United States Patent

[11] 3,609,646

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[21] Appl. No. **804,837**
[22] Filed **Mar. 6, 1969**
[45] Patented **Sept. 28, 1971**

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[54] **CONNECTOR ASSEMBLY**
3 Claims, 4 Drawing Figs.

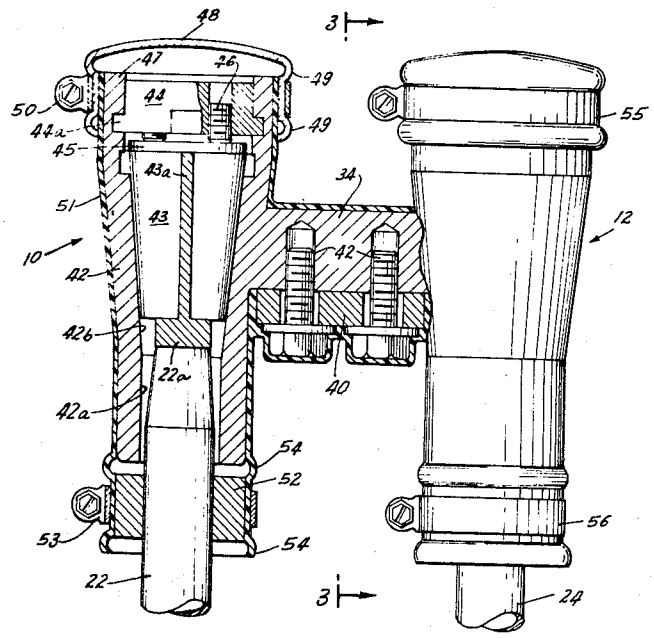
[52] **U.S. Cl.** **339/116,** 174/72, 339/270
[51] **Int. Cl.** **H01r 3/02,** H01r 3/06
[50] **Field of Search** 339/94, 114, 116, 270; 174/71, 72

[56] **References Cited**
UNITED STATES PATENTS

2,635,132	4/1953	Rogoff	174/71 X
3,137,764	6/1964	Gunthel et al.	174/72
3,350,677	10/1967	Daum	174/72 UX

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ABSTRACT: A rugged and compact connector assembly for a plurality of connections for direct burial applications providing permanent, watertight, insulated junction means, in which a plurality of connectors are provided for attachment to a bus bar in such manner that the user can select the direction in which a conductor will enter the connector and the direction from which the attaching means for conductor to connector is accessible.



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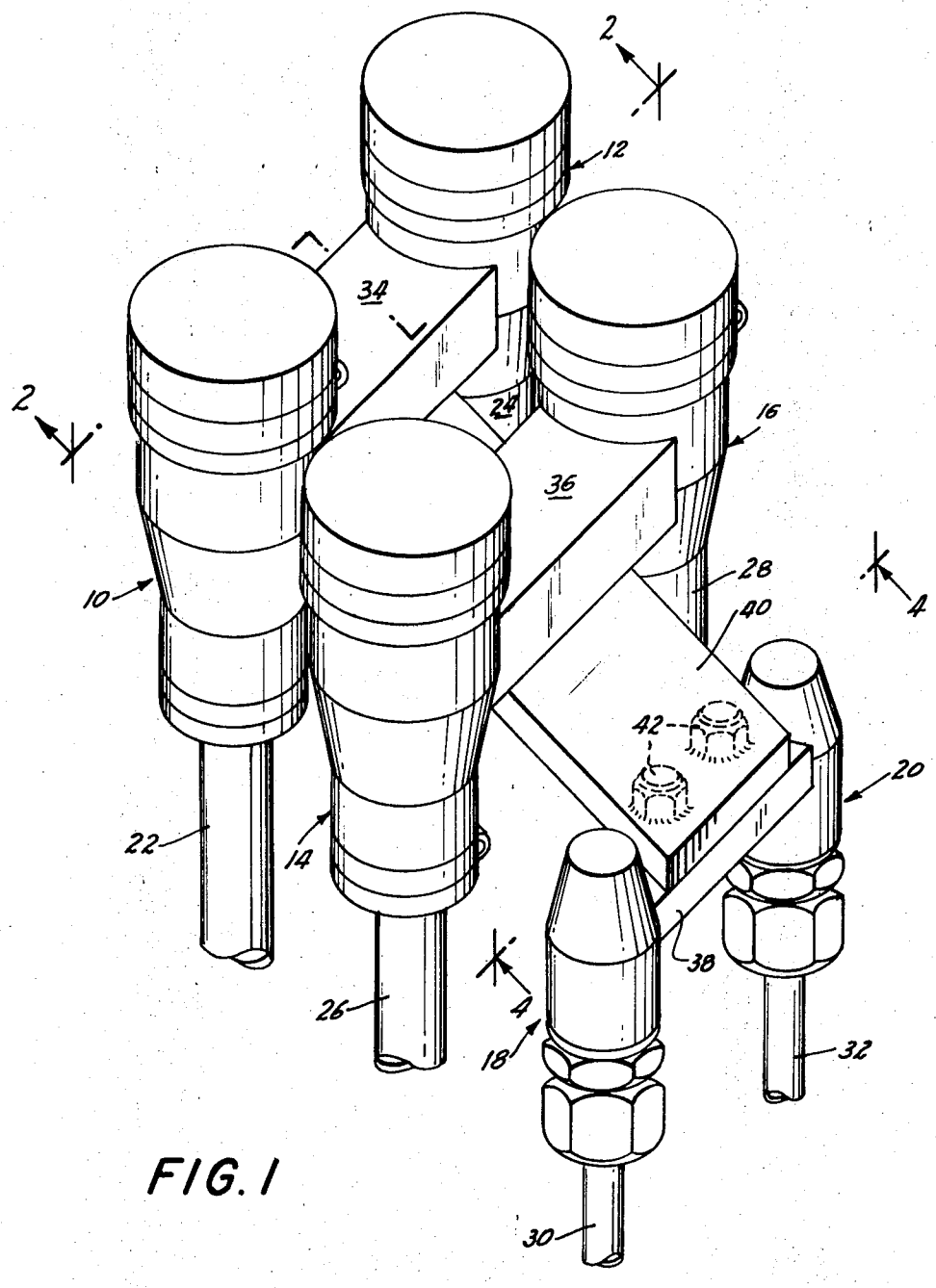
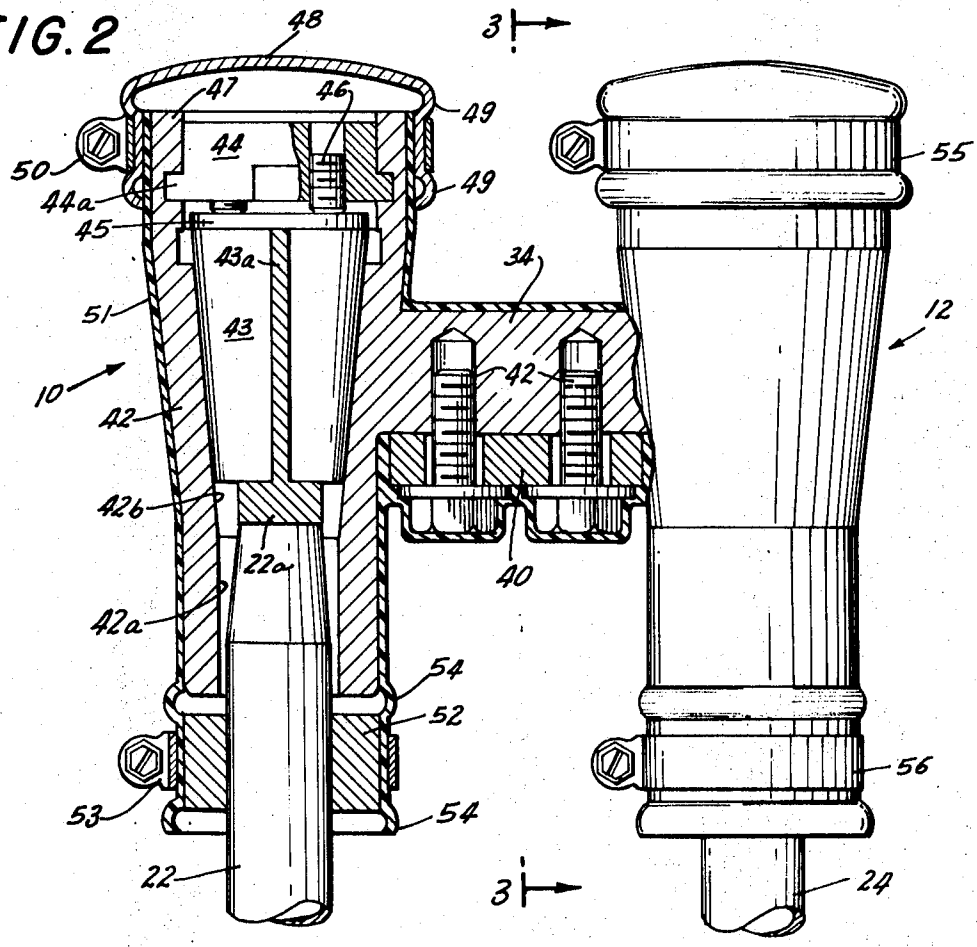


FIG. 1

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FIG. 2



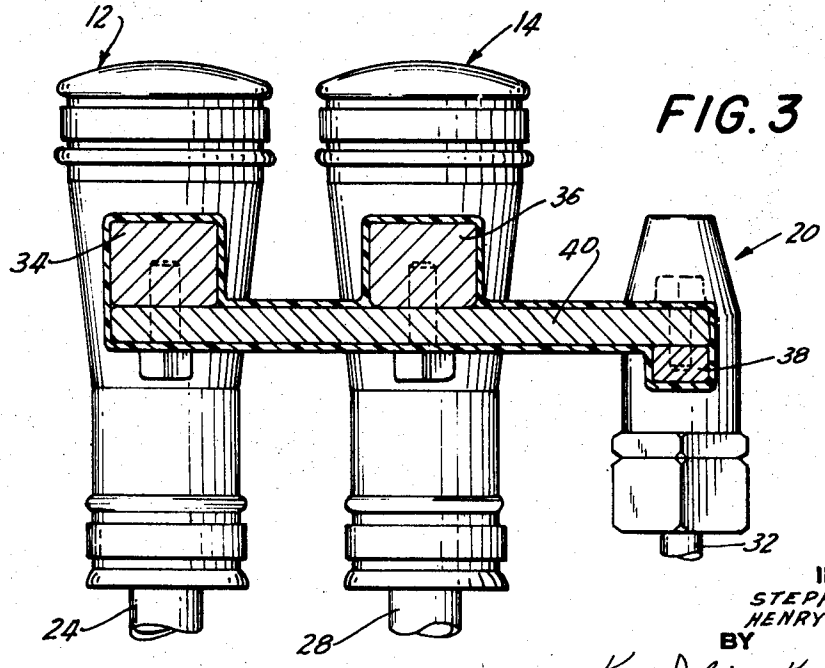


FIG. 3

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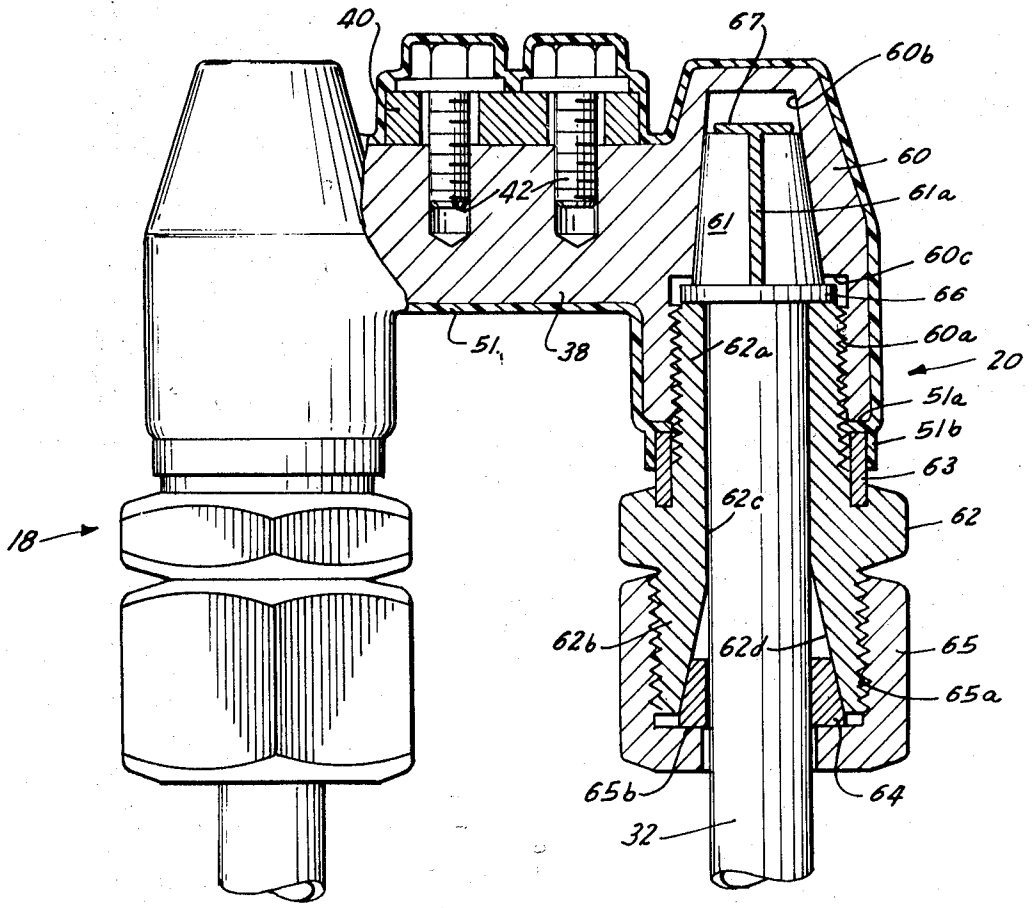


FIG. 4

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CONNECTOR ASSEMBLY

BACKGROUND OF THE INVENTION

It has become highly desirable for a number of reasons to bury electrical components underground. Connector assemblies for such underground applications must be specifically designed with this end use in view and with means to provide moistureproofing and sealing. Additionally, the connector must be easy to use and such that the user can make the desired connection quickly and with a minimum of effort and without special tools, and further with a minimum of effort be able to place the connector assembly in the watertight condition.

SUMMARY OF THE INVENTION

A rugged and compact cable connector assembly including a bus bar, a plurality of connectors, first attaching means for attaching the connectors to the bus bar, second attaching means for attaching cables to the connectors and encapsulating insulation means for the bus bar, connectors and the attaching means.

DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a perspective view from above a cable connector assembly constructed in accordance with the teachings of this invention;

FIG. 2 is a partially sectional view taken alo ng the line 2—2 in the direction of the arrows in FIG. 1 disclosing one form of connector used in the assembly;

FIG. 3 is a partially sectional view taken along the line 3—3 in the direction of the arrows in FIG. 2; and

FIG. 4 is a partially sectional view of a second form of connector used in the assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The connector assembly which is the subject of this invention is shown in the FIGS. to include connectors **10, 12, 14, 16, 18** and **20** which respectively connect cables **22, 24, 26, 28, 30** and **32** to the assembly. Connectors **10** and **12** are joined by connector bar **34**, connectors **14** and **16** are joined by connector bar **36** and connectors **18** and **20** are joined by connector bar **38**. The connector bars **34, 36** and **38** are joined together electrically and mechanically by means of bus bar **40** and bolts, which are indicated by the numeral **25** in the FIGS., are utilized to fasten respective connector bars to the bus bar **40**.

In the particular embodiment shown in the FIGS., connectors **10, 12, 14** and **16** have identical means for attachment of a cable thereto. In FIG. **2**, connector **10** is sectioned and illustrates by way of example the configuration of connectors **10, 12, 14** and **16** and the means for attaching a cable thereto.

In FIG. **2** the cable is indicated by the numeral **22** as it was in FIG. **1** and the connector includes a body member **42** provided with a cylindrical bore section **42*a***, and a conical bore section **42*b***. The conical bore section increases in diameter as the distance from section **42*a*** is increased and receives therein a conical connecting member **43** which is resilient and provided with a longitudinal slot therein indicated by the numeral **43*a***. The body member **42** and connecting cone **43** are formed of a suitable conducting material and as seen in FIG. **2** strands **22*a*** of cable **22** are received within the connector cone **43**. Pressure plate **44**, bearing washer **45** and pressure screws **46** are provided for applying pressure to connector cone **43** to force it downwardly as seen in FIG. **2** so that the outer surface of the cone **43** bearing against the conical surface of bore **42*b*** will result in the cone **43** being squeezed in view of its resiliency and slot **43*a*** thereby embracing strands **22*a*** of cable **22**. Thus, screwing down screws **46** against washer **45** results in attaching the cable **22** to the connector. Bayonet-type slots **47** are provided in the body member **42** for receiving and holding pressure plate **44** therein. These slots are the type wherein a

vertical passage is provided for insertion of the pressure plate with the radial projections **44** *a* thereof within the vertical slot and upon turning the projection **44*a*** fits into the foot of the slot. Such L-type bayonet slots are well known in the art. The pressure plate **44**, bearing washer **45** and screws **46** are formed of any appropriate material for this purpose. A tap **48** is provided with ridges **49** so that the resilient hose clamp **50** can be placed between the ridges **49** and tightened to fasten tap **48** in position. The body member is coated with a suitable insulating coating **51**, such as durable hard vinyl or plastisol coating, by means of a dip coating or other process and the tap **48** is caused to embrace the coating **51** providing a watertight seal. A grommet **52** of resilient plastic material is provided at the ends of body member **42** whereat the cable **22** enters cylindrical bore **42*a***. The insulating coating **51** extends beyond the body member to form a receptacle for grommet **52** through which the cable passes so that a tightening of clamp **53**—which is substantially identical to clamp **50**—results in the insulation **51**, grommet **52** and insulation of the cable **22** providing a watertight and moistureproof connection at this end. The insulation is provided with ridges **54** which define the position of clamp **53** when it is in position. The connector **12** is substantially identical to connector **10** and provided with clamps **55** and **56**. Connector **12** is attached to connector **10** by connector bar **34** which is actually a portion of body member **42** since the body member **42** is integral with the body member of connector **12**. The connector bar **34** is attached to bus bar **40** by means of bolts **25** received within threaded inserts in the connector bar **34**. The insulation **51** extends over the connector bar **34** and portions of connector **12** in the manner that the insulation **51** covers the body member and grommet shown and described with respect to connector **10**.

A connector of slightly different configuration is shown in section in the assembly in FIG. **3**. This connector is the connector indicated by the numeral **20** in FIG. **1**.

The connector **20** has a body member indicated by the numeral **60** which is an extension of connector bar **38** shown in FIG. **1** and which is integral therewith. This is formed of a conducting material, such as aluminum. Body member **60** is provided with cylindrical threaded bore section **60*a*** and conical bore section **60*b*** adjacent thereto. Bore section **60*b*** has a cross-sectional diameter which decreases and which has the portion greatest in diameter closest to bore section **60*b***. An annular bore section **60*c*** of limited axial dimension is provided between bore sections **60** *a* and **60*b***. Bore section **60*c*** is substantially equal in diameter to bore section **60*a*** but is not threaded and is greater in diameter than the greatest diameter of conical bore section **60*b*** providing a shoulder at the junction of bore section **60*c*** and bore section **60*b***.

The remaining parts of connector **20** are cone **61**, jamnut **62**, washer **63**, sealing grommet **64**, sealing nut **65** and bearing washer **66**.

Connector cone **61** is formed of an electrically conducting material and provided with a full-length longitudinal slot **61*a***. The connecting cone **61** is provided to encircle and grip the strands **67** of a cable **32** attached to the connector and the cone **61** is sized to the conductor to provide optimum encirclement and strand-to-strand contact. The slot **61*a*** is provided to allow the connecting cone to become reduced in diameter in the fully assembled connector and firmly grip the cable strands. The internal surface of the cone is provided with a corrigated configuration to aid in the formation of a firm contact with the conductor strand.

The jamnut **62** is formed of a nonconducting material and has a hex nut central flange with cylindrical portions **62*a*** and **62*b*** extending from opposite sides thereof and providing a continuous longitudinal bore **62*c*** which is flared outwardly slightly at end **62*d***. A major part of the outer surface of portion **62*b*** and a minor part of the outer surface of portion **62*a*** are threaded. Jamnut **62** is preferably formed of a plastic material.

Washer 63 is annular and formed of a rubber or other plastic flexible material. The sealing grommet 64 is also formed of a plastic material and in the preferred form the material is soft plastic as compared to the harder plastic from which the jamnut 62 and sealing nut 65 are formed. Flexible sealing grommet 64 is nonconducting and is provided with a central longitudinal bore of uniform diameter and a section at one end having a uniform outer diameter. The remaining portion of the outer surface of the grommet 64 is tapered having an outer diameter which decreases constantly to provide an outer conical surface.

The sealing nut 65 is also formed of nonconducting material and has a threaded bore section 65*a* and a lesser diameter bore section forming annular shoulder 65*b*. The outer surface of nut 65 is in hex configuration.

Bearing washer 66 is between members 62 and 61 and is provided to transmit the longitudinal force of member 62 against cone 61 forcing the cone further into the bore 60*b* of the body member 60.

As mentioned above, the body portion 60 is integral with connector bar 38 which is fastened to bus bar 40 by bolts 25.

The body portion of connector 18, which connector is identical to connector 20, is also integral with connector bar 38. As seen in FIG. 1, connector 20 has cable 32 attached thereto and connector 18 has cable 30 attached thereto. Cables 30 and 32 are electrically in contact through their body portions and connector bar 38 are also electrically in contact with cables 22 and 24 since these are in electrical contact with the bus bar 40 as explained above. Additionally, the cables 26 and 28 are in contact in the assembly since these too are in contact with bus bar 40.

In connection with the description of the connector shown in FIG. 2, it was pointed out that an insulating coating 51 was provided. The insulating coating 51 is also shown in FIG. 3 since it extends to and covers the body section 60 of connector 20, connector bar 38, screws 42 and bus bar 40 in the vicinity of connector 20. Additionally, the coating 51 covers the like portions of connector 18. The insulating cover 51, therefore, covers and insulates the body portions of connectors 10, 12, 14, 16, 18 and 20 as well as the bus bar 40 and connector bars 34, 36 and 38.

With respect to each of connectors 18 and 20, a portion of the insulating material 51 extends within the bore of its respective body member covering a portion of the edge of the mouth of the bore. This is seen in FIG. 3 wherein the portion of the insulating material within the bore is indicated by the numeral 51*a* and a recess is formed by portion 51*b* of the material to receive the washer 44.

In assembling or in attaching a cable to either of connectors 18 or 20, the cable is prepared by skinning of the insulation in the usual manner to expose, as in the case of connector 20, the stranded portion 67. The cable end is threaded through the sealing nut 65, grommet 64, jamnut 62 and washer 63 and washer 66 and the exposed end 67 of the cable is inserted within connector cone 61. Connector cone 61 is within the bore of member 60 and its outer conical surface is adjacent to the conical surface of the bore section 60*b*. Sealing washer 63 abuts on one side of the ends of body member 60 adjacent to the insulating coating which is extended outwardly. It also abuts the jamnut 62. The threaded portion of the jamnut is engaged with the threads of the body member and rotation of the jamnut wedges the conical connector cone into the bore section of the body member providing a captive connection between the connector cone and the conductor. The washer 63, together with the insulating coating 51, seals the body member 34 and prevents entry of moisture within the bore thereof. Tightening of the sealing nut completes the watertight the bore by the annular shoulder of sealing nut 65 forcing the sealing grommet 64 within the flared portion of the bore of the jamnut.

The connectors 18 and 20 are, therefore, tightened through the end at which the respective cable enters the connector whereas the connectors 10, 12, 14 and 16 are provided to have the cable attached and fastened therein by access to the end opposite the end at which the cable is made to enter the connector. The connectors may be interchanged or different connectors utilized in the practice of the invention provided, however, the insulation that is taught in the invention is utilized. An insulating covering such as 51 must be used to cover the conducting body portions which conducting body portions are necessary in view of the necessity of providing a good path for flow of current between connectors. Additionally, the places whereat the cable enters the connector respectively must be provided with sealing means to keep out moisture and wherever access is available at a location other than that whereat the cable enters the connector adequate sealing must be provided at that point.

We claim:

1. A connector assembly for underground applications including a bus bar, a plurality of connectors, first attaching means for attaching the connectors to the bus bar, attaching conductors to the connectors, second attaching means for attaching conductors to one of said connectors, a first conductor-receiving bore formed in said second attaching means, a first end of said first conductor-receiving bore open at the end opposite to the point of entry of a conductor therein, first fastening means accessible from said first end, third attaching means for attaching conductors to one of said connectors, a second conductor receiving bore formed in said third attaching means, a second end of said first conductor-receiving bore open at the end through which a conductor disposed therein enters, second fastening means accessible from said second end, and encapsulating insulation means for said bus bar, connectors and attaching means.

2. A connector assembly for underground applications including a bus bar first and second connectors, a connector bar formed of electrically conductive material integral with and connecting said connectors, attaching means in each of said connectors for attaching a conductor to said respective connector, a conductor-receiving bore formed in each of said attaching means, an end of each of said conductor-receiving bores open at the end opposite to the point of entry of a conductor therein, fastening means associated with each of said attaching means accessible from said respective end, means for attaching said connector bar to said bus bar at a selected surface of said bus bar and encapsulating insulation means for said bus bar, connectors, connector bar and attaching means.

3. A connector assembly for underground applications including a bus bar first and second connectors, a connector bar formed of electrically conductive material integral with and connecting said connectors, attaching means in each of said connectors for attaching a conductor to said respective connector, a conductor-receiving bore formed in each of said attaching means, an end of each of said conductor-receiving bores open at the end through which a conductor disposed therein enters, fastening means associated with each of said attaching means accessible from said respective end, means for attaching said connector bar to said bus bar at a selected surface of said bus bar and encapsulating insulation means for said bus bar, connectors, connector bar and attaching means.