

[54] **CONNECTING DEVICE**

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[58] Field of Search 339/151 M, 49 R, 61 M, 75,
339/92; 24/205.13 R

[56]

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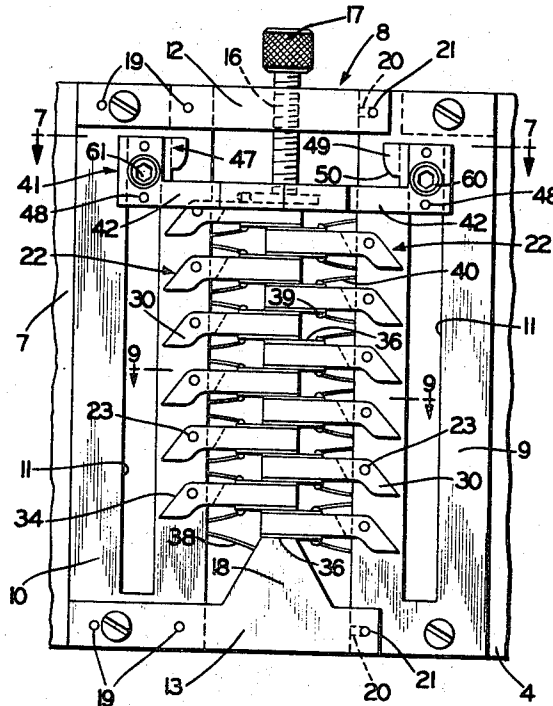
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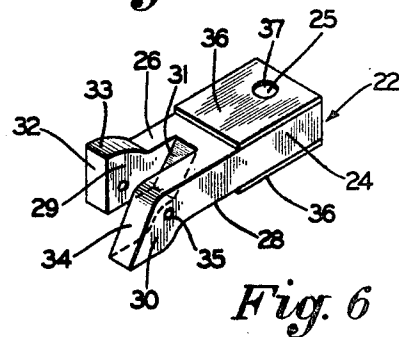
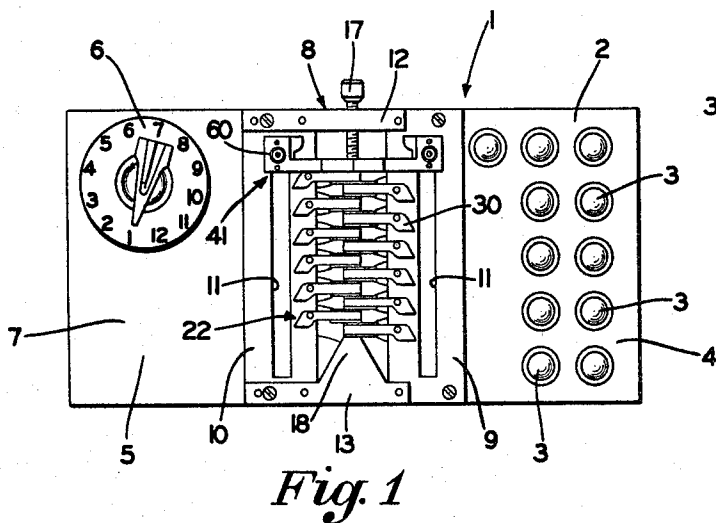
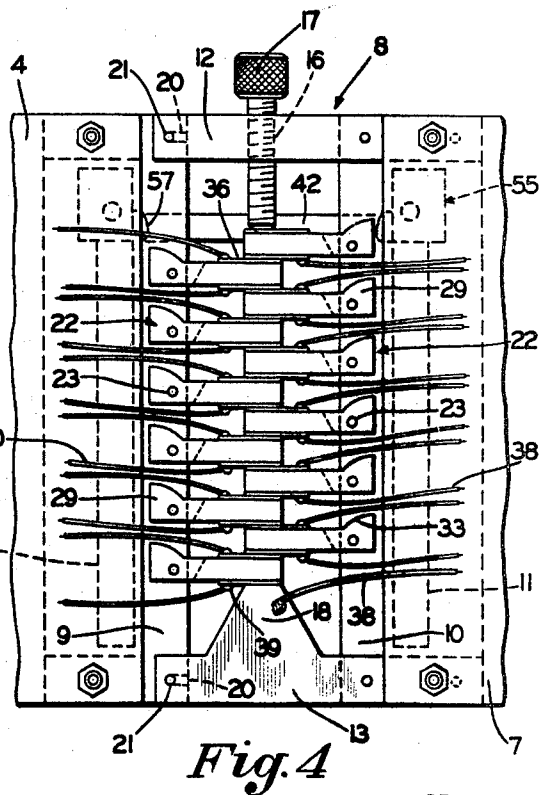
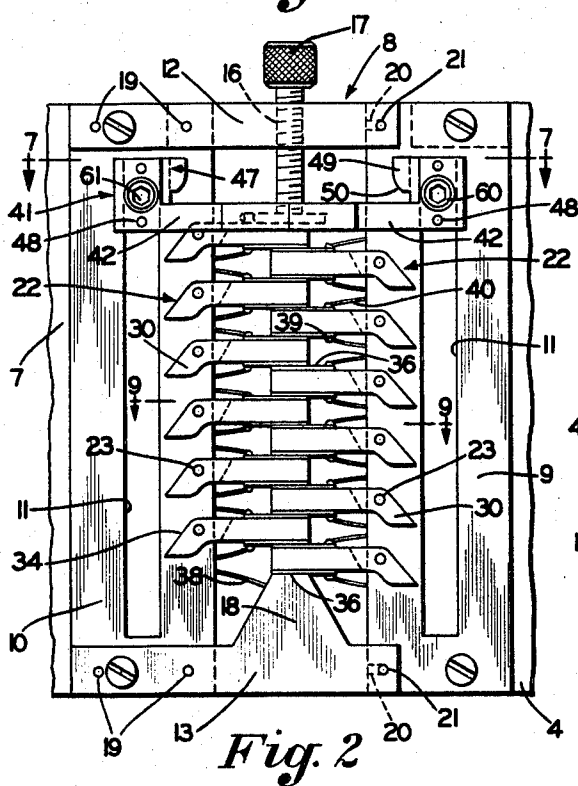
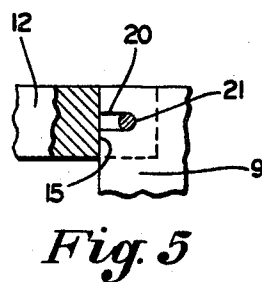
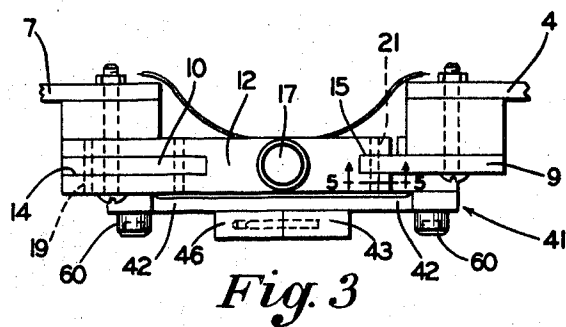
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ABSTRACT

A connecting device for joining together two panels end-to-end of various sizes and materials. Each panel includes a plurality of pivotally mounted toggle arms which are alternately positioned with respect to arms on the opposite panel. The toggle arms are also positioned so that their ends overlap and interlock when in closed or engaged position. A top and bottom bar partially connects and properly positions the two panels. The top bar may be provided with a bolt or other means to secure the interlocked toggle arm ends together against the bottom connecting bar when in closed position. A slide member is provided with two pairs of slidable cams to operate the toggle arms which are provided with corresponding cams. The device is connected and disconnected by opposite movement of the slide member with the cams pivoting the toggle arms open or closed by engaging mating cam surfaces.

4 Claims, 14 Drawing Figures





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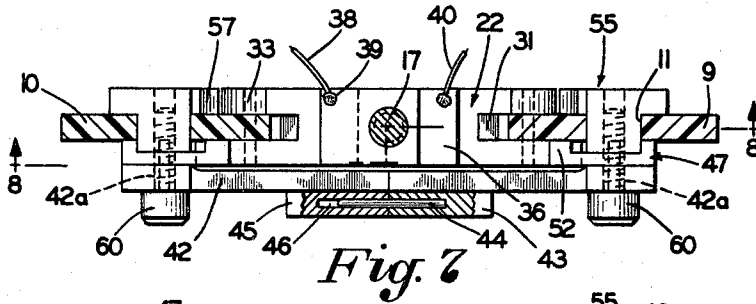


Fig. 7

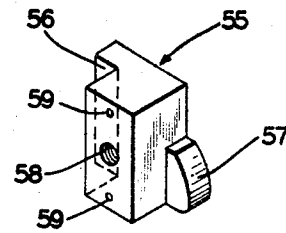


Fig. 11

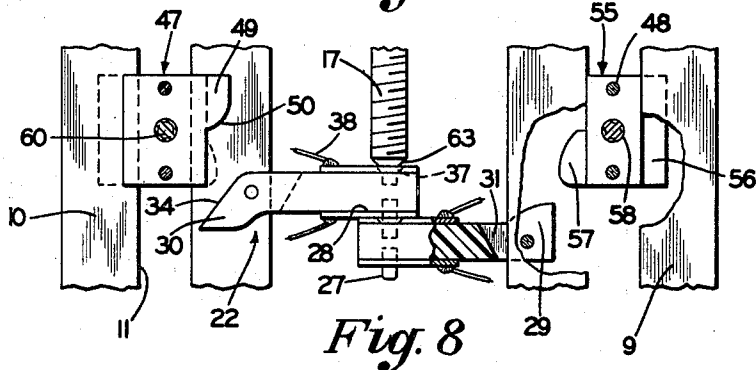


Fig. 8

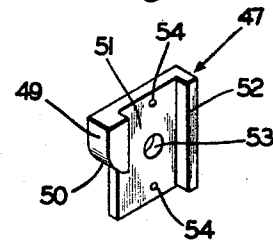


Fig. 12

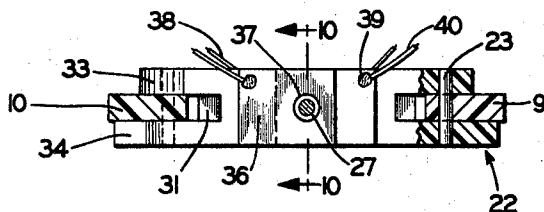


Fig. 9

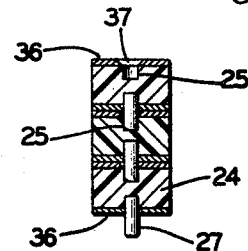


Fig. 10

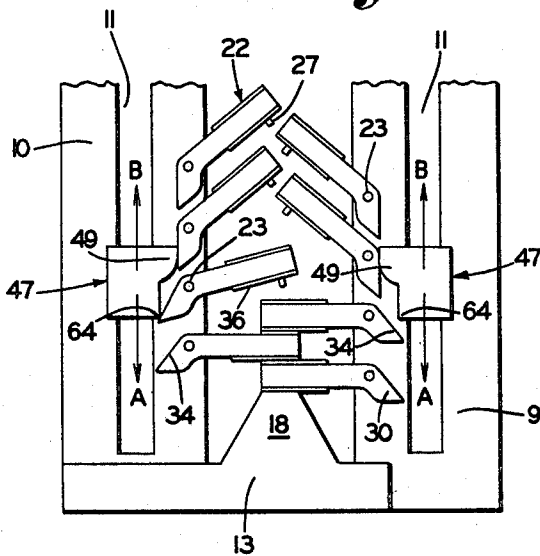


Fig. 13

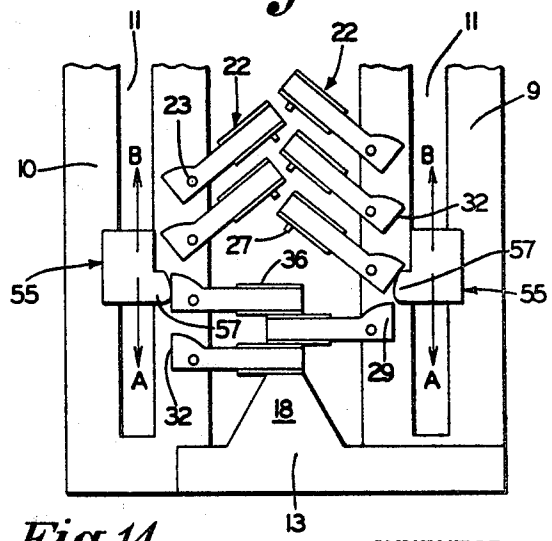


Fig. 14

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CONNECTING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a new and convenient connecting device for securely joining together two panels, which device may be employed with a variety of panels desired to be permanently or temporarily joined together. More particularly the invention relates to a connecting device construction by which separately prewired electrical panels may repeatedly be joined together and separated, both electrically and structurally, easily and quickly and without the use of additional fastening means.

2. Description of the Prior Art

It is often desirable to prewire various portions of electrical control circuits, switching circuits, etc., and later join them together into a completed unit. Many types of connecting means have been used, both for structurally and electrically joining various panels together. These connections are accomplished in a number of ways, such as by soldering complementary wires directly together or to a common binding post. These known methods do not provide a convenient means for quickly separating all of the connections and reconnecting them if desired.

Other known electrical connections utilize a bayonet type arrangement in which the wires on one panel are each connected to a slender metal finger or "jack" which is inserted into a receiving plug mounted on another panel. Electrical connection is made but other means for structural connections must be provided if needed by the particular equipment.

There are countless numbers of structural connectors for various styles and panel materials. Most of the connectors can be used only once and must be discarded if removed when the panels are disjoined. Other connectors are difficult to install and remove, requiring considerable time and expense. Likewise, some of the connectors are structurally strong preventing the panels from pulling apart but provide insufficient strength against twisting force.

SUMMARY OF THE INVENTION

Objectives of the invention include providing a connecting device for structurally joining together two panels of various styles and materials; providing a connecting device which can be repeatedly used for connecting and disconnecting panels without requiring additional parts or destroying existing parts; providing a connecting device whereby a single operating movement will disengage or engage a plurality of connecting members; providing a connecting device which may also be used for joining together prewired electrical panels both structurally and electrically; providing a device for energizing or de-energizing a number of electrical circuits in a single operation; and providing a new, convenient connecting device which can reduce construction and maintenance costs and which solves problems, satisfies needs, and obtains new results in the art.

These objects and advantages are obtained by the connecting device construction of the present invention, the general nature of which may be stated as including a pair of elongated panel members; a series of toggle arm members pivotally mounted at one end along one edge of the elongated panel members, the toggle arms of one panel being alternately positioned with respect to the arm position of the opposite panel; each toggle arm being provided with engaging means at its free end, the arms of one panel being located so that their ends overlap and engage the corresponding ends of the arms on the opposite panel; cam means on the arms for moving the toggle arms from engaged to disengaged position located adjacent the pivot of each toggle arm; and actuator means having complementary cam means for operating the toggle arms from engaged to disengaged position.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention — illustrative of the best mode in which applicant has contemplated applying the principles — is set forth in the following description and shown in the drawings, and is particularly and distinctly pointed out and set forth in the appended claims.

In the drawings,

FIG. 1 is a front elevation of the connecting device showing two electrically wired panels connected together;

FIG. 2 is an enlarged fragmentary front elevation of the connecting device of FIG. 1;

FIG. 3 is a top elevation of the connecting device shown in FIG. 2;

FIG. 4 is a rear elevation of the connecting device shown in FIG. 2;

FIG. 5 is an enlarged fragmentary sectional view, with parts broken away, taken on line 5—5, FIG. 3;

FIG. 6 is a perspective view of one of the toggle arms of the connecting device;

FIG. 7 is an enlarged sectional view taken on line 7—7, FIG. 2;

FIG. 8 is an enlarged fragmentary elevation, partly in section, of the first two toggle arms in engaged position;

FIG. 9 is a sectional view taken on line 9—9, FIG. 2;

FIG. 10 is a sectional view taken on line 10—10, FIG. 9;

FIG. 11 is a perspective view of the rear portion of the sliding cam of the connecting device.

FIG. 12 is a perspective view of the front portion of the sliding cam shown in FIG. 11;

FIG. 13 is a diagrammatic front view of the connecting device partially connected together; and

FIG. 14 is a diagrammatic rear view of the connecting device shown in FIG. 13.

Similar numerals refer to similar parts throughout the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An electrical assembly indicated generally at 1 (FIG. 1) is shown utilizing the new connecting device. Assembly 1 includes a light panel 2 which may consist of a group of individually wired lights 3 arranged on panel board 4. Another panel 5 may consist of a selector switch 6 mounted on panel board 7 with related wiring (not shown) for controlling lights 3 on panel 2. Panels 2 and 5 are joined together, both electrically and structurally, by the new connecting device indicated generally at 8.

Device 8 (FIG. 2) includes two parallel rectangular sections 9 and 10 formed with vertical slots 11 extending nearly the entire length of sections 9 and 10. Sections 9 and 10 are held in a parallel spaced relationship by upper and lower connecting bars 12 and 13, respectively. Bars 12 and 13 are each provided with slot 14 at the end adjacent panel 7 and a second slot 15 at the opposite end adjacent to panel 4 (FIG. 3).

Bar 12 is provided with a threaded opening 16 which may receive bolt 17, for purposes described more in detail below. Bar 13 has a generally triangular portion 18 projecting upwardly and generally aligned with bolt 17.

Section 10 has its upper portion located in elongated slots 14 of bars 12 and 13 and is rigidly secured therein by pins 19, or any other suitable means. Section 9 is formed with an upper and a lower notch 20 which engages pins 21 which extend across slot 15 formed in the ends of bars 12 and 13 (FIGS. 2 and 5).

A plurality of spaced toggle arms indicated at 22 are pivotally mounted along the inner edge of panel sections 9 and 10 by any suitable means such as pins 23 (FIGS. 2 and 4). Each toggle arm 22 (FIGS. 6 and 8) includes a generally elongated rectangular body portion 24. Hole 25 may be formed in its top surface 26 and a pin 27 may be provided, projecting from the bottom surface 28. Cams 29 and 30 extend outwardly from one end of body 24 and form a groove 31 therebetween. Cam 29 is generally rectangular in shape hav-

ing a flat end cam surface 32, and a curved top surface 33, whereas cam 30 has an inclined cam surface 34 extending slightly out beyond the plane of cam surface 32. Cam portions 29 and 30 are provided with means for mounting the toggle arms to sections 9 or 10, such as by holes 35 which receive a pin about which the arms may pivot.

Electrical conducting plates 36, formed with an opening 37, are attached by any suitable means to the top and bottom surfaces 26 and 28, respectively, of body 24. Wires 38 from switch 6 are selectively attached to plates 36. Attachment may be made by various means such as solder as indicated at 39. Similarly, wires 40 from lights 3 are selectively attached to plates 36 of toggle arms 22 mounted on panel 9.

Actuator bar indicated at 41 (FIG. 2 and 7) is comprised of two L-shaped arms 42 formed with openings 42a in the short leg portion thereof, which arms are slidably mounted in slots 11 of sections 9 and 10. Attachment means are provided on the long leg portion of arms 42, which may consist of a rectangular member 43 having a pin 44 partially embedded therein, attached to one leg portion. A similar rectangular member 45 is attached to the other arm 42 and is provided with an opening 46 for receiving the projecting end of pin 44.

A cam plate 47 is attached to the back surface of the short leg of L-shaped arms 42 by pins 48 or other fastening means. An ear 49 having a curved lower surface 50 projects laterally from cam 47 with a channel 51 being formed between ear 49 and flange 52. Channel 51 is provided with an opening 53 and a smaller opening 54 above and below opening 53 through which attaching pins 48 may be inserted.

Cam block 55 is inserted partially through slot 11 and is attached to cam 47. Cam 55 (FIG. 11) has a cut out portion 56 extending along one side and a curved ear 57 projecting laterally from the opposite side. A threaded opening 58 is formed in the center of cam 55 and a small hole 59 is formed above and below opening 58 for receiving pins 48. Screw 60 is inserted through aligned opening 42a and 53 in arm 42 and cam plate 47 respectively, and is threadably engaged with opening 58 in cam block 55. Means may be provided in the head of screw 60 for tightening, such as a hexagonal recess 61 adaptable for receiving an allen wrench. It should be understood that block 55 and plate 47 may be attached to slide bar 42 by any other suitable means or the assembly made of one or more components to facilitate convenient manufacture.

Connecting device 8 is shown in connected position in FIGS. 1, 2 and 4 joining together panels 2 and 5. In connected position, slide bar 41 will be located above toggle arms 22. Arms 22 are interlocked, by pins 27 being engaged in top holes 25 of the toggle bodies 24 (FIG. 10). The plurality of arms 22 may be held parallel in this interlocked position by tightening tip 63 of bolt 17 into top hole 25 of the uppermost arm 22 (FIG. 8). Conducting plate 36 attached to the bottom surface 28 of the lowermost arm 22 is held secure against the top surface of triangular portion 18 of lower connecting bar 13 by the action of bolt 17. The height of portion 18 is such that lower arm 22 will be in a parallel position when contacting portion 18.

In this locked position, panels 2 and 5 are securely interlocked preventing independent movement in any direction. Electrical connection is likewise achieved by the adjacent conducting plates 36 being pressed tightly together between bolt 17 and triangular portion 18. Portion 18 may also be made of a conducting material permitting attachment of a wire 38 (FIG. 4) to control another light 3 on panel 2.

In accordance with the present invention, any number of lights 3 or other electrical circuits or devices can be prewired on panel 4 with wires 40 being selectively connected to the conducting plates 36 of toggle arms 22 which are mounted on section 9 of connecting device 8, (right-hand side of FIG. 2). Panel 4 may be attached to section 9 by bolt 62 as shown, or section 9 may be made as an integral part of the end of panel 4. The control means (switch 6) for lights 3 is prewired on panel 4 with the wires 39 being selectively connected to plates 36 of toggle arms 22 mounted on section 10.

Disconnecting panel 2 from panel 5 is achieved by the action of slide bar 41 moving downward in slots 11 to the extreme lower end. Bolt 17 is first retracted from contacting top toggle arm 22 and withdrawn a sufficient distance to permit arm 22 to pivot upward without striking tip 63 of bolt 17. As bar 41 moves downward (arrow A, FIG. 13) including cams 47 and 55, the square corner 64 of each cam 47 alternately contacts the inclined cam surface 34 causing the corresponding arm 22 to begin pivoting about pin 23, disengaging pin 27 from the lower adjacent toggle body 24. Projecting ear 49 following corner 64 continues to pivot arm 22 upward by contacting surface 34. Ear 49 pivots arm 22 upward in the opposite direction and avoid contacting the previously pivoted opposite arm.

Ear 49 of the cam 47 will contact surface 34 on topmost arm 22 just prior to opposite ear 49, respectively, contacting the next lower arm 22. This permits the upper arm 22 to begin pivoting upward with pin 27 becoming disengaged from hole 25 before the next lower arm 22 begins to pivot upward. Arms 22 pivot upward alternating between the arms mounted on section 10 and the arms mounted on section 9, as cams 47 moved downward.

After bar 41 has reached the bottom of slots 11 pivoting all toggle arms 22, sections 9 and 10 of device 8 can be separated. Pin 44 is slidably detached from opening 46 in rectangular member 45, and pins 21 are removed from notches 20 in section 9 completely separately connecting device 8.

Joining device 8 together is accomplished in the reverse manner as that described above for disconnecting the device. Pins 21 in connecting bars 12 and 13 are inserted into notches 20 of section 9 to align the device, and pin 44 is engaged in opening 46. Slide bar 41 is then moved upward in slots 11 including cams 47 and 55. As cam blocks 55 move upward (arrow B, FIG. 14), curved ears 57 contact the flat end surface 32 of cam arms 29 which are in an inclined position after being disconnected. Ears 57 pivot toggle arms 22 alternately downward to a generally parallel position, with opposite arms 22 alternately overlapping each other.

Cams 47 will also move upward with slide bar 41 and cam 55 in the direction of arrow B on the opposite side of sections 9 and 10 in slots 11. Projecting ear 49 being located on the top portion of cam 47 will pass cam surfaces 34 which are now in a vertical position (FIG. 13) prior to arms 22 pivoting downward by contact ear 57 which is located on the bottom portion of cam 55 (FIG. 14).

This difference in elevation between ear 49 and 57 is necessary for the downward connecting movement (arrow A) of bar 41. Ear 57 will pass by surface 32 (FIG. 14) prior to ear 49 pivoting arms 22 (FIG. 13).

Thus, two panels can be separately wired and easily connected together, physically and electrically, by attaching each panel to one side of the connecting device. The panels can be separated and reconnected whenever desired with the two sides of the connecting device being reusable on different panels.

Although the new connecting device is illustrated as a means of connecting electrical circuits, it need not be limited to such application. The device can be used entirely for a structural connecting device with the two sides of device 8 being attached to construction panels of wood, steel, etc. This would enable temporary structures, such as office partitions, to be erected easily and quickly and later disassembled for reuse.

It should be understood also that the device of the present invention may be used as a connector of one heavy-duty high amperage circuit. In such case, the whole device would be constructed of electrically conducting material and panels 2 and 5 connected respectively to cables or wires which are to be joined together.

Similarly, medium power circuits could be connected together by providing alternate toggle arms of conducting and insulating material.

Furthermore, many other possible uses could be achieved by using the device of the present invention by varying the size

and material of the various components included in the construction. For example, in employing the specific construction shown in the drawings, telephone circuits, computer circuits or control circuits for industrial machinery can easily be joined, and later disconnected if desired.

In all applications, the device is structurally strong, preventing any lateral movement by the clamping effect of bolt 17 against triangular portion 18 (or other clamping means) through arms 22 with their interlocking pins. Longitudinal or twisting movement is prevented by the engagement of sections 9 and 10 in slots 14 and 15 of connecting bars 12 and 13, respectively, and the joining together of sections 9 and 10 by movement of slide bar 41.

Accordingly, the new connecting device construction provides a new and convenient manner whereby two panels may be joined together structurally; provides a connecting device for joining together one or more electrical circuits that have been prewired on the two separate panels; provides a connecting device which can be operated easily and quickly to disconnect or connect panels; provides a connecting device which is reusable for connecting and disconnecting two panels; and provides a device which is relatively simple, effective and safe in use, which may be quickly assembled for any type of panel and which achieves the objectives and solves problems existing in the art.

In the foregoing description certain terms have been used for brevity, clearness and understanding; but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such terms are used for descriptive purposes and are intended to be broadly construed.

Moreover, the description and illustration of the invention is by way of example, and the scope of the invention is not limited to the exact details shown or described.

Having now described the features, discoveries and principles of the invention, the manner in which the new connecting device is constructed and used, the characteristics of the new construction, and the advantageous, new and useful results obtained; the new and useful structures, devices, elements, ar-

rangements, parts, and combinations, are set forth in the appended claims.

I claim:

1. Connecting device construction including a pair of panels, each panel having an inner edge and an elongated slot formed adjacent to and parallel with said inner edge and extending through said panel; a plurality of toggle arms, each having a cam end and an engaging end, pivotally mounted for movement from engaged to disengaged position along the inner edge of the panels; the toggle arms on one panel being alternately positioned with respect to the toggle arms on the opposite panel so that the engaging ends overlap when in engaged position; cam means having an engaging cam surface and a disengaging cam surface at the cam end of each toggle arm; actuator means movable along said elongated slot and having actuator cam means including an engaging portion and a disengaging portion; the actuator engaging portion engaging the engaging surface of the toggle arm cam means to pivot the toggle arms to engaged position; and the disengaging portion contacting the disengaging surface of the toggle arm cam means to pivot the toggle arms to disengaged position.

2. Connecting device construction as defined in claim 17 in which the panels include alignment means located to position the panels for engagement.

3. Connecting device construction as defined in claim 2 in which said alignment means extend between the tops and bottoms of said panels; and in which said alignment means includes clamping means engageable with the uppermost and lowermost toggle arms when said upper and lowermost toggle arms are in engaged position for retaining the toggle arms in engaged position.

4. Connecting device construction as defined in claim 3 in which said clamping means includes a portion of the bottom alignment means; in which said bottom portion supports the lowermost toggle arm when in engaged position; and in which the top alignment means includes an adjustable member extending from said top alignment means for engaging the uppermost toggle arm.

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