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ELECTRIC TERMINAL BOARD CONNECTOR ASSEMBLY

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2 Sheets-Sheet 1

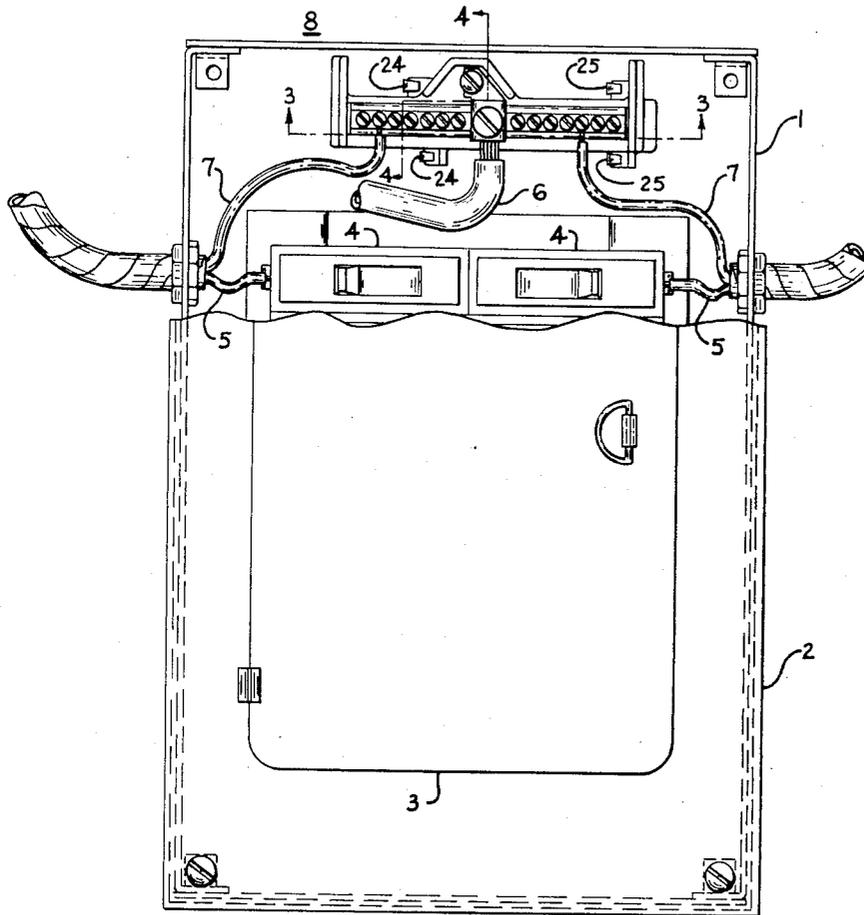


Fig. 1

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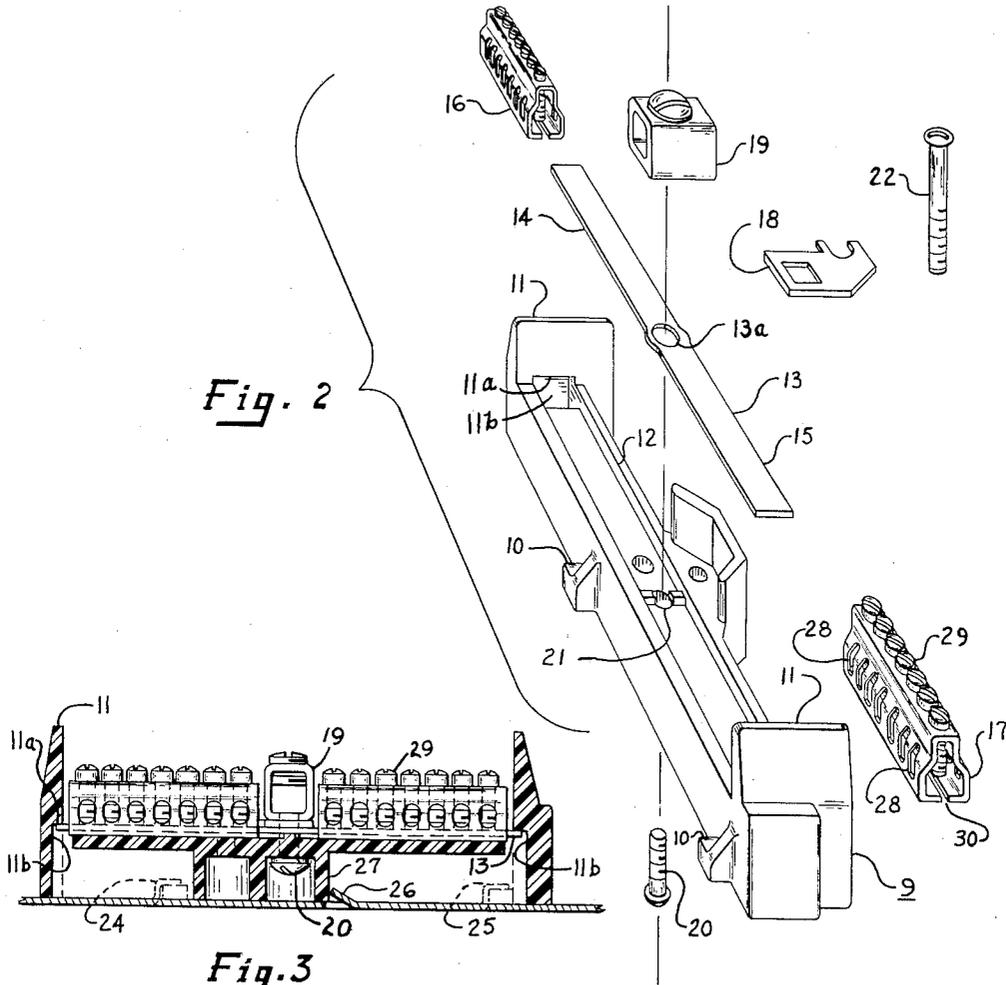


Fig. 2

Fig. 3

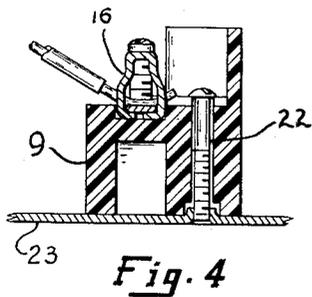


Fig. 4

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**ELECTRIC TERMINAL BOARD CONNECTOR ASSEMBLY**

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9 Claims. (Cl. 339—198)

My invention relates to electric terminal connectors and particularly to assemblies of such connectors adapted for use in connecting a number of small conductors to a single relatively large conductor. Terminal connector assemblies of this type are used in electrical devices such as panelboards and load centers to provide a common junction point for connection of return or ground wires of branch lighting and power circuits to the main power line return or "ground," and are commonly referred to as "neutral terminal blocks."

It is highly desirable in such devices that a continuous current-path be provided for such return circuits consisting of highly conductive material, such as copper. It is also desirable that the expense of manufacture and ultimate cost of such structures be maintained at a minimum. Such terminal assemblies must provide connection means for a relatively large number of conductors, however, and prior art structures have involved the use of large amount of copper and, therefore, have been relatively expensive.

One object of my invention is to provide a terminal connector assembly in which a continuous current path is provided of highly conductive material such as copper but which permits the use of less expensive materials for a major part of the assembly, thereby substantially reducing the cost.

A further object of my invention is to provide a terminal connector assembly which is extremely compact in size and yet provides means for connecting a relatively large number of conductors.

A still further object of my invention is to provide a construction of this type having simplified assembly and mounting means which do not require the use of screws or other separate fastening devices.

In carrying out my invention in one form, I provide an elongated generally rectangular tubular clamping sleeve which may be of low-conductivity material such as steel and an elongated contact plate of highly conductive material such as copper within the tubular member, against the bottom wall. The tubular clamping member has pairs of aligned holes in its opposite side walls and clamping screws threaded in its top wall. In use, a number of small conductors are inserted through the aligned holes in the tubular member and the portion of the conductors within the clamping sleeve is clamped against the bottom contact plate by the screws in the top wall. A single large conductor is then connected to the contact plate by means of a large connector mounted on a portion of the contact plate projecting out of the end of the sleeve.

My invention will be readily understood from the following description taken in connection with the accompanying drawings and its scope will be pointed out in the appended claims.

Figure 1 is a front elevation view of a panelboard incorporating a terminal connector assembly in accordance with my invention, portions of the front wall of the panelboard enclosure being broken away.

Figure 2 is a view in perspective of the major parts of the terminal connector assembly of the panelboard of Figure 1, the parts being shown in exploded relation.

Figure 3 is a view of the terminal connector assembly of Figure 1 taken on the line 3—3 of Figure 1.

Figure 4 is a sectional view of the terminal connector assembly of the panelboard of Figure 1 taken on the line 4—4 of Figure 1.

Referring now to the drawings, I have shown my invention as embodied in a panelboard comprising an enclosure 1 provided with a front wall 2 having an openable cover 3 therein, and containing electrical control devices 4. The electrical control devices 4 are connected to a source of electric power by suitable connecting means (not shown), and each device is connected to a power consuming device (not shown) by suitable means such as by conductor 5. The power consuming devices are in turn connected to the main return conductors 6 of the power source by means of return conductors 7 and by means of my improved terminal connector assembly 8, to be described.

My improved terminal connector assembly comprises an insulating support 9 having four offset mounting lugs 10 and two protective end barriers 11. The insulating base 9 is provided with an elongated generally central recess 12 which has located therein an elongated contact plate 13 of highly conductive material having a hole 13a in the central portion thereof. The contact plate 13 is preferably made of a length slightly greater than the distance between the mutually confronting surfaces of the end barriers 11 so that when in assembled position it cannot be removed by a straight upward movement regardless of the presence or absence of other fastening means being retained by shoulders 11a as shown particularly in Figure 3.

It will be observed that in the assembled condition, the ends of the plate 13 are spaced a short distance from the inner surfaces 11b of the end walls of the base 9. This is for the purpose of permitting assembly and disassembly of the contact plate. In assembling the contact plate, the members 16 and 17 are first assembled on the plate 13, and one end is then inserted under one of the shoulders 11a, and the plate is simultaneously slid lengthwise and lowered until it lies flat in the recess 12. It is then slid lengthwise a short distance in the opposite direction to the assembled position of Figure 3, in which position the opening 13a registers with the opening 21 in the base 9, where it is thereafter retained by screw 20.

The contact plate 13 carries on its outwardly extending arms 14 and 15, two generally tubular clamping members 16 and 17, to be further described. The contact plate 13 may also be provided with a connecting lug 18 for a purpose to be described, and is provided with a relatively large connecting device 19 for connecting the plate 13 to the main return conductor of the power source. The screw 20 extends upwardly through the hole 21 in the insulating base 9 and is threadedly engaged in a tapped hole in the bottom wall of the connector 19 and serves to clamp the connector 19 against the lug 18 when used, and against the plate 13, and to clamp both of these against the insulating support 9. Thus the plate 13 is mechanically retained in place on the insulating base 9 and the connector 19 and lug 18 are mechanically and electrically connected to the plate 13. A connecting screw 22 may be utilized, if desired, to "ground" the enclosure 1 by connecting the back wall 23 thereof to the lug 18. It will be understood that the lug 18 and the grounding screw 22 are used only when it is desired to place the enclosure at the same potential as the main return conductor 6, in systems having a "grounded neu-

tral," and in any case do not affect the requirement for and the purposes served by the large connector 19.

The insulating base 9 is adapted to be retained in place upon the back wall 23 of the enclosure 1 by means of generally L-shaped integral lugs 24 and 25 which are adapted to overlie the projecting mounting lugs 10. A single locking lug 26 also preferably integral with the back wall 23 of the enclosure is provided which is bent inwardly after the base 9 is in place, and is engaged by the surface 27 of a wall of a recess on the underside of the insulating base 9. The lugs 24 and 25 are struck up in the position indicated when the enclosure 1 is originally fabricated. The lug 26, however, is left in the plane of the back wall of the box and is not deformed upwardly until after the insulating base 9 is assembled. The complete terminal connector assembly is assembled, after all of the respective parts are mounted thereon, in the following manner—the base is placed against the back wall of the enclosure 1 in the proper position and slid horizontally so that the mounting lugs 10 underlie the lugs 24 and 25. The base is retained in this position and the lug 26 is bent inwardly against wall 27 locking it in place. It will be observed that by means of this mounting provision I render it unnecessary to use separate mounting screws or other fastening devices.

Referring particularly to the generally tubular clamping members 16 and 17, these members are generally rectangular in cross section, but the opposite side walls thereof are stepped, being formed closely together at the upper portion and wider apart at the lower portion. The lower portions of the opposite side walls of the tubular members 16 and 17 are provided with pairs of aligned vertically elongated holes 28, and the top wall is provided with a series of tapped holes in which there are threadedly engaged a number of clamping screws 29. As will be seen, especially from Figure 4, the clamping screws 29 are threadedly engaged not only in the top wall but also in the internal side walls of the closely spaced portions of the opposed side walls. By this means the screws 29 are provided with a relatively large thread area for firm dependable clamping. By means of the stepped-wall construction shown, I render it possible to utilize clamping screws of relatively small diameter in the tubular clamping member while at the same time permitting use of a contact plate of substantial width. It will be observed that if the sides were made the same distance apart at top and bottom, it would be necessary to utilize clamping screws of larger diameter in order to achieve the threading area which includes threaded portions of the inner side walls. To utilize such larger diameter screws would in turn require that the screws be spaced further apart along the length of the tubular member and fewer connections would then be possible. On the other hand, if the reduced width of the top portion were continued through the bottom portion, the usable width of the conducting and clamping area of the conducting strap 13 would be materially reduced, thereby reducing the efficiency and capacity of the connector assembly. By my novel construction I have provided a clamping member which provides a large number of compact connectors and which accepts a conducting contact plate of substantial area. The contact plate 13 is preferably made of relatively highly conductive material, such as copper or silver-plated copper. The generally tubular clamping members 16 and 17, on the other hand, are preferably fabricated of the suitable less expensive materials such as steel.

The tubular clamping members 16 and 17 and the contact plate 13 are preferably so proportional that, when assembled, the upper surface of the plate 13 is slightly below the lowest point of the holes 28. By this construction a lip is provided at each side wall, over which a conductor is bent when it is clamped in place by the corresponding clamping screw, as shown particularly in Figure 4. This provides a mechanical inter-

locking action which supplements the holding action of the clamping pressure of the screw. Holes are provided in both sides and in alignment so that a conductor may be inserted in one opening and projecting slightly out the other opening. This construction effectively prevents a small conductor from wrapping itself around the clamping screw when the screw is tightened, as it would otherwise tend to do.

The generally tubular clamping members 16 and 17 may be fabricated by a blanking and bending process so as to have an elongated slot 30 in the bottom wall thereof. It will be understood, however, that I may make the tubular members 16 and 17 from extruded seamless tubing or in any other suitable manner. While I have shown a construction in which the supporting member 9 is formed of insulating material, it will also be understood that the supporting member may be fabricated of conductive material whenever it is not required that the clamping plate 13 be insulated from the wall upon which the support 9 is mounted.

Although I have shown a particular embodiment of my invention, it will be understood that I do not wish to be limited thereto since many modifications thereof may be made. I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A terminal connector comprising a generally rectangular tubular clamping member having a uniform wall thickness and having generally parallel opposite side walls joined by generally parallel top and bottom walls, a clamping screw in said top wall extending within said clamping member toward said bottom wall, the portion of said side walls adjacent said top wall being spaced closer together than the portions adjacent said bottom walls, said clamping screw having a portion threadedly engaging the inwardly confronting surfaces of said closely spaced portions of said side walls and a pair of aligned openings in the widely spaced portions of said side walls.

2. A terminal connector comprising a generally rectangular tubular clamping member having a uniform wall thickness and having generally parallel opposite side walls joined by generally parallel top and bottom walls, a clamping screw in said top wall extending within said clamping member toward said bottom wall, the portions of said side walls adjacent said top wall being spaced closer together than the portions adjacent said bottom wall, a flat contact plate of highly-conductive material within said clamping member against said bottom wall, said clamping screw having a portion threadedly engaging the inwardly confronting surfaces of said closely spaced portions of said side walls and a pair of aligned openings in the widely spaced portions of said side walls.

3. A terminal connector assembly comprising a supporting base of insulating material, a relatively thin flat elongated contact plate of highly conductive material mounted on said supporting base and having a central portion and two outwardly extending arm portions, an elongated generally rectangular tubular clamping member on each of said outwardly extending arms and each having a plurality of pairs of aligned openings in the opposite side walls thereof and a plurality of clamping screws threadedly engaged in the top wall thereof, terminal connecting means on said central portion separate from said elongated clamping members, fastening means for clamping said central terminal connecting means to said supporting base with said contact plate therebetween, said outwardly extending arms of said contact plate having the outer ends thereof extending beyond said elongated clamping members, respectively, said supporting base having retaining projections overlying said extended ends of said contact plate said contact plate being slidable a small amount longitudinally between an initially inserted position in which one end only thereof underlies one of said

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retaining projections and a finally assembled position in which both ends thereof underlie said retaining projections respectively, said fastening means serving to retain said contact plate in said assembled position.

4. A terminal connector assembly comprising a supporting base of insulating material having an elongated generally central recess therein, a relatively thin, flat elongated contact plate of highly conductive material located in said recess and having a central portion and two outwardly extending arms, said supporting base having shoulder portions overlying the ends of said contact plate, a generally rectangular tubular clamping member on each of said outwardly extending arms and each having a plurality of pairs of aligned openings in the opposite side walls thereof and a plurality of clamping screws threadedly engaged in the top wall thereof, a single relatively large connector adjacent the central portion of said contact plate and a mounting screw passing through a portion of said supporting base and through the central portion of said contact plate and threadedly engaging said large connector so as to clamp said contact plate between the said large connector and the insulating base said contact plate being slidable a small amount longitudinally between an initially inserted position in which one end only thereof underlies one of said shoulder portions and a finally assembled position in which both ends thereof underlie said shoulder portions respectively, said mounting screw serving to retain said contact plate in said assembled relation.

5. A terminal connector assembly comprising a mounting base of insulating material, an elongated generally tubular clamping member supported on said base, an elongated conductive contact plate within said clamping member and longitudinally slidable between an initially inserted position and a finally assembled position, said mounting base including two opposed shoulder portions, said contact plate having one end thereof retained under one of said shoulder portions in said initially inserted position and having both ends under said shoulder portions respectively in said finally assembled position, and means retaining said contact plate in said finally assembled position.

6. A terminal connector assembly comprising an elongated generally rectangular tubular clamping member having a uniform wall thickness and having generally parallel opposite side walls joined by generally parallel top and bottom walls, a plurality of pairs of aligned openings in said opposite side walls, a plurality of clamping screws in said top wall and extending within said tubular clamping member in transverse alignment with said pairs of aligned openings respectively, said opposite side walls being spaced relatively closely together adjacent said top wall and relatively far apart adjacent said bottom wall, said pairs of transversely aligned openings being located in said relatively widely spaced portions of said side walls, said clamping screws having portions threadedly engaging the inwardly confronting portions of said relatively closely spaced portions of said side walls, an elongated flat contact plate of highly conductive material extending

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within said clamping member adjacent said bottom wall whereby a plurality of conductors inserted through said pairs of aligned holes respectively may be individually clamped against said contact plate and electrically connected thereto and to each other by said clamping screws.

7. A terminal connector assembly comprising an elongated generally rectangular tubular clamping member having generally parallel opposite side walls joined by generally parallel top and bottom walls and formed of a strip of flat sheet metallic material bent up along longitudinally extending lines parallel to the longitudinal edges of said strip so that said edges are disposed in juxtaposed relation generally centrally of said bottom wall the portion of said side walls adjacent said top wall being spaced closer together than the portions of said side walls adjacent said bottom wall, said top and bottom portions of said side walls extending perpendicular to said top wall whereby said top portions of said side walls have the major flat surface portions thereof extending in a pair of parallel planes contained within the extended planes of said bottom portions of said side walls, said top and bottom portions of said side walls being integrally connected by an offset wall portion, a plurality of pairs of aligned holes in said bottom portions of said side walls, a plurality of clamping screws in said top wall and extending within said tubular clamping member in transverse alignment with said pairs of aligned openings respectively, said clamping screws each having a portion threadedly engaging the inwardly confronting surfaces of said top portions of said side walls.

8. A terminal connector assembly as set forth in claim 7, said assembly also comprising an elongated strip of flat sheet metallic material of relatively highly conductive material extending within said tubular clamping member and overlying said bottom wall.

9. A terminal connector assembly as set forth in claim 7 wherein said assembly also includes an elongated strip of highly conductive material of flat sheet metallic material extending within said tubular clamping member and in contact with said bottom wall, a supporting surface, the bottom surface of said bottom wall portion resting on said supporting surface, and mounting means retaining said conductive strip toward said supporting surface to hold said bottom wall thereagainst.

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