

[54] **EQUIPMENT FRAME FOR ELECTRICAL ELEMENTS**

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[51] Int. Cl..... **H05k 5/02**, H02b 1/04

[58] Field of Search..... 317/99, 101 D, 101 DH, 317/101 CB, 112, 120, 122

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[57] **ABSTRACT**

A panel system comprising three components or other electrical switching units, a frame or panel for mounting said electrical units, and a connector panel unit containing a number of interlinked connectors to which the electrical units are releasably connected. The components can be individually pre-fabricated at a factory and separately transported to the installing site where they can be assembled in a simple manner.

**1 Claim, 9 Drawing Figures**

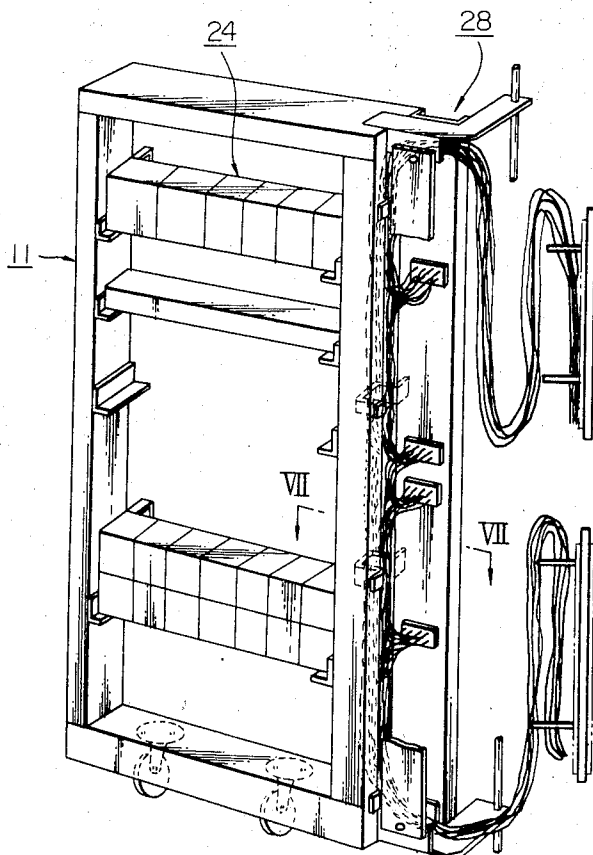


Fig. 1

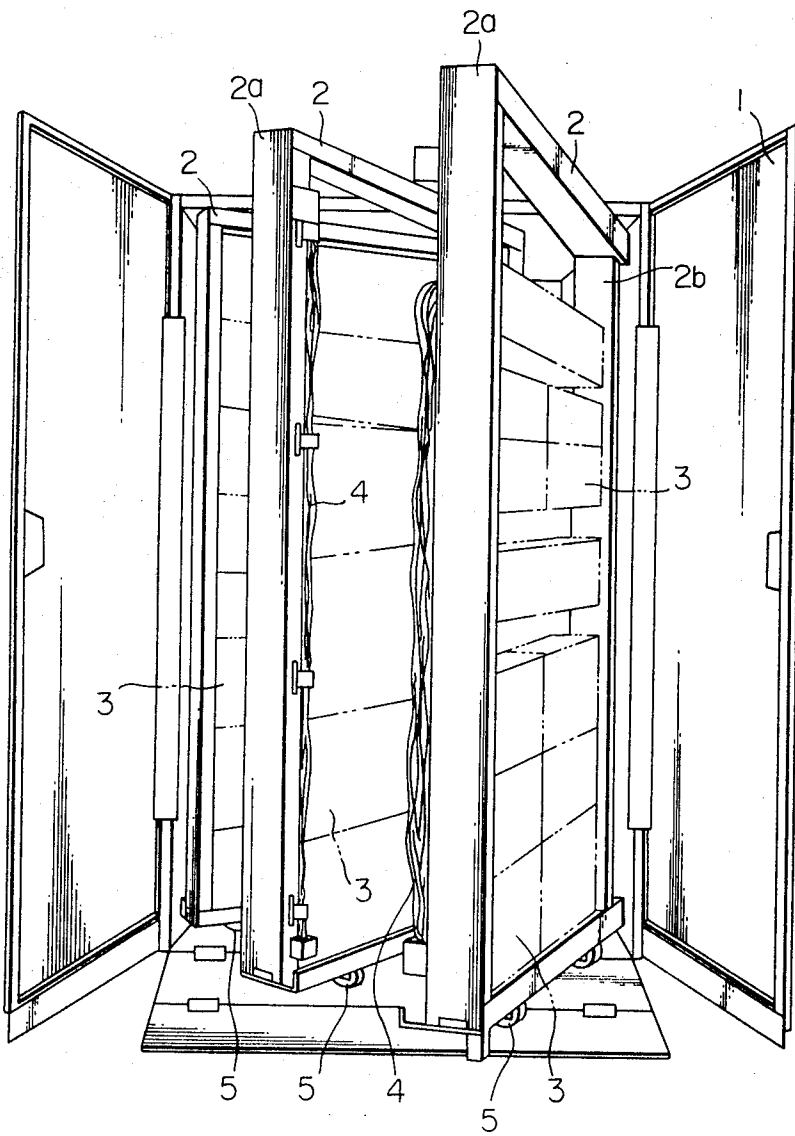


Fig. 2A

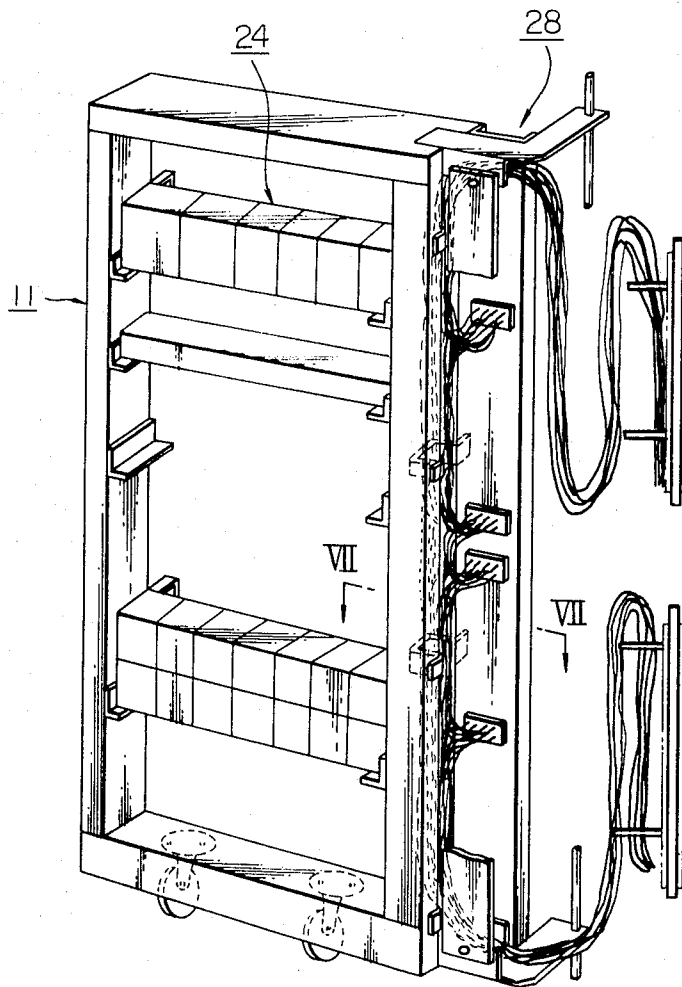


Fig. 2B

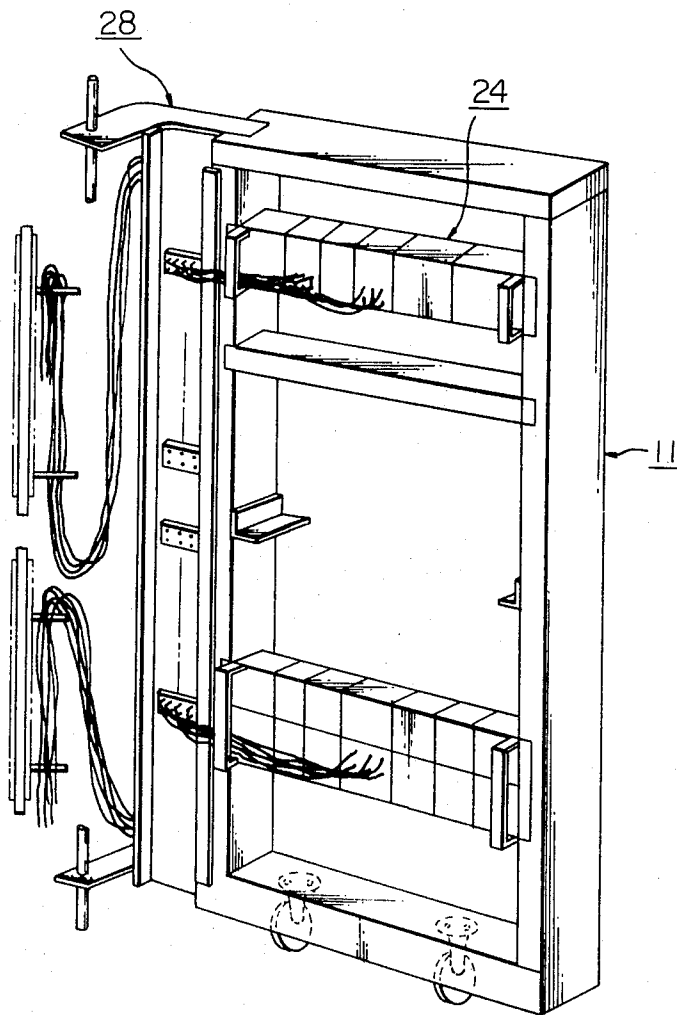


Fig. 3

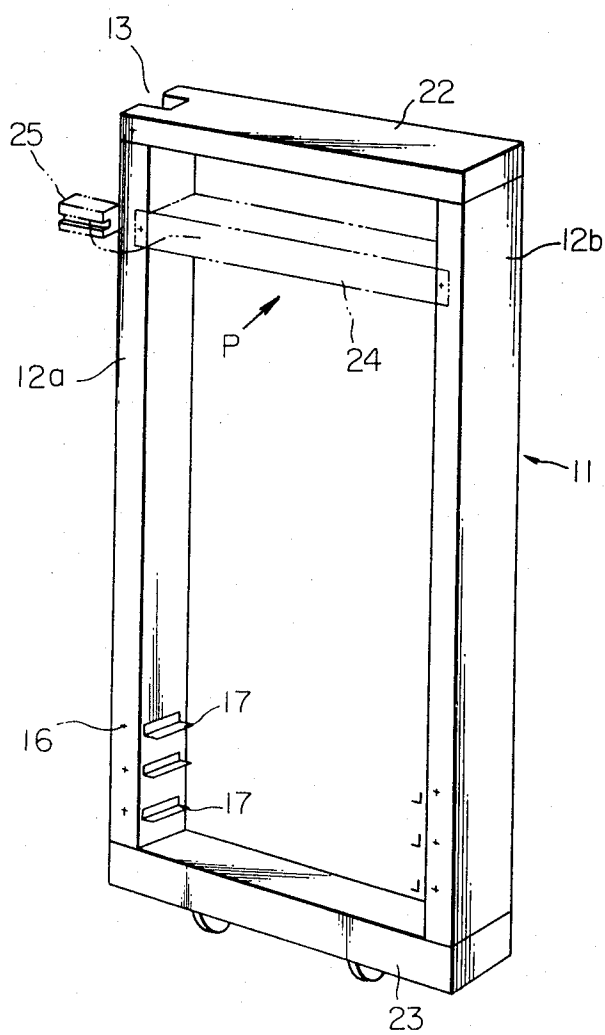


Fig. 4A

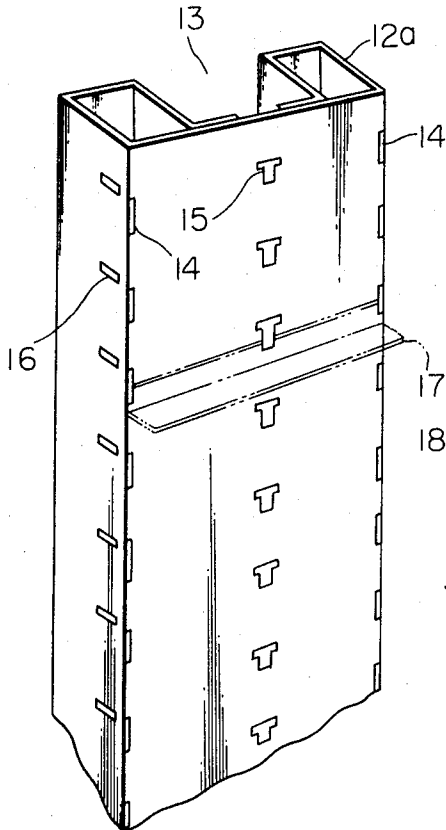


Fig. 4B

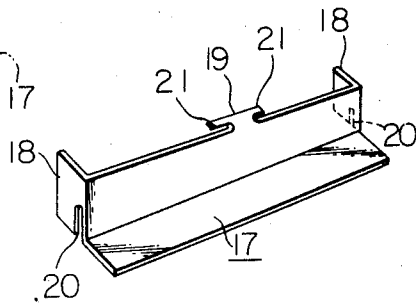


Fig. 5

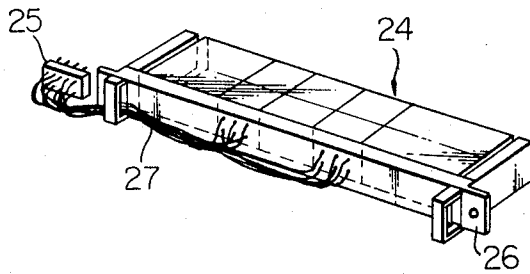


Fig. 6

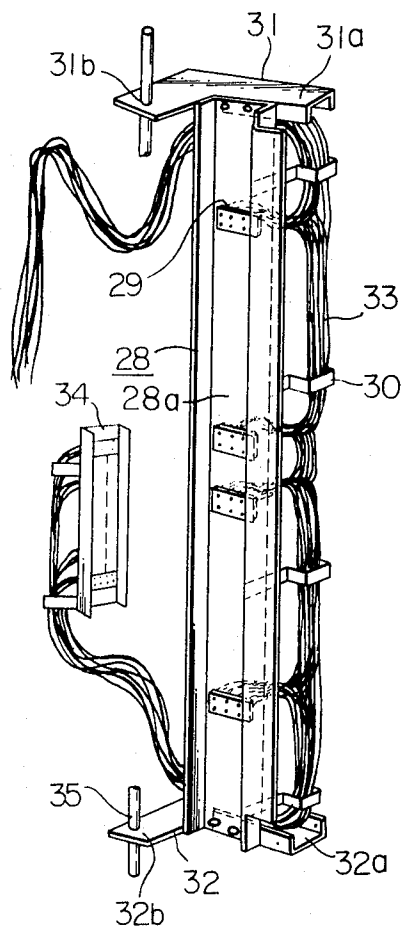
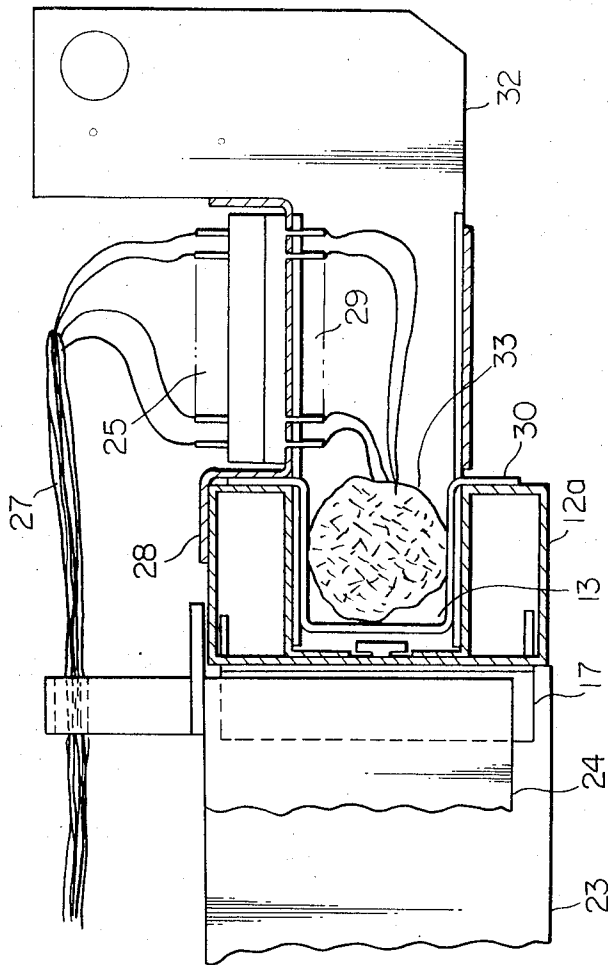


Fig. 7





## EQUIPMENT FRAME FOR ELECTRICAL ELEMENTS

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The present invention relates to a panel system for mounting electrical apparatus such as the plurality of switching units used in a telephone exchange.

#### 2. Description of the Prior Art

In a conventional apparatus of the type mentioned above, it is common practice to mount switching units by means of screws to a frame or panel. Electrical connection between said switching units is normally accomplished by wiring between terminal plates previously attached thereto. Further, in a telephone exchange composed of apparatuses, the electrical interconnections between them have been effected by wiring between terminal plates provided within the respective apparatuses. Wiring for electrically interconnecting the switching units, and also the panels to one another usually took place only after the switching units had been mounted to the frame or panel and the apparatuses had been installed at the installing site. However, since every switching unit for a telephone exchange apparatus may happen to weigh as much as several tens through hundreds of kilograms, mounting them by screw-fastening is very difficult. This difficulty is even larger where it is desired to mount an additional unit between units already mounted because it requires the performance of such screw fastening within a limited space. Therefore, because assembling and wiring of the apparatus at the installing site involved considerable difficulties, these steps were, of necessity, carried out at the factory. Consequently, the overall weight of the completely assembled apparatus was, of course, very large. This was especially true in the case where each apparatus was housed in a cabinet, since it was necessary that each apparatus be provided with a further mechanism for moving it into and out of the cabinet. Consequently, delivery from the factory, transportation to the installing site and installation of the apparatus was very difficult.

Another disadvantage of the conventional apparatus was that the arrangement of wires between the switching units and also between the panels themselves was very difficult due to the structure of the panels.

### SUMMARY OF THE INVENTION

An object of the present invention, therefore, is to eliminate such drawbacks as described above by providing an improved panel system which is simple and easy to assemble. More specifically, the invention provides a panel system which is constructionally separable into three components, switching (or similar) units, a frame or panel unit for mounting said electrical units thereto, and a connector panel unit having a plurality of interlinked connectors. This enables prior fabrication of the individual units at the factory, individual unit shipment to the installation site, and, finally assembly of all units at the installing site.

By referring to the accompanying drawings, the present invention will now be described in more detail, particularly with regard to its structure, features and effects in comparison with those of the prior art apparatus.

### BRIEF DESCRIPTION OF THE DRAWINGS

In the detailed description of the preferred embodiments of the invention presented below, reference is made to the accompanying drawings, in which:

FIG. 1 is a general perspective view of the prior art apparatus;

FIG. 2 contains perspective views of apparatus according to the present invention wherein (A) is a front view and (B) is a rear view of same;

FIG. 3 is a perspective view of one part of the apparatus shown in FIG. 2;

FIG. 4 is a perspective view of a part of a beam constituting an element of the apparatus and a guide rail mounted to it;

FIG. 5 is a perspective view of a switching unit mountable in the frame;

FIG. 6 is a perspective view of a connector panel unit used with the frame; and

FIG. 7 is a partly sectional view of the apparatus taken along the line VII—VII of FIG. 2, showing wiring disposed in the recess provided in the edge of the frame.

Referring to the drawings, FIG. 1 shows one example of conventional panels which are installed in a cabinet 1. In this construction, each panel or frame 2 includes L-shaped beams, 2a and 2b, to which switching units 3 are secured by means of fastening screws (not shown). These switching units 3 are electrically interconnected by means of bundled wires 4 which are visible at the backs of the panels. Each of said frames 2 is provided with wheels 5 to permit easy storing and removal of the apparatus in and from the cabinet 1.

FIGS. 2 through 6 illustrate a preferred embodiment of a panel system according to the present invention. As shown best in FIG. 2, the system is composed of three components: frame unit 11, switching units 24, and a connector panel unit 28.

FIG. 3 shows said frame unit 11 which comprises two beams 12a, 12b vertically disposed in opposite relationship and two horizontal beams 22, 23 arranged at the top and bottom respectively. These beams are fastened together by means of screws, for example. FIG. 3 also illustrates the manner in which a switching unit 24 is applied for mounting on the framework unit 11 along two parallel guide rails 17 in the direction of the arrow P.

As shown in FIG. 4, each of the beams 12a and 12b is provided with a plurality of sets of holes at the inner side thereof, each set including two opposed and vertically elongated end-holes 15, and a T-shaped middle-hole 14. Said sets of holes are vertically spaced from one another at a relatively small distance. Into these holes, rails 17, adapted for mounting switching units, are fitted detachably and simply. Further, holes 16 are provided on the rear side of the beams for holding the switching units mounted on the guide rails 17. Each rail 17 has, at its opposite ends and middle, tongues 18 and 19, respectively, which are adapted to fit detachably and simply into said fitting holes 14 and 15 respectively. Each of said end-tongues 18 and the middle-tongue 19 has slits 20 and 21, respectively. Thus, the rail 17 can be held in place on the beam 12a or 12b only by inserting its tongues 18 and 19 into respective holes 14 and 15 of the pillar 12a or 12b and then moving it downwardly. In this simple fashion, the rail 17 is securely attached to the pillar 12 without the necessity

of using any fasteners, screws, etc. In other words, these rails 17 can readily be mounted on the beams 12a, 12b at a desired position, properly spaced from one another, depending on the height of switching unit to be mounted, without employing screws or any tools.

Further, the beam 12a is provided with a vertically extending channel 13 formed on the outer side as shown in FIG. 4. In this embodiment, the beam 12a only is provided with said channel; however, the beam 12b also may be provided with a similar channel. Said channel 13 serves to accommodate bundled wires, the details of which will be described hereinafter.

FIG. 5 shows a schematic view of the switching unit 24 in which a plurality of electric elements (not shown) have been already accommodated. Switching unit 24 is provided with a multi-pole connector plug 25 connected with said elements which extends around the rear side of the switching unit 24, via surface wiring 27. Mounting tabs 26 are designed so as to be fastened to the beams, for example, by means of fasteners which engage the respective holes 16 on the beams 12a and 12b.

In the present invention, the electrical interconnection between a plurality of switching units 24, and also between the associated panels is accomplished by using connectors on panel unit 28 as shown in FIG. 6. In this unit 28, multipole connector sockets 29 are secured to a plate 28a, the number of the sockets equalling the number of plugs of the switching units 24 to be mounted on the frame unit 11. These fixed sockets 29 are in connection with one another via bundled wires 33. The bundled wires 33 are held by means of holders 30 and are extended further for connection to another connector panel or terminal plate 34. This terminal plate 34 allows interconnection between the associated frame or panels. The connector panel unit 28 has arms 31 and 32 fixed at its upper and lower ends of the plate 28a, respectively. The extreme end portions 31a, 32a of the arms 31, 32 can be fixed in the channel 13 formed in the beam 12a shown in FIG. 3, so that the connector panel unit 28 and the frame unit 11 are securely connected together. In this case, the bundled wires 33 are accommodated within the channel 13. In this manner, there can be provided a protecting effect for the bundled wires 33 and also a good external appearance. Moreover, this arrangement also attains the effect of substantially reducing the width of the apparatus.

Meanwhile, the other ends of said arms 31, 32 serve as journal supports for a shaft fixed to a cabinet as shown in FIG. 1. Therefore, these arms 31, 32 enable pivotal movement around said shaft so as to permit opening and closing of the apparatus relative to the cabinet. In FIG. 6 said shaft is shown at 35, and the journal supports on the arms 31 and 32 are shown at 31b and 32b, respectively.

FIG. 7 is a partly sectional view of the apparatus showing how the bundled wires 33 of the connector panel unit 28 are received in the recess 13 formed on the pillar 12a of the frame unit 11. As described previously, it is possible to provide protection of the bundled wires 33 and also present a good external appearance due to no visible exposure of the bundled wires. FIG. 7 also shows how the connector plug 25 is connected to the connector socket 29.

The switching units 24, the frame unit 11, and the connector panel unit 28, described above, can be indi-

vidually pre-fabricated at the factory. These pre-fabricated units are separately transported from the shop to the installing site. At the site the units are assembled into the apparatus in such a manner that: firstly, the connector panel unit 28 is mounted to the supporting member, for example, the shaft 35 shown in FIG. 6; then, the frame unit 11 is fixed to the arms 31 and 32 of the connector panel unit, and; finally, the electrical units 24 are mounted to the frame unit 11.

The major advantage of the present invention is that the apparatus is constructionally separable into the above-described three components. This separable structure of the present apparatus eliminates the necessity for handling of a large and heavy assembled apparatus. Accordingly it enables simplification and savings in labor in manufacturing, transporting, assembling, and installing.

Another important advantage is the facilitation of electrical connection between units 24 or between frames 11. The electrical connections between the switching units 24 are instantly and simply completed by connecting plugs 25 with the sockets 29. Especially, in a case where a number of the apparatuses are installed in a cabinet, as shown in FIG. 1, the electrical connections between the panels can be accomplished prior to mounting in the frame unit by connecting the bundled wires 33 of the connector panel unit 28 via the terminal plate 34. This connecting work is very easy due to the existence of the wide free-space in the cabinet. As described above, the electrical connection in the present apparatus can be accomplished at the installing site in a much more simple manner and also in a short time.

The present apparatus has an important advantage that the rail 17, for mounting the switching units thereon, can be attached to the pillar without the use of any screws and, accordingly, without any assembling tools. Therefore, every rail is readily detachable so that its position may be properly located according to the height of each switching unit to be mounted. This is more effective in a case where it is desired to mount an additional switching unit between the units already mounted.

A further advantage is the facilitation of wiring. That is, the bunched wires are limited to only the connection in the connector panel unit 28 and the wiring in the switching unit can be accomplished by surface wiring. In the prior art apparatus, the electrical connection between the switching units had also been previously done by the bunched wire technique at the factory.

The invention has been described in detail with particular reference to preferred embodiment thereof. But it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

What we claim is:

1. A panel system comprising, electromechanical units each having a plurality of electrical elements accommodated therein, and plugs connected with said elements via electrical wires;

a frame unit having two vertical beams joined to one another at the upper and lower ends thereof by means of horizontal beams, and pairs of rails mounting a selected number of said electromechanical units thereon, each of said vertical beams having a plurality of sets of fitting holes at the inner

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side thereof, each said set including two opposed and vertically elongated end-holes and a T-shaped middle-hole, each rail having a set of horizontally-extending tongues fitted into a corresponding one of said sets of holes whereby each rail is detachably mountable to said beam, at least one of the vertical beams having a vertically extending channel at the outer side thereof; and  
a connector panel unit having vertical means on

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which a plurality of sockets are disposed to which said plugs removably attached, wires electrically interconnecting said plugs, and arms fixed at the upper and lower ends of said vertical means which engage said frame unit and pivotally engage a supporting member for the apparatus, and said wires being disposed to extend laterally from said vertical means so as to be received within said channel.

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