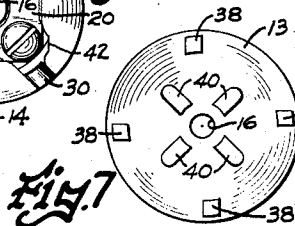
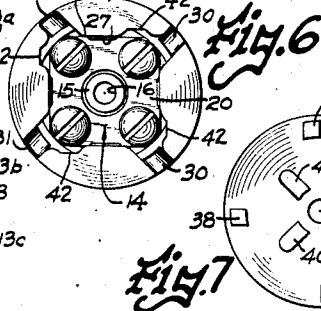
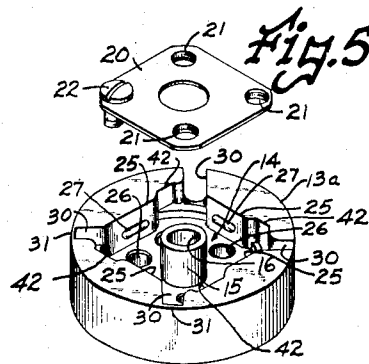
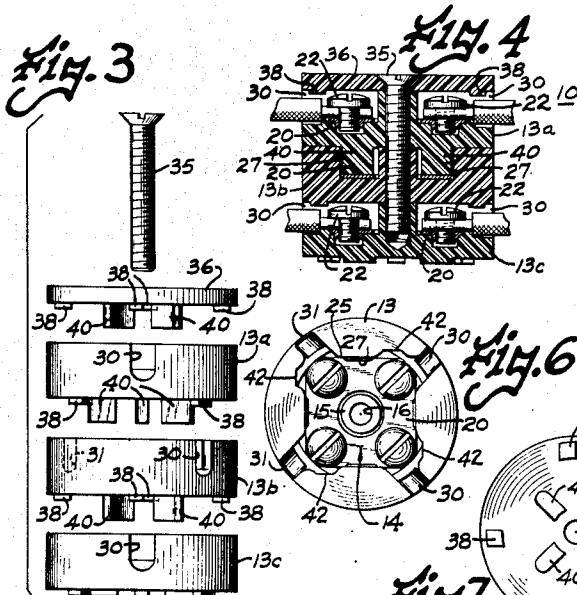
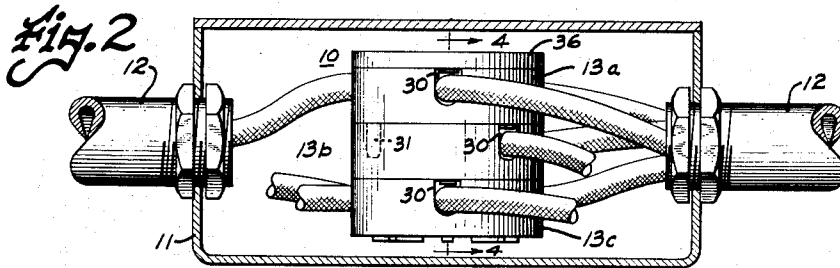
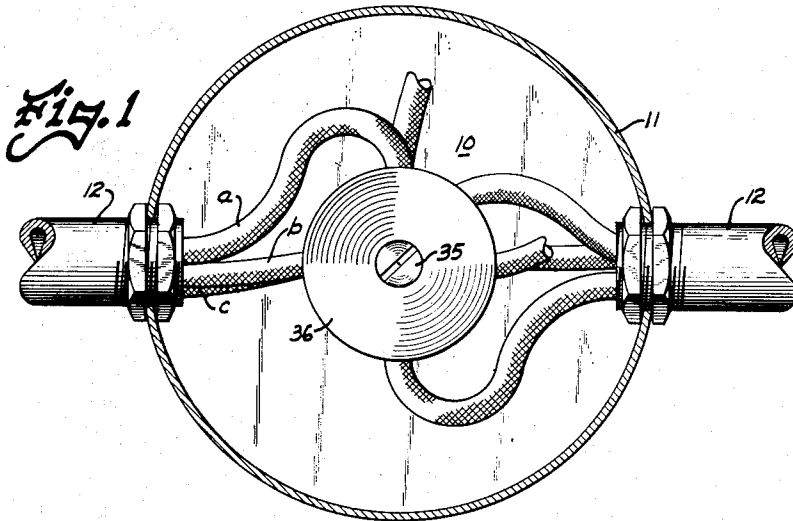


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A DE V. HARNETT
PLURAL-CIRCUIT CONNECTOR

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INVENTOR
A. Devere Harnett
by Mason, Kolchman, Rathburn & Wilson
Attys.

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PLURAL-CIRCUIT CONNECTOR

A De Vere Harnett, Racine, Wis., assignor to Devere Company, Racine, Wis., a corporation of Wisconsin

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The present invention relates to electrical circuit connectors and, more particularly, to an improved multi-circuit connector assembly. Specifically, the present invention is an improvement of the multi-circuit connector assembly described and claimed in applicant's prior Patent 2,463,034, which issued on March 1, 1949.

It is standard practice in wiring houses and other structures for electrical current distribution to employ conduit boxes for enclosing circuit conductor interconnections. Usually the circuit junctions are formed by mechanically joining the circuit conductors and then soldering and taping the joints. Thereafter the jointed conductor parts are forced into the conduit box and covered by the box lid. This procedure is quite laborious and hence costly, because of the soldering and taping operations involved. Also, when repair is required it is necessary to remove the conductors from the conduit box and remove the tape from the joints in order to repair the joint or replace a conductor. These are laborious and time consuming operations.

While the assembly disclosed in the prior patent referred to above provides an improved circuit connector assembly which permits easy and reliable interconnection of the conductors in a circuit and yet is small enough to fit in a conduit box of standard size while leaving available within the box adequate room to accommodate substantial segments of the circuit conductors extending to the assembly, it requires insert molding of the parts and hence the structure is relatively expensive. It would be desirable, therefore, to provide a multi-circuit connector assembly wherein the connector units may be injection molded on a mass production basis and separate conductive terminal plates may then be snapped into place within the top opening cavities in the body members. It would also be desirable to provide a multi-circuit connector assembly which is completely sealed except for thin-walled knockout portions which may be removed in accordance with the number of conductors to be connected to each connector unit.

Accordingly, it is an object of the present invention to provide a new and improved circuit connector assembly for connecting a plurality of conductors which comprises a plurality of connector units adapted for stacking one on top of another so that each stacked connector unit completely insulates the exposed conductive parts of the connector immediately below, and wherein the units are each provided with knockout openings in the walls thereof so that the conductive part of the terminal may be accessible only as required to connect the desired number of conductors to each connector unit.

It is another object of the present invention to provide a new and improved circuit connector for connecting a plurality of conductors wherein the number of exposed openings to the conductive parts of the connector may be selected to coincide with the number of conductors to be connected.

It is a further object of the present invention to provide a new and improved circuit connector for interconnecting a plurality of conductors, wherein the conductors may be connected to a separable conductive part of the connector which is then placed in an insulated housing having the same number of openings as the number of conductors.

Still another object of the present invention resides in the provision of a connector element having a body portion of insulating material and a separable conductive terminal part which may be snapped into place in a top opening cavity in the body portion to enclose the same.

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In accordance with a further object of the present invention, the top opening cavities are employed in conjunction with projections on the bottom of the body portion of the connector elements to hold the terminal plates firmly within the cavities of the elements when secured together in stacked relationship.

In accordance with a still further object of the present invention the top opening cavities are employed in conjunction with projections on the bottom of the body portion of the connector element to interlock the elements against relative rotation and to hold the terminal plates securely within the cavities of the elements when secured together in stacked relationship.

The invention, both as to its organization and mode of assembly, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings, in which:

Fig. 1 is a top plan view illustrating the present improved connector assembly positioned in a conduit box;

Fig. 2 is a side view of the connector assembly and box shown in Fig. 1;

Fig. 3 is an exploded view showing a plurality of connectors and means for securing them together;

Fig. 4 is a sectional view through the stacked connectors of Fig. 2;

Fig. 5 is an exploded perspective view showing the details of one circuit connector of the present invention;

Fig. 6 is a top view of a single connector and

Fig. 7 is a bottom view of a single connector.

Referring now to the drawings, in Figs. 1 and 2 there is illustrated a multi-circuit connector assembly 10 which is composed of three separate circuit connectors 13a, 13b and 13c and is positioned in a conduit box 11. Conductors 12 are connected to the box and carry the conductors a, b, and c of a three-wire electrical circuit. The connectors 13a, 13b and 13c may be color coded (green, red and black, for example) to correspond to the color coding of the conductors. The connector assembly is not directly secured to the conduit box but being very light in weight is held in position by the stiffness of the conductors themselves. A cover, not shown, is ordinarily provided for the conduit box 11.

For the details of construction of the improved connectors of the present invention, reference is made to Fig. 5 in which the connector 13a is shown as having an annular body portion molded from a suitable thermo-plastic or thermo-setting insulating material, at its upper side, the connector is provided with a top opening cavity 14 and an upwardly extending post 15 which is positioned centrally of the cavity 14 and is provided with a bore 16 therethrough which is concentric with the annular body portion of the connector 13. In order to connect a plurality of conductors internally of the insulating body member 13, a rectangularly shaped conductive terminal element 20 is provided which is in the form of a flat metal disc and may be snapped into place within the top opening cavity 14. This element is provided with openings 21 in each corner thereof which are threaded to receive terminal screws 22. Preferably the plate 20 is relatively thin and is deformed as shown to provide sleeves of sufficient length to permit threading. As clearly shown in Figs. 5 and 6, the cavity 14 is provided with substantially vertical side walls 25 which define a substantially rectangular opening which is adapted to receive the conductive element or plate 20, and the bottom surface of the cavity 14 is provided with a plurality of depressions 26 which permit the terminal screws 22 to be threaded through the under side of the plate 20 by a substantial amount. Thus the terminal plate 20 may be seated on the bottom of the cavity 14 with clearance for the terminal screws 22. In order that the conductive terminal plate may be snapped into place within the cavity 14 and held in place at the bottom of the cavity, inwardly extending ridges 27 are provided which are formed to extend inwardly from the side walls 25. It will be understood that in assembling the plate 20 with the annular body part 13, the edges of the plate first engage the ridges 27, following which the resilient plate 20, or the body part 13, or both, is deformed slightly to permit the edges of the plate to pass over the ridges as the plate is pushed into the bottom of the cavity 14.

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In accordance with an important feature of the present invention, the terminal plate 20 is rendered accessible from the side of the connector by means of a plurality of top opening channels 30 which communicate internally with the cavity 14 and which are blocked at the outer end thereof by means of thin-walled knockout portions 31. The knockout portions 31 normally block the channels 30 so that the terminal plate 20 is completely enclosed within the insulating body member 13 when the connectors are stacked one on top of the other. However, the knockout portions 31 may be selectively removed so as to render a particular terminal screw adjacent the associated channel 30 accessible from the side of the insulating body member 13. In this connection it will be understood that the knockout portions 31 may be removed by employing any suitable means for this purpose, as, for example, by forcing the shank end of a screw driver downward against the top edge of the knockout portion to break away the same.

Reference is now made to Fig. 3 wherein the manner of securing the three connectors 13a, 13b and 13c together to form a connector assembly for use in a three-wire system is shown. A bolt 35 is provided for this purpose which is adapted to be positioned in the central bore 16 of the connectors and to be threaded into the bore of the bottom most connector 13c. The connectors are thus maintained in assembled axially aligned relationship by the bolt 35 when this bolt is inserted through the central portions thereof and threaded into the connector 13c in the manner described. A cover member 36 of insulating material is also provided in the connector assembly so as to completely cover and insulate the top opening cavity and channels in the top connector 13a and to form a washer for the bolt 35. A first set of projections 38 are provided to project downwardly from the bottom of each connector and to fit into the top opening channels 30 of the next lower connector to prevent relative rotation between the connectors when the connectors are stacked as shown to form a multi-circuit connector. As best shown in Figs. 2 and 3 of the drawings, the projections 38 are preferably so positioned that when the connectors are stacked together, the channels 30 are angularly staggered to provide more room for the conductors.

In accordance with a further feature of the present invention, a second set of projections 40 is provided on the bottom of each of the connectors. The projections 40 are spaced inwardly from and are of substantially greater length than the projections 38 and are adapted to extend into the top opening cavity 14 of the next lower connector. They are sufficiently long to press the terminal plate 20 of the next lower member firmly against the bottom of the cavity 14 thereof, as is well illustrated in Fig. 4. In order to permit the above-described clamping action the projections 40 are off-set from the projections 38 so as to permit the projections 40 to be inserted between the heads of the terminal screws 22 and to engage the terminal plate 20 intermediate the terminal screws and press the same firmly against the bottom of the cavity. Preferably the projections 40 are in the form of radially extending fins (Fig. 7) which possess substantial strength and cannot be broken off during handling and assembly of the connectors. The projections 38 need only be of sufficient length to interlock with the top opening channels 30 and should not be long enough to interfere with the positioning of a relatively large conductor in the channel 30. It will be noted that the projections 40 on the bottom connector 13c are shortened to the length of the projections 38 to provide a smooth bottom surface for the assembly and to reduce the overall height thereof.

It will be evident from the foregoing explanation that the projections 38 may be omitted if desired and the projections 40, which are positioned between adjacent terminal screws on the terminal plate 20, will provide a coarse means of interlocking the stacked connectors due to the fact that the projections 40 will strike the adjacent terminal screws. In order to eliminate the necessity for forming screw receiving eyes in the ends of the conductors connected to the connectors 13a, 13b and 13c, the conductors are preferably stripped of insulation and the bare conductor ends are positioned under the head of the adjacent terminal screw either before or after the plate 20 of the connector is snapped into the cavity 14 of the connector body. The terminal screw is then tightened so as to clamp the bare end of the conductor between the under side of the terminal screw head and the terminal plate.

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As is well illustrated in Fig. 6, the terminal plate 20 is preferably positioned within the cavity such that the terminal screws are off set slightly with respect to the associated conductor channels 30 so that the conductor need not be bent or deformed in the cavity 14 of the connector body. Also the walls of the cavity 14 are recessed as illustrated at 42 to provide clearance for the heads of the terminal screws 22. Preferably the conductor insulation is only stripped back far enough so that when the conductor end is inserted in the channel 30 the end of the insulation will extend inwardly beyond the side of the conductor. When this procedure is followed, all portions of the conductor outside of the connector are insulated to preclude any likelihood of short circuits.

Although an assembly has been described in which three connectors have been used together, it will be apparent that any desired number of connectors can be used by using bolts 35 of various lengths. The only factor limiting the number of connectors which may be used together is the amount of space available in the conduit box.

From the foregoing description it will be evident that the present improved multi-circuit connector assembly comprises insulating body members which may be injection molded at extremely low cost and separable conductive terminal plates which may be in the form of stampings and may be snapped into place within the insulating body member by the electrician as the individual circuits are wired. Each connector structure also includes thin-walled knockout portions which close the unused wire channels to insulate the internal cavity of the connector. Furthermore, each connector is equipped with the projections 40 which are adapted to extend into the top opening cavity of the next lower connector and to press the terminal plate 20 thereof against the bottom of the cavity to prevent the same from vibrating and loosening the conductors. Each terminal plate 20 is additionally held in place while connection is being made to the individual terminal screws thereof by means of the ridges 27 which are positioned on the side walls of the cavity 14. Additionally, the terminal screws are off set from the side opening conductor channels so as to facilitate insertion of the bare ends of the conductors under the heads of the terminal screws.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein which are within the true spirit and scope of the invention as defined in the appended claims.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A connector assembly for interconnecting the conductors of a plurality of circuits, comprising a number of connector units corresponding to the number of circuits to be connected, said connector units being stacked one on top of the other and respectively including insulating body members each provided with a top opening non-circular cavity, separable flat conductive elements held within the top opening cavities in said body members, spaced terminal screws on said conductive elements, each of said body members having thin-walled knockout portions therein for selectively rendering said terminal screws accessible from the side of said body member and having at least one projection on the bottom thereof extending into the cavity of the next lower member so that the cavity of the lower member is covered by the upper member, said projection being positioned to extend between two adjacent terminal screws and engage the conductive element of the next lower member to prevent relative rotation between the members and to hold the conductive elements securely within their respective cavities, and means for holding said members in stacked relationship.

2. A connector assembly for interconnecting the conductors of a plurality of circuits, comprising a number of connector units corresponding to the number of circuits to be connected, said connector units being stacked one on top of the other and respectively including insulating body members each provided with a top opening non-circular cavity, separable flat conductive elements held within the top opening cavities in said body members, spaced terminal screws on said conductive elements, each of said body members having thin-walled knockout portions therein for selectively rendering said terminal screws accessible from the side of said body member and having a projection on the bottom thereof extending into the cavity of the next lower

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member so that the cavity of the lower member is covered by the upper member, said projection being positioned to extend between two adjacent terminal screws of the next lower member to prevent relative rotation between the members, and means for holding said members in stacked relationship.

3. A connector assembly for interconnecting the conductors of a plurality of circuits, comprising a number of connector units corresponding to the number of circuits to be connected, said connector units being stacked one on top of the other, and respectively including insulating body members each provided with a top opening non-circular cavity, separable flat conductive elements held within the top opening cavities in said body members, spaced terminal screws on said conductive elements, each of said body members having thin-walled knockout portions therein for selectively rendering said terminal screws accessible from the side of said body member and having a projection on the bottom thereof positioned to extend into the space between two adjacent terminal screws of the next lower connector unit, whereby the cavity of the lower member is covered by the upper member and relative rotation between units is prevented, and means for holding said units in stacked relationship.

4. A connector assembly for interconnecting the conductors of a plurality of circuits, comprising a number of connector units corresponding to the number of circuits to be connected, said connector units being stacked one on top of the other, and respectively including insulating body members each provided with a top opening non-circular cavity, separable flat conductive elements held within the top opening cavities in said body members, spaced terminal means on said conductive elements, each of said body members having thin-walled knockout portions therein for selectively rendering said terminal means accessible from the side of said body member and having a projection on the bottom thereof positioned to extend into the space between two adjacent terminal means of the next lower connector unit, whereby the cavity of the lower member is covered by the upper member and relative rotation between units is prevented, the projection of each of said units being substantially in line with one terminal means thereof to provide for staggering of the conductors connected to the stacked connector units, and means for holding said units in stacked relationship.

5. A connector assembly for interconnecting the conductors of a plurality of circuits, comprising a number of connector units corresponding to the number of circuits to be connected, said connector units being stacked one on top of the other and respectively including insulating body members each provided with a top opening non-circular cavity, separable flat conductive elements held within the top opening cavities in said body members, spaced terminal screws on said conductive elements, each of said body members having thin-walled knockout portions therein for selectively rendering said terminal means accessible from the side of said body member and having a projection on the bottom thereof positioned to extend into the space between two adjacent terminal screws of the next lower connector unit, whereby the cavity of the lower member is covered by the upper member and relative rotation between units is prevented and means for holding said units in stacked relationship, said projection being of sufficient length to engage the conductive element of the next lower unit and hold the element firmly within the cavity thereof.

6. A circuit connector, comprising an insulating body member having a top opening non-circular cavity therein, a flat conductive element positioned within said cavity, spaced terminal screws on said element, said body member having thin knockout wall portions adjacent said terminal screws, whereby said terminal screws may be rendered accessible from the side of said body member in accordance with the number of conductors to be connected, said body member being provided with a first projection on the bottom thereof for interfitting with the top opening cavity in the body member of a similar connector, whereby the cavity of the lower member is covered by the upper member and relative rotation between members is prevented when the members are stacked one on top of the other, said body member being provided with a second projection on the bottom thereof for restraining the movement of

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the conductive element of the lower member within the cavity thereof.

7. A circuit connector, comprising an insulating body member having a top opening non-circular cavity therein, a flat conductive element positioned within said cavity, spaced terminal screws on said element, said body member having top opening channels extending from said cavity and terminating in thin knockout wall portions adjacent said terminal screws, whereby said terminal screws may be rendered accessible from the side of said body member in accordance with the number of conductors to be connected, by selectively removing said knockout wall portions, said body member being provided with a first projection on the bottom thereof for interfitting with a top opening channel in the body member of a similar connector whereby the cavity and top opening channels of the lower member are covered by the upper member and relative rotation between members is prevented when the members are stacked one on top of the other, said body member being provided with a second projection on the bottom thereof extending into the top opening cavity of the lower member for restraining the movement of the conductive element of the lower member within the cavity thereof, said first projection being offset relative to said knockout portions to provide for staggering of the conductors connected to two stacked circuit connectors.

8. A circuit connector, comprising an insulating body member having a top opening non-circular cavity therein, a flat conductive element positioned within said cavity, spaced terminal screws on said element, said body member having top opening channels extending from said cavity and terminating in thin knockout wall portions adjacent said terminal screws, whereby said terminal screws may be rendered accessible from the side of said body member in accordance with the number of conductors to be connected by selectively removing said knockout wall portions, said body member being provided with a first projection on the bottom thereof for interfitting with a top opening channel in the body member of a similar connector whereby the cavity of the lower member is covered by the upper member and relative rotation between members is prevented when the members are stacked one on top of the other, said first projection being relatively short to permit insertion of a conductor into the corresponding channel of the lower member said body member being provided with a second projection on the bottom thereof extending into the top opening cavity of the lower member for restraining the movement of the conductive element of the lower member within the cavity thereof, said first projection being offset relative to said knockout portions to provide for staggering of the conductors connected to two stacked circuit connectors, said second projection being substantially in line with said knockout portions and of sufficient length to engage the conductive element of the next lower connector between two adjacent terminal screws thereon.

9. A connector assembly for interconnecting the conductors of a plurality of circuits, comprising a number of connector units corresponding to the number of circuits to be connected, said connector units being stacked one on top of the other and respectively including insulating body members each provided with a top opening cavity and with one or more horizontal projections extending inwardly from the walls defining said cavity, a thin flat conductive element detachably but non-rotatably retained within each of said cavities by forcing the edges thereof past said projections, spaced terminal screws on said conductor elements, said body members being provided with conductor receiving channels extending outwardly from said terminal screws toward the outer periphery of the body members, said body members having at least one projection on the bottom thereof extending into the cavity of the next lower member so that the cavity of the lower member is covered by the upper member, said projection being positioned to extend between two adjacent terminal screws of the next lower member to prevent relative rotation between the body members, and means for holding said body members in stacked relation.

10. A connector assembly for interconnecting the conductors of a plurality of circuits, comprising a number of connector units corresponding to the number of circuits to be connected, said connector units being stacked one on top of the other and respectively including insulating

body members each provided with a top opening cavity and with one or more horizontal projections extending inwardly from the walls defining said cavity, a thin flat conductive element detachably but non-rotatably retained within each of said cavities by forcing the edges thereof past said projections, spaced terminal screws on said conductor elements, said body members being provided with conductor receiving channels extending outwardly from said terminal screws toward the outer periphery of the body members, said body members having at least one projection on the bottom thereof extending into one of the conductor receiving channels on the next lower member, whereby the cavity of the lower member is covered by the upper member and relative rotation between the body members is prevented, and means for holding said body members in stacked relationship.

11. A connector assembly for interconnecting the conductor of a plurality of circuits, comprising a number of connector units corresponding to the number of circuits to be connected, said connector units respectively including insulating body members each provided with a top opening cavity and with an apertured boss extending upwardly from each of the body members at approximately the center of its cavity, said connector units being stacked one on top of the other so that each body member covers the cavity of the next lower body member and the apertures in the bosses are aligned, thin flat conductive elements each positioned within one of said top opening cavities and each having a central opening therein in registry with the boss in that cavity, said body members having one or more horizontal projections extending in-

wardly from the walls defining said cavity in order to retain the conductive element therein, spaced terminal screws on each of said conductor elements, said body members being provided with conductor receiving channels extending outwardly from said terminal screws toward the outer periphery of the body members, said body members having at least one projection on the bottom thereof inter-engaging the next lower connector unit in order to prevent relative rotation between the stacked connector units, and means extending through the aligned apertures on said bosses for holding said connector units in stacked relationship.

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