

May 26, 1959

B. FOX
SINGLE AND MULTIPLE TIER ASSEMBLY FOR
QUICK DETACHABLE CONNECTOR

2,888,660

Filed Aug. 30, 1955

4 Sheets-Sheet 1

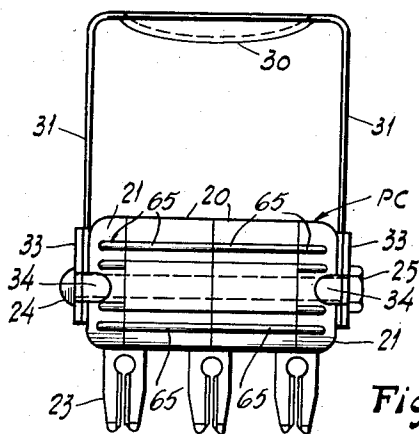


Fig. 1

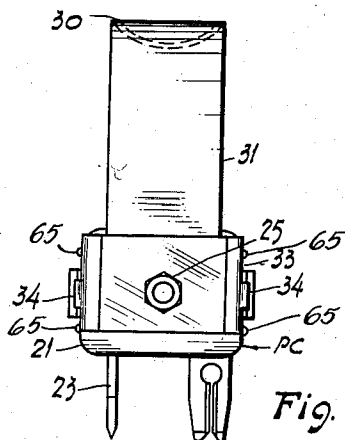


Fig. 2

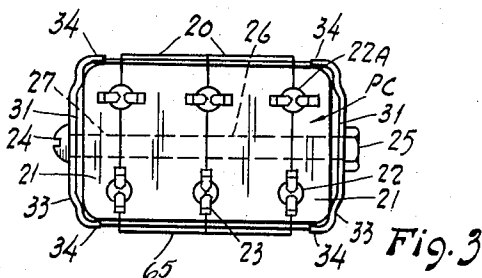


Fig. 3

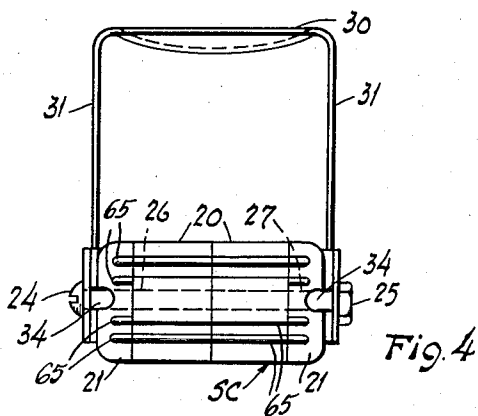


Fig. 4

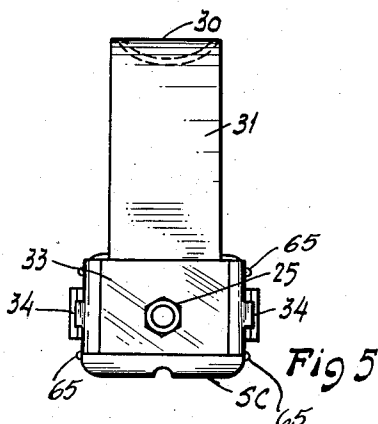


Fig. 5

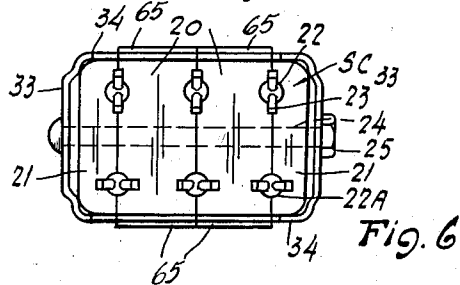


Fig. 6

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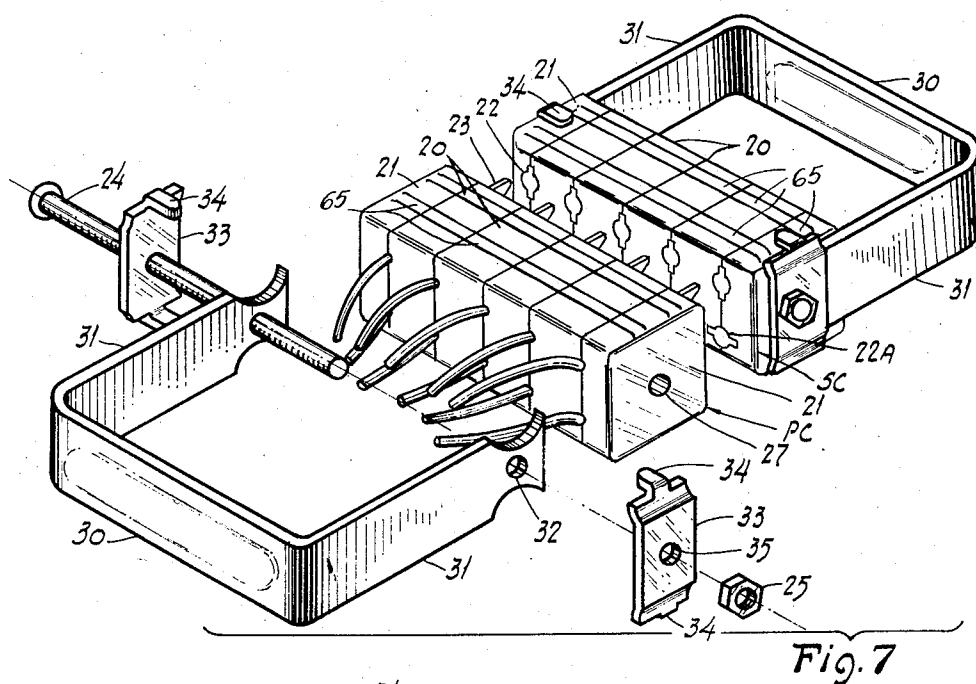


Fig. 7

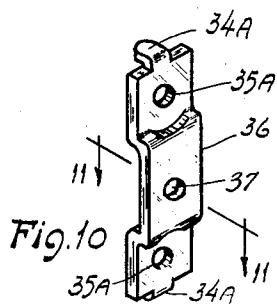


Fig. 10

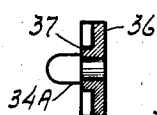


Fig. 11

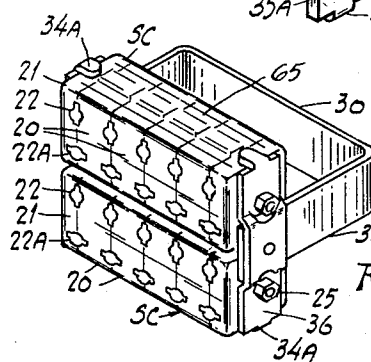


Fig. 9

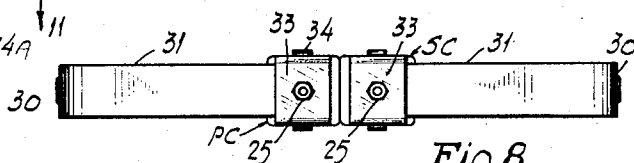


Fig. 8

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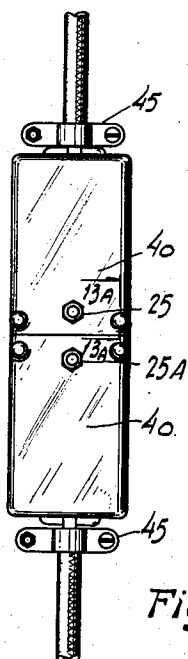


Fig. 13

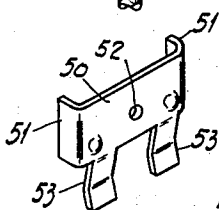


Fig. 14

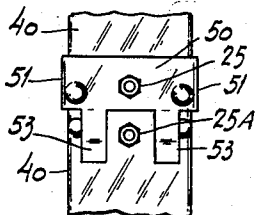


Fig. 15

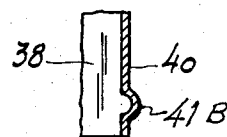


Fig. 13A

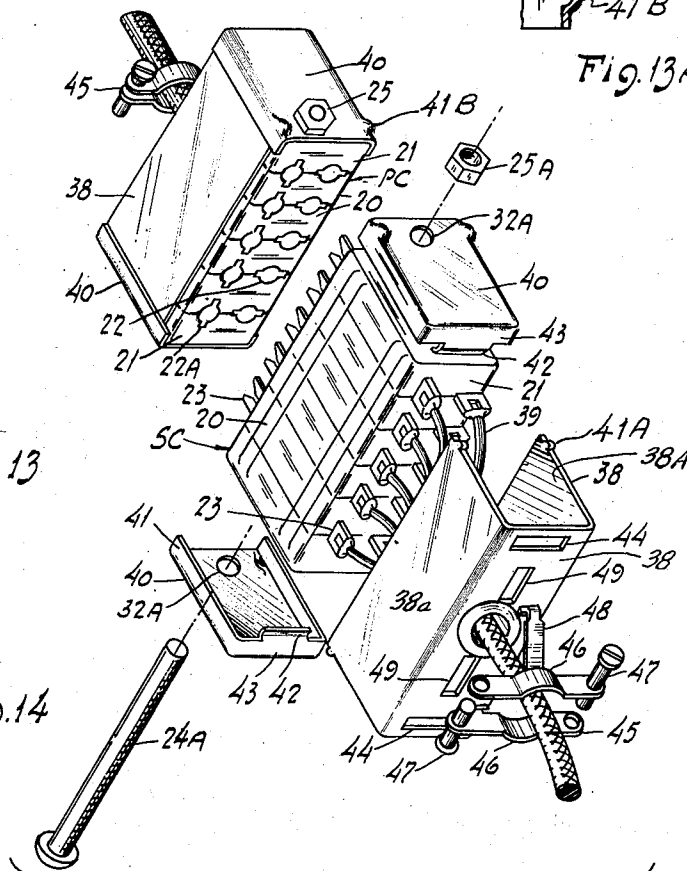


Fig. 12

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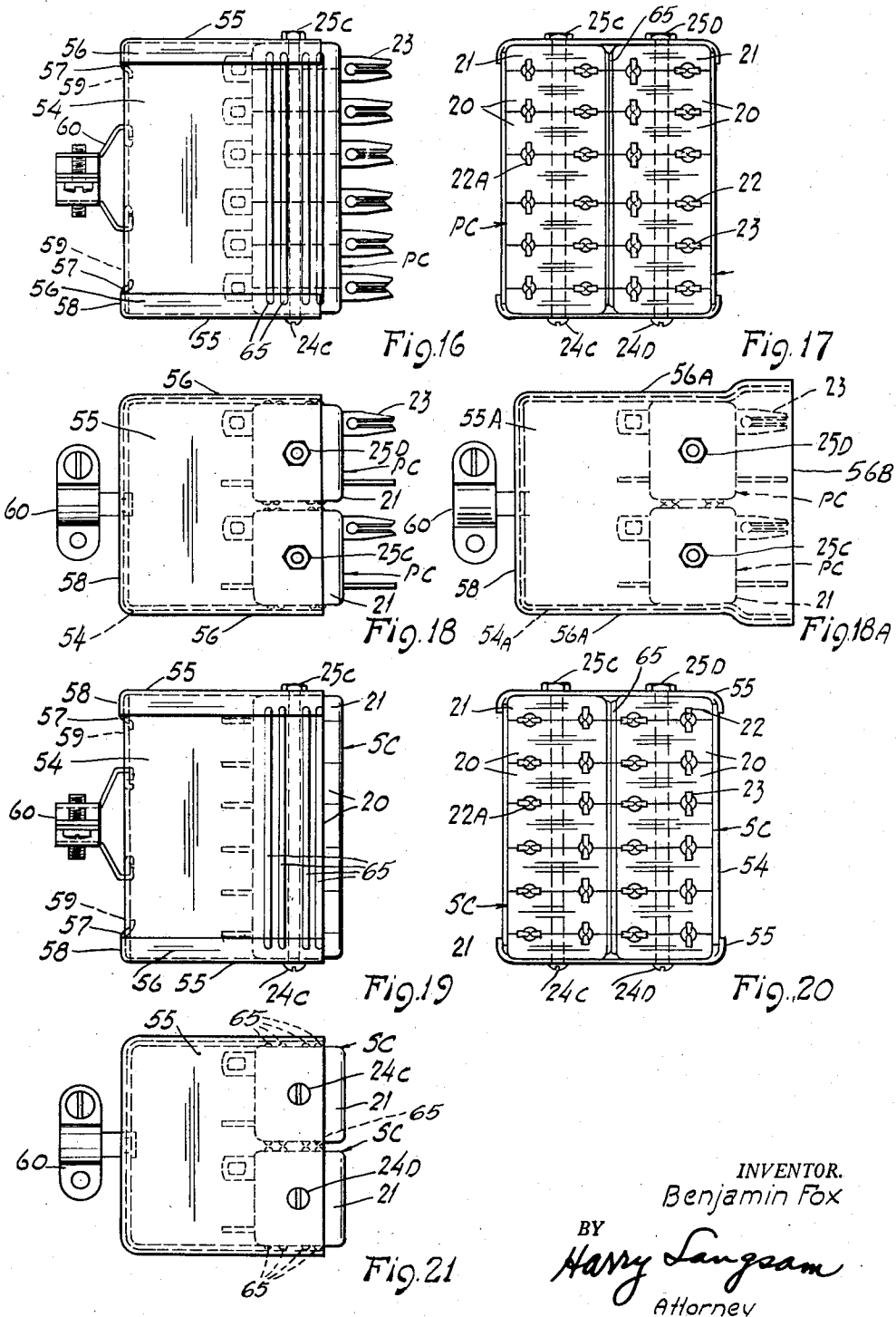
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SINGLE AND MULTIPLE TIER ASSEMBLY FOR QUICK DETACHABLE CONNECTOR

Benjamin Fox, Philadelphia, Pa.

Application August 30, 1955, Serial No. 531,490

1 Claim. (Cl. 339—110)

My invention relates to electrical connectors of the quick detachable plug and socket type, and relates more particularly to handling and securing means for multiple contact units of the type as set forth in my Reissue Patent No. 23,547.

It has been found that a large number of assembled contacts in a single unit may be made, but it is difficult for the user to handle the units as they become relatively long. The contacts of the plug and the receptacle units, when forced together, engage so firmly in the aforementioned connectors that it is often necessary to employ tools to separate the plug and socket assemblies.

It is, therefore, an object of my present invention to provide securing and handling means for a plug and receptacle connector made of substantially identical parts which may be easily manipulated no matter how many individual contacts are employed.

Another object of my present invention is to provide a securing and handling means whereby quick connectors of the type specified above, made of substantially identical parts, may be easily mated or separated.

Another object of my present invention is to provide a securing and handling means for a multiplicity of contact units of the type set forth which is equally applicable either to the plug or the socket type of quick connector.

Another object of my present invention is to provide a securing and handling means for a multiplicity of diminutive contacts that permits the user to mate or disengage groups of the contacts in plug and socket arrangement without the use of any tools.

Another object of my present invention is to provide a securing and handling means for a multiplicity of diminutive contacts, the securing and handling means completely enclosing the plug type of connector and the socket type of connector when in mating position to provide a metallic grounding shield.

Another object of my present invention is to provide a securing and handling means for the aforementioned male or female type of connector made of a multiplicity of substantially identical parts which also embodies a cord or cable clamp on each connector.

Another object of my present invention is to provide a handle for a quick connector of the type set forth wherein the handle serves as a cover for the connector and a part of a cord relief.

Another object of my present invention is to provide a cover for the wire ends joined to a quick connector of the type set forth wherein the cover also serves as a handle.

Other objects of my present invention are to provide an improved device of the character described which is easily and economically produced, which is sturdy and compact in construction, which is easily assembled by an unskilled person, and which provides positive and accurate alignment of the contacts of the plug and the connector unit.

With the above and related objects in view, my invention consists in the details of construction as hereinafter

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shall be described, the description of which will more readily be understood when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a side view of a plug connector having a plurality of identical contacts and complementary end caps and core blocks together with a handle in accordance with my present invention.

Fig. 2 is an end view of the plug assembly shown in Fig. 1.

Fig. 3 is a bottom plan view of the plug assembly shown in Fig. 1.

Fig. 4 is a side view of a six contact socket connector having a handle attached thereto in accordance with my present invention.

Fig. 5 is an end view of the socket shown in Fig. 4.

Fig. 6 is a bottom plan view of the socket assembly shown in Fig. 4.

Fig. 7 is an exploded view of a plug and socket unit analogous to that shown in Figs. 1 to 6 and having a handle in accordance with my present invention.

Fig. 8 is an end view of the mating socket and plug unit shown in Fig. 7.

Fig. 9 is a perspective view showing a handle according to my present invention attached to two tiers or stacks of socket or receptacle type of quick detachable connector.

Fig. 10 is a perspective view of an end bracket or coupling unit for securing a handle to the two tiers of socket connector, as in Fig. 9, as well as to retain the two tiers together.

Fig. 11 is a sectional view taken along lines 11—11 of Fig. 10.

Fig. 12 is a perspective view of a modified form of my improved plug and socket connector in which the connector units are partially enclosed by a cover and wherein a cord clamp or strain relief is embodied.

Fig. 13 is an end view of the plug and socket connectors shown in Fig. 12 in close coupled arrangement.

Fig. 13A is a sectional view taken along the lines 13A—13A of Fig. 13, but shown drawn to a somewhat larger scale.

Fig. 14 is a perspective view of a grounding clip.

Fig. 15 is a fragmentary view of the plug and socket connectors shown in Fig. 13 with the grounding clip in position.

Fig. 16 is a side view of a plug connector having twenty-four contacts mounted in two tiers.

Fig. 17 is a front view of the plug shown in Fig. 16.

Fig. 18 is an end view of the plug assembly shown in Fig. 16.

Fig. 18A is an end view of a modified type of cover for the plug connector wherein the cover completely surrounds the free ends of the contacts on the terminals.

Fig. 19 is a side view of a socket assembly having twenty-four contacts in two tiers to match with the plug shown in Fig. 16.

Fig. 20 is a front view showing the socket assembly of Fig. 19.

Fig. 21 is an end view showing the socket assembly of Fig. 19.

Referring now in greater detail to the drawings, wherein similar reference characters refer to similar parts, there is shown, in Figs. 1 to 3, a six contact plug, generally designated as PC, and in Figs. 4 to 6, a socket generally designated SC, of a quick detachable plug and socket connector. Both the socket and the plug which mate one another are assembled from identically constructed parts.

The plug PC comprises a core block or insulating unit 20, and a pair of end caps 21. The core block and end caps are described in detail in my co-pending applications, Serial No. 351,913, now Patent No. 2,750,572, granted June 12, 1956, and Serial No. 383,053, now Patent No. 2,828,474, granted March 25, 1958. The core block 20

and end caps 21 have interfitting cavities and projections (not shown) on the surfaces that interfit with each other, the cavities and projections being provided to insure alignment and definite positioning of the intermediate and end contact retaining units when in assembled arrangement (see Fig. 1). Also, on the adjacent surfaces between the core block 20 and end caps 21 are opposed or mirror images of complementary electrical contact receiving cavities 22. Identical, flat, bifurcated, electrical contacts or terminals 23 are arranged to be retained by and secured in the identical opposed cavities 22. The cavities 22 are located so that one opposed pair of them secures an electrical contact 23 in one plane, and an adjacent opposed cavity pair 22A on the same surface secures an identical contact 23 in a second plane normal to the first plane. The cooperating pairs of cavities also are located so that the electrical contacts 23 can be received and retained therein either with the bifurcated ends thereof wholly within the assembled core block 20 and end caps 21, in which case a female or socket member is provided (see Figs. 4 and 19), or with the bifurcated ends of the contacts extending out of the casings to thereby provide a male or plug member (see Figs. 1 and 16). Such plug and socket assemblies can be brought into mating relationship with each other to provide electrical coupling, the electrical contacts 23 of the plug and socket units straddling each other and engaging each other in cross-relationship at their bifurcated ends to afford electrical contact. In order to insure that the electrical contact between the engaged electrical contacts is good and is of low electrical resistance whereby the contacts are of high current carrying capacity, the opposed edges of each bifurcation of the contact members are chamfered or tapered and are arranged so that considerable pressure is exerted between the opposed contact edges of each bifurcation. The pressure of the opposed edges offers frictional resistance when the user attempts to insert the plug and socket assemblies into mating relationship and when separating the plug and socket. The bodies of the connector plug and socket members are of such diminutive size that, when a multiplicity of units are assembled, the surfaces presented to the grasp of the user are so small that it is difficult for the user to make and break the circuit.

In applications employing a multiplicity of plug contacts PC or socket contacts SC (see Figs. 1 and 4) or combinations of the two, in line, a single retaining or securing means comprised of a bolt 24 and a complementary nut 25 passes through a hole 26 provided in the core block 20 and a hole 27 (Fig. 7) in the end caps 21 to secure the end caps and core blocks and the electrical contacts in definite, spaced relationship to each other. The securing means employed to secure a line of contacts, whether a plug or a socket, is employed as well to secure a handle or handling means to the assembled units.

In the drawings, Figs. 1 to 8 inclusive, a U-shaped handle 30 having parallel ends or legs 31, 31 lies adjacent to the insulator end caps 21 of a stack of end and core insulators. The handle enables the user to pull the socket unit apart from its complementary plug unit of the connector, or to mate them without exerting any strain upon the insulators themselves. The bolt 24 passes through openings 32 in the free ends of the legs 31, 31, so that a pull on the handle 30 exerts a pull upon the bolt 24, while a push on the handle 30 exerts a corresponding push on the bolt 24.

The ends of the handle 30 are pressed against the insulator end caps by a clamp or bracket 33 (Fig. 7) which is provided with right angularly extending, short tabs 34 that abut against opposite sides of the end caps 21 to secure, and prevent oscillation of, the U-shaped handle 30 about the bolt 24 as a pivot, and to insure definite, spaced relationship between the handle 30 and the stack of insulator units of the connector. A central hole 35 is provided in the end clamp 33 for the bolt 24 to pass through. The entire assembly and all the components

are retained in definite, spaced-relationship to each other by the bolt 24 and its nut 25.

The handle 30, with the aid of a suitable end clamp unit, is applied equally as well to a single tier or a plurality of tiers or stacks of plug type units PC and tiers or stacks of socket type units SC (see Figs. 4 and 9). The handle 30, thus provided and secured to the stack of electrical contact positioning units, facilitates the handling of the contact assemblies when bringing the plug and socket connector units into mating relationship to complete electrical circuits, and when separating the plug and socket connector units in order to break the electrical circuits to which the socket and the plug are connected.

The outside surface of each end cap 21 and each core block 20 has a plurality of spaced ridges 65 which are aligned with one another when the end caps and core blocks are assembled as a unit. In Figs. 17 and 20, where two tiers of plug and socket connectors are shown, the ridges 65 on each tier of end plugs abut one another, thereby serving as spacers.

In assemblies of plug type electrical contact units and socket type electrical contact units of ten or more contact retaining units positioning twenty or more contact members, it has been found desirable to mount the units in two or more stacks (see Fig. 9). When the handle 30 is applied to a dual stack arrangement of this type, a coupling clamp unit 36 (see Figs. 10 and 11) is employed. Tabs 34A, provided on the ends of the coupling clamp unit 36, interfit with the sides of the end caps 21 of the dual stacks (see Figs. 9) to prevent oscillation of the connector with respect to the clamp. A boss 37 (Fig. 11) formed on the inner surface of the coupling clamp unit 36 is arranged to interfit with the hole 32 in one end of the handle 30. Holes 35A—35A are located in the coupling clamp unit 36 to receive the stack securing bolts 24—24. The handle 30, applied to a dual stack or tier of the socket connector SC is shown in Fig. 9. However, it is to be understood that the handle 30, secured by coupling clamp units, can be applied equally as well to a dual stack of plug type of connectors.

In many applications where stacks of plug contact units PC and stacks of associated socket type units SC are employed in an electrical circuit, it is desirable to have the contact means, connections, and the ends of the connected wires completely housed in a metal casing both to protect the wires and to serve as a handle for making or breaking the circuit through the plug and socket. I have disclosed, in Figs. 12 and 13, a metal housing or handle for a stack of insulators forming a plug unit PC and one that is applicable as well to a stack of insulators forming a socket unit PS.

A U-shaped metallic cover and handle 38 is located to enclose the wires 39 which engage the electrical contacts 23. The cover 38 has its sides 38A extend downwardly over the sides of the stack of plug connectors PC (see Fig. 12). Rectangular, flanged, metallic end clamps 40 with flanged, intumed edges 41 are arranged to engage the ends and form an enclosed housing with the U-shaped metallic cover 38. When the cover 38 is pulled, it pulls in the top flange 43 of each end clamp, and the clamps, in turn, pull on the bolt 24. A tongue 42, formed on the top flange 43 of each cap 40, is constructed to extend through and interfit with a rectangular hole 44 to serve as a hinge in the top surface of the U-shaped cover 38, thus insuring definite spaced relationship between each cap 40 and the cover 38 when the caps and the cover are assembled with the stack of insulator caps and their core blocks. The cover 38 and end caps 40, when assembled together, are secured to the stack of plug connectors PC by the bolt 24A, which passes through the holes 32A—32A and nut 25A.

A wire strain or strain relief clamp 45 secures the multiple conductor wire to the electrical contact unit. The strain relief clamp is comprised of two identical wire clamps 46—46 that are secured around the wire by the

threaded bolts 47—47. Tongues 48 with T-shaped ends, attached to and extending from the wire clamps 46, are arranged to interfit with rectangular slots or holes 49—49 in the top surface of the U-shaped cover 38.

The rectangular slots 49 enable the strain relief clamp 5 to be shifted to one side of the central opening when the necessity arises, as in the case where a large number of wires are located in a position to cause the clamp to be offset from the center of the cover.

The clamps 46 may move along the slots 49, 49 by virtue of the T-shaped ends on the tongue 48.

It will be observed in Figs. 12 and 13 that the cover 38, the end caps 40, and the wire strain relief clamp 45 are applicable to stacks or tiers of plug connector PC as well as to stacks of the socket connector SC.

In applications where more positive electrical contact is desired between the cover on the plug connector and the cover on the socket connector, a grounding clip 50 is provided (see Figs. 14 and 15). Grounding clip 50 has inturned flanges 51—51 arranged to interfit with the sides of the rectangular, flanged, metallic cap 40 to prevent rotation of the grounding clip 50 on the securing bolt 24 that extends through the hole 52 provided in the grounding clip 50. Downwardly extending contact making fingers 53—53 are arranged to engage the surface of the companion cover on the mating connector when in joined position (see Figs. 15), and thus provide a positive electric contact between the cover on the plug type electrical contact assembly and the cover on the socket type electrical contact assembly.

In assemblies of plug and socket connectors having ten or more insulator end caps and core blocks whereby there are twenty or more contacts, it has been found advisable to mount the units in two or more stacks or tiers (see Figs. 16 to 21 inclusive).

With the contact units arranged in this manner, greater stability in the assembly is accomplished. In the dual stack arrangement, the U-shaped metallic cover 54 is formed so that the sides of the cover extend downwardly over the outer sides of the contact unit stacks (see Fig. 16), and each rectangular, flanged, metallic end clamp or bracket 55 is arranged so that inturned edges or flanges 56 engage and secure the U-shaped metallic cover 54. A tongue 57 formed on the top flange 58 of the clamp 55 is arranged to extend through and interfit as a hinge with rectangular holes 59 in the top surface of the U-shaped cover 54, thus insuring definite, spaced relationship between each end clamp 55 and the cover 54 when the clamps 55 and the cover are assembled with the stacks of electrical contact units. The top flange 58 of each end clamp overlaps an edge of the cover 54 so that each end clamp hinges about the rectangular hole 59 and its interfitting tongue 57.

The cover 54 and the clamps 55, when assembled together with the stacks of plug connectors PC, are secured to the plug contact ends and the core by the bolts 24C, 24D, and nuts 25C and 25D, respectively. The tiers of connectors are secured by the same bolts.

In Fig. 18A is disclosed a modified type of cover 55A wherein the metal end clamps 56A surrounds the plug contact 23 by being flared outwardly at its end 56B, and each U-shaped metal cover 55A is likewise flared.

The purpose of the enclosed contacts is to prevent injury thereto in the event the connector is dropped upon a sharp or solid object.

A wire strain and retaining unit or strain relief clamp 60 is provided to secure the multiple conductor to the metallic cover and is constructed and applied in a manner as described above for the connector shown in Fig. 12.

It will be observed in Figs. 16 to 21, inclusive, that the U-shaped cover 54 and rectangular, metallic end clamps 55 and the wire strain and retaining units are applicable to multiple stacks of plug PC and socket SC connectors.

I also may place index projections 41A on the side edges of the cover which protrude into recess 41B in the metallic end clamp 40 to align the cover 38 with respect to the connector and to prevent longitudinal movement of the end clamps 40 with respect to the metallic U-shaped cover.

Although my invention has been described in considerable detail, such description is intended as being illustrative rather than limiting, since the invention may be variously embodied, and the scope of the invention is to be determined as claimed.

I claim as my invention:

An electrical connecting unit comprising an assembly of a plurality of contiguous contact supporting members including a pair of end caps at opposite ends of said assembly, a plurality of flat electrical contact elements carried by said members between adjacent ones of said members, a holding bolt, an opening through each of said supporting members through which said holding bolt extends, a metallic end clamp at each end of said contact support members having an opening therein through which said holding bolt passes, a handle having spaced legs on the sides thereof, each of said legs having an opening therein adjacent its end for receiving said holding bolt, each leg being adapted to be inserted between one of said end clamps and one of said end caps and said metallic clamp has side tabs integrally formed therewith which overlap the sides of the end caps to prevent oscillation of said handle with respect to said contact supporting members.

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