July 7, 1959 R. J. O'NEILL ET AL 2,893,777

ELECTRONIC PLUG-IN UNIT HANDLE

Filed Jan. 15, 1957

Fig. 1

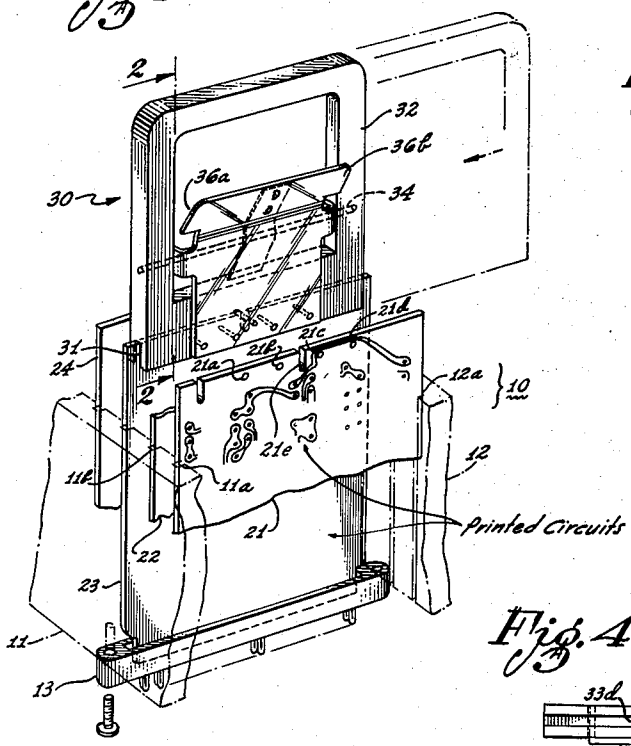


Fig. 2

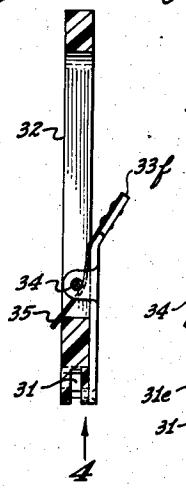


Fig. 3

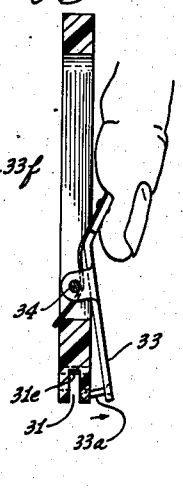


Fig. 4

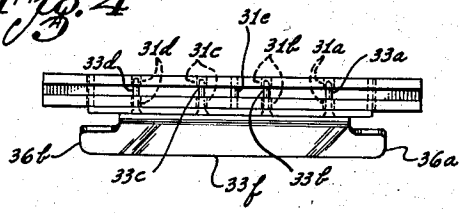


Fig. 5

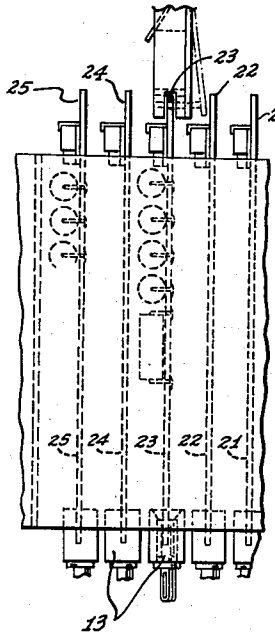
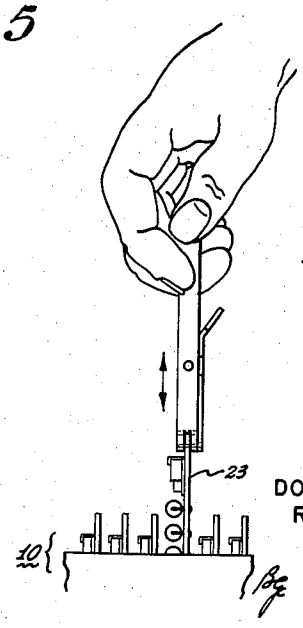


Fig. 6



INVENTOR.
DONALD L. MAC INTYRE
RICHARD J. O'NEILL
By Morris Spector
Attorney

United States Patent Office 2,893,777
Patented July 7, 1959

2,893,777

ELECTRONIC PLUG-IN UNIT HANDLE

Richard J. O'Neill, Fullerton, and Donald L. MacIntyre, El Monte, Calif., assignors, by mesne assignments, to Thompson Ramo Wooldridge Inc., Cleveland, Ohio, a corporation of Ohio

Application January 15, 1957, Serial No. 634,186

4 Claims. (Cl. 294—1)

The present invention relates to a detachable handle for forcibly manipulating an electronic plug-in unit, and more particularly, to a handle which may be attached to a thin electronic plug-in unit and exert a precise and forcible control of the movement of the unit.

The detachable handle of the present invention is described herein in its most important application, namely, that of being selectively attached to an electronic plug-in unit for inserting it into, or removing it from, a miniaturized electronic assembly. The described plug-in unit includes a gripping portion in the form of a thin plate to which the detachable handle of the present invention is attached.

In the packaging of modern electronic equipment a conventional type of construction which is widely used is a tier, or box, having a plurality of pairs of grooves on the inner surfaces of its two sides so that a corresponding plurality of wiring panels may be inserted therein. The wiring panels themselves are frequently of the printed circuit type consisting of an insulating material having some electrical circuit components printed or painted thereon, and frequently having provision for the mounting of other components of conventional types. In order to make the most efficient use of space, it is desirable to mount the panels very closely together within the tier.

A necessary feature of this type of packaging, however, is a provision for removing the various individual panels from the tier from time to time for purposes of inspection or maintenance. It is therefore desirable to provide a device for inserting and removing the panels from the tier. The principal advantage of such a device is that its use permits spacing the panels much more closely together than if it were necessary to provide working space to insert them or remove them by hand.

In the conventional tier described above, each panel must not only be inserted into its proper position, but must also be provided with necessary electrical connections. For this purpose, a bank of connector terminals is mounted on the bottom of the tier running transversely from a groove on the inner surface of one wall to the associated groove on the inner surface of the opposite wall, and a corresponding bank of connectors is mounted on that edge of the panel which is inserted first into the tier. When the panel is inserted into its final position, therefore, the bank of connectors on the leading edge of the panel and the corresponding bank of connectors on the bottom of the tier mesh together, usually by some type of spring contact. A considerable amount of force must be exerted in order to mesh the banks of connectors together when the panel is inserted, or to pull them apart when the panel is removed. In addition, when the panel is being inserted its direction of movement must be carefully controlled. The requirements placed upon the device noted above, therefore, are that it must operate within a very confined space, must exert a precise control over the direction of motion of the panel, and must be able to exert considerable force in controlling the motion of the panel. These requirements are met by the detachable handle of the present invention.

It is, therefore, an object of the present invention to provide a detachable handle suitable for forcibly manipulating a thin plate within a relatively confined space.

Another object of the present invention is to provide a detachable handle which may be attached to an electronic plug-in unit in a confined working space too small for human hands.

According to the present invention there is provided a detachable handle for an electronic plug-in unit, including a body portion adapted to be gripped by hand, a locking member movably mounted on the body portion and adapted to occupy either a locked position or an unlocked position, and spring means normally retaining the locking member in its locked position. The body portion has at one end thereof a substantially U-shaped groove for engaging the plug-in unit. Each of the opposing walls of the groove has a plurality of holes respectively aligned with the corresponding holes in the opposite wall. The locking member has mounted upon it, opposite the holes in the groove, a plurality of metal locking pins arranged in a configuration identical to the configuration of the holes in the groove. In the locked position of the locking member the metal locking pins extend through the holes in one wall of the groove, across the groove, and into the holes in the other wall of the groove; whereas in the unlocked position the metal locking pins are fully withdrawn from the groove.

The features of this invention which are believed to be novel and patentable are pointed out in the claims which form a part of this specification. For a better understanding of the invention, reference is now made to the accompanying drawing, in which:

Figure 1 is a partially cutaway view of an electronic tier assembly illustrating four wiring panels mounted in position within the tier and showing a detachable handle in accordance with the present invention engaging one of the panels;

Figure 2 is an elevation view of the detachable handle of Figure 1 showing the normal locked position of the locking member;

Figure 3 is a view similar to Figure 2, but showing the unlocked position of the locking member;

Figure 4 is a bottom view of the handle of Figure 2 looking toward the U-shaped groove as indicated by arrow 4;

Figure 5 is a side view of a portion of the tier of Figure 1 illustrating the working space between adjacent panels for attaching and detaching the handle, and the meshing of mated banks of connectors at the bottom of the tier; and

Figure 6 illustrates the insertion or removal of one of the panels by means of the detachable handle.

Referring now to Figure 1 of the drawing, there is illustrated therein an electronic assembly tier **10** in which wiring panels **21**, **22**, **23** and **24** are mounted. A detachable handle **30** in accordance with the present invention is attached to panel **23**.

The tier is in the form of a box or trough including a lefthand wall **11** having grooves, such as **11***a*, **11***b* on the inner surface thereof, and a right-hand wall **12**, having grooves such as **12***a* on its inner surface. Each of the panels is positioned in a corresponding pair of the grooves, for example, panel **21** is positioned in grooves **11***a* and **12***a*. The panels are indicated as having printed circuit wiring mounted thereon in the conventional manner. A bank **13** of female electrical connectors mounted on the bottom of the tier meshes with a corresponding bank of male connectors (shown only in dotted lines in Figure 5) mounted on the bottom edge of panel **23**.

In Figure 1 detachable handle **30** is illustrated as being

locked into position on the upper edge of panel **23**. Dotted lines to the right of handle **30** illustrate an alternative position in which it may be placed and then slid to the left in order to be centered and locked into position on the panel in a manner which will be subsequently described.

Various details of the detachable handle are illustrated in various figures of the drawing with the same reference numerals being used throughout for the same parts. Therefore, the detachable handle will be described with reference to all of the figures.

In Figure 1 each of the wiring panels is illustrated as having an upper portion in the form of a thin plate suitable for attaching the handle thereto. On the upper portion of each panel there is located a row of four holes having predetermined relative spacings, and a centering slot. For example, panel **21** has holes **21***a*, **21***b*, **21***c* and **21***d* located near its upper edge. A centering slot **21***e* is located in the upper portion of the panel at approximately the center.

The body portion of detachable handle **30** includes on its bottom end surface a long U-shaped groove **31** having pairs of holes **31***a*, **31***b*, **31***c* and **31***d* passing through the walls of the groove. A predetermined spacing is provided between adjacent pairs of holes to match the spacings between corresponding holes on panel **23**.

A center pin **31***e* is permanently mounted in the center of the U-shaped groove of handle **30** in such a position as to engage the centering slot on one of the panels when the handle is in the proper position. Although it is not necessary that the spacings between adjacent holes in the edge of each panel be equidistant, it is nevertheless preferred so that the detachable handle is reversible. Thus, it is preferred that both the panels and the handle be so arranged that either end of the U-shaped groove may be positioned at either end of the gripping edge of the panel. This preferred form is illustrated in the drawing. The rows of holes in the gripping portion of each panel and in the U-shaped groove of the handle are therefore not only spaced at equal intervals, but are arranged in a balanced or symmetrical configuration with respect to the center of the panel and of the handle.

The detachable handle further includes a hand-grip **32** which is provided on the body portion of the handle. In the preferred form of the handle illustrated in the drawing, the body portion of the handle is a hollow rectangle, the exterior surface of one side of the hollow rectangle providing the U-shaped groove **31**, and the opposite side of the rectangle providing the hand-grip. A locking member **33** having a row of metal locking pins **33***a*, **33***b*, **33***c* and **33***d* provides the means for locking the detachable handle to one of the panels when the corresponding rows of holes have been appropriately aligned. Locking member **33** is pivotally mounted on a pivot rod **34** which is parallel to the U-shaped groove and is fixedly mounted upon the body portion of the handle. To provide the pivotal mounting, locking member **33** has extended portions on each side which are bent at right angles to the main portion of the member and provided with holes through which the pivot rod passes. Locking member **33** on its upper extremity has a finger tab **33***f* which is inclined outwardly and provides a suitable means for controlling rotation of the locking member with respect to the pivot rod. A spring **35**, preferably consisting of a flat piece of leaf spring steel, has one end rigidly fastened to the back side of tab **33***f* (as viewed in Figure 1), passes between locking member **33** and pivot rod **34** and has its other end resting on the back of that side of the rectangular body portion which carries the grooved surface (the lower side as viewed in Figure 1). Spring **35**, therefore, exerts a normal force on tab **33***f* to retain locking member **33** in its locked position, that is, with the locking pins passing through the corresponding pairs of holes in the walls of the U-shaped groove.

When the handle is to be operated to its unlocked position for the purposes of either attaching it to or detaching it from a panel, finger tab **33***f* is manually depressed toward hand-grip **32**, as illustrated in Figure 3. The resulting rotation of locking member **33** about pivot rod **34** serves to withdraw the locking pins from the holes to an extent such that they no longer occupy any portion of the U-shaped groove. Preferably, the locking pins are not completely withdrawn from the row of holes in the front surface of the U-shaped groove, but are kept partially inserted therein (as shown in Figure 3) so as to insure a proper mesh when the handle is to be restored to its locked position. In order to insure that the locking pins are not completely withdrawn from the holes, tab **33***f* has two ends **36***a*, **36***b* extending in front of the corresponding sides of hand-grip **32**. When tab **33***a* is depressed, these ends or wings come to rest on the corresponding sides of the hand-grip, thus inhibiting further rotation of locking member **33** about the pivot rod.

When the handle is in the locked position, the panel such as panel **23** is fully inserted into the bottom of groove **31**. This provides a good control of the movement of the panel and, in fact, the handle when attached acts as if it were an extension of the panel.

Locking member **33** preferably floats on pivot rod **34** so that during insertion of the panel into the tier the full load of the panel is applied against the bottom of groove **31**; whereas, during extraction of the panel the full load is applied via pins **33***a*—**33***d* and via the sides of holes **31***a*—**31***d* to the body portion of handle **30**.

Wiring panels **21**—**25** shown in Figures 1 and 5 carry printed circuit wiring which extends to their upper edges to provide electrical test terminals. This wiring is enveloped by the lower portion of handle **30** when the handle is attached to one of the panels. In order to avoid any disruption of the electrical operation of the circuit, therefore, the lower portion of the handle is made of an electrical insulating material.

While the invention has been described in one particular form it will be readily understood by persons skilled in the art that many other forms and modifications may be used without departing from the spirit and scope of the invention.

We claim:

1. A detachable handle for an electronic plug-in unit including a thin plate having a perforated outer edge, said handle comprising: a body portion adapted to be gripped by hand and having an elongated, substantially U-shaped groove at one end thereof for engaging said thin plate, each of the opposing walls of said groove having a plurality of holes therein respectively aligned with the corresponding holes in the opposite wall; a locking member hinged to and movably mounted on said body portion and having a plurality of metal locking pins mounted thereon opposite said holes and in a configuration identical to that of said pluralities of holes, said locking member being mounted to occupy either a locked position in which said plurality of metal locking pins extend through the plurality of holes in one wall of said groove, across said groove, and into the plurality of holes in the other wall of said groove, or an unlocked position in which said plurality of metal locking pins are fully withdrawn from said groove; spring means normally retaining said locking member in said locked position; and means operable when said locking member is in said unlocked position and the outer edge of the plate is inserted into said groove for automatically establishing a predetermined position of the handle with respect to the plug-in unit, said last-named means including an aligning pin permanently bridging a portion of said groove spaced, between the longitudinal ends of said groove, and between the ends of the legs of the U of the groove and a portion of said groove opposite said leg ends of said groove, with

said aligning pin being adapted to mate with a passageway in said unit constructed to receive said aligning pin during insertion of said unit into said handle for determining the position of said unit relative to said handle.

2. A detachable handle for an electronic plug-in unit including a thin plate having a perforated outer edge, said handle comprising: a body portion adapted to be gripped by hand and having a substantially U-shaped groove at one end thereof for engaging said thin plate, each of the opposing walls of said groove having a plurality of holes therein respectively aligned with the corresponding holes in the opposite wall; a locking member hinged to and movably mounted on said body portion and having a plurality of metal locking pins mounted thereon opposite said holes and in a configuration identical to that of said pluralities of holes, said locking member being mounted to occupy either a locked position in which said plurality of metal locking pins extend through the plurality of holes in one wall of said groove, across said groove, and into the plurality of holes in the other wall of said groove, or an unlocked position in which said plurality of metal locking pins are fully withdrawn from said groove; spring means normally retaining said locking member in said locked position; means limiting the motion of said locking member so that in its unlocked position said plurality of metal locking pins are only partially withdrawn from the plurality of holes in said one wall of said groove; and means operable when said locking member is in said unlocked position and the outer edge of the plate is inserted into said groove for automatically establishing a predetermined position of the handle with respect to the plug-in unit, said last-named means including an aligning pin permanently positioned within a region of said groove remote from the ends thereof and spaced between the open end of said groove, defined by the legs of the U-shaped groove, and the upper extremity of said groove, defined by the groove portion opposite said legs.

3. A detachable handle for an electronic plug-in unit including a thin plate having a perforated outer edge with a centering notch at approximately the longitudinal center of said edge, said handle comprising: a body portion having a substantially U-shaped groove at one end thereof for engaging said thin plate, each of the opposing walls of said groove having a plurality of holes therein respectively aligned with the corresponding holes in the opposite wall; a locking member hinged to and movably mounted on said body portion and having a plurality of locking pins mounted thereon opposite said holes and in a configuration identical to that of said pluralities of holes, said locking member being mounted to occupy either a locked position in which said plurality of locking pins extend through the plurality of holes in one wall of said groove, across said groove, and into the plurality of holes in the other wall of said groove, or an unlocked position in which said plurality of locking pins are fully withdrawn from said groove; spring means normally retaining said locking member in said locked position; and a centering pin positioned transverse to said groove at approximately the longitudinal center thereof, the location of said holes being such that when the perforated outer edge of the plate is inserted into said U-shaped groove said locking member is not permitted to return to its locked position until said centering pin engages the centering notch, said pluralities of holes being symmetrically located with respect to said centering pin so that the position of the handle with respect to the plug-in unit is reversible.

4. A detachable handle for an electronic plug-in unit having a substantially flat end portion defined by substantially parallel wall portions, comprising: a handle body portion adapted to be gripped by hand and having a substantially U-shaped groove at one end thereof for engaging said plug-in unit; said groove having a length, in a direction normal to planes containing the U of the groove, substantially equal to that of the unit to be supported thereby, and being defined by a pair of substantially parallel, adjacent, opposing walls spaced apart a distance substantially equal to the dimension of said unit to be supported therebetween, thereby to support said plug-in unit between said opposing walls in a substantially snug fit in planes substantially parallel to said opposing walls and to preserve said unit from wobble with respect to said handle; each of said opposing walls of said groove having a plurality of holes therein respectively aligned with the corresponding holes in the opposite wall; a locking member hinged to and movably mounted on said body portion and having a plurality of locking pins mounted thereon opposite said holes and in a configuration substantially identical to that of said plurality of holes, said locking member being adapted to occupy either a locked position in which said plurality of locking pins extend through the plurality of holes in one wall of said groove, across said groove, and into the plurality of holes in the other wall of said groove, or an unlocked position in which said plurality of locking pins are fully retracted from said groove; spring means normally retaining said locking member in said locked position; and means limiting the motion of said locking member so that in its unlocked position said plurality of locking pins are only partially withdrawn from the plurality of holes in said one wall of said groove.

References Cited in the file of this patent

UNITED STATES PATENTS

134,160	Orton	Dec. 24, 1872
286,757	Worn et al.	Oct. 16, 1883
463,974	Richards	Nov. 24, 1891
737,353	Cornelius et al.	Aug. 25, 1903
800,641	Goldsmith	Oct. 3, 1905
1,837,425	Gastan	Dec. 22, 1931
2,106,391	Duraj	Jan. 25, 1938
2,228,298	Brotherson	Jan. 14, 1941
2,569,170	Hooe	Sept. 25, 1951

FOREIGN PATENTS

23,712 of 1909	Great Britain	June 23, 1910