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3,259,876

ELECTRICAL TERMINAL BLOCKS AND MOUNTING RAILS

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FIG. 1

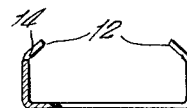
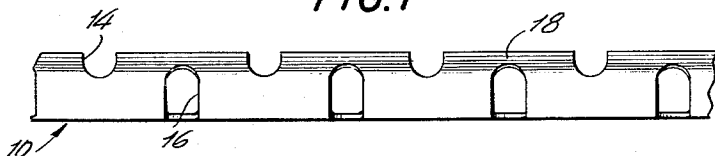


FIG. 2

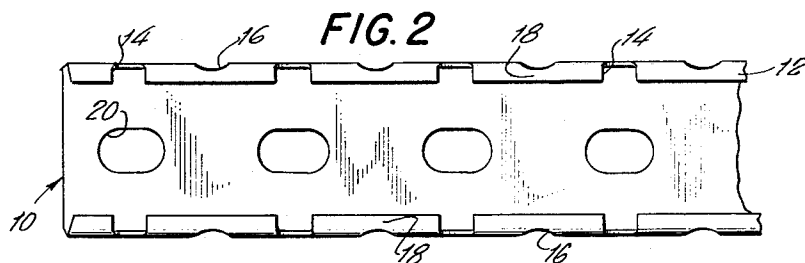


FIG. 3

FIG. 4

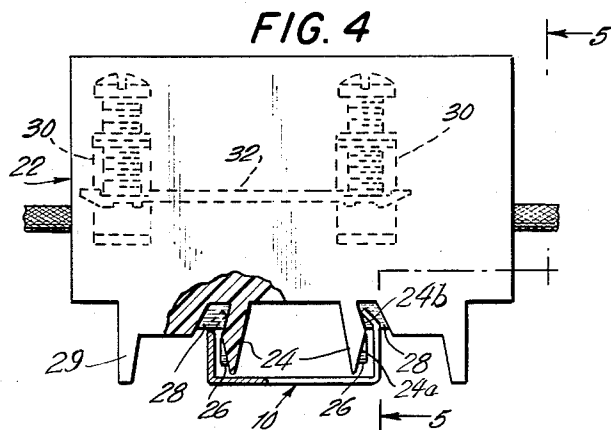


FIG. 5

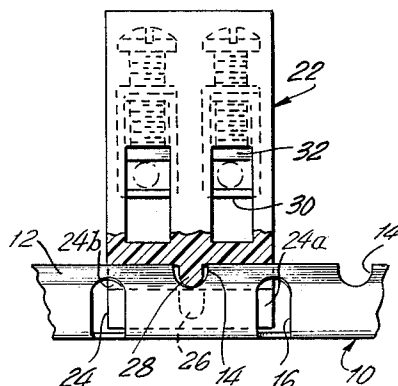


FIG. 6

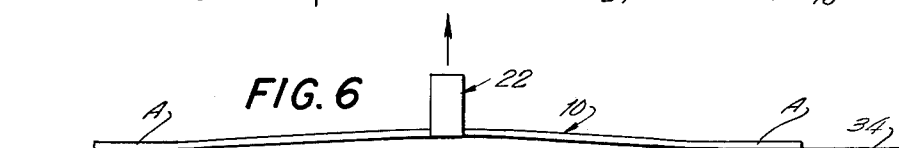
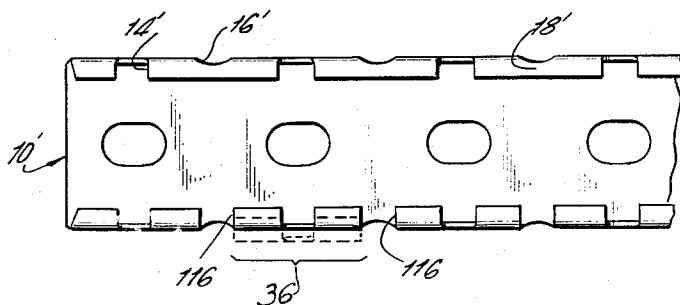


FIG. 7



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ELECTRICAL TERMINAL BLOCKS AND MOUNTING RAILS

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The present invention relates to electrical terminal blocks and to mounting means for such terminal blocks.

Electrical terminal blocks are widely used in such apparatus as motor control centers, elevators and similar wired apparatus, for providing terminal connections. A given piece of apparatus usually involves a large number of circuits requiring external connection. An individual terminal block for each circuit makes connection to a wire in the apparatus, and the terminal block provides a terminal for connecting the wire of the apparatus to an external wire. Various pieces of circuit apparatus require various numbers of terminal blocks, and these may be of various current-carrying capacities. In meeting this situation, it has become common to assemble a number of terminal blocks for providing the necessary number of terminals of the necessary ratings. All the terminal blocks are of a certain modular size or multiple thereof, and the requisite complement of terminal blocks are mounted in a row, side-by-side.

An object of the present invention resides in the provision of a novel form of securing means for modular terminal blocks that is readily adapted to accommodate various numbers of terminal blocks. A more specific object of the invention resides in the provision of a novel mounting rail that can easily be cut down from a standard length that can hold a maximum number of terminal blocks to a shorter length to receive some smaller number of modular terminal blocks. Mounting rails for terminal blocks pursuant to the present invention can be made quite strong in relation to the service requirements, and yet portions of standard, long mounting rails are easily removed to provide the desired length corresponding to the number of terminal blocks to be mounted. In this way, long connector-mounting rails can be stocked and can readily be adapted to receive shorter rows of terminal blocks.

As will be seen, the connectors that are described in detail below have depending portions that are gripped between confronting walls of a resilient metal channel that forms a mounting rail. Each terminal block may have metal parts of different sizes corresponding to the current-carrying capacity of that terminal block. The metal parts in any given terminal block may provide terminals for one, two or three separate circuits. Where more than three circuits are to be accommodated, and where large values of current limit a terminal block to two or one circuit, a row of terminal blocks is assembled. The individual terminal blocks are of a given modular size, measured along the mounting rail.

Another feature of the invention resides in the provision of cooperating formations on the terminal blocks and the mounting rail that initially facilitate mounting of the terminal blocks at regular modular positions along the rail, and which thereafter retain each mounted terminal block in position. A further object of the invention resides in the novel form of the mounting rail for facilitating the mounting of any individual terminal block on the rail and for accommodating its removal from the rail as may be required from time to time, without disturbing companion terminal blocks already mounted and without unduly weakening the mounting rail.

The nature of the invention and the foregoing objects and features, as well as further features of novelty and other objects, will be readily appreciated from the fol-

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lowing detailed description of a preferred embodiment of the invention and of a modified mounting rail, shown in the accompanying drawings.

In the drawings:

FIGURE 1 is an enlarged lateral view of a portion of a typical mounting rail, embodying features of the present invention;

FIGURE 2 is a plan view of the mounting rail in FIG. 1;

FIG. 3 is an end view of the rail of FIG. 1, shown partly in section at the vertical plane 3-3 of FIG. 1;

FIGURE 4 is an enlarged end view, partly in section, of the mounting rail in FIGS. 1-3, with a typical terminal block mounted thereon, illustrating further features of the invention;

FIGURE 5 is an enlarged lateral view of a portion of a mounting rail as in FIGS. 1-3, with a terminal block mounted thereon, shown partly in section as viewed from the section line 5-5 in FIG. 4;

FIGURE 6 is a diagrammatic illustration of a mounting rail and a single terminal block mounted thereon, illustrating the strain involved in removing a terminal block from a mounting rail; and

FIGURE 7 is a fragmentary plan view resembling FIG. 2 of a modified mounting rail, embodying features of this invention.

Referring now to the embodiment in FIGURES 1-6 inclusive, mounting rail 10 is formed of a channel of relatively thin resilient sheet steel, whose vertical side walls have edge portions 12 that are turned in at a moderate angle. A row of notches 14 is formed in each of the in-turned edge portions 12 at regular modular positions along the mounting rail, and at each of these positions there is a generally oval hole 20 in the bottom of the channel. Openings 16 in the side walls are formed midway between each edge slot 14 and the next one along the side wall, these openings being closed at the top by bridging portion 18 so as to form windows. These windows 16 and bridging portions 18 occur in directly opposite pairs in the side walls of the channel.

As seen in FIGURES 4 and 5, terminal blocks 22 mounted on rail 10 are provided with depending portions 24 whose outer surfaces initially diverge upwardly and provide wedge surfaces 24a that are used during the mounting of the terminal block on a mounting rail. Nibs 26 project from the lower wedge surfaces 24a (FIGURE 4) midway along the terminal block 22 as viewed in FIGURE 5. The terminal block illustrated in FIGURE 5 is of a single modular size, it being understood that terminal blocks of multiples of this modular size (measured along the rail) may also be mounted on rail 10. Depending portions 24 of terminal block 22 have upwardly converging surfaces 24b above surfaces 24a so that depending portions 24 are of reduced cross-section, as shown in FIGURE 4, and provide recesses that receive in-turned edge portions 12 of the mounting rail 10. The recesses in terminal block 22 which are thus provided for receiving edge portions 12 are interrupted by integral ribs or webs 28 that are aligned with nibs 26. Terminal block 22 also has a pair of legs 29 that are of the right length to abut a surface to which rail 10 is secured when edge portions 12 grip surfaces 24b.

The illustrated terminal block contains metal parts for two separate circuits. Each circuit terminal block includes a conductor 32 in the form of a metal strip, and a pair of wire clamps 30 at the ends, respectively, of conductor 32. The internal details of the terminal block here involved do not form any part of the present invention, and are more fully disclosed and claimed in my copending application, Serial No. 271,160, filed April 8, 1963.

The use of the terminal block and mounting rail de-

scribed above may now be explained. A mounting rail 10 is selected that is at least as long as is required for receiving the necessary complement of terminal blocks 22. Rail 10 is initially much longer than required in most applications. The excess length of rail may easily be removed. The bridging portion 18 in each in-turned edge 12 of the confronting side walls of the mounting rail are cut, conveniently by means of diagonal cutting pliers. The mounting rail is then bent, in the direction to spread the cut edges of the bridging portions 18. It may be necessary to bend the rail back and forth, but it quickly breaks across the bottom of a channel. Because the mounting rail is of resilient sheet metal, usually thin-gage spring steel, it tends to fracture when bent sharply and breaks quickly when subjected to back-and-forth bending. The broken edge of the bottom of the channel tends to curve downward, so that any sharpness resulting from the break is directed toward the ultimate support to which the rail is secured and there is no hazard from such broken edge.

The shortened rail thus provided is next mounted on a supporting surface, usually by a screw at each end of the mounting rail received in holes 20. Where a long mounting rail is involved, one or more additional mounting screws may be used at points distributed along the length of the rail. Next, the desired complement of terminal blocks 22 having been selected, an individual terminal block 22 is mounted by disposing depending portions 24 between the in-turned edges 12 of the rail. The terminal block may be moved along these edges and the proper location of the terminal block is quickly reached when the nibs 26 at the opposite sides of portions 24 "find" corresponding notches 14 in edge portions 12 of the mounting rail. Thereupon, the terminal block is forced down, portions 24 being driven slightly toward each other and the walls of the channel being spread somewhat apart, the deflection of the depending portions 24 and of the channel side walls depending on their relative stiffness. Where the connector body is of tough insulating material such as nylon, both the terminal block and the mounting rail yield during the forcible movement of the terminal block into its mounted position. When the terminal block has been driven all the way down, edge portions 12 of the mounting rail grip inward sloping surfaces 24b of the depending portions 24, thus retaining terminal block 22 in its mounted position. Ribs 28 are received in notches 14, FIG. 5. By virtue of this construction, a terminal block 22 that has been mounted cannot shift out of its mounted position, lengthwise along rail 10. As thus located, each terminal block 22 is in a position that does not interfere with the mounting of like modular terminal blocks in the adjoining modular spaces of the mounting rail, identified by windows 16, and no end-stops are needed to prevent the end terminal blocks of a row from slipping off the ends of the rail.

Bridge portions 18 provide great strength of the mounting rail, for resisting the stress that is imposed on the mounting rail when an individual terminal block 22 is to be removed. This operation is diagrammatically illustrated in FIGURE 6, wherein mounting rail 10 is shown secured to a supporting surface 34 by fastening means at points A, A. When a terminal block 22 is being pulled away from the mounting rail, the stress imposed on rail 10 tends to cause the rail to arch upward, in the manner shown (greatly exaggerated) in FIGURE 6. Bridging portions 18 provide great strength in resisting such imposed stress. When a directly opposite pair of such bridging portions 18 are cut, it becomes relatively easy to break the channel for providing short lengths of mounting rail, as described above. Only one terminal block 22 is illustrated in FIGURE 6, but it will be appreciated that the illustrated terminal block 22 represents only one terminal block of a large number of such terminal blocks mounted side-by-side along rail 10.

It will be appreciated that many modifications may be

made in the details of the terminal block and mounting rail described above, while retaining the novel features thereof. A distinctive modification of the mounting rail 10 is illustrated in FIGURE 7, having special merit. Rail 10' is in all respects the same as rail 10 described above, except that only one window 16' is provided at any one transverse plane, such window being bridged by an edge portion 18'. Opposite each window 16' is a notch or slot 116 that extends all the way from the bottom of the channel to the edge, thus omitting a bridging portion 18'. It has been found that one bridging portion 17' at each transverse cross-section of the rail provides a great deal of strength that resists a stress such as is represented in FIGURE 6. However, by virtue of the slots 116 that recur at regular modular intervals along one of the side walls of channel 10', the intervening side wall portion 36 is separated from the next adjoining portions 36 of that side wall, and is thus more resilient than in the embodiment of FIGURES 1-6. This facilitates mounting and removal of an individual terminal block 22. Moreover, because only portion 36 deflects in the mounting or the removal of any one terminal block 22, the portions 36 of adjoining modular spaces remain in firm engagement with terminal blocks that have already been mounted in such adjoining modulator spaces.

It will be appreciated that various modifications and varied application of the novel features of this invention will occur to those skilled in the art, in light of the foregoing illustrative disclosure, and consequently the invention should be broadly construed in accordance with its full spirit and scope.

What is claimed is:

1. In combination, a mounting channel for modular electrical terminal blocks, and a side-by-side series of modular electrical terminal blocks thereon, each said electrical terminal block including depending portions which have lateral upwardly diverging surfaces and upwardly converging surfaces above and adjoining said upwardly diverging surfaces, said mounting channel having upwardly extending side walls that confront said upwardly diverging surfaces and inwardly extending edge portions on said side walls in tight gripping engagement with said upwardly converging surfaces, said side walls having transversely aligned windows formed therein at regularly spaced intervals marking the modular spaces along the mounting channel corresponding to said modular terminal blocks, said windows of at least one side wall being closed by bridging integral side-wall edge portions, said in-turned edges having notches formed therein at modular intervals along the channel between said window openings, said upwardly diverging surfaces having locating nibs extending therefrom in vertical alignment with said notches and each said terminal block having integral portions extending into said notches for arresting said terminal block in position against movement lengthwise of the mounting channel.

2. In combination, a mounting channel for modular electrical terminal blocks, and a side-by-side series of modular electrical terminal blocks thereon, each said electrical terminal block including depending portions which have lateral upwardly diverging surfaces and upwardly converging surfaces above and adjoining said upwardly diverging surfaces, said mounting channel having upwardly extending side walls that confront said upwardly diverging surfaces and inwardly extending edge portions on said side walls in tight gripping engagement with said upwardly converging surfaces, said side walls having transversely aligned pairs of windows formed therein at regularly spaced intervals marking the modular spaces along the mounting channel corresponding to said modular terminal blocks, at least one window of each pair being closed by bridging integral side-wall edge portions, said in-turned edges having notches formed therein at modular intervals along the channel between said windows, said upwardly diverging surfaces having locating

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nibs extending therefrom in vertical alignment with said notches.

3. In combination, a mounting channel for modular electrical terminal blocks, and a side-by-side series of modular electrical terminal blocks thereon, each said electrical terminal block including depending portions which have lateral upwardly diverging surfaces and upwardly converging surfaces above and adjoining said upwardly diverging surfaces, said mounting channel having upwardly extending side walls that confront said upwardly diverging surfaces and inwardly extending edge portions on said side walls in tight gripping engagement with said upwardly converging surfaces, said side walls having transversely aligned pairs of windows formed therein at regularly spaced intervals marking the modular spaces along the mounting channel corresponding to said modular terminal blocks, at least one window of each pair being closed by bridging integral side-wall edge portions, said in-turned edges having notches formed therein at modular intervals along the channel between said windows, and each said terminal block having integral portions extending into said notches for arresting said connector in position against movement lengthwise of the mounting channel.

4. In combination, a mounting channel for modular electrical terminal blocks, and a side-by-side series of modular electrical terminal blocks thereon, each said electrical terminal block including depending portions which have lateral upwardly diverging surfaces and upwardly converging surfaces above and adjoining said upwardly diverging surfaces, said mounting channel having upwardly extending side walls that confront said upwardly diverging surfaces and inwardly extending edge portions on said side walls in tight gripping engagement with said upwardly converging surfaces, said in-turned edges having notches formed therein at modular intervals along the channel, said upwardly diverging surfaces having locating nibs extending therefrom in vertical alignment with said notches and each said terminal block having integral portions extending into said notches for arresting said terminal block in position against movement lengthwise of the mounting channel.

5. In combination, a mounting channel for modular electrical terminal blocks and a side-by-side series of modular electrical terminal blocks thereon, said channel having an elongated bottom portion and elongated side walls extending upward from said bottom portion, said side walls having formed therein a series of openings formed therein at modular intervals along the channel and extending to the bottom of the channel, said openings being arranged in pairs transverse to the channel and at least one opening of each pair having the top thereof closed by an integral bridging portion of the side wall, said side walls and said terminal blocks having in-

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terengaging formations for retaining the terminal blocks on the channel against removal therefrom and against displacement along the channel out of the modular positions defined by said pairs of openings.

6. A mounting rail for retaining a series of modular terminal blocks, including an elongated metal channel having a bottom portion and side walls extending upward therefrom, said side walls having formed therein a series of openings spaced apart at modular intervals along the channel, said openings in the side walls being aligned in pairs transverse to the channel and said openings extending down to the bottom portion of the channel, at least one of said openings of each aligned pair having the top thereof closed by an integral bridging portion of the corresponding side wall, and said side walls having formations between said openings for interengagement with corresponding formations of terminal blocks.

7. A mounting rail in accordance with claim 6, wherein said retaining formations include top marginal laterally projecting portions extending from said side walls.

8. A mounting rail for retaining a series of modular terminal blocks, including an elongated resilient metal channel having a bottom portion and confronting side walls extending upward therefrom, the uppermost edge portions of the side walls being turned in at an angle to constitute terminal-block retaining elements, said side walls having formed therein a series of openings spaced apart at modular intervals along the channel, said openings in the confronting side walls being aligned in pairs transverse of the channel and at least one of said openings of each aligned pair being closed by an integral bridging portion of the side wall along the uppermost edge portion thereof, one opening of each pair extending the full height of the side wall in which it is formed, thereby to divide the side wall into longitudinal portions separated from each other in successive modular spaces along the rail for independent lateral deflection during insertion and removal of terminal blocks at the respective modular spaces.

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