b which are spaced apart by a distance corresponding to the thicker, lower parts of the walls 9 and are just long enough to extend to the shoulder 9c between the two parts of the wall 9, when the base part 56a is in engagement with the notch 9a. One of the limbs 56b has an internal rib 56c which, when the part 56a engages notch 9a, just resiliently clips over the corresponding shoulder 9c. The masking member 56 is thus held resiliently in engagement with the notch 9a, but can be displaced along the wall 9 to free the grooves 10. In this case the part 56a is displaced downwardly over the edge of the wall 9, the rib 56c holding the member 56 on the wall 9 by frictional engagement with the latter.

FIG. 3 of the drawings illustrates, at 43, a well known form of multicontact relay proposed for use with the matrix mouldings above described. Since this type of relay is already well known, its general construction will be outlined only in sufficient detail to enable a modification, required to adapt the relay for use with the matrix mouldings, to be understood. Thus, the relay comprises a coil winding 44 mounted upon a core of magnetic material, not seen in the drawing. One end of the core is secured to a L-shaped yoke 45, the long limb of the L, also not seen in the drawing, extends alongside the coil and terminates substantially level with the free end of the core so that the core and yoke together form a generally U-shaped magnetic circuit. The armature 46 is suspended in operative relationship with the core

and yoke ends by a flat phosphor bronze spring member which is clamped between the long limb of the yoke and a spring set mounting bracket 47, the latter being secured to the yoke by a stud 48. Two spring set operating levers, of which only one, designated 49, is seen in the drawing, are formed upward from either side of the relay armature, the free ends of these levers being bridged by a contact operating ladder 50 of insulating material. The contact spring-set 51, which in the example shown in the drawing provides a total of 12 "make" contact actions arranged in two rows of six contact actions is secured, in a spring set pile of conventional form, to the mounting bracket 47 by three screws, of which only the screw 52 is seen in the drawing.

Known forms of the multicontact relay above described are particularly suited for mounting upon a printed circuit board or upon a suitable socket member such that the relay can be secured by the soldering of the relay contact tags to the printed circuit or socket tags. For the matrix application of this relay now proposed, the co-ordinate wiring of the relay terminal pins is advantageously effected by the use of insulated flexible printed wiring. However, while this type of wiring adequately meets the electrical requirements of the proposed application it is not sufficiently robust to also provide mechanical support for the relays to which it is connected and consequently the relays have to be located and secured by means other than their terminal pins.

To meet the above requirement, the multicontact relays as described above are provided with a spring set mounting bracket formed as shown at 53, FIG. 3. This mounting bracket 53 differs from the mounting bracket 47 included in the relay assembly 43, in that it is formed with lugs 54 and 55 which project from opposite edges of the bracket. Thus, when the spring set mounting bracket 53 is assembled into the relay, in place of the bracket 47, the lugs 54 and 55 project laterally from either side of the relay.

Referring again to FIG. 1, the recesses 11, formed in the longitudinally extending side walls 8 of the lattice frame 2, are formed so that the lugs 54 and 55 are a sliding fit therein. The depth of the recesses 11 are made to be equal to the width of the lugs, so that when the relays are correctly assembled into the lattice frame 2, the upper edges of the lugs 54 and 55 are level with the upper surfaces of the lattice walls. When thus assembled, the relay terminal tags extend rearwardly from the lower face of the lattice frame, while the front end of the relay extends outwardly from the front face of the lattice frame 2.

To assemble the complete matrix, the multicontact relays are inserted into the lattice frame compartments as above described. The assembled terminal packets 3 and 4 are then inserted into their respective apertures in the flange 6. The upper frame part 1 is then fitted over the lower frame part 2 so that the upper ends of the terminal packets 3 and 4 enter the respective apertures 36 and 37 in the flange 5. Prior to fitting the upper frame part 1 the members 56 are engaged with the notches 9a. The upper frame part 1 is correctly located upon the lower frame part 2 by the portions 35 of ribs 25, by engagement of the bosses 30 in the lower frame part with the corresponding recesses 39 in the upper frame part and also by engagement of the ribs 26 over the corners of the lower frame part 2. Screws are then passed through the screw holes 38 of the upper

frame part into the threaded bushes of the holes 12 of the lower frame part and tightened to clamp the two parts firmly together. The walls 9 of the upper part extend between adjacent columns of relays and the members 56 supported thereby engage the upper surfaces of the longitudinally extending side walls 8 of the lower part 2, and the upper edges of the relay supporting lugs 54 and 55, thus clamping the relays in place. The cover plate 40 is now fitted over the upper frame part 1, in location with the recess 32 of the upper frame part, and is finally secured by screws passed through the holes 41 and screwed into the threaded bushes of the holes 24 of the upper frame part.

The provision of the upper frame part 1 with the grooves 10 and masking members enables easy removal of individual relays of the assembly for repair or replacement, as will now be described. When the frame is assembled as described above the members 56 are firmly clamped against the lower frame part and the lugs 54, 55 of the relays and are thus immovable.

By removing the cover 40, however, and loosening the fastening screws securing the two frame parts 1 and 2 together, it is possible to slide the masking members 56 along their corresponding walls 9, without complete disassembly of the parts 1 and 2. When a member 56 is thus moved, the grooves 10 are made accessible to the lugs 54, 55 of a relay, and the latter can be lifted directly out of the mounting frame, after unsoldering any associated wiring, without the need for complete disassembly of the mounting frame or disturbance of any other relay.

The assembly as described above has numerous advantages.

It will be appreciated that to form a lattice frame capable of accommodating a matrix of relays of the type described and providing several hundred accurately located terminal tags around its periphery, as a one piece moulding would necessitate extremely difficult and expensive tooling which the present invention avoids by building the matrix from a number of separate parts for which the tooling requirements can be met economically.

It will also be appreciated that the design of the various mouldings described above could be altered in a number of ways, without departing from the invention. Thus the terminal pin packets may have different shapes and may accommodate different numbers of

terminal pins. Again the arrangements for securing the relays within the lower lattice moulding may be different from those described above.

It will further be appreciated that the invention also provides a simple method of locating and securing relays of the kind described, independently of their contacts within any moulded matrix like configuration.

What we claim is:

1. A component mounting assembly comprising: a plurality of relays or other multi-contact electrical switching components, said components having lugs;

first and second frame parts defining lattice apertures for location of said relays or other multi-contact electrical switching components, said second frame part having recesses located in the lattice aperture defining walls of said second frame part, said recesses receiving said lugs, and said first frame part having grooves located in the corresponding walls of said first frame part, said grooves registering with said recesses;

means releasably securing said first frame part and said second frame part in superposed relationship; and

means longitudinally slidable in the last mentioned walls between a first position in which said grooves are open to passage of said lugs and a second position in which said grooves are masked and said lugs are retained in said recesses;

whereby upon placement of said slidable means into said second position said relays or other components are clamped between said first and second frame parts by said securing means, whereas upon placement of said slidable means into said first position said relays or other components may be individually removed from said assembly by partially releasing said securing means.

2. A mounting assembly as claimed in claim 1, wherein there are provided notches for receiving said masking members on the edges of the walls of said first frame part facing said second frame part, the masking means when in said second position being clamped in said position by said securing means but being longitudinally slidable along said walls to said first position upon partial release of said securing means.

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