Oct. 8, 1946. H. D. CAHILL 2,408,755

LATCHING MECHANISM

Filed Sept. 22, 1944 2 Sheets-Sheet 1

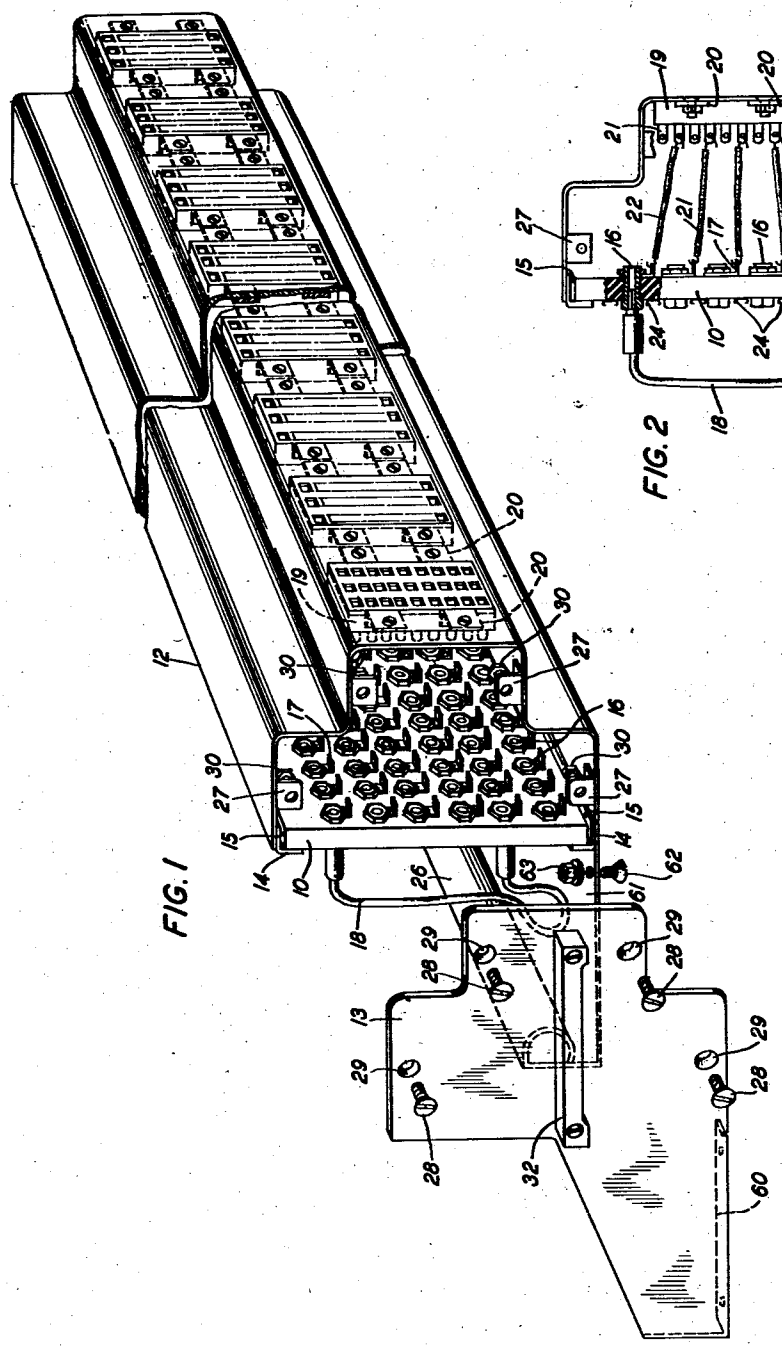


FIG. 1

FIG. 2

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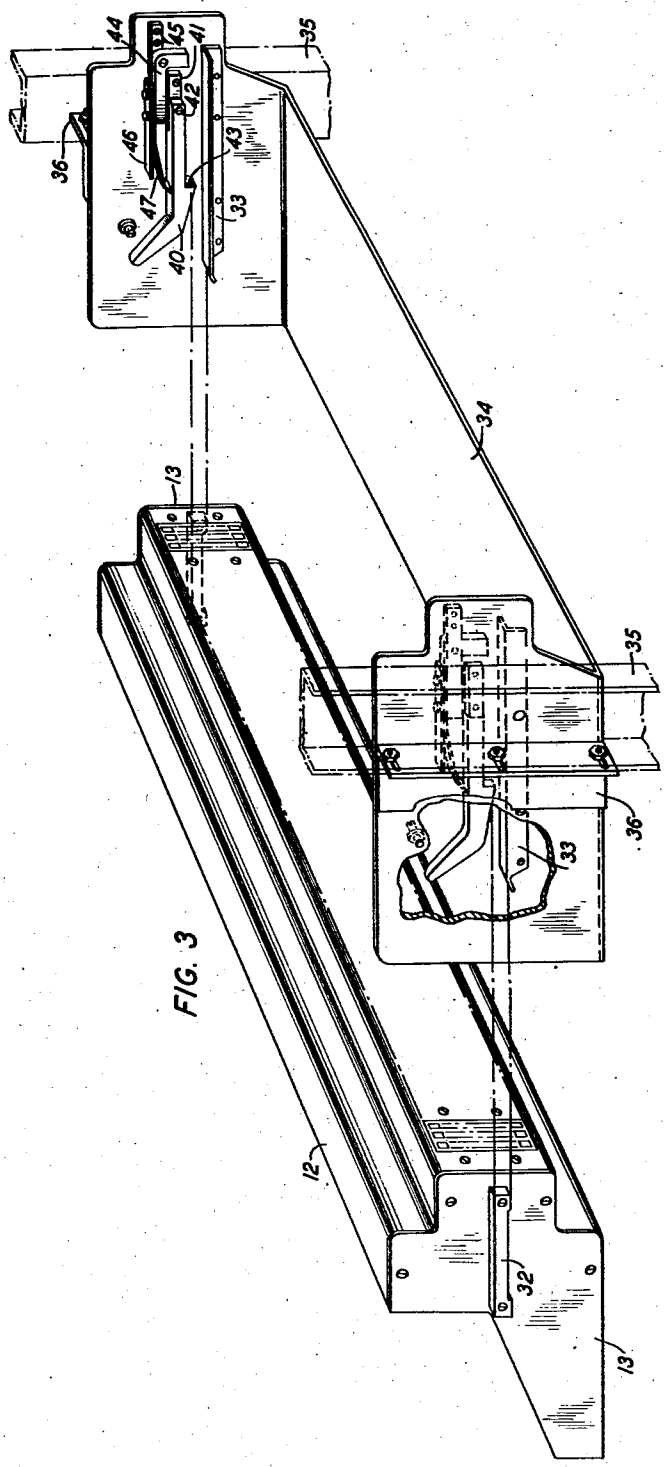


FIG. 3

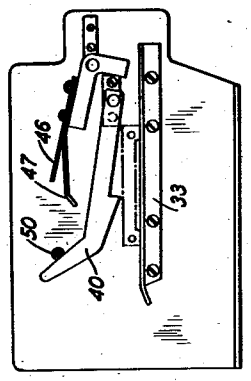


FIG. 6

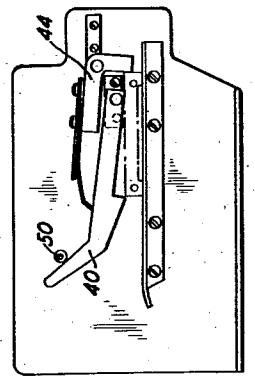


FIG. 5

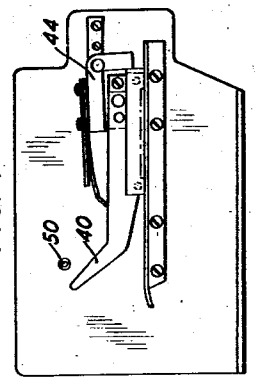


FIG. 4

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LATCHING MECHANISM

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10 Claims. (Cl. 248—361)

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This invention relates to apparatus mountings and particularly to latching means for releasably locking an apparatus unit in position on a mounting frame.

It is the object of this invention to simplify and otherwise improve latching mechanisms of the type employed in locking electrical apparatus units in position on a switch mounting frame.

In certain fields of electrical signaling, plug boards are utilized for the purpose of facilitating the interconnection of a plurality of electric circuits. It becomes necessary under certain circumstances to interchange, at frequent intervals, the electrical connections between circuits. Such circuit changes must be made expeditiously, and for this purpose the circuit interconnections are made through the media of manually operable plug ended cords. In some instances it is desirable to change the interconnections of all, or of a great number of a multipilicity of circuits accommodated by the plug board. In such cases it is the practice to provide duplicate plug boards so that the anticipated circuit changes may be made on one board while the other board is in service. When the required changes are made, the plug board in service is removed from its mounting and the previously prepared board substituted therefor. This practice permits the substitution of a completely different set of circuit interconnections for a set previously in service, with substantially no delay. Such plug boards are usually mounted between the vertical members of a switch mounting frame and are accessible from the front of the frame for withdrawal therefrom.

In accordance with a feature of the present invention, a simplified latching mechanism is provided which functions automatically, upon the insertion of the plug board into the mounting frame, to lock the board in its home position, and to do so in such a manner as to eliminate substantially all relative play between the board and the mounting frame.

Another feature of the invention resides in a latch mechanism which, when manually operated to its unlatching position, functions automatically to partially eject the board from its home position and to thereby preclude the possibility of the latch resuming its latching position when the hands of the person engaged in withdrawing the board from the frame are transferred from the latch releasing members to the board for effecting the removal of the board. This feature is particularly desirable where the plug board is of such size and weight as to require the use of both hands in its removal since, once the latch is manually operated to its unlatching position, it requires no further attention and leaves both hands free to perform the actual removal operation.

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These and other features of the invention will be readily understood from the following detailed description when read in connection with the accompanying drawings, in which:

Fig. 1 is a perspective view of a plug board to which the latching mechanism of this invention is particularly adaptable and shows one of the end plates thereof removed so as to expose the interior of the plug board;

Fig. 2 is an end view of the plug board with the end plate removed, and illustrates the manner in which the interior terminals of the board are electrically interconnected;

Fig. 3 is a perspective view of a latch-supporting mounting tray fixed to a pair of vertical channel members of a mounting frame, and the plug board in removed aligned relation thereto; and

Figs. 4, 5 and 6 show three views of the latching mechanism. In Fig. 4 the latch is shown in its latching position; in Fig. 5 it is shown in the position it occupies just prior to reaching its unlatching position when manually operated; and in Fig. 6 it is shown after it has functioned to unlatch the plug board and to partially eject the same.

The plug board consists essentially of an elongated rectangular front panel 10 of suitable insulating material and a metallic frame 12 which, with the front panel 10 and two end plates 13, serves to effect an enclosure for the internal wiring of the board. A pair of angle members 14 of substantially the same length as the panel 10 are fixed to the front of the panel near its upper and lower edges by any suitable means, such as screws (not shown), so as to provide a spacing between the upper and lower edges of the panel and the horizontally extending portions of the angle members. These spacings are identified in Figs. 1 and 2 by the numeral 15 and provide sufficient clearance to permit the frame 12 to be secured to the angle members 14 by any suitable means such as screws (not shown).

The panel 10 accommodates six rows of female, or jack type contacts 16 each of which is provided at its inner end with a terminal lug 17. In the panel illustrated, each row of jack contacts is intended to include forty contacts making a total of two hundred and forty such jacks. These jacks protrude through the panel so as to render them accessible from the front

for the accommodation of plug-ended cords, such as shown at 18 in Figs. 1 and 2, by means of which interconnections between any pair of jacks 16 may be made.

The frame 12 is formed so as to effect two substantially rectangular portions, one having its longer dimension slightly greater than the height of the panel 10, and the other having its longer dimension slightly greater than the height of the jack-type terminal units 19 which are fixed to the inner face of the rear wall of the frame 12 by means of small angular brackets 20, there being two such brackets fixed to each side of a terminal unit 19 and secured to the rear wall of the frame 12 by screws, as illustrated. The rear wall of the frame 12 is provided with a series of equi-spaced apertures, or windows through which the female contacts of the terminal units 19 are accessible for the reception of corresponding multiplug contact units not shown. As shown in Fig. 2, each jack-type multicontact unit 19 is provided with a plurality of terminals 21 which may be individually connected to the individual terminals 17 of the jacks 16 carried by the panel 10, by wires such as shown at 22 in Fig. 2. Obviously, the connections of the wires 22 to the terminals 17 and 21 may be made in any suitable manner.

Above each row of jacks on the front face of the panel 10 is located a designation strip 24 for the purpose of providing means for identifying the circuits associated with the jacks.

Each end plate, at its lower edge, is provided with an integral flange 60. The flanges of the end plates 13 project inwardly and provide seats upon which a shelf 61 is adapted to rest and to be secured thereto by means of screw bolts 62 and nuts 63, one set of which is shown in Fig. 1. The shelf 61, at its forward end terminates in a rolled portion constituting a hand grip 26 which facilitates the withdrawal and removal of the board from its support on the mounting frame. The leads of the plug ended cords 18 rest upon the shelf 61 as shown in Fig.1.

At suitable points near each end of the frame 12 are fixed four angle brackets 27 to which are secured the end plates 13. As shown in Fig. 1, four screws 28 are screwed into suitably threaded holes 29 in the end plates and pass through corresponding holes in the angle brackets 27 to receive the nuts 30. Thus, when the end plates are placed in position and held therein by the screws 28 and the nuts 30, the interior of the plug board is completely enclosed.

On the outer surface of each end plate 13 and fixed thereto is a horizontal steel bar or runner 32, which, as will be described presently, is adapted to ride upon a slide rail 33 fixed to the inner surface of each of the side walls of the tray 34.

At 35 in Fig. 3 there are indicated portions of the vertical channel members of a switch mounting frame. An angle bracket 36 is adjustably mounted on each channel 35 as illustrated. The side walls of the tray 34 are fixed in any suitable manner to the brackets 36. The tray thus constitutes a compartment into and out of which the plug board may be slid.

Each side wall of the tray 34 supports, on its inner face, a latching unit and the slide rail 33, the latter, in each case, being located immediately below the latching unit. Each latching unit comprises a manually operable latching lever 40 pivotally mounted on a small rectangular plate 41 by means of a pivot screw 42. The lever 40, at its lower edge and substantially midway of its length, is provided with a depending lug or tooth 43. A small L-shaped lever or bell crank 44 is disposed immediately above the lever 40 and to the rear thereof, being pivotally mounted at its elbow to a small plate 45 adjustably fixed to the inner face of the side wall of the tray. On its upper edge, the lever 44 carries two springs 46 and 47 in superposed contiguous relation. These springs are fixed to the lever 44 in any suitable manner so as to project forwardly from the forward end of the horizontal arm thereof. The lower spring 47 is inclined in the direction of the lever 40 so as to be engageably associated therewith.

Normally, that is when the plug board is removed from the mounting frame, the lever 40 would assume a position such that the integral lug 43 thereof would rest upon the slide rail 33. This position of the lever is not shown in Fig. 3 since this figure is intended to show the lever position when the plug board is positioned on the mounting frame. Since, to show the plug board in this position would obscure the latching mechanism, the board is illustrated removed from the frame.

When the plug board is inserted bodily in the mounting frame the rear edges of the supports or runners 32 ride up on the forward inclined ends of the slide rails 33, and as the board is pushed to its home position the levers 40 are raised to positions similar to that shown in Fig. 6, until the lugs 43 thereof clear the forward ends of the corresponding supports 32 fixed to the exterior of the side plates 13 of the board. The levers 40, under the action of their associated springs 46 and 47 and by the force of gravity, assume their latching positions such as illustrated in Fig. 4. It will be observed that when the plug board is in its home position the rear ends of the supports 32 abut the depending legs of their corresponding levers or bell cranks 44 so that the springs 47 are tensioned against their corresponding levers 40 thereby firmly maintaining the levers 40 in their latching positions and precluding any shifting of the plug board in a horizontal direction.

To initiate the removal of the plug board from the mounting frame the forward upturned ends of levers 40 are manually lifted, one lever being manipulated by each hand of the person removing the board. As the levers 40 are raised, the springs 47 are put under tension and as the levers approach the stop 50 this tension is augmented by the tension of springs 46, it being understood that the depending legs of the levers 44 abut the rear ends of the supports 32 during the upward movement of the levers 40. Thus, a considerable tension is built up in the springs 46 and 47 until the lugs 43 of the levers 40 clear the forward ends of the supports 32, at which time, when the board is no longer restrained from moving forwardly by the engagement of the lever lugs 43 with the forward ends of the supports 32, the energy stored in the springs 46 and 47 is utilized in causing the levers 44 to rotate about their pivots in a clockwise direction. By this action of the levers 44 and by virtue of the engagement of the depending legs thereof with the rear ends of the plug board runners 32, the board is projected forwardly a short distance on the slide rails 33. This position of the board is indicated in Fig. 6. Should the tension in springs 46 and 47 be insufficient to eject the plug board, lever 40 will engage lever 44 before lever 40 reaches stop 50 and exert additional pressure

on runners 32. It will be noted that when the hands are removed from the levers 40 and the plug board is automatically ejected from its home position, the levers 40 are held in raised positions by virtue of the lugs 43 thereof riding on the upper surface of the runners 32. Without the initial automatic ejection feature it is apparent that the levers 40 when raised to their unlatching positions would have to, somehow, be held in such positions until the board was manually withdrawn from its home position until the lever lugs 43 were cleared by the front end of the runners 32. Otherwise, when the hands were removed from the levers to grasp the hand grip 26 of the plug board to remove the board from the frame, the levers would fall into their latching positions. The initial automatic ejection of the plug board, therefore, renders it possible for the use of both hands in operating the levers to their unlatching positions and insures the levers remaining in their unlatching positions after the hands are removed therefrom. Both hands may then be employed in withdrawing the plug board from the mounting frame.

What is claimed is:

1. In combination, an apparatus mounting tray, an apparatus unit having a home position on said tray, a manually operable latch for locking said unit in its home position in said tray, and means coupled to and controlled by said latch when manually operated to an unlatching position for ejecting said unit from its home position on said tray.

2. In combination, a stationary tray, an apparatus unit movable into said tray so as to occupy a home position thereon, side wall projections on said unit, manually operable latches on said tray each cooperating with a different one of the side wall projections on said unit for locking said unit in its home position on said tray, and means controlled by said latches when manually operated to unlatching positions for ejecting said unit from its home position on said tray.

3. In combination, a stationary tray having side walls, an apparatus unit movable into said tray so as to occupy a home position thereon, end wall runners mounted on said unit having front and rear ends, a latch lever pivotally mounted on each side wall of said tray, a bell crank for each lever pivotally mounted at its elbow on the corresponding side wall of said tray and having one leg thereof in spaced superposed relation to its corresponding lever and with its longitudinal axis parallel to the longitudinal axis of said lever and a second leg disposed to the rear of said lever and with its longitudinal axis at right angles to the longitudinal axis of said lever, and biasing springs supported on said one leg of each of said bell cranks and extending therefrom in cooperable engagement with the corresponding lever, said second leg of each of said bell cranks being engageable by the rear ends of said end wall runners of said unit when said unit is moved into its home position on said tray to cause said biasing springs to force said levers into latching engagement with the forward ends of the said end wall runners and said springs being operable to cause the said second leg of each of said bell cranks to act upon the rear ends of said end wall runners when said levers are manually operated to their unlatching positions to eject said unit from its home position on said tray.

4. In combination, a mounting frame, an apparatus unit, a latching mechanism supported by said mounting frame including a manually operable latch operable automatically when said unit is inserted in said mounting frame for locking said unit in its home position in said frame, and means operable by said latch when said latch is manually operated to an unlatching position for automatically ejecting said unit from its home position in said frame.

5. In combination, a receptacle having side walls to each of which is fixed a slide rail, an apparatus unit having end walls to each of which is fixed a runner, the runners of said unit being slidable on said slide rails when said unit is inserted into said receptacle, a manually operable latching lever pivotally mounted on each side wall of said receptacle for engagement with corresponding runners of said unit when said unit is inserted in said receptacle so as to occupy a home position therein, whereby said unit is locked in the said home position, and means controlled by said latching levers and rendered effective when said latching levers are manually operated to unlatching positions for automatically ejecting said unit from its home position in said receptacle.

6. In combination, an apparatus unit, a pair of spaced frame members, a support for said unit comprising a pair of slide rails each fixed to a different one of said supports, a pair of runners fixed to opposite ends of said apparatus unit adapted to slide on said slide rails when said unit is inserted between said frame members, a pair of manually operable latch levers each cooperating with one of said runners when said unit is slid on said rails so as to occupy a home position between said members for locking said unit in the said home position, and means responsive to the manual operation of said latch members to unlocking positions for automatically dislodging said unit from its home position between said frame members.

7. In combination, an apparatus unit having side walls, a runner fixed exteriorly to each side wall of said unit, a receptacle for housing said unit comprising a pair of spaced frame members and a tray having oppositely disposed side walls fixed each to one of said frame members, a slide rail fixed to the interior face of each of the side walls of said tray and adapted to accommodate the runners of said unit when said unit is inserted in said receptacle and to permit relative sliding movement therebetween, a manually operable lever pivotally mounted on each side wall of said tray in superposed relation to the corresponding slide rail for effecting a latching engagement with one of said runners when said unit occupies a home position on said rails, spring tensioning means for biasing said levers in their latching positions and for storing energy when said levers are manually operated to their unlatching positions, and means effective when said levers reach their unlatching positions for utilizing the energy stored in said spring tensioning means to dislodge said unit from its home position within said receptacle.

8. In combination, an apparatus unit of appreciable size having end walls, a runner fixed to the exterior of each end wall of said unit, a mounting frame comprising a pair of spaced frame members, a tray having oppositely disposed end walls each fixed to one of said frame members to define a compartment for the accommodation of said unit, a slide rail fixed to each end wall of said tray upon which the runners of said unit slide when said unit is inserted in the compartment defined by said tray, a latching mechanism

mounted on each wall of said tray in superposed relation to the corresponding slide rail and each comprising a manually operable pivotally mounted latching lever having an integrally formed detent engaging the forward end of a corresponding one of said runners when said unit is inserted in said compartment so as to occupy its home position therein, and means engageable with the rear ends of said runners and controlled by said latch levers when said latch levers are manually operated to unlatching positions for ejecting said unit from its home position.

9. In combination, a supporting structure comprising two spaced frame members, a tray having side walls fixed to said frame members and each wall supporting a horizontally disposed slide rail, a plug board having rigidly fixed to each end thereof a runner adapted to slide on a corresponding slide rail when said plug board is moved into said tray, means for latching said plug board to said tray when moved thereinto so as to occupy its home position comprising a latch lever pivotally mounted on each side wall of said tray in superposed relation to the slide rails so as to permit the free passage of each of said runners between a latch lever and slide rail as the plug board is moved on said slide rails into its home position, a detent integrally formed on each of said levers, spring biasing means effective when said plug board reaches its home position in said tray for biasing said levers in their latching positions in which the integrally formed detents thereof each abut one of the ends of corresponding ones of said runners so as to maintain said plug

board in its home position, and means comprising a pair of bell cranks each carrying at one end said spring biasing means and having its other end abutting the other end of a corresponding one of said runners, responsive to the manual operation of said levers to their unlatching positions for ejecting said plug board from its home position.

10. A latching mechanism for releasably locking a plug board in a stationary tray having slide rails upon which runners fixed to the ends walls of said plug board are adapted to slide in either direction as the plug board is moved into and out of said tray, comprising a pair of manually operable latching levers, a bell crank for each lever, and spring tensioning means fixed to each of said bell cranks and engageably associated with a corresponding lever, said levers and bell cranks being independently pivotally mounted on said tray and so disposed relative to one another and to the slide rails of said tray that, when the runners of said plug board are moved in one direction on the slide rails of said tray as the plug board is moved to its home position in the tray said bell cranks are engaged by said runners to cause said spring tensioning means to bias said latches in locking engagement with said runners to lock said plug board in its home position in said tray, and when said latches are manually operated to their unlatching positions said spring tensioning means causes said bell cranks to move said runners in the other direction on said slide rails and to thereby eject said plug board from its home position in said tray.

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