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ELECTRICAL PANEL STRUCTURE

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Fig. 1.

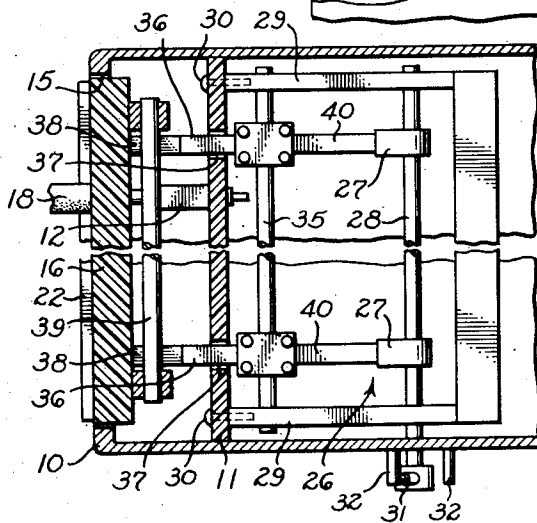
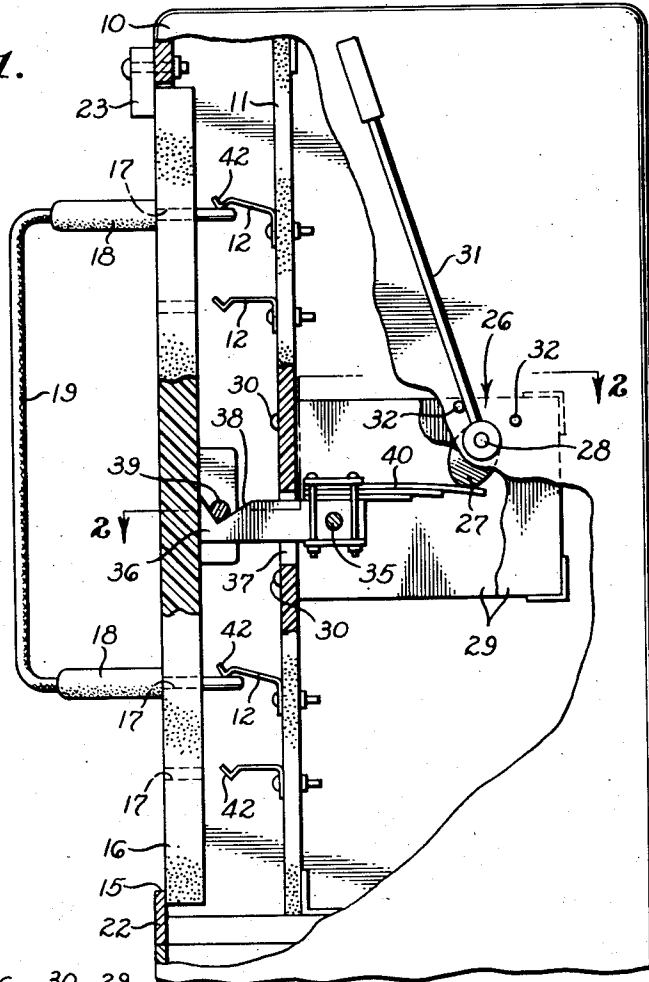


Fig. 2.

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ELECTRICAL PANEL STRUCTURE

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3 Claims. (Cl. 339—18)

The present invention relates in general to an electrical panel structure comprising two panels respectively provided with contacts or terminals adapted for electrically conductive engagement, a primary object of the invention being to provide novel means for establishing and maintaining electrically conductive engagement between the terminals or contacts on the respective panels.

More particularly, the present invention relates to a panel structure which includes a first panel having thereon an array of flexible and resilient terminals or contacts which project from the first panel on one side thereof, such terminals or contacts being regarded as projecting forwardly from the first panel as a matter of convenience. The panel structure also includes a second panel having rearwardly extending terminals or contacts respectively electrically engageable with selected ones of the terminals or contacts on the first panel when the second panel is placed in an operative position wherein it is parallel to and spaced forwardly from the first panel. In the particular structure illustrated, the second panel is a plug board having apertures therein through which banana plugs, or the like, may be inserted from the front side of the plug board to project rearwardly therefrom. With this construction, which is utilizable in computers and similar equipment, any one of a wide variety of plug combinations may be used on a particular plug board, and any one of a wide variety of plug boards may be utilized, all in connection with the single first panel, to produce a wide variety of electrical circuits, although it is to be understood that the present invention is not to be regarded as limited to use with computers, or like equipment.

An important object of the present invention is to provide a panel structure of the foregoing general character wherein one of the panels is movable relative to the other in a transverse direction with respect to the direction of projection of the contacts or terminals so as to move the contacts on the movable panel laterally into engagement with the corresponding contacts on the other panel, the plug board preferably being the movable panel and the said first panel preferably being stationary.

By laterally moving the contacts or terminals into electrically conductive engagement with each other in this manner, good electrical connections are established and maintained without applying to the plugs in the plug board any force or force component tending to cause them to back out of their respective apertures so that simple plugs of conventional form may be used, which is an important feature of the invention. Also, such lateral presentation of the plugs on the plug board to the contacts or terminals on the stationary panel permits the use of inexpensive and conventional plugs to act as single-element contacts between the connector cords and stationary contacts. The more expensive alternatives of using special types of locking plugs, or of fitting the plug board with intermediate contact elements, to make a two-element electrical connection between

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connector cords and stationary contacts, are thereby avoided.

Another important object of the invention is to provide a positive actuating means for producing lateral movement of the plugs on the plug board into engagement with the respective contacts on the stationary panel which is capable of applying substantial actuating forces to the plug board to insure positive electrical engagement.

More particularly, an object of the invention is to provide an actuating means for moving the plug board in a plane parallel to the stationary panel which includes cam means for camming the plugs on the plug board into electrically conductive engagement with the contacts or terminals on the stationary panel. A related object is to provide a cam means which includes a cam engaging a pivoted member which in turn engages the plug board to move the plug board in a plane parallel to the stationary panel upon rotation of the cam.

Another object in this connection is to provide a pivoted member which includes spring means for yieldingly connecting the cam means to the movable panel or plug board. With this construction, the spring means is deflected as the cam is rotated so that, after the plug board has been displaced into the proper position, the spring means maintains a constant lateral bias between the plugs on the plug board and the contacts or terminals on the stationary panel to insure electrically conductive engagement.

Another object is to provide guide means for guiding the plug board along the desired path in a plane parallel to the stationary panel. In the particular construction disclosed herein, the plug board is moved in a straight line in an upward direction, although it will be understood that the invention is not to be regarded as limited thereto.

Another object is to provide the contacts or terminals on the stationary panel with forward ends which are inclined relative to the axis of such contacts or terminals so that, even when the plug board has been cammed into its operating position, additional plugs may be inserted into the plug board into engagement with corresponding contacts on the stationary panel if desired, the inclined forward ends of the contacts on the stationary panel providing means for camming these contacts laterally out of the way as the plugs are inserted.

The foregoing objects, advantages and features of the present invention, together with various other objects, advantages and features thereof which will become apparent, may be attained with the exemplary embodiment of the invention which is illustrated in the accompanying drawing and which is described in detail hereinafter. Referring to the drawing:

Fig. 1 is a view, partially in elevation and partially in section, illustrating an apparatus which embodies a panel structure of the invention; and

Fig. 2 is a sectional view taken along the arrowed line 2—2 of Fig. 1.

In the drawing, the numeral 10 designates a housing in which is mounted a stationary, first panel 11, this panel being suitably secured to the housing. The stationary panel 11, which is preferably formed of an electrically insulating material, has mounted thereon an array of forwardly projecting contacts or terminals 12 formed of spring material so as to be flexible and resilient, the contacts 12 being connected in any desired electrical circuits, not shown. In actual practice, the stationary panel 11 may carry a very large number of the contacts 12, only a few being shown for illustrative purposes.

The housing 10 is provided in its front wall with an opening 15 through which a movable, second panel 16 may be inserted into a position parallel to the stationary panel 11, the movable panel 16 being, in the particular

construction illustrated, a plug board having apertures 17 therein corresponding to and aligned with the respective contacts 12 and respectively adapted to receive conventional plugs 18, which may be of the banana type, or other suitable type, and which are electrically engageable with the contacts 12 corresponding to the apertures 17 into which they are inserted. In the particular construction illustrated, two plugs 18 are shown interconnected by an electrical conductor 19, whereby the two plugs shown interconnect the corresponding two contacts 12 when the plug board is in its operative position, as will be described hereinafter. However, it will be understood that any two given plugs such as plugs 18 may be electrically independent in many applications of the invention.

In the particular construction illustrated, the plug board 16 is guided for straight-line vertical movement by a guide means which includes a flange 22 engageable with the lower edge of the plug board and a pivoted catch or dog 23 engageable with the upper edge of the plug board, the dog 23 being pivotable to one side to permit insertion of the plug board into the housing 10 and removal thereof from the housing also, and the side edges of the opening 15 guiding or locating the plug board with respect to lateral position. As will be apparent, this guide means serves to maintain the plug board 16 in parallel relation to the stationary panel 11, it being understood that other types of guide means may be substituted for the particular guide means shown without departing from the spirit of the present invention.

In use, the plug board 16 is placed in the housing 10 with the rearwardly projecting plugs 18 disposed below the corresponding contacts 12, thereby in a first presentation motion positioning plug board 16 into its final operating plane parallel to the stationary panel 11. Preferably, for maximum utilization of the invention whereby no forces act to push the plugs 18 back out of the apertures 17, the plugs 18 are presented sufficiently below the corresponding contacts 12 to be fully out of engagement therewith. Alternatively, a very light engagement with the contacts may be allowed. Electrically conductive engagement between the plugs 18 and the corresponding contacts 12 is established and maintained by a second presentation motion by moving the plug board 16 upwardly, while keeping it substantially in the same operating plane, into the position shown in Fig. 1 of the drawing, and by maintaining it in this position. As will be apparent, such upward movement of the plug board 16 flexes the spring contacts 12 upwardly so that their inherent resilience biases them downwardly into positive electrical engagement with the rearwardly projecting plugs 18, which is an important feature of the invention.

Considering the means by which the plug board 16 is moved laterally relative to the direction of projection of the contacts 12 and the plugs 18, the invention provides a cam means 26 for camming the plug board 16 upwardly into its operative position shown in the drawing. The cam means 26 includes two cams 27 in the particular construction illustrated, these cams being fixed on a shaft 28 which is journaled in frame members 29 suitably fixed in position, as by being secured to the stationary panel 11 by screws 30, or the like. The shaft 28 projects through one side wall of the housing 10 and is provided with a handle 31 thereon externally of the housing, rotation of the cams 27 being limited by stops 32 with which the handle is engageable.

Also journaled in the frame members 29 is a shaft 35 having lever members 36 thereon, such lever members being rendered pivotable by virtue of being mounted on the shaft 35. The lever members 36 extend forwardly through openings 37 in the stationary panel 11 and are provided at their forward ends with notches 38 adapted to receive a rod 39 carried by and spaced rearwardly of the plug board 16. The lever members 36 include spring

means 40 which extend rearwardly and which are engageable by the cams 27, respectively, each spring means including a multileaf cantilever spring clamped to the body portion of the corresponding lever member. As will be apparent, when the cams 27 are rotated to move the plug board 16 upwardly, the spring means 40 yieldingly connect the cams to the plug board to impose a constant upward bias on the plug board to insure positive electrical engagement of the plugs 18 with the corresponding contacts 12.

Considering the operation of the invention, prior to the installation of the plug board 16 in the housing 10, the desired plugs 18 are inserted therein to produce the circuit connections required in a given set of circumstances. After the plugs have been inserted into the plug board 16, the board is placed in position in the guide means, the dog 23 being swung aside to permit insertion of the plug board into the housing and then being swung downwardly into the position shown in the drawing to retain the upper edge of the plug board. When the plug board is inserted into the housing, the handle 31 is at the clockwise end of its range of movement to permit insertion of the rod 39 into the notches 38 in the lever members 36.

When the foregoing has been accomplished, the rearwardly extending plugs 18 are disposed beneath the forwardly extending contacts 12 and preferably out of engagement therewith. Subsequently, the handle 31 is rotated in the counterclockwise direction to the limit of its movement, whereupon the cams 27, acting through the lever members 36, move the plug board 16 upwardly into the position of Fig. 1 of the drawing to produce positive electrical engagement between the plugs 18 and the contacts 12, the resilience of the affected contacts and the resilience of the spring means 40 biasing the contacts and the plugs into positive electrical engagement.

As will be apparent, the present invention provides a very simple and inexpensive panel structure which may be assembled readily and with which positive electrical engagement may be attained very simply with a minimum expenditure of time and effort, which are important features of the invention. Also, since substantially only lateral forces are applied to the plugs 18, there is no tendency for the plugs to be forced forwardly out of the apertures 17, which is another important feature.

It will be noted that the contacts 12 are provided with forward ends 42 which are inclined with respect to the axes thereof. With this feature, if it is desired to insert an additional plug or plugs 18 after the plug board 16 has been moved into its operating position, the inclined forward ends 42 of the contacts 12 affected serve as cams to spring these contacts upwardly, as shown in the drawing. Once such an additional plug or plugs have been inserted, only lateral forces are applied thereto to avoid any tendency to back the plugs out of their apertures.

Although the plug board 16 has been described as movable, during the contact-closing motion, in a straight line in the upward direction, it will be understood that it may be moved into its operating position along other paths. For example, the plug board may be moved into its operating position downwardly, or sidewise, the stationary contacts 12 being correspondingly adapted for such presentation.

Also, while the plug board 16 has been shown and described as presentable to the stationary panel 11 manually and in the horizontal direction along more or less a straight line, the plug board may be presented along other paths also. For example, the plug board may be mounted for initial pivotal movement about an axis along one of the edges of the board, prior to lateral movement for closing the electrical connections in the manner described.

Although we have disclosed an exemplary embodiment of the invention herein for purposes of illustration, it will be understood that various changes, modifications and substitutions may be incorporated in such embodiment without departing from the spirit of the invention as defined by the claims which follow.

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We claim as our invention:

1. In a panel structure, the combination of: a supporting structure; two panels arranged in face-to-face relation and respectively provided with contacts projecting therefrom toward each other, one of said panels being movable relative to the other in a transverse direction with respect to said contacts to bring said contact on said movable panel into engagement with said contact on said other panel, said other panel being mounted on said supporting structure; guide means on said supporting structure and engageable with said movable panel for guiding movement thereof in said transverse direction; and actuating means on said supporting structure and engageable with said movable panel for moving same in said transverse direction, said actuating means including cam means mounted on said supporting structure and including a pivoted member mounted on said supporting structure and engageable with said movable panel and engageable by said cam means to transmit movement of said cam means to said movable panel so as to move said movable panel in said transverse direction, said pivoted member including spring means, whereby said pivoted member yieldingly connects said cam means to said movable panel.

2. In a panel structure, the combination of: a supporting structure; a stationary panel mounted on said supporting structure and having a plurality of flexible and resilient contacts projecting forwardly therefrom; a second panel provided with a plurality of apertures through which manually removable plugs may be inserted to project rearwardly therefrom, said stationary panel and said second panel being arranged in face-to-

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face relation so that any manually removable plugs inserted through said apertures and projecting rearwardly therefrom are aligned with corresponding contacts on said stationary panel; guide means on said supporting structure for guiding said second panel for movement in a plane parallel to and spaced forwardly from said stationary panel to bring any plugs on said second panel into engagement with corresponding contacts on said stationary panel; and actuating means on said supporting structure and engageable with said second panel for so moving same in said plane, said actuating means includes a pivoted member on said supporting structure which is engageable with said second panel and which is engageable by a cam means on said supporting structure for pivoting said pivoted member to so move said second panel in said plane, said pivoted member including spring means, whereby said pivoted member yieldingly connects said cam means to said second panel.

3. A panel as defined in claim 2 wherein said spring means includes a cantilever spring forming part of said pivoted member and engageable by said cam means.

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