United States Patent

[11] **3,564,118**

[72] Inventor **Stephen P. Becker**
Poughkeepsie, N.Y.

[21] Appl. No. **835,432**
[22] Filed **June 23, 1969**
[45] Patented **Feb. 16, 1971**

[73] Assignee **Fargo Mfg. Company, Inc.**
Poughkeepsie, N.Y.
a corporation of New York

---

[54] **CABLE CONNECTOR FOR UNDERGROUND APPLICATIONS**
4 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **174/93,** 174/77, 174/90; 339/270, 339/273
[51] **Int. Cl.** **H01r 7/06;** H02g 15/08
[50] **Field of Search** 174/71, 72; 84.3, 90, 91, 93, 88, 77; 339/273, 274, 263, 268, 270, 94

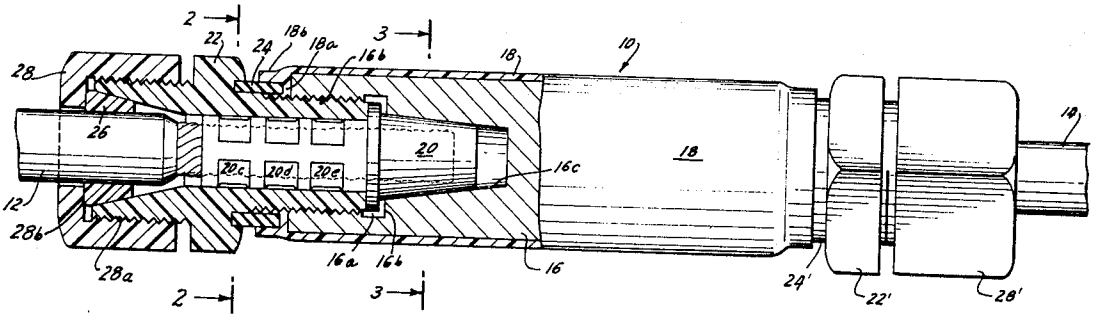
[56] **References Cited**

UNITED STATES PATENTS

2,087,384	7/1937	Lee	174/72
2,232,963	2/1941	Papp et al.	174/72UX

Primary Examiner—Darrell L. Clay
Attorney—Kane, Dalsimer, Kane, Sullivan & Kunucz

ABSTRACT: A rugged and compact cable connector for direct burial applications providing a permanent, watertight, insulated junction, including an electrically conducting member for providing direct metal to metal electrical contact between the cable and the body of the connector.



PATENTED FEB 16 1971

3,564,118

SHEET 1 OF 2

FIG. 1

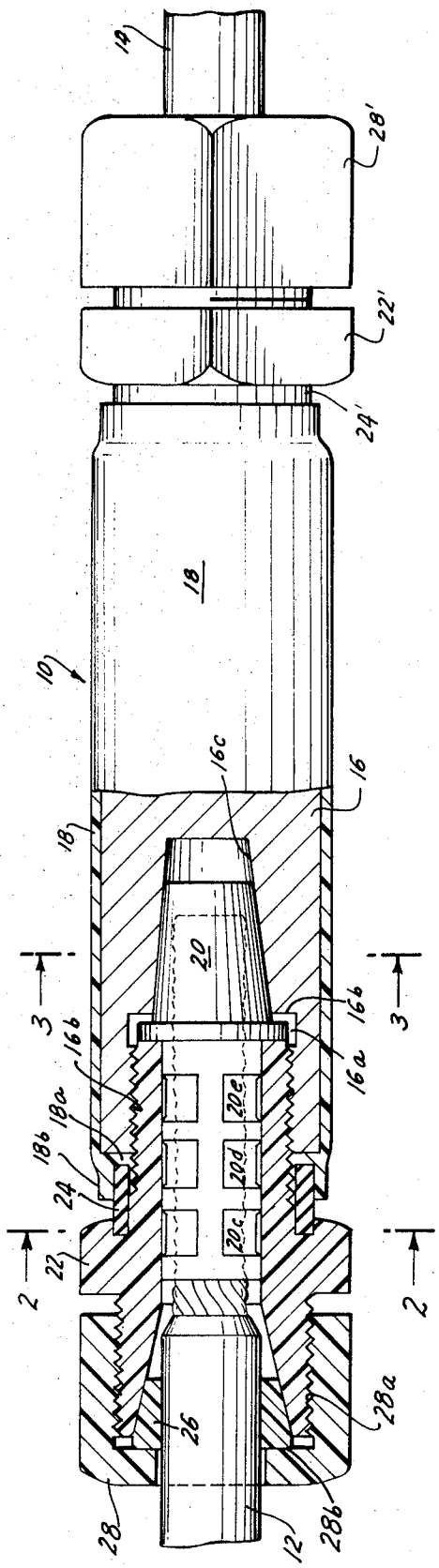


FIG. 3

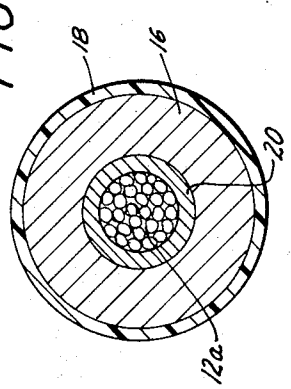
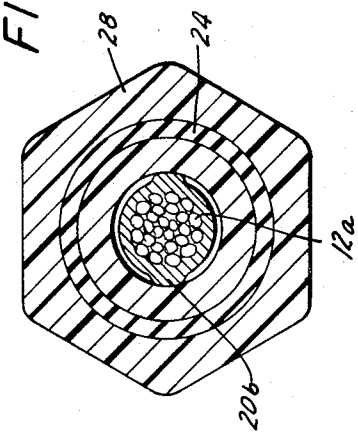


FIG. 2



INVENTOR
STEPHEN P. BECKER
BY
Kane, Dalsimer, Kane, Sullivan & Smith
ATTORNEYS

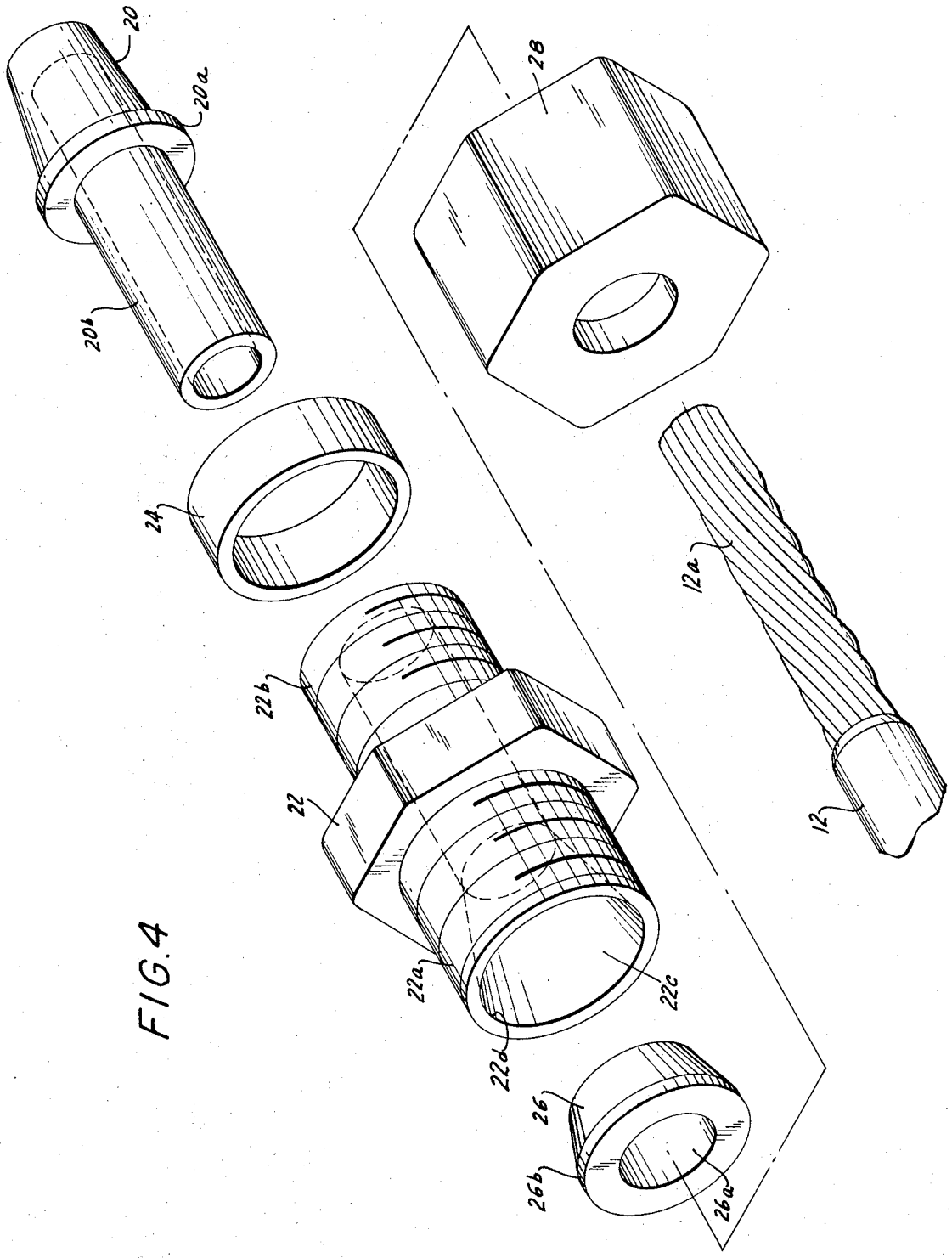


FIG. 4

INVENTOR
STEPHEN P. BECKER
BY
Kane, Dalsimer, Kane, Sullivan & Kurucz
ATTORNEYS

CABLE CONNECTOR FOR UNDERGROUND APPLICATIONS

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. In "direct burial" applications where the connection is made and left without benefit of enclosure in a vault, the connection means must be moistureproof and provide its own sealing. Additionally, it must be relatively simple to use.

Also, it is found desirable for many application that a direct metal to metal contact be made between the metal strands of the cable and the body of the connector so that with time and the changes which all materials undergo the direct metal to metal contact will be maintained so that the electrical and mechanical connection will not be weakened.

SUMMARY OF THE INVENTION

A connector assembly for electrically and mechanically connecting conductors including in combination a body formed of an electrically conductive material, a body bore in the body, an insulating coating of the body, a conical section of the body bore having its greatest diameter outwardly of the body, an electrically conducting connector cone having an outer conical surface at least partially within the conical section in adjacency with the inner surface of the body bore and a conductor-receiving bore for embracing the exposed conductor end, a crimping sleeve projecting rearwardly from the connector cone and providing a continuation of the conductor-receiving bore, the crimping sleeve constructed and arranged to have portions of its diameter reduced to embrace the exposed conductor end in tight contact, a threaded bore section of the body bore outwardly of the conical section, a fastening member having a fastening member bore through which the conductor can pass to be received within the connector cone, a threaded portion of the fastening member cooperable with the threaded bore section for attaching the fastening member thereto, an abutting surface of the fastening member abutting the connector cone and urging the connector cone toward the body with the connector cone being brought into firm contact with the body by the wedging action of its outer surface and the surface of the bore of the conical section, a resilient washer member with first and second annular surfaces respectively abuttingly engaging the body at the insulating coating and the fastening member providing a seal between the fastening member and the body bore, an internal camming surface provided by a flared outer end of the fastening member bore of increased diameter, a resilient grommet member and a sealing nut cooperable with the fastening member, the sealing nut having an inwardly facing annular shoulder abutting the resilient grommet member and urging it between the camming surface and the conductor providing a seal between the fastening member and the conductor.

DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a partially sectional longitudinal view of a cable connector constructed in accordance with the teachings of this invention;

FIG. 2 is a transverse sectional view taken along the line 2–2 in the direction of the arrows in FIG. 1;

FIG. 3 is a transverse sectional view taken along the line 3–3 in the direction of the arrows in FIG. 1; and

FIG. 4 is an exploded perspective view of that portion of the assembly shown in FIG. 1 which it utilized for cable attachment.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The cable connector which is the subject of this invention is indicated in the FIGS. by the numeral **10** while cables connected thereby are indicated respectively by the numerals **12** and **14**.

The connector has a conducting body portion **16** provided with an insulating coating **18** such as durable hard vinyl by means of a dip-coating process. Of course, other insulating materials can be used for coating or enclosing the body portion **16** and other means of attachment of the insulating materials can be utilized in the practice of the invention.

A portion **18*a*** of the insulating material extends toward the bore **16*a*** of the body portion **16** covering the edge of the mouth of the bore while a portion **18*b*** of the material forms an annular section spaced from bore **16*a***.

The bore **16*a*** is provided with two sections. One bore section is cylindrical and indicated by the numeral **16*b*** and provided with threads. The second bore section is indicated in the FIGS. by the numeral **16*c*** and is conical in configuration with the cross-sectional diameter of the bore adjacent section **16*b*** greatest in diameter but less in diameter than the diameter of bore section **16*b*** providing an annular shoulder **16*d***.

The remaining parts of the connector are connector cone **20**, jam nut **22**, washer **24**, sealing grommet **26** and sealing nut **28**.

Connector cone **20** is formed of an electrically conducting material and provided with a flange **20*a*** and a projecting cylindrical crimping sleeve **20*b***. The connecting cone **20** is provided, as will be explained below in greater detail, to encircle and grip the strands **12*a*** of a cable **12** attached to the connector and the cone and its sleeve are sized to the conductor to provide optimum encirclement and strand to strand contact. The sleeve **20*b*** is provided to surround the strands **12*a*** and to become reduced in diameter at certain zones by crimping in the fully assembled connector and firmly grip the cable strands in tight metal to metal contact. The internal surface of the cone **20** might be provided with a corrugated configuration to aid in the formation of a firm contact with the conductor strand. The outer surface of cone **20** is formed to abut in tight wedge contact the surface of bore **16*c***.

The jam nut **22** is formed of nonconducting material and has a hex nut central flange with cylindrical portions **22*a*** and **22*b*** extending from opposite sides thereof and providing a continuous longitudinal bore **22*c*** which is flared outwardly slightly at **22*d*** at one end. A major part of the outer surfaces of portions **22*a*** and **22*b*** is threaded. Jam nut **22** is preferably formed of a plastic material.

Washer **24** is annular and formed of rubber or other plastic material. In the final assembly it is between ring **18*b*** and portion **22*b*** and abuts insulation at **18*a***. The sealing grommet **26** 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 jam nut **22** and sealing nut **28** are formed. Flexible sealing grommet **26** is nonconducting and is provided with a central longitudinal bore **26*a*** of uniform diameter and a section **26*b*** at one end having a uniform outer diameter. The remaining portion of the outer surface of grommet **26** is tapered having an outer diameter which decreases constantly to provide an outer conical surface having its greater diameter adjacent section **26*b***.

The sealing nut **28** is also formed of nonconducting material and has a threaded bore section **28*a*** and a lesser diameter bore section forming annular shoulder **28*b***. The outer surface of nut **28** is in hex configuration. In assembling or in attaching cable **12** to the connector the cable is prepared by skinning the insulation in the usual manner to expose threaded portion **12*a***. The cable end is threaded through the sealing nut **28**, grommet **26**, jam nut **22** and washer **24** and the exposed end of the cable is inserted within sleeve **20*b*** and connector cone **20**.

The sleeve **20*b*** is then crimped at zones **20*c***, **20*d*** and **20*e*** to reduce the diameter thereof at these zones to cause the sleeve at **20*a***, **20*d*** and **20*e*** to firmly embrace cable end **12*a*** and establish firm mechanical and electrical metal to metal contact between cone and cable.

Connector cone **20** is placed within bore **16*c*** of member **16** and its outer conical surface is adjacent the conical surface of

bore section **16c**. Sealing washer **24** abuts on one side the end of body member **16** adjacent the insulating coating **18a** and **18b** which enables the washer **24** to be slipped between the insulation and the jam nut **22**. The threaded portion of the jam nut is engaged with the threads of the body member **16** and rotation of the jam nut wedges the conical connector cone into bore section **16c** of the member **16** with the jam nut abutting flange **20c** providing a captive connection between the connector cone and the conductor giving firm metal to metal contact between conductor and connector. Washer **24** and the insulation **18** seals the body member and prevents entry of moisture within the bore thereof. The insulation **18** in contact with washer **24** provides a sealed junction. Tightening of sealing nut **28** completes the watertight seal by the annular shoulder of sealing nut **28** forcing the sealing grommet **26** within the flared portion of the bore of the jam nut.

It is noted therefore that the conductor can be connected to the assembly by mechanical tightening with a standard wrench to provide a permanent yet easily disconnected joint.

An identical assembly is used to connect cable **14** to the connector **10** and thus place the conducting portion of that cable in electrical contact with portion **12a** of cable **12** through body portion **16** of the connector. In FIG. **1** only the cable **14**, jam nut **22'** and sealing nut **28'** and washer **24'** of this end of the assembly are shown.

In the practice and use of the invention a set or kit may be supplied to the lineman including for example, the jam bushing **22**, gasket **24**, sealing nut **28** and sealing grommet **26** as well as the cone **20**. A crimping tool is generally readily available and standard equipment with most linemen. Thus, the lineman will use the kit parts to make the connection after having stripped the ends of the conductor.

I claim:

1. In a connector assembly for electrically and mechanically connecting conductors, a body formed of an electrically conductive material, a body bore in said body, an insulating coating of said body, a conical section of said body bore having its greatest diameter adjacent the entrance to the body bore, an electrically conducting connector cone having an outer conical surface at least partially within said conical section in adjacency with the inner surface of said body bore and a conductor receiving bore for embracing the exposed conductor end, a crimping sleeve integral with and projecting rearwardly from said connector cone and providing a continuation of said conductor-receiving bore, said crimping sleeve adapted to have portions of its diameter reduced to embrace the exposed conductor end in tight contact, a threaded bore section of said body bore outwardly of said conical section, a fastening member having a fastening member bore through which said conductor can pass to be received with said connector cone, a threaded portion of said fastening member cooperating with said threaded bore section for attaching said fastening member thereto, and an abutting surface of said fastening member abutting said connector cone and urging said connector cone toward said body with said connector cone being brought into firm contact with said body by the wedging action of its outer surface and the surface of the bore of said conical section, a resilient washer member with first and second annular surfaces respectively abuttingly engaging said body at said insulating coating and said fastening member providing a seal between said fastening member and said body bore, an internal camming surface provided by a flared outer end of said fastening member bore of increased diameter, a resilient grommet member and a sealing nut cooperating with said fastening member, said sealing nut having an inwardly facing annular shoulder abutting said resilient grommet member and urging it between said camming surface and said conductor providing a seal between said fastening member and said conductor.

2. A connector assembly in accordance with claim **1** in which the connector is provided with a radially extending flange which is abutted by the abutting surface of the fastening member.

3. A connector assembly in accordance with claim **1** in which the insulation terminates in a first portion extending toward the body bore and an annular section spaced from said body bore and said washer member sealingly embraces and lies between said annular section and said fastening member and sealingly abuts said first portion.

4. A connector assembly for electrically and mechanically connecting conductors including in combination a body formed of an electrically conductive material, end portions extending from said body, an end bore in each of said end portions, an insulating coating of said body, a conical section of said end bore having its greatest diameter outwardly of said body, an electrically conducting connector cone having an outer conical surface at least partially within said conical section in adjacency with the inner surface of said end bore, a conductor-receiving bore for embracing the exposed conductor end, a crimping sleeve projecting rearwardly from said connector cone and providing a continuation of said conductor receiving bore, said crimping sleeve adapted to have portions of its diameter reduced to embrace the exposed conductor end in tight contact, a threaded bore section of each end bore, a fastening member having a fastening member bore through which said respective conductor can pass to be received within said connector cone, a threaded portion of said fastening member cooperating with said threaded bore section for attaching said fastening member thereto, an abutting surface of said fastening member abutting said connector cone and urging said connector cone toward said body with said connector cone being brought into firm contact with said body by the wedging action of its outer surface and the surface of the bore of said conical section, a resilient washer member with first and second annular surfaces respectively abuttingly engaging said end at said insulating coating and said fastening member providing a seal between said respective fastening member and said respective bore, an internal camming surface provided by a flared outer end of said fastening member bore of increased diameter, a resilient grommet member and a sealing nut cooperating with said fastening member, said sealing nut having an inwardly facing annular shoulder abutting said resilient grommet member and urging it between said camming surface and said respective conductor providing a seal between said respective fastening member and said respective conductor.