

SPECIFICATION

A connection for mounting electrical leads

- 5 This invention relates to connectors for use in test stations of the type employed to monitor electrical currents and potentials associated with underground piping, cables and the like. In one preferred form, described below, our connector is made
- 10 principally from plastics material that is non-corrosive and electrically protective for field installation without special tool requirements and to the improvement in the construction of the connector to provide access to test terminals from both sides of a terminal block while the test station is carried by a novel support plate arrangement.

- Test stations are typically employed to provide aboveground terminals for convenient monitoring of electrical currents and potentials associated with numerous types of underground piping, cables and other metallic structures. For example, test stations are used as a terminal point for test leads to read underground structure to soil potentials, cathodic protection anode currents, the resistive integrity of insulating flanges and joints as well as the integrity of insulation between various types of underground metallic structures including a pipe, its casing or carrier. Such test stations are also used for detecting and measuring stray electrical currents in underground or subterranean structures as well as for reading electrical potential.

- In the past, a test station was made from a conduit and fittings comprising aluminium. Not only does the aluminium undergo destructive corrosion but also it offered no protection to personnel against electrical shocks. The test terminals were usually housed in a heavy cast aluminium structure that had a removable cover plate for access to only one side of the terminals without physically detaching the entire terminal block from the stationary cast aluminium enclosure. Moreover, this portion of the enclosure included a threaded flange to receive the threaded end of a conduit pipe. After installation of a test station was completed, it was a difficult and cumbersome operation to remove the cast aluminium enclosure from the conduit pipe since the threaded interconnection was usually corroded and the lead wires had to be removed from the test terminals to accommodate the required rotation to disconnect the threaded interconnection.

- According to the present invention there is provided a connector for mounting electrical leads, which connector comprises a collar having a side wall and an end wall, the end wall having an opening therein for the passage of leads therethrough, the collar further including an outwardly extending resilient arm having a stop thereon; pedestal means extending from the end wall of the collar and supporting a terminal block which traverses the opening, terminals being provided on the block to receive leads passed through the opening, and a cover for selective attachment to the collar to enclose the terminal block, the cover having a wall portion with a recess therein for receiving the stop on the resilient arm to hold the cover to the collar.

In an embodiment of the invention the connector includes a nut for threadedly engaging the side wall of the collar.

- Possibly the recess in the cover and the resilient lock bar form part of a bayonet-type releasable joint. I describe below the provision of a sleeve member with a divided side wall for compressive fit with the collar.

- Embodiments of a connector according to the invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

- Figure 1* is an exploded elevational view of a connector according to one embodiment of the present invention;

- Figure 2* is a sectional view taken along the line II-II of *Figure 1*;

- Figure 3* is an isometric view of a connector for aboveground support;

- Figure 4* is a plan view of a carrier plate to support the connector shown in *Figures 1* or *3*;

- Figure 5* is a plan view of a sleeve member for use between a conduit and a connector; and

- Figure 6* is a sectional view taken along the line VI-VI of *Figure 5*.

- In *Figure 1*, there is illustrated a conduit 10 in the form of a plastics pipe preferably made from polyethylene for subterranean implantation in close proximity to underground piping, cables and other metallic structures. The conduit includes an annular opening for receiving and passing test leads into the interior of the conduit 10 and extending along the length of the conduit to a point aboveground.

- As shown in *Figures 1* and *2*, the aboveground connector forming part of the test station essentially includes a connector that is principally constructed from plastics material and specifically by moulding polycarbonate resin material. This material is presently available from the General Electric Company, sold under the trade mark LEXAN, and Mobay Chemical Corporation, sold under the trade mark MERLON. These polycarbonate materials typically have a dielectric strength of 380 volts per mil. They are stable under ultraviolet attack and dimensionally stable within the temperature range of -100°F to $+250^{\circ}\text{F}$. The material is light weight, approximately one-half that of aluminium, and exhibits a strength-to-weight ratio equal to aluminium while providing an impact strength of four times greater than provided by aluminium. The connector 20 includes a collar 21 having an annular side wall with threads 22 extending to the lower terminal edge of the collar. These threads are rendered discontinuous about the peripheral surface of the collar by spaced-apart slotted openings 24. The lower portion of the collar consisting of the threaded portion 22 and openings 24 defines a collet chuck which is compressively secured on to the upper end of the conduit 10 by a collet nut 25. The upper portion of the collar supports a cover 26 which is a dome-like structure normally enclosing the terminal members of the test station to be hereinafter described. The collar 21 further includes an end wall 27 defining a centrally-arranged opening 28. Pedestal means 29 project vertically from the wall 27 at diametrically-opposed

sides of the collar. These pedestal means are an integral part of the collar and integral with a terminal block 30 which extends between the pedestal means to traverse across the opening 28 such that the

5 opposed face surfaces of the terminal block overlies semi-circular segments of the opening. This arrangement of parts enables free and unimpeded access to both sides of the terminal block whereby test leads in the conduit 10 may pass along either or both sides
10 of the terminal block for coupling to terminals 31. As illustrated in Figure 1, the terminals are in the form of screw and nut assemblies that are arranged to extend from either side of the terminal block. As is the usual practice, shunts may be connected across
15 various terminals as necessary or desirable. The shunt may be removed or installed without disassembling the parts forming the connector.

Typically, the test station apparatus including the connector described herein is placed into operation
20 by first implanting the conduit 10 to a desired extended depth within an excavated area adjacent a metallic pipeline or the like. The test leads are passed through the annular opening providing access with the conduit 11 and drawn vertically along
25 the extended length of the conduit. The earth is then back-filled and a connector 20 is attached to the exposed upper end of the conduit by the collet-type compression fitting. By coupling the connector 20 to the conduit in this manner, it may be replaced
30 without unearthing the entire conduit assembly. Moreover, different diameter conduits may be used with a single design of connector by employing adapter collars. As will be described hereinafter, one such adapter collar is shown in Figures 5 and 6
35 having an inner diameter conforming to the diameter of the conduit 10 and an outside diameter conforming to the internal diameter of the collar 21. The test leads are then drawn through either semi-circular opening beneath the terminals for coupling
40 to the terminals 31. After this assembly procedure is completed, the cover is placed on the collar and held in place by a resilient lock interconnection.

As shown in Figure 2, projecting outwardly from collar 21 are diametrically-opposed lock bars 65 and
45 66. Lock bar 66 includes a resilient arm 67 having at its projected end a stop member 68. The stop member 68 projects outwardly from the collar for passage into a recess 69 at the inside surface of an enlarged end 26A at the bottom of cover 26. A small
50 diameter hole 70 extends from the recess 69 through the wall of the cover 26 so that a rod-shaped instrument can be inserted through hole 70 into contact with the stop member 68 when received within recess 69. The cover further includes lock bars
55 71 at diametrically-opposed locations arranged so that one lock bar 71 extends across and terminates at recess 69. Lock bars 71 form with the lock bars 65 and 66 a bayonet-type connection. The arrangement of parts is such that when the cover is positioned on
60 to the collar 21, the lock bars pass along the side wall at the enlarged end thereof between the lock bars 65 and 66. After the enlarged end 26A is seated against the end wall 27 of the collar, the cover is rotated so that lock bars 71 pass beneath lock bars 65 and 66.
65 Continued rotation of the cover 26 moves the recess

69 into alignment with the stop member 68, the latter passing into the recess under the resilient force developed by arm 67. When this occurs, the cover can no longer be rotated relative to the sleeve to
70 deter unauthorized access to the terminals. However, by displacing the stop member 68 from recess 69 through the use of a rod-shaped instrument passed through hole 70, rotation of the cover is possible since it is no longer locked to the collar.

75 Figure 3 illustrates the arrangement of parts for aboveground support for the connector. In Figure 3, the connector 20 carries electrical devices employed for but not limited to measuring and/or feeding an anode current for cathodic protection.

80 The connector of the present invention is useful to mount a variable resistor and a shunt while coupled across an insulating flange at the well-heads in underground storage fields. In making an installation, a test lead is attached to each side of an
85 insulating flange and the connector is bolted to the flange so that the leads are connected in separate terminals on the terminal block. A slide wire resistor 72 and a shunt 72A are wired across the two terminals. Based upon test data taken at each well,
90 the resistor is adjusted to control the cathodic protection current on the gathering line to the valve required to properly protect the well casing. The cover 26 completely encloses the terminal block, resistor and shunt, thus providing a neat appearance
95 with no dangling wires. This also serves to discourage tampering and vandalism. Moreover, because the connector is an electrical insulator, it also serves to protect corrosion control personnel from electrical shock hazards. These hazards exist when alternating
100 current potentials are encountered on pipeline structures in shared utility corridors. Unmitigated alternating current voltages have been measured as high as 45 volts on pipelines paralleling high-voltage electrical transmission lines in these corridors. For
105 utility corridor applications, a test station including the connector protects pipeline personnel from coming into direct contact with the metal leads from the underground piping. The connector of the present invention is also useful to mount and protect
110 lightning arrester devices as used, for example, to protect an insulated flange for underground piping. Resistor 72 has a movable slide wire coupled by a jumper wire 73 to a test terminal 31. Shunt 72A is mounted between two test terminals 31. The resistor
115 72 is attached by a threaded fastener to end wall 27 of the collar 21. The openings 24 in the collar each extend to a point just above the termination point of threads 22. It is to be understood, if desired a support ring 75 is located within the collar against the top wall 27.
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Figure 4 illustrates a carrier plate 76 for aboveground support for the connector. The carrier plate 76 has an enlarged circular end 77 having a diameter which is greater than the diameter of collar 21. Four
125 arcuate slots 78 extend to support ribs 79 between each slot. Two or more openings to receive test leads are located within the circular area surrounded by slots 78. This area of the carrier plate closes the bottom of the test station to form an insect barrier.
130 The support ribs are arranged and dimensioned to

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pass into the slotted openings 24 that extend along the lower threaded portions of the collar 21. The arcuate segments of the collar between slots 24 pass through slots 78. The extended height of slots 24 determines the extent to which the carrier plate 76 is passed along collar 21. The support ring 75 (Figure 3) provides added support for the carrier plate 76. After the carrier plate is placed on the collar 21, collet nut 25 is passed into threaded engagement with the threads 22. As this occurs, the collar is compressively secured onto the upper end of a conduit when a conduit is used. Further rotation of the collet nut forcibly engages the nut against the enlarged end 77 of the carrier plate 76. Thus, the collet nut serves to secure an aboveground carrier plate to the collar and when a conduit is used the nut 25 brings about the compressive engagement of the collar 21 with the conduit. The carrier plate 76 has a projected end that may be bent, if desired, to provide desired mounting on to an aboveground structure.

Figures 5 and 6 illustrate a sleeve member 80 employed to form a compressive interfitting connection between collar 21 and conduit 10. Sleeve member 80 is used when, for example, the inside diameter of collar 21 is $1\frac{1}{4}$ inches and the outside diameter of conduit 10 is $\frac{3}{4}$ inch. The sleeve member 80 has a tubular configuration with a U-shaped cross section formed by an end wall 81 and side walls 82 and 83. These walls are divided to form a gap at 84 into which guard plates 85 extend. The guard plates 85 form an insect barrier when the sleeve member 80 is compressed by the collet nut on collar 21. A lug 86 on wall 82 is used to position the sleeve member 80 within collar 21. Spacer legs 87 engage the end wall 27 of the connector to maintain the sleeve member 80 at the inside wall surface of collar 21 at the site of threads 22.

The readers' attention is drawn to my copending application No. 7923513 from which this application has been divided out.

CLAIMS

1. A connector for mounting electrical leads, which connector comprises a collar having a side wall and an end wall, the end wall having an opening therein for the passage of leads therethrough, the collar further including an outwardly extending resilient arm having a stop thereon; pedestal means extending from the end wall of the collar and supporting a terminal block which traverses the opening, terminals being provided on the block to receive leads passed through the opening; and a cover for selective attachment to the collar to enclose the terminal block, the cover having a wall portion with a recess therein for receiving the stop or the resilient arm to hold the cover to the collar.

2. A connector according to Claim 1, including a nut member for threadedly engaging the side wall of the collar.

3. A connector according to Claim 1 or Claim 2, including a sleeve member having a divided side wall to compressively fit within the collar.

4. A connector according to any of Claims 1 to 3, wherein the recess in the cover and the resilient arm

and stop form part of a bayonet-type releasable joint.

5. A pipe containing electrical leads having a connector according to any preceding claim mounted thereon, the electrical leads being connected to terminals on the terminal block.

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