

March 31, 1970

J. H. MULLEN ETAL

3,504,311

PLUG-IN RELAY AND SUPPORT THEREFOR

Filed April 14, 1967

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FIG. 1.

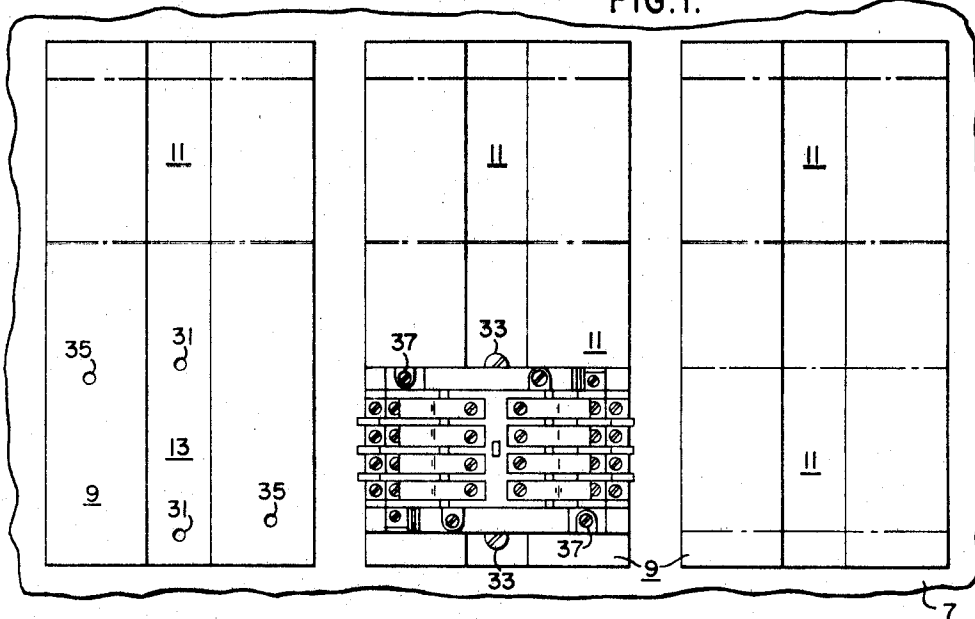


FIG. 2.

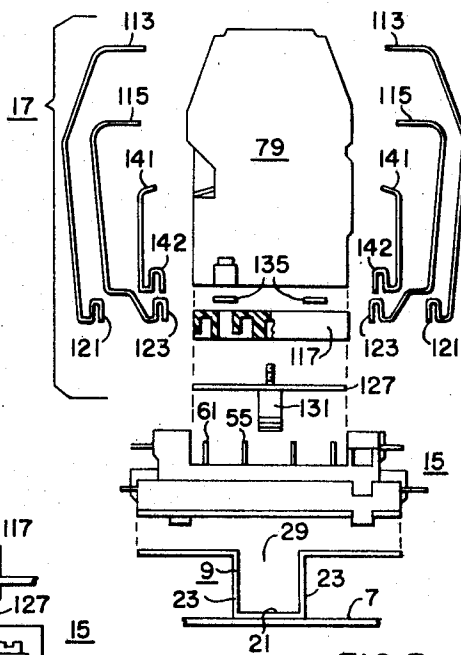
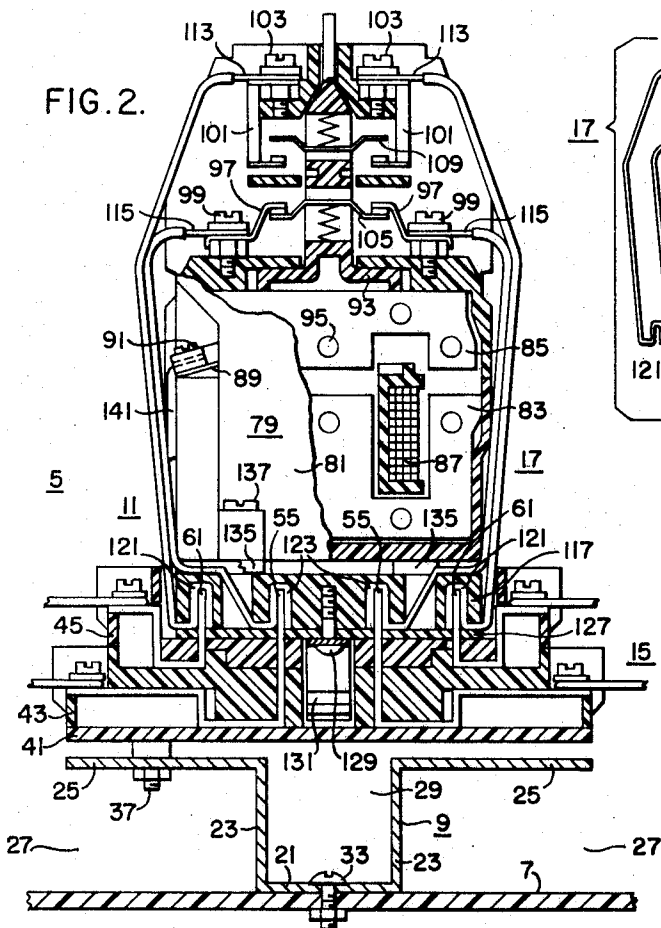


FIG. 3.

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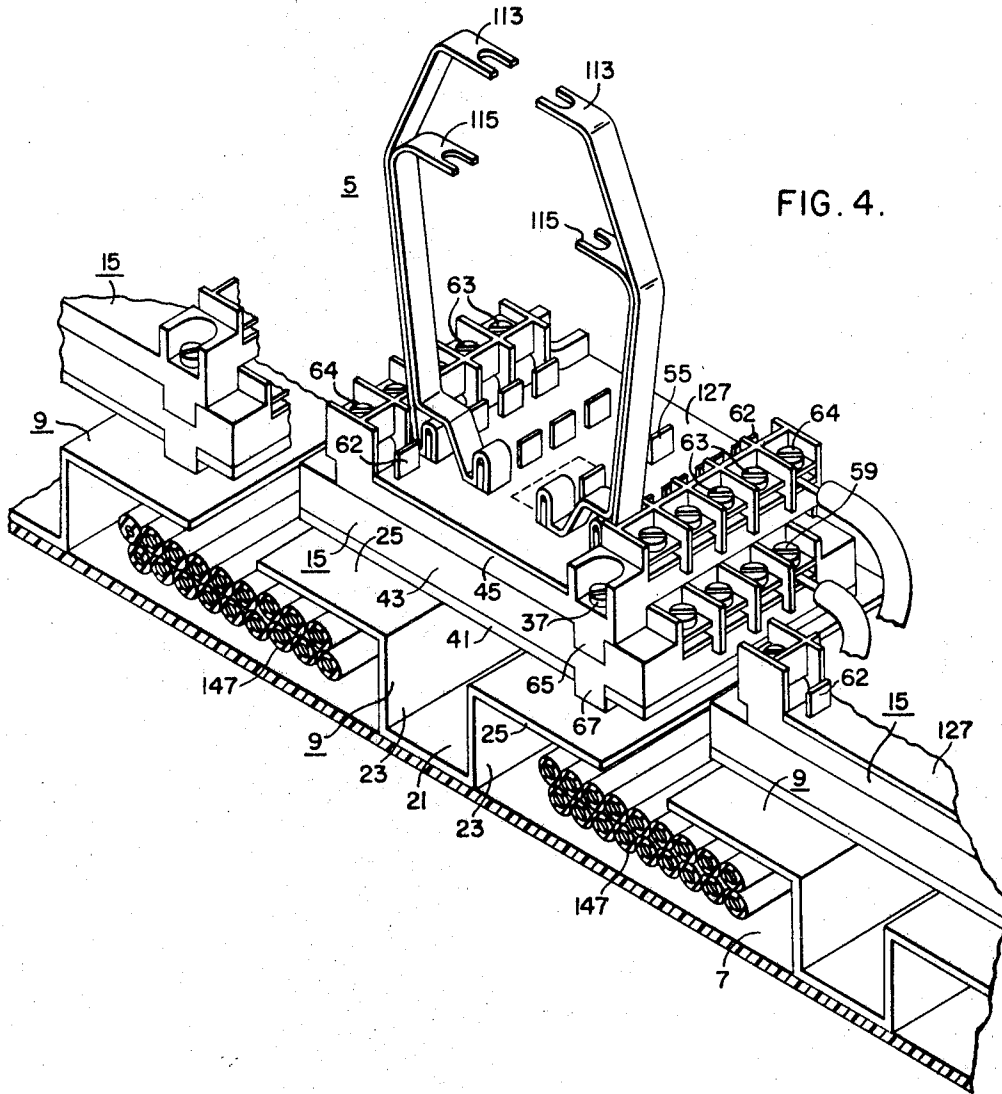
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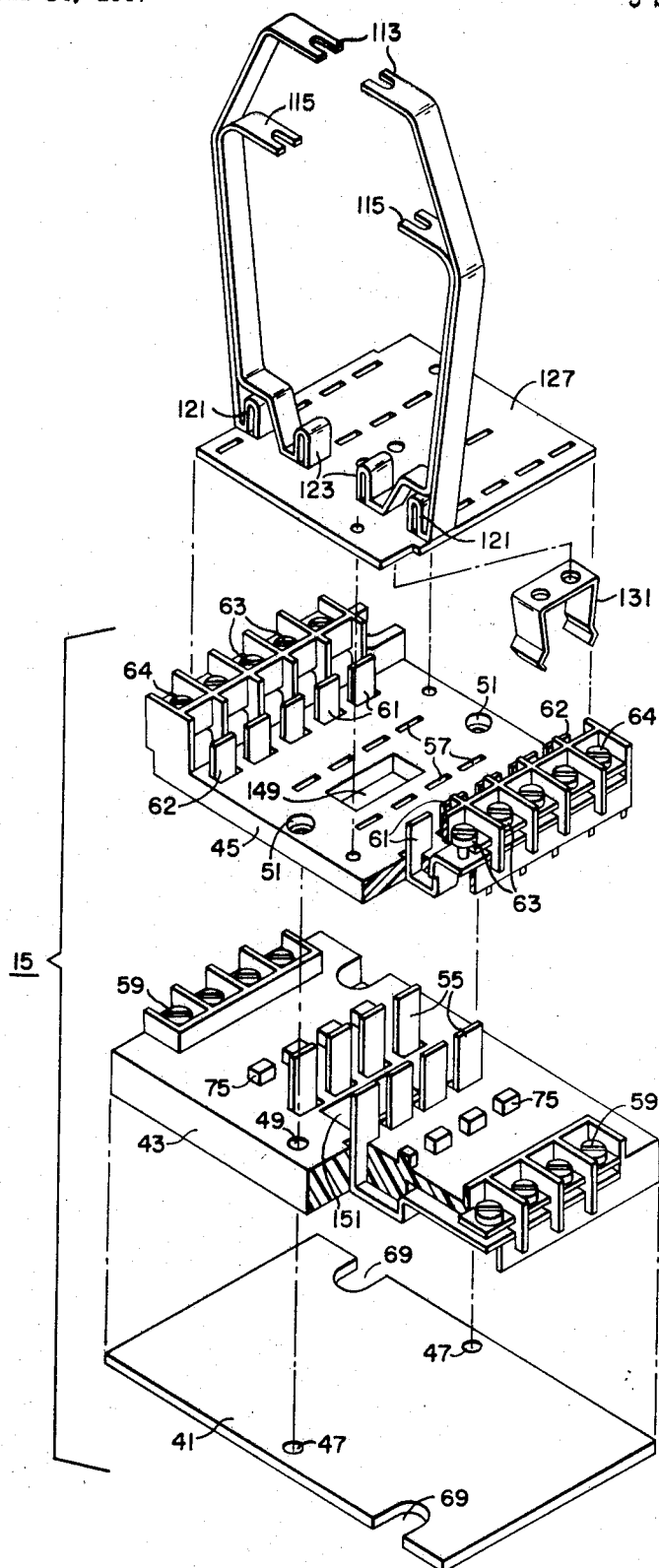


FIG. 5.

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PLUG-IN RELAY AND SUPPORT THEREFOR
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20 Claims

ABSTRACT OF THE DISCLOSURE

A plug-in relay having a plug-in base for plug-in connection between the relay and base. The relay comprises female-type or clip-on type terminals and the base comprises male-type or stab-type terminals that cooperate with the base. The relay comprises a plurality of elongated conductors that extend on the outside of the relay housing to a support at the back of the relay housing and that are formed to provide female-type clip-on terminals at the back parts thereof to cooperate with stab terminals on the base. A support is constructed to support the base and to provide wiring channels for receiving wires that are connected to the base at an installation.

Brief summary of the invention

A rigid supporting member comprises a base part, a pair of opposite leg parts extending upward from the base part and a pair of shelf parts extending outward from the upper ends of the leg parts for supporting one or more relay structures and for providing space for receiving wires that are connected to the terminals of the relay structure at the installation. The relay structure comprises a plug-in base that may be fixedly secured to the shelf parts of the support. The plug-in base comprises a plurality of stabs for receiving plug-in connection with a relay and a plurality of terminals at opposite sides thereof for receiving conducting wires that extend up to the terminals from the wiring channels. The plug-in relay comprises a plurality of female-type clip-on terminals that engage the stabs of the plug-in base when the relay is plugged into position on the plug-in base. The plug-in terminals are formed integral with elongated conductors that extend upward on opposite sides of the relay housing and that are connected at the front ends thereof to the relay terminals.

An object of this invention is to provide an improved support for supporting one or more relay structures and for providing wiring-channel space for receiving wires that would be connected to the relay structures to connect the relay structures in various control circuits.

Another object of this invention is to provide an improved plug-in type relay structure comprising an insulating-housing type relay and a plurality of elongated conductors that extend, on the outside of the relay housing, from terminal conductors of the relay to an insulating support at the back of the relay, which structure includes quick-detachable terminals supported on the insulating support for quick-detachable connection to quick-detachable terminals of a plug-in base.

Another object of this invention is to provide an improved plug-in type relay comprising a plurality of female-type plug-in terminal structures at the bottom of the relay for cooperating with stab-type terminals of a plug-in base. The use of female-type plug-in terminals on the relay has the advantage that any failure to make good contact at any one of the plurality of plug-in terminals, such as by loss of resilience, can be quickly cured

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by simply plugging in a new relay without disconnecting all of the wiring to the relay as would be necessary if the female-type terminals were on the base where they would be connected to the circuit wiring.

Another object of this invention is to provide an improved combination comprising a plug-in base having a plurality of stab-type terminals supported at the front thereof and a plug-in relay having a plurality of female-type terminals at the bottom thereof for cooperating with the stab-type terminals of the plug-in base. The fact that the plug-in base has stab or male-type terminals projecting therefrom does away with plug-in openings on the base which could collect dirt or other foreign matter which could prevent good contact from being made.

A more general object of this invention is to provide an improved plug-in type electric control device.

These and other objects of the invention will be apparent from the following detailed description when read in conjunction with the accompanying drawings.

In said drawings:

FIGURE 1 is a plan view, with parts broken away, of part of a control panel having a plurality of relay structures mounted thereon with only one relay structure being shown in detail and with one station being empty to enable a more accurate description of the control panel;

FIG. 2 is a side view, with parts broken away, illustrating one of the supports, one of the plug-in bases, and an exploded plug-in relay structure of the panel of FIG. 1;

FIG. 3 is a view partly in section and partly in elevation, with parts broken away, illustrating the relay structure, base and support of FIG. 2 in the mounted position;

FIG. 4 is a perspective view, with parts broken away and with parts shown in section, illustrating part of the control panel of FIG. 1; and

FIG. 5 is an exploded perspective view, partly in section, of the plug-in base of FIG. 4 and parts of the plug-in relay structure of FIG. 4.

Referring to the drawings, a control panel 5 comprises a flat metallic rigid supporting panel plate member 7 having three elongated metallic rigid support members 9 mounted thereon. A plurality of plug-in type relay control structures 11, only one of which is seen in detail in FIG. 1, are mounted on the support members 9. Each of the support members 9 comprises a plurality of stations 13, and a separate control structure 11 is mounted on each of the stations 13 with one station 13 being empty as seen in FIG. 1 to enable description thereof. As can be seen in FIGS. 2 and 3, each of the control structures 11 comprises a separate plug-in insulating base 15 and a separate plug-in relay structure 17.

Each of the support members 9 is an elongated metallic rigid channel support member comprising a flat support base part 21, a pair of spaced leg parts 23 extending upward (FIGS. 2 and 3) from the base part 21 normal to the plane of the base part 21 and a pair of shelf parts 25 extending outwardly from the leg parts 23 along the same plane which plane is parallel to the plane of the base part 21 and normal to the planes of the leg parts 23. As can be seen in FIG. 3, the parts 21, 23 and 25 of each support member 9 are formed as integral parts of the sheet-metal member 9. The shelf parts 25 are raised above the plane of the plate member 7 to provide spaces that form channels in a manner to be hereinafter specifically described. The base part 21 and legs 23 form a generally U-shaped center part providing a center channel portion 29 that is open and that is provided with a plurality of openings 31 (FIG. 1) for receiving bolts 33 (FIG. 3) that are used to secure the support 9 to the plate 7. As can be seen in FIG. 1, the open channel 29

permits a worker to install the bolts 33 (FIG. 3) in order to secure the channels 9 to the plate 7. Each of the support members 9 comprise a plurality of stations with each station being adapted to receive and support a separate control structure 11. As can be seen in FIG. 1, each of the stations comprises a pair of openings 35 for receiving a pair of bolts 37 (FIG. 4) that are used to secure a plug-in base 15 to the support 9 at the associated station.

The plug-in base 15 comprises a flat insulating back plate 41 (FIGS. 4 and 5), an intermediate insulating support part 43 and a front insulating support part 45 which parts are secured together as a unit by means of a pair of bolts that extend through aligned openings 47, 49 and 51 in the members 41, 43 and 45 respectively. As is best seen in FIG. 5, a plurality of male-type terminals or conducting stabs 55 are supported between the insulating members 41, 43 with the stabs 55 extending upward through suitable openings in the insulating member 43 and through openings 57 in the insulating member 45 to be positioned at the front of the plug-in base 15. As can be seen in FIG. 5, the stabs 55 are bent-over extending downward and between the insulating members 41, 43 with the end parts thereof positioned in stalls formed in the insulating member 43 which end parts are provided with openings therein for receiving screw-type terminal connectors 59 that are used to connect conducting lines to the stab conductors 55 at the panel installation. The stalls are formed by insulating barriers that are molded integral with the insulating member 43. As is best seen in FIG. 5, a plurality of male-type terminals or conducting stabs 61 and 62 are supported on the insulating member 45 between the insulating members 43, 45 which conducting stabs 61 and 62 are bent-over with the outer ends thereof being positioned in stalls for receiving screw-type terminal connectors 63 and 64 that are used to connect the stab conductor 61 to conducting lines at the panel installation. The stalls on the member 45 are formed by means of barriers that are molded integral with the insulating member 45. When the parts 41, 43 and 45 are secured together, the stabs 55, 61 and 62 protrude upwardly from the front of the plug-in base 15 to receive connection with a plug-in relay in a manner to be hereinafter described. As is illustrated in FIG. 4, the insulating member 45 of the plug-in base 15 is provided with a pair of leg portions 65 that extend into suitable slots in the member 43. Although only one of the legs 65 is shown in FIG. 4, it can be understood that there is another leg 65 in a diagonal position on the member 45 that cooperates with a similar slot in the member 15. The member 43 is provided with a pair of diagonally spaced support legs 67 (only one of which is seen in FIG. 4) which extend through diagonally spaced openings 69 (FIG. 5) in the insulating member 41 to provide a pair of diagonally spaced leg portions that engage the shelf parts 25 of the support 9 to support the plug-in base 15 on the shelf parts 25 of the support 9. The leg portion 65, 67 of the members 45, 43, respectively are provided with aligned openings therein for receiving a pair of bolt members 37 (FIGS. 3 and 4) that extend through the openings in the legs 65, 67 and that extend through the openings 35 (FIG. 1) in the associated station of the associated support 9 to receive threaded nuts on the undersides of the shelf parts 25 to thereby permit securing of the plug-in base 15 to the support 9 at the associated station. A plurality of molded projections 75 (FIG. 5) are formed integral with the member 43 to extend into the into the openings in the member 45 through which the stabs 61 and 62 extend in order to provide a backing for the stabs so that the stabs will be fixedly positioned on the assembled plug-in base.

The plug-in relay structure 17 comprises a unitary industrial relay 79 (FIGS. 2 and 3) and a plurality of attachments that are secured to the relay 79 to convert the relay to the plug-in relay structure that will be herein-

after specifically described. The relay 79 is of the type that is more specifically described in the patent to Gustav Jakel, Patent No. 3,088,058, issued Apr. 30, 1963. Thus, only a brief description of the relay 79 is given herein. As is shown in FIG. 3, the relay 79 comprises an insulating housing 81. An E-shaped magnetic core member 83 is supported in the housing 81, and an E-shaped magnetic armature 85 is supported in the housing to cooperate with the core member 83. An energizing winding or coil 87 is positioned over the middle leg of the E-shaped core 83 and two terminal conductors 89 (only one being seen in FIG. 3) protrude through the housing at diagonal corners of the housing to enable connection of the coil 87 in an electric circuit. A screw-type connector 91 is provided on the external end of each conductor 89. The armature 85 is connected to an insulating contact carrier 93 by means of a pin 95. As can be understood with reference to FIGS. 1 and 3, the relay 79 is an eight-pole relay with the housing 81 comprising barriers molded integral therewith to provide four adjacent stall sections with each stall section comprising insulating barrier means forming an upper pole unit section and a lower pole unit section. Each lower pole unit section comprises a pair of spaced stationary contact structures 97 having a pair of screw-type terminal connectors 99 thereon for enabling connection of the contact structures 97 in an electric circuit. Each of the upper pole unit sections comprises a pair of spaced stationary contact structures 101 having a pair of screw-type terminal connectors 103 thereon for enabling connection of the spaced contact structures 101 and an electric circuit.

Each of the lower pole unit sections comprises a lower bridging contact member 105 resiliently supported in a window opening on the insulating contact carrier 93 to cooperate with the stationary contact structures 97. Each of the upper pole unit sections comprises a bridging contact structure 109 resiliently supported in a window opening on the contact carrier 93 for cooperating with the stationary contact structures 101. Suitable spring means (not shown) biases the armature 85 and insulating contact carrier 93 to the upper position shown in FIG. 3. The relay 79 is shown in the deenergized position in FIG. 3. Upon energization of the coil 87, the armature 85 will be attracted downward toward the core member 83 moving the insulating contact carrier 93 and the bridging contact members 105, 109 downward to the actuated position wherein each bridging contact member 105 opens a circuit between the associated stationary contact structures 97 and wherein each bridging contact member 109 closes a circuit between the associated stationary contact structures 101. Upon deenergization of the coil 87 the spring means (not shown) will return the armature 85 and insulating contact carrier 93 to the upper deenergized or unactuated position shown in FIG. 3. The movement of the armature 85 will move the bridging contact members of the eight-pole units simultaneously between opened and closed positions. As shown in FIG. 3, the lower pole unit section is normally closed and the upper pole unit section is normally opened. The contact structures can be modified to provide any combination of normally opened and normally closed operation in a manner well known in the art. The relay 79 is an industrial type relay that can be used without the plug-in accessories that will be hereinafter described. The accessories are provided to complete the assembly to provide the plug-in relay structure 17. In each of the four adjacent stall sections a pair of elongated conductors 113 are connected to the stationary contact structures 101 at the upper ends thereof by means of the screws 103 and a pair of elongated conductors 115 are connected to the stationary contact structures 97 by means of the screws 99. The lower ends of the conductors 113 and 115 are supported in cavities in an insulating support block 117. The conductors 113 are bent-over at the lower ends thereof to pro-

vide female-type or clip-on type terminals 121 and the conductors 115 are bent-over at the lower ends thereof to provide female-type or clip-on type terminals 123. As can be seen in FIG. 3, the terminal portions 121, 123 are positioned in suitable recesses in the insulating block 117 and an insulating back plate 127 is connected to the back insulating support 117 by means of a screw 129. The screw 129 also connects a U-shaped spring clip 131 to the lower portion of the back plate 127. The back plate 127 is provided with openings therein that are aligned with the cavities in the support block 117 so that the stabs 55 can protrude into the openings and recesses to cooperate with the terminal parts 121, 123. A pair of insulating spacers 135 are positioned below the insulating base of the relay 79 to space the relay from the insulating block 117 to enable the conductors 115 to pass between the relay 79 and the insulating block 117. A pair of screws 137 (FIG. 3) extend through sections of the insulating housing 81 of the relay 79, through the spacers 135 and into tapped openings in the support block 117 to secure the relay 79 and support block 117 together. In addition to the pairs of conductors 115 and 113, two elongated conductors 141 are connected at their upper ends to the two terminals 89 (only one being seen in FIGS. 2 and 3). The conductors 141 are formed to provide female-type or clip-on type terminals 142 similar to the terminals 121, 123 which terminals 142 are seated in cavities in the support block 117. When the accessory parts have been connected to the relay 79 (FIG. 2) the combination comprises a unitary plug-in relay structure 17 that can be moved into and out of the connected position seen in FIG. 3 as a unitary structure. As can be seen in FIG. 3, the conductors 113, 115, 141 are insulated except for the upper ends thereof that are connected to the associated terminals and except for the lower ends thereof that are formed to provide the female-type clip-on terminals.

As was previously set forth, the support members 9 (FIGS. 1-4) are secured to the base plate 7 by means of the screws 33 (FIG. 3). Each of the support members 9 is an elongated member with a plurality of stations along the length thereof with each station comprising two of the openings 35 (FIG. 1) on the two opposite shelf parts of the support. The two bolts 37 (only one being seen in FIG. 4) extend through the openings in the insulating members 41, 43, and 45 of the associated plug-in base 15 and through the openings 35 (FIG. 1) in the associated support 9 to secure the plug-in base 15 to the support 9. A plurality of similar plug-in bases 15 are supported on each of the supports 9 along the length of each support 9 with one plug-in base being supported at each of the stations 13. A plurality of conducting lines 147 (FIG. 4) are supported in the wiring channels that are formed under the shelf parts of the adjacent support members 9. As can be seen in FIGS. 1 and 4, the shelf parts of adjacent support members 9 are spaced a dimension to permit moving the conducting lines 147 up from the wiring channels between the members 9 to a position where they may be connected to the plug-in base 15 by means of the terminal connectors 59, 63, 64 of the plug-in base. When it is desired to mount the plug-in relay structure 17, the relay structure is merely moved down into the position disclosed in FIG. 3 with the clip-on type terminals 121, 123 of the upper and lower pole units clipping onto the associated stabs 61, 55 respectively of the plug-in base and with the clip-on type terminals 142 of the two coil-energizing conductors 141 clipping onto the stabs 62 of the plug-in base. The spring clip 131 extends into an opening 149 in the member 145 and an aligned opening 151 in the member 43 with an interference-type fit to more fixedly secure the plug-in relay structure 17 in position on the plug-in base 15. The spring-clip 131 and openings 149, 151 are slightly off center and the stabs are off center to an extent that the relay will be keyed such that the relay can be mounted on the plug-in base 15 in only the correct position. A worker can remove the plug-in

relay structure merely by pulling the plug-in relay structure away from the plug-in base. With the provision of recessed female-type terminals on the plug-in relay structure, rather than on the base, it is less likely that undesirable dust or foreign matter will be collected between the cooperating contact portions of the female-type terminals. If it is desired to use just a four-pole relay at the installation, the bottom portion 43 (FIG. 5) of the plug-in base can be removed and the leg parts 65 (FIG. 4) of the upper portion 45 will engage the shelf parts 25 of the support 9 to support the upper portion 45 and plate member 41 of the plug-in base on the support 9 and with just the stabs 61 for the four pole units and the stabs 62 for the energizing coil positioned to cooperate with clip-on type connectors of a four pole relay.

From the foregoing, it can be understood that there is provided by this invention improved control means. An improved channel support member is constructed and formed to support a plurality of control structures in an aligned relationship on a pair of spaced shelf parts at the front of the channel support member. The shelf parts are elevated relative to the base support part of the channel support member to provide space under the shelf parts for receiving conducting wires that are connected to terminals of the control structure at an installation. A pair of channel support members can be supported in a side-by-side relationship with the adjacent shelf parts cooperating to form a wiring channel and with the adjacent shelf parts spaced sufficiently to permit wires to be brought up to the control structures from the wiring channel. Each channel support member comprises a plurality of stations with each station comprising opening means for receiving connecting members that are used to secure a plug-in base of a control structure to the channel member at the station. The channel support member has an elongated channel opening between the spaced shelf parts, which opening provides access to a worker to permit mounting of the base part of the channel member to a panel support plate. The invention comprises an improved plug-in base and an improved plug-in relay structure for plug-in connection with the base. The plug-in relay structure comprises an insulating-housing type relay and a plurality of elongated conductors that extend, on the outside of the relay housing, from terminal conductors of the relay to an insulating support at the back of the relay, which structure includes quick-detachable terminals supported on the back insulating support for quick-detachable connection to quick-detachable terminals of the plug-in base. The quick-detachable terminals of the plug-in relay structure are female-type clip-on terminals that are positioned in recesses in the back insulating support to cooperate with stab-type terminals of the plug-in base. The plug-in base is mounted on the support at the associated station with screw-type terminals of the base facing opposite sides of the support member to receive wires from the wiring channels. At the installation, the plug-in bases are mounted on the channel members and the plug-in relay structure can be mounted and dismounted without the necessity of disconnecting the conducting wires that are connected to the screw-type terminals of the plug-in base. If one of the relay structures becomes damaged, a worker need only pull the relay structure out of the mounted position and replace it with another relay structure.

While the invention has been disclosed in accordance with the provisions of the patent statutes, it is to be understood that various changes and modifications may be made without departing from the spirit and scope of the invention.

We claim as our invention:

1. A plug-in relay structure comprising a relay, said relay comprising an insulating relay housing having a front and a back, a plurality of pairs of spaced stationary contact structures supported on said insulating relay housing in proximity to the front of said insulating relay housing, a separate movable bridging contact structure for

each of said pairs of spaced stationary contact structures, means supporting said bridging contact structures for reciprocal rectilinear movement in the directions of front-to-back and back-to-front on said insulating relay housing, electromagnetic operating means operable to effect operation of said movable bridging contact structures into and out of engagement with said stationary contact structures, a separate insulating terminal support means at the back of said insulating relay housing secured to said insulating relay housing, a plurality of elongated conductors electrically connected at the front thereof to said stationary contact structures and extending on the outside of said insulating relay housing to a position wherein the back parts thereof are supported at the back of said insulating relay housing on said separate insulating support means, and female-type plug-in terminals on said plurality of conductors at the back parts of said plurality of conductors for quick-detachable connection to male-type plug-in terminals of a plug-in base structure.

2. A plug-in relay structure having a front and a back, said relay structure comprising an insulating housing structure, relay means supported on said insulating housing structure,

said relay means comprising a stationary contact structure, a movable contact structure cooperable with said stationary contact structure and movable between opened and closed operating positions,

electromagnetic means operable between an energized condition and a de-energized condition, said electromagnetic means comprising a stationary magnetic member, a movable magnetic armature, coil means positioned to effect magnetic energization of said stationary magnetic member and movable magnetic armature, said movable magnetic armature being supported for reciprocal movement in said insulating housing structure in one direction from front to back and in the opposite direction from back to front, upon operation of said electromagnetic means from one of said conditions to the other of said conditions said movable contact structure being moved from one of said operating positions to the other of said operating positions, upon operation of said electromagnetic means from said other of said conditions to said one of said conditions said movable contact structure being movable from said other operating position to said one operating position,

female-type terminal means at the back of said insulating housing structure for quick-detachable connection to male-type terminals means of a plug-in base, and said female-type terminal means comprising a first female-type terminal means for said stationary and movable contact structures and a second female-type terminal means for said electromagnetic means.

3. A plug-in relay structure having a front and a back, said relay structure comprising an insulating housing structure, relay means supported on said insulating housing structure,

said relay means comprising a pair of spaced stationary contacts, a movable bridging contact structure supported to bridge said spaced stationary contacts in the closed position and being movable between opened and closed operating positions, electromagnetic means operable between an energized condition and a de-energized condition, upon operation of said electromagnetic means from said de-energized condition to said energized condition said movable contact structure being moved from one to the other of said operating positions, upon operation of said electromagnetic means from said energized condition to said de-energized condition said movable bridging contact structure being movable from said other to said one of said operating positions, said bridging contact structure being supported for reciprocal movement in said insulating housing structure in one direction from front to back and in the opposite

direction from back to front when moving between said operating positions,

female-type terminal means at the back of said insulating housing structure for quick-detachable connection to male-type terminal means of a plug-in base, said female-type terminal means comprising a first female-type terminal means for said spaced stationary contacts and bridging contact structure and a second female-type terminal means for said electromagnetic means, and said first female-type terminal means comprising a female-type terminal in electrical series with one of said stationary contacts and another female-type terminal in electrical series with the other of said stationary contacts.

4. A multi-pole plug-in relay structure having a front and a back and comprising a plurality of pole units, said plug-in relay structure comprising an insulating housing structure, relay means supported on said insulating housing structure,

said relay means comprising a pair of spaced stationary contacts for each of said pole units, a separate bridging contact structure for each of said pole units, a stationary magnetic member, a movable magnetic armature supported for movement relative to said stationary magnetic member, means operatively connecting all of said bridging contact structures with said movable magnetic armature for simultaneous movement with said movable magnetic armature in one direction from front to back and in the opposite direction from back to front, coil means positioned to effect magnetic energization of said stationary magnetic member and movable magnetic armature, upon electrical energization of said coil means said movable magnetic armature being attracted toward said stationary magnetic member and moving to simultaneously move said bridging contact structures from an unactuated operating position to an actuated operating position, spring means operable to move said movable magnetic armature and bridging contact structures from said actuated operating position to said unactuated operating position when said coil means is de-energized,

said relay structure comprising a separate quick-detachable female-type terminal supported at the back of said insulating housing structure for each of said stationary contacts, a separate conducting means electrically connecting each of said quick-detachable female type terminals with the associated stationary contact, a pair of quick-detachable female-type terminals supported at the back of said insulating housing structure and being electrically connected to said coil means whereby said multi-pole plug-in relay structure can be moved into plug-in operating condition on a plug-in base having quick-detachable male-type terminals for cooperating with the quick-detachable female-type terminals of said plug-in relay structure.

5. A multi-pole plug-in relay structure according to claim 4, a multi-pole plug-in base structure,

said multi-pole plug-in base structure comprising an insulating base, a separate quick-detachable male-type terminal for each of said quick-detachable female-type terminals of said plug-in relay structure, said quick-detachable female-type terminals of said plug-in relay structure and said quick-detachable male-type terminals of said plug-in base structure being cooperating inter-engageable terminals, and said plug-in relay structure being removably mounted in said plug-in base structure with said quick-detachable female-type terminals of said plug-in relay structure being in quick-detachable inter-engagement with said quick-detachable male-type terminals of said plug-in base structure.

6. A plug-in type relay structure according to claim 1, said separate insulating terminal support means having

a plurality of recesses at the back thereof, said plurality of female-type plug-in terminal structures being supported in said recesses at the back of said separate insulating terminal support means.

7. A plug-in type relay structure according to claim 1, a plug-in base structure comprising an insulating base, a plurality of male-type terminals extending frontward at the front of said insulating base, a plurality of terminal connectors in proximity to each of two opposite ends of said insulating base with each of said male-type terminals being in electrical series with a different one of said terminal connectors, and said plug-in type relay structure being removably mounted on said plug-in base structure with each of said plurality of female-type plug-in terminals being in cooperating engagement with a different one of said male-type terminals.

8. The combination according to claim 7, a rigid planar base plate, a rigid support member comprising a base part, means securing said base part to said base plate, said support member comprising a pair of legs extending upward from said base part at opposite sides of said base part, said support member comprising a pair of shelf parts extending outward from said leg parts along a plane parallel to the plane of said base plate with each of said shelf parts extending from a different one of said leg parts, and means mounting said plug-in base structure on said shelf parts.

9. The combination according to claim 8, said plug-in base structure being mounted on said shelf parts with said two opposite ends of said insulating base being positioned in proximity to the two opposite outer ends of said shelf parts whereby conducting wires that may be positioned under said shelf parts at a panel installation may be extended around said ends of said shelf parts and connected to said terminal connectors.

10. A support for an electric control device, said support comprising a rigid member, said member comprising a base part, a pair of leg parts extending upward from said base part at opposite sides of said base part, and a pair of shelf parts extending outward from the upper ends of said leg parts along the same plane with each of said shelf parts extending from a different one of said leg parts,

a base plate, means securing said support on said base plate at said base part,

a control structure having a front and a back, said control structure comprising a plug-in base and a plug-in relay,

said plug-in base comprising an insulating base, a plurality of plug-in type terminals on said insulating base, a plurality of additional terminals on said insulating base at each of two opposite ends of said insulating base, conducting means on said insulating base electrically connecting said additional terminals with said plug-in type terminals,

means mounting said insulating base on said support with said insulating base being mounted across said support on both of said shelf parts and with one of the opposite ends of said insulating base in proximity to the outer end of one of said shelf parts and with the other of said opposite ends of said insulating base being in proximity to the outer end of the other of said shelf parts.

said plug-in relay comprising an insulating housing structure, relay means on said insulating housing structure, a plurality of plug-in type terminals at the back of said insulating housing structure for plug-in type connection of said relay means which plug-in type terminals are constructed to cooperate with said plug-in type terminals of said plug-in base, and said plug-in relay supported on said plug-in base with said plug-in type terminals of said plug-in relay in plug-in engagement with said plug-in type terminals of said plug-in base.

11. The combination according to claim 10, said sup-

port comprising a station supporting said control structure, each of said shelf parts having opening means therein at said station, and securing means extending through said opening means to secure said insulating base on said shelf parts at said station.

12. The combination according to claim 10, said rigid member being elongated to provide an elongated channel-support, said elongated channel-support having a plurality of adjacent stations along the length thereof, each of said shelf parts having opening means therein at each of said stations, a separate one of said control structure for each of said stations, at each of said stations securing means extending through the associated opening means to secure the associated separate control structure on said shelf parts.

13. A first support according to claim 10, said first support being elongated to provide a first elongated channel-support,

a second support according to claim 7, said second support being elongated to provide a second elongated channel-support,

a base plate,

means securing the base parts of said first and second channel-supports to said base plate to mount said channel-supports on said base plate in an adjacent parallel relationship with the adjacent ends of the adjacent shelf parts of the adjacent channel-supports being spaced to provide a wire-passage whereby said base plate, the adjacent leg parts of said adjacent channel-supports and the adjacent shelf parts of said adjacent channel-supports cooperate to provide an elongated wiring channel between said base plate and said adjacent channel-supports,

a plurality of said control structures mounted on said shelf parts of said first channel-support along the length of said first channel support, a plurality of said control structures mounted on said shelf parts of said second channel-support along the length of said second channel-support,

a plurality of conducting wires extending from a plurality of said additional terminals of each of said control structures through said wire-passage into said wiring channel.

14. A plug-in relay structure according to claim 3, said electromagnetic means comprising a stationary magnetic member and a movable magnetic armature, coil means positioned to effect magnetic energization of said stationary magnetic member and movable magnetic armature, said second female-type terminal means at the back of said relay structure comprising a pair of female-type terminals for connecting said coil means in an electric circuit, and said movable magnetic armature being supported for reciprocal movement in one direction from front to back and in the opposite direction from back to front.

15. A plug-in relay structure according to claim 14, said stationary magnetic member being supported in proximity to the back of said insulating housing structure, said movable magnetic armature being supported in front of said stationary magnetic member for movement toward and away from said stationary magnetic member, said stationary contacts being supported in front of said movable magnetic armature, said bridging contact structure being supported in front of said movable magnetic armature and connected to move with said movable magnetic armature, upon energization of said coil means said movable magnetic armature being attracted toward said stationary magnetic member and moving in the direction from front to back to move said bridging contact structure from said one operating position to said other operating position, spring means biasing said movable magnetic armature and bridging contact structure toward the front of said relay structure, and upon de-energization of said coil means said spring means being operable to move said movable magnetic armature and bridging con-

tact structure frontward away from said magnetic core from said other operating position to said one operating position.

16. A multi-pole plug-in relay structure according to claim 4, said insulating housing structure comprising an insulating back surface having recess means therein, and each of said quick-detachable female-type terminals on said relay structure comprising a clip-type terminal positioned in said recess means.

17. A multi-pole plug-in relay structure and multi-pole plug-in base structure according to claim 5, support means, means fixedly supporting said plug-in base structure on said support means, said insulating base of said plug-in base structure comprising barrier means forming a plurality of stalls in proximity to one end of said base and barrier means forming a plurality of stalls in proximity to the opposite end of said base, a separate screw-type terminal means in each of said stalls in electrical series with a separate one of said stab-contacts of said plug-in base structure, each of said stalls being open at the associated end of said base for receiving a wire that may be extended into the stall from the associated end of said base and each of said stalls being open at the front of said base for receiving a screw-driver type tool that may be inserted into the stall from the front of said base to operate the screw-type terminal means, said plug-in relay structure being mounted on said plug-in base structure, conducting wires connected to said screw-type terminals to connect said coil means of said plug-in relay structure and said pole units of said plug-in relay structure in electric circuits, and said plug-in relay structure being removable from said plug-in base structure without disturbing the connection of said wires with said screw-type terminal means.

18. A multi-pole plug-in relay structure, a multi-pole plug-in base structure and support means all according to claim 17, and said plug-in relay structure and said plug-in base structure comprising resilient snap-in type support means for providing quick-detachable additional support of said plug-in relay structure on said plug-in base structure.

19. A plug-in base structure for supporting a plug-in relay structure, said plug-in base structure comprising an insulating base, male-type terminal means on said insulating base for cooperating with female-type terminal means of a plug-in type relay structure, additional terminal means on said insulating base for enabling connection of said male-type terminal means in an electric circuit,

said male-type terminal means comprising a plurality of pairs of conducting stabs, a terminal part in proximity to one end of said insulating base for one of the stabs of each of said pairs and a terminal part in proximity to the opposite end of said insulating base for the other stab of each of said pairs, each of said terminal parts being in electrical series with the associated stab, said insulating base comprising barrier means forming a plurality of stalls in proximity to each of said ends of said base, each of said terminal parts being positioned in a separate one of said stalls,

a separate screw-type terminal means in each of said stalls for cooperating with the terminal part in the associated stall, said insulating base comprising an insulating back base part and an insulating front base part, four pairs of stabs on said front base part protruding frontward in two generally parallel spaced rows with each row comprising one stab from each of said pairs, an additional pair of stabs on said front base part protruding frontward in a spaced relationship, said front base part comprising five of said stalls in proximity to each of said opposite ends thereof for housing the ten screw-type terminal means associated with the ten stabs on said front base part, said front base part having opening means therein,

four pairs of stabs on said base part protruding frontward in two generally parallel spaced rows with each row comprising one stab from each of said pairs, said back base part comprising four of said stalls in proximity to each of said opposite ends thereof for housing the eight screw-type terminal means associated with the eight stabs on said back base parts, said front base part being removably mounted on said back base part with the stabs on said back base part protruding through said opening means in said front base part and with said two rows of stabs on said back base part being generally parallel to said two rows of stabs on said front base part, and each of said rows of stalls on said back base part being off-set endwise outwardly relative to the associated row of stalls on said front base part to facilitate screw-driver type operation of the screw-type terminal means that are housed in the stalls on said back base part.

20. A plug-in base structure according to claim 19, said barrier means on said insulating base forming said stalls with each of said stalls being open at the associated end of said base for receiving a conducting wire that may be brought into the stall from the open end thereof and with each of said stalls being open at the front thereof for receiving a screw-driver type tool that may be inserted into the stall from the front of said plug-in base structure to operate the screw-type terminal means in the stall.

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