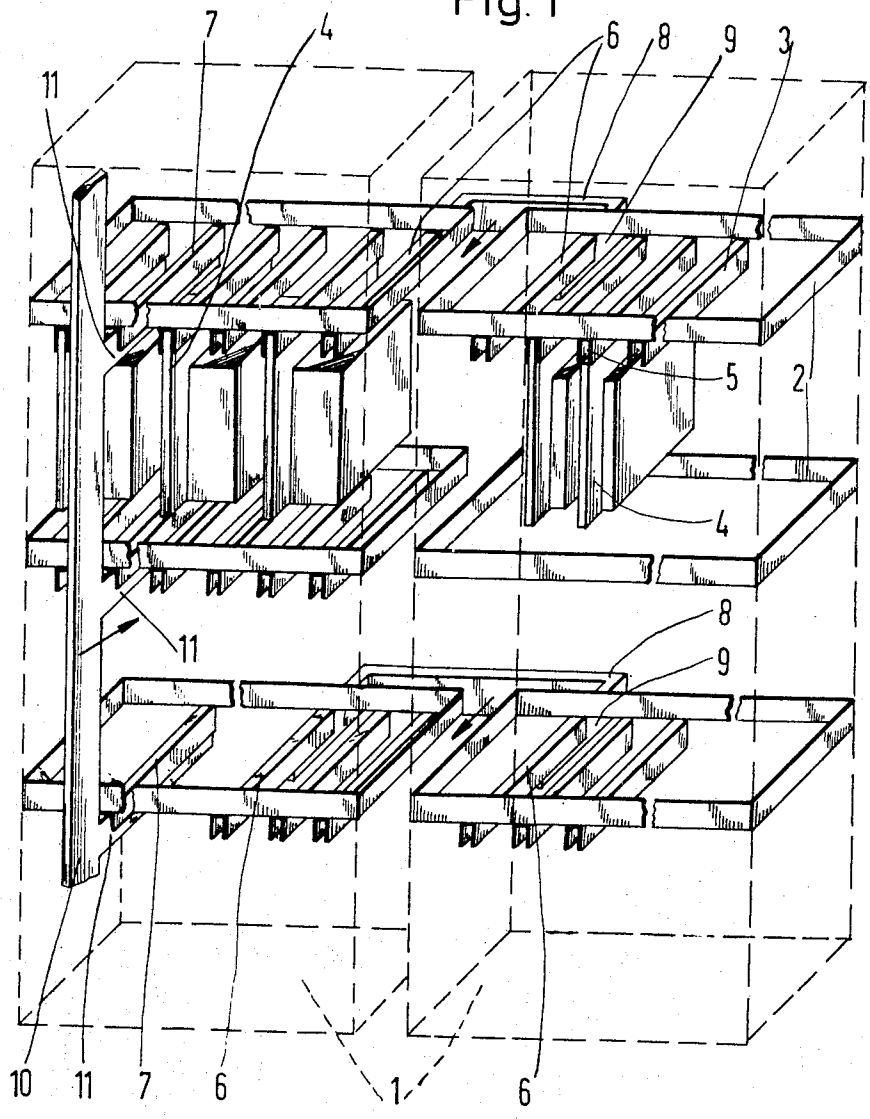
Oct. 24, 1967 W. LOHS ETAL 3,349,288

FRAMEWORK AND CONNECTION SYSTEM FOR REMOVABLE ELECTRICAL COMPONENTS

Filed April 5, 1965 3 Sheets-Sheet 1

Fig. 1

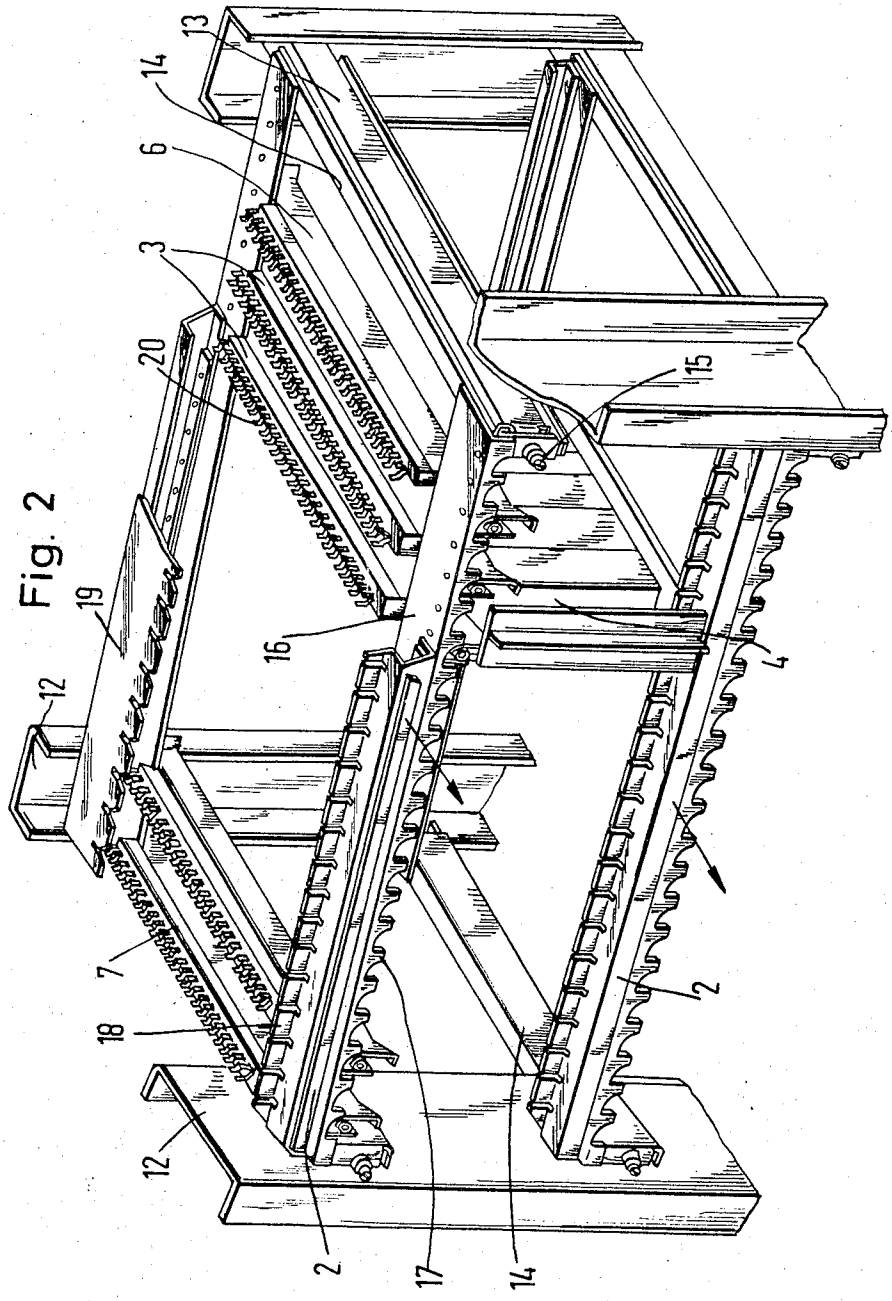


Oct. 24, 1967 W. LOHS ETAL 3,349,288

FRAMEWORK AND CONNECTION SYSTEM FOR REMOVABLE ELECTRICAL COMPONENTS

Filed April 5, 1965 3 Sheets-Sheet 2

Fig. 2



Oct. 24, 1967 W. LOHS ETAL 3,349,288
FRAMEWORK AND CONNECTION SYSTEM FOR REMOVABLE ELECTRICAL COMPONENTS
Filed April 5, 1965 3 Sheets-Sheet 3

Fig. 4

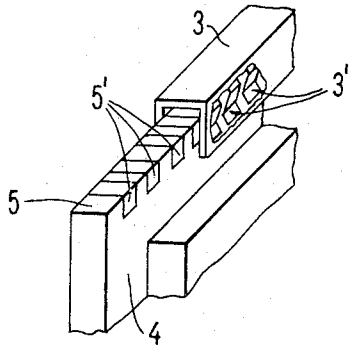


Fig. 3

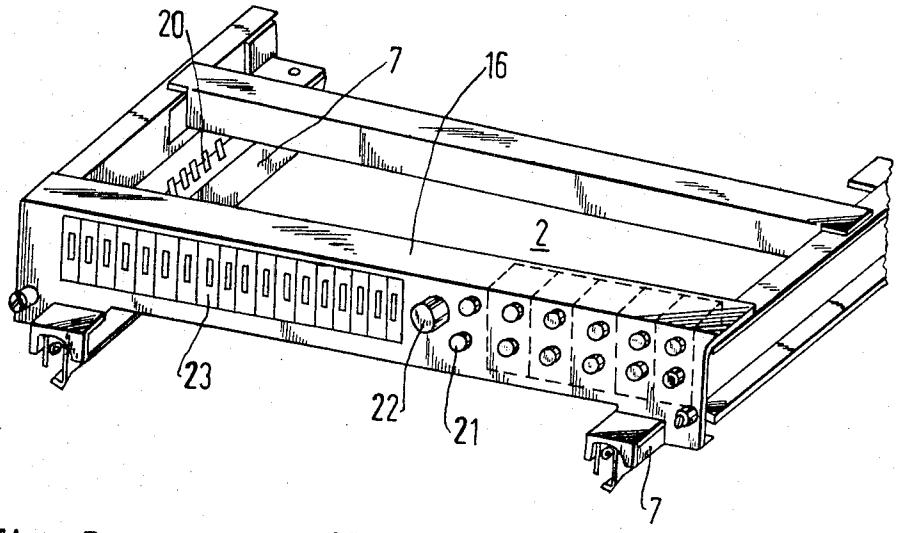


Fig. 5

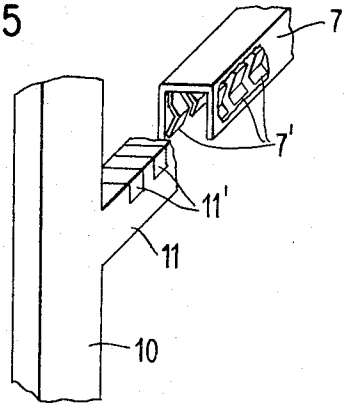
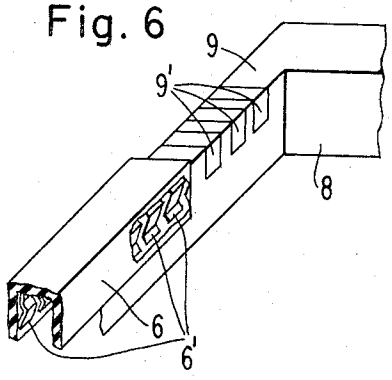


Fig. 6



United States Patent Office 3,349,288 Patented Oct. 24, 1967

3,349,288

FRAMEWORK AND CONNECTION SYSTEM FOR REMOVABLE ELECTRICAL COMPONENTS

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Claims priority, application Germany, Apr. 7, 1964, S 90,412
6 Claims. (Cl. 317—101)

The invention concerns a framework for the reception of component-carrying inserts which is equipped with spring contact strips extending along the direction of insertion of inserts into the frame. The component carrying inserts have edges carrying contacts connected to the components, and cooperate with the said spring contact strips in long distance communication installations and in particular in telephone exchanges.

An object of the invention is to construct a framework of this type in such a way that it can be assembled with the least possible expense at the location where it is to be set up, and that its construction allows alteration in the assembly and wiring thereof without considerable difficulty.

There are known frameworks for the reception of inserts carrying components (connection boards) whereon spring contact strips are mounted on horizontally-extending carrying frames and extend thereon in the direction of insertion. Boards carrying interconnected components are inserted into these spring contact strips, from the front sides of the strips, and the spring contacts of the strips are constructed as press-in contacts, with the strip itself employed to suspend the boards. In one known form of these frameworks, the carrying frames, wired together with the spring contact strips, are supplied as one unit to the building site and there assembled with movable supports into large frameworks. This method permits the supply of units already wired together, i.e., the carrying frames and the inserts, and of individual movable frame parts for the framework rows, i.e., the framework supports.

However, in the case of smaller frame units, and particularly in the case of cabinet frameworks used for private installation, it is not profitable to assemble the frameworks at the building site, and furthermore there is often insufficient space at such sites to carry out the mounting operation. Furthermore, such a carrying frame, after its assembly into a framework row, cannot readily be removed from the framework row, so that, for changes in the wiring, only the space limited by the fixedly installed carrying frames, lying on top of one another, is available. This fact of course reduces the advantage provided by the plane and open wiring surface.

According to the invention, these disadvantages are overcome by the fact that the spring contact strips are joined together into strip frames which are insertable into the framework in the same insertion direction as the inserts, but as independent units. In this manner, the strip frame, supplied in completely wired condition, can be mounted in the framework simply by pushing it in, and can be just as simply removed therefrom, so that its wiring surface is accessible without obstacle, or it can be made accessible freely, without complete separation from the framework, by pulling it out. If these frameworks are built into cabinets by attachment of casings and doors, then the removal of the strip frame can be from the door side of the framework, which at the same time is also the operation side of the framework, where the inserts are put in and taken out.

According to one development of the invention, at least one of the strip frames carries on its front or access edge,

switching and supervision devices connected to the spring contact strips. In this manner, these devices also take on the characteristics of inserts, and thereby also obtain the corresponding advantages, and they are completely compatible with the other insertable strip frames.

It is known to connect together the apparatus groups which form vertically-spaced rows by plug-in framework cables, instead of with a fixed soldered framework cable. These plug-in cables can be supplied to the installation site in prefabricated form, and can be mounted easily. In one of the known constructions, cables having vertically protruding contact strips are utilized, which strips can be plugged into spring contact strips at the front side of the cabinet.

According to a further embodiment of the invention such plug-in connections are utilized for the electrical connection of several strip frames in the same framework by use of a cable provided with contact strips. Such a cable can be plugged into the strip frames, from the insertion side of the framework. The utilization of such cables in the framework, with push-in strip frames has the special advantage that the connection of the strip frames among themselves remains intact, even if the strip frames together are pulled out of the framework. At the same time, this cable can be connected to the strip frame from the same side as that from which the insertion of the inserts and of the strip frames takes place.

Suitably the connections from framework to framework are also made in detachable fashion through use of one or more cables provided with contact strips which can be plugged into the spring contact strips of the strip frames of the frameworks. Thereby the connections between two frameworks, as well as the above-mentioned connections between the individual strip frames, are made by spring contact strips which generally extend in a single plane, so that all such connections can be wired together in one operation, without necessitating specially constructed connection elements for the framework connection.

According to a further embodiment of the invention, the strip frames are provided with repelling members between the front sides of the spring contact strips, at the insertion sides thereof. These members safeguard against the improper attachment of the inserts to the spring contact strips, which, in most cases, are made in rapid sequence.

In the known framework construction mentioned at the beginning hereof, and which has a mounting frame carrying spring contact strips, it is known to equip each mounting frame with guiding means for the boards which are to be inserted and suspended in the mounting frame immediately thereabove. Suitably the strip frames of the present invention are provided with similar guiding means between which are locked the inserts located on the strip frame lying thereabove.

The invention will now be more fully described in conjunction with an operative embodiment thereof shown in the accompanying drawings.

In the drawings:

FIG. 1 is a diagrammatic perspective view showing a pair of frameworks constructed in accordance with the invention;

FIG. 2 is a detailed perspective view of a portion of one of the frameworks of FIG. 1;

FIG. 3 is a diagrammatic perspective view of one type of strip frame of the invention; and,

FIGS. 4 to 6 are enlarged diagrammatic and fragmentary perspective views showing portions of the contact strips and associated connector devices, in accordance with the schematic view of FIG. 1.

In FIG. 1 two frameworks are shown in dotted lines. Each of the frameworks **1** contains several strip frames **2** located on top of each other, which can be pushed into

framework 1 horizontally in the direction of the arrow. These strip frames each carry a plurality of spring contact strips 3 which extend across the respective strip frame, in the insertion direction of the frames. The strips are designed for cooperation with modules 4 consisting of plates on which several components (indicated by boards) seat. These components are wired together, and their contacts (not shown) are located alongside edge 5 of the plate and extend in the insertion direction.

The spring contact strips 3 are constructed as press-on spring strips, i.e., are provided with spring contacts (not shown), which, in rest position, leave open a plate insertion path in the spring contact strip, and, after insertion, are pushed against the contacts, for example, through operation of a crossbar (not shown). When in inserted condition, the inserts 4 then are suspended in the spring contact strips 3. In addition to spring contact strips 3 which receive the inserts 4, the strip frames 2 are provided with additional spring contact strips 6 and 7, which are constructed like spring contact strips 3, but are utilized for further electrical connections.

The division of strip frames 2 is such that either inserts 4 which are not very thick (right framework) are next to each other, or inserts 4 of greater thickness (left framework) can be pushed into each n^{th} (shown as 2*nd*) spring contact strip 3. Spring contact strips 6 and 7 accordingly are either arranged to the side of the group of spring contact strips 3, or, utilizing the space which is needed anyway for inserts 4, between these spring contact strips 3. For the electrical connection between two frameworks 1, preferably cables 8, formed as flat ribbons are utilized. The wires of cables 8 terminate at contact strips 9, which are of similar construction to the upper edges of inserts 4. These strips 9 may be inserted into spring contact strips 6, as inserts 4 are pushed into spring contact strips 3, either from the rear, as shown, or from the front.

At the insertion side of framework 1 there are provided one (or several) cables 10 for the electrical connection of strip frames 2 associated with the same framework 1. This cable 10, like cables 8, is equipped with contact strips 11, which can be pushed into contact spring strips 7 in the direction of the arrow, i.e., in insertion direction of inserts 4 from the insertion side of framework 1.

FIG. 2 shows further details of each framework 1 and of the strip frames 2. Framework 1 is comprised of four supports 12, which are connected with each other in pairs by guide rails 13 and which can be completed by casings and a door (not shown) to form a cabinet. Strip frames 2 each include a pair of rail sections 14 by which they may be pushed onto corresponding guide rails 13 and fastened to framework 1 by means of lock bolts 15. The edge 16 of ledge frame 2, which extends along the insertion side of framework 1 when in pushed-in condition, is provided with repelling members 17, which project between the spring contact strips 3, or 6, or 7, respectively, at their front or "insertion sides," to prevent faulty attachment of inserts 4 or contact strips 9 or 11 (FIG. 1) respectively. Strip frame 2 is also provided with guide members 18 and 19 which have slots into which extend and lock edges of the inserts 4 other than the upper edges 5 (FIG. 1), so that, upon the insertion of inserts 4, they are guided into the overlying spring contact strips 3 and are supported against swinging motion by the guide members 18 and 19 associated with the next lower strip frame 2.

As is evident from the drawing, contact members 20 of spring contact strips 3, 6 and 7, lie in a single plane and form a wire field especially suited for machine connection. In such operation, the individual wires (not shown) are partly led to the upper ends of spring contact strips 3, 6 and 7, and partially between them, so that open wire pockets equipped with side slits (also not shown) can be provided between the spring contact strips 3, 6 and 7, or wire guidance strips at both sides of the spring contact strips 3, 6 and 7 can be formed. The spring contact strips 7 and 6, respectively serving for the connection of the framework wiring and for the connection to the next framework 1, replace the distributors otherwise necessary in such apparatus and can in the same manner be wired together with spring contact strips 3, as these are wired together among each other, so that switching wires (not shown) can be connected to the contact members 20, which then form a switching field which directly adjoins the wiring plane defined by the contact members 20.

In order that alterations may be made in the switching procedure, the strip frames 2 need only be pulled out of framework 1, in the direction indicated by the arrows, to make the wiring plane thereof completely accessible. If all strip frames 2 are desired to be pulled out of framework 1 for testing purposes, this operation can be performed while cable 10 (FIG. 1) is plugged in, so that it is not necessary to interrupt the connection between the ledge frames 2. If the clamping function in the contact spring strips 3, 6 and 7 is released, then, after removal of cable 10, each strip frame 2 can be completely detached from frame 1 and, for example, can be exchanged. Since the inserts 4 are also pushed in and pulled out from the same side of the framework 1 as the cable 10, and the ledge frames 2, a framework which can easily be mounted and supervised is obtained, which framework can be constructed in different variations.

In FIG. 3 is shown a strip frame 2, which contains spring contact strips 7 and has on its edge 16, at the insertion side of the framework 1, switching members 21, such as blocking push buttons, supervision devices 22, such as signal lamps; and safety devices 23, which devices can be strip fuses. Of course, there can also be provided plug-in strip fuse devices to connect any supervisory systems. The devices 21 to 23 are wired together with the contact members 20 of spring contact strip 7, over which, with the aid of cable 10 (FIG. 1) the connection to the rest of the strip frames 2 and to the inserts 4 is made.

FIGURES 4 to 6 show, in diagrammatic perspective views, illustrations of suitable contact structures for use in the spring contact strips of the framework of the invention and in the associated insertable elements. Elements of the structures shown in FIGURES 4 to 6 which are identical to those of FIG. 1 are identified by identical numbers.

In FIG. 4, the contact strip 3, which represents one of the contact strips 3 of FIG. 1, is shown in partial section. A portion of the side wall of contact strip 3 is broken away to disclose the spring contacts 3' positioned interiorly thereof. The edge 5 of module 4, also shown in partial section, is shown partially inserted into the spring contact strip 3. A plurality of contacts 5' are mounted on the edge 5. When the module is completely inserted into the contact strip 3, the spring contacts 3' provide electrical connection to corresponding ones of the contacts 5'. Each of the spring contacts 3' is electrically connected to contact members 20 (not shown in FIG. 4), providing terminals for external connection, in accordance with FIG. 2 and the description thereof. Similarly, the contacts 5' carried by the edge 5 are electrically connected to the components of the insertable module 4, in a manner not indicated.

FIG. 5 shows, in a fragmentary view, portions of a spring contact strip 7 for receiving and providing electrical connection to the insertable contact strip 11 of a strip frame connector. The strip frame connector, as shown in and discussed with relation to FIG. 1 further includes a cable 10 and one or more additional contact strips. A portion of the spring contact strip 7 is broken away to indicate the interiorly positioned spring contact 7'. As indicated, additional spring contacts 7' are positioned in opposed relationship on the interior vertical surfaces of the contact spring strip 7. The contact strip 11 associated with the cable 10 includes contacts 11' on the surface thereof which, when the contact strip 11 is in-

serted into the spring contact strip **7**, engage corresponding ones of the spring contacts **7'**. To simplify the illustration of FIG. 5, the cable **10** is shown as a rectangular element; it will readily be appreciated that the rectangular element represents a cable having a plurality of conductors providing electrical connection to associated ones of the contacts **11'** on the strip **11**. The cable conductors further are connected to associated contacts on one or more additional contact strips (not shown) associated with the cable **10**. Suitable contact terminals (not shown in FIG. 5) are provided on the spring contact strip **7** to provide external terminals for the interiorly positioned spring contacts, as shown by the terminals **20** on strip **7** in FIG. 2.

FIG. 6 shows, in a manner similar to FIGS. 4 and 5, portions of a cable **8** and an associated contact strip **9**, as the latter is received within a spring contact strip **6**, in accordance with FIG. 1. The end view and the broken away portion of the spring contact strip **6** disclose interiorly positioned spring contacts **6'** for engaging the contacts **9'** provided on the contact strip **9**. External terminals (not shown) are provided on the spring contact strip **6** to permit electrical connection to the interiorly positioned spring contacts **6'**, as shown by the terminals **20** on strip **6** in FIG. 2. To simplify the illustration of FIG. 6, the cable **8** is shown as a rectangular element; it is to be understood, however, to represent a cable having a plurality of conductors providing electrical connection to associated ones of the contacts **9'** of the contact strip **9** and to the contacts of one or more other contact strips (not shown) associated therewith.

It will be evident that many minor changes could be made in the apparatus specifically described herein without departure from the scope of the invention. Accordingly, the invention is not to be considered limited to such apparatus, but rather only by the scope of the appended claims.

We claim:

1. An electrical equipment frame into which a plurality of plug-in inserts may be inserted, with the inserts having contacts spaced along the direction of insertion, comprising:

strip frames removably insertable into the equipment frame,

said equipment frame including means for supporting said strip frames within said equipment frame, each of said strip frames being movable along said direction of insertion in engagement with said supporting means, and

contact strips mounted in groups on said strip frames, said contact strips extending along said direction of insertion and engaging said contacts of said inserts when the latter are inserted.

2. The apparatus of claim **1** including at least one strip frame connector for connecting together a plurality of strip frames,

each strip frame having an interconnection contact strip extending along said insertion direction,

and said strip frame connector having contacts spaced along the direction of insertion and engageable with the respective interconnection contact strip when the frame connector is inserted into said frame.

3. The apparatus of claim **2** in which said inserts are substantially vertically-extending modules with said contacts extending along the uppermost surfaces thereof, and said strip frames are substantially horizontally-extending shelflike assemblies, the contact strips of said strip frames being of the opposed type providing a channel therebetween into which the contacts of said inserts can be inserted, and being generally horizontally spaced apart along said strip frame in a direction perpendicular to the direction of insertion.

4. The apparatus of claim **3** in which one of said strip frames carries one contact strip for a frame connecting cable for connection of two frames together.

5. The apparatus of claim **4** in which said strip frames are provided with guide members operable to engage the edges of said inserts and hold the inserts against swinging motion with respect to said contact strips.

6. The apparatus of claim **5** in which said strip frames are provided with repelling members disposed between their contact strips at the forward edge thereof and operable to prevent inserts from being inserted other than with their contacts extending within said contact strips.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,349,288 October 24, 1967

Willy Lohs et al.

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 34, "press-in" should read -- press-on --. Column 2, line 8, "fixed" should read -- fixedly --. Column 6, line 27, the claim reference numeral "4" should read -- 3 --.

Signed and sealed this 16th day of September 1969.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents