

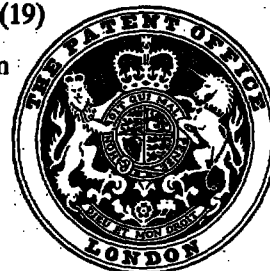
PATENT SPECIFICATION

(11) 1 580 144

1 580 144

- (21) Application No. 31381/77 (22) Filed 26 Jul. 1977
(31) Convention Application No. 788285 (32) Filed 18 Apr. 1977 in
(33) United States of America (US)
(44) Complete Specification Published 26 Nov. 1980
(51) INT.CL.³ H02G 3/08
(52) Index at Acceptance
H2E 7E1

(19)



(54) A CONNECTOR FOR USE IN TEST STATION APPARATUS

(71) I, NORRIS ELDON COTT, a citizen of the United States of America, of 216 Trinity Drive, McMurray, Pennsylvania 15317, United States of America, do hereby declare the invention for which I pray that a patent may be granted to me and the method by which it is to be performed, to be particularly described in and by the following statement:-

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.

Such test stations are typically employed to provide above ground 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 loads 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, such test stations were 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.

It is therefore a general aim of the present invention to design a test station of the kind described above in a form which may be easily dismantled and permits the support for the test terminals to be electrically isolated from either or both of an underground installation and a pipe carrying test leads therefrom. The invention is particularly directed at a connector for mounting on the end of such a pipe.

Accordingly, the present invention provides a connector for mounting on a pipe end to receive electrical leads from a pipe, which connector comprises a collar having a cylindrical side wall for enclosing the pipe end, with a screw thread on the surface of the side wall, and slotted openings at spaced peripheral locations therethrough, and an end wall with an opening therein for the passage of leads therethrough; pedestals extending from the end wall of the collar on opposite sides of the opening, and supporting a terminal block which traverses the opening, terminals being provided on the block to receive leads from the pipe; and a screw-threaded nut member for mating engagement with the collar side wall to clamp the connector to a pipe end.

Conveniently, the nut member comprises a collet nut adapted to pass on to a pipe end, the slotted openings in the collar defining a collet chuck for compressive engagement with the pipe and by the collet nut, the pipe end thus providing a support for the connector.

17 MAR 1981

In a test station incorporation the invention, the connector is mounted on a pipe which comprises a tubular plastics conduit and anchor means for supporting the conduit in a body of earth. Various forms of anchor means may be used and some are described hereinafter.

The connector of the invention can be readily secured and removed from a conduit pipe and at the same time provide complete access to the test terminals without the need for disassembling parts of the test station. In the preferred form, the aforesaid collar, pedestals and terminal block of the connector are defined by a unitary plastics member.

The invention will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is an exploded elevational view of a test station apparatus according to one embodiment of the present invention;

Figure 2 is a scrap view illustrating a modified form of an anchor for the test station apparatus shown in Figure 1;

Figure 3 is an exploded elevational view illustrating a modification to the connector shown in Figure 1;

Figure 4 is an elevational view illustrating a further embodiment of connector in accordance with the invention;

Figure 5 is a plan view of the connector shown in Figure 4; and

Figure 6 is an elevational view, partly in section, of a modified support for a test station apparatus.

Referring to Figure 1, the apparatus comprises 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 opening 11 at diametrically-opposed sides for receiving the passing test leads into the interior of the conduit 10 and protecting them for passage along the length of the conduit to a point above ground.

An anchoring means is provided to inhibit unintentional withdrawal of the conduit 10 from the subterranean implantation. In one form, the anchor means is a length of tubing 12 preferably made from polyethylene. The diameter of the tubing 12 is substantially smaller than the diameter of the conduit so that the tubing may extend through aligned openings at diametrically-opposed locations at the lower end of the conduit and project outwardly therefrom at each side of the conduit by a distance of approximately of at least 2-1/2 or 3 inches. Figure 2 illustrates a modified form of an anchor wherein a collar 14 made from a flat plate of polyethylene or similar material has an annular opening corresponding essentially to the outside

diameter of the conduit 10. The collar is passed onto the end of the conduit after which a sleeve 15 is adhered by glue or other suitable means to the end of the tubing and forms a retainer for the collar.

Referring again to Figure 1, the above ground apparatus forming part of the test station essentially includes a connector 20 that is preferably constructed from plastics material and specifically by molding polycarbonate resin material. This material is presently available from the General Electric Company of the United States of America, sold under the Trade Mark LEXAN, and Mobay Chemical Company of the United States of America, 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°F. The material is lightweight, approximately one-half that of aluminium and exhibits a strength-to-weight ration 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 formed on its outer surface with a first series of threads 22 and a second series of threads 23. The first series of threads 22 is located on the lower terminal edge of the collar and 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 onto the upper end of the conduit 10 by a collet nut 25.

A second series of threads 33 on the outer surface of the collar is employed for mating engagement with internal threads formed in 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 has an end wall 27 defining a centrally-arranged opening 28. Pedestals 29 project vertically from the wall 27 at diametrically-opposed sides of the collar. These pedestals are an integral part of the collar and integral with a terminal block 30 which extends between the pedestals to traverse across the opening 28 such that the opposed face surfaces of the terminal block overlie semicircular 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 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 various terminals as necessary or desirable. A shunt 32 is shown in Figure 1 and may be removed or installed without disassembling the parts forming the test station.

The test station apparatus shown in Figure 1 is placed into operation 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 openings 11 and drawn vertically along the extended length of the conduit. The earth is then back-filled and the 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 without unearthing the entire conduit assembly. Moreover, different diameter conduits may be used with a single design of connector by employing adapter collars. Such adapter collars, while not shown in the drawing, consist of a collar 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 semicircular opening beneath the terminals for coupling to the terminals 31. After this assembly procedure is completed, the cover is placed on the collar and held in place by the threaded interconnection.

Figure 3 illustrates a modified form of an interlock to releasably fasten the cover 26 onto the collar 21 for enclosing terminals 31. Diametrically-opposed surfaces of the collar 21 each includes an outwardly projecting wall 35. The walls define boundaries to interconnected areas wherein a lock bar 36 on the cover 26 is releasably retained. When the cover is lowered into an enclosing relation with pedestals 29, the lock bar 36 is first received within an entry recess 37. The cover is then rotated to the left as one views Figure 3, to move the locking bar into a holding recess 38 wherein the bar is moved downwardly toward nut 25 against the lower portion of wall 35. The cover is then rotated to the right as one views Figure 3 whereby the locking bar moves into a locking recess 39. This tortuous path of travel by the locking bar deters unauthorized and unintentional removal of cover 26 from the test station apparatus 20.

Figures 4 and 5 illustrate a modified form of terminals and protective cover for one side thereof. The terminal block 30, pedestals 29 and collar 21 are the same as previously described. An array of openings in the terminal block support terminal assemblies 40. Each terminal assembly includes a threaded shaft 41 having a socket

opening 42 in one end to receive a lead of a test meter. A plastic sleeve 43 forms an insulative covering on a metal nut 44 which engages the threaded shaft 41. Metal washers 45 carrying plastic sleeves 46 are located at opposite sides of the terminal block 30 on shaft 41. A nut 47 secures the bare end of a test lead on the free end of shaft 41 and secures the terminal assembly to the terminal block. It is preferred to arrange the terminal assemblies so that all the test leads are located at a common side of the terminal block. A plastic protective cover 48 is semicircular and includes a semicircular lip 49 extending downward from the bottom wall 30. The lip 49 extends into a segment of the annular opening 28 at one side of the terminal block 30. The bottom wall 50 is supported upon the wall 27 of the collar 21. An upper wall 51 of the cover 48 includes parallel slots 52 with a projection 53. The projection has a notched end for locking engagement in an opening in the terminal block 30. The area of the top wall between slots 52 is elastically deformable to unlock the projection 53 from the block 30 for removal of cover 48.

Figure 6 illustrates another manner in which a connector according to the invention may be used. A connector 20 including cover 26 is connected by a short length of a plastic pipe conduit 55 to a rectangular base 56. The base is made from plastics material such as molded polycarbonate resin and includes a plurality of openings 57 arranged to pass test leads into the conduit 55. The base is used for free-standing support of the test station within an opening provided in a concrete block 58 located below ground level. A pipe 59 with a removable cover 60 extends from the concrete block to ground level to protectively house the free-standing test station.

WHAT WE CLAIM IS:

1. A connector for mounting on a pipe end to receive electrical leads from a pipe, which connector comprises a collar having a cylindrical side wall for enclosing the pipe end, with a screw thread on the surface of the side wall and slotted openings at spaced peripheral locations therethrough and an end wall with an opening therein for the passage of leads therethrough; pedestals extending from the end wall of the collar on opposite sides of the opening, and supporting a terminal block which traverses the opening, terminals being provided on the block to receive leads from the pipe; and a screw-threaded nut member for mating engagement with the collar side wall to clamp the connector to a pipe end.
2. A connector according to Claim 1 wherein the nut member comprises a collet nut adapted to pass onto a pipe end, the slotted openings in the collar defining a

10



20

the terminal block. As is the usual practice, shunts may be connected across various terminals as necessary or desirable. A shunt 32 is shown in Figure 1 and may be removed or installed without disassembling the parts forming the test station.

The test station apparatus shown in Figure 1 is placed into operation 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 openings 11 and drawn vertically along the extended length of the conduit. The earth is then back-filled and the 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 without unearthing the entire conduit assembly. Moreover, different diameter conduits may be used with a single design of connector by employing adapter collars. Such adapter collars, while not shown in the drawing, consist of a collar 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 semicircular opening beneath the terminals for coupling to the terminals 31. After this assembly procedure is completed, the cover is placed on the collar and held in place by the threaded interconnection.

Figure 3 illustrates a modified form of an interlock to releasably fasten the cover 26 onto the collar 21 for enclosing terminals 31. Diametrically-opposed surfaces of the collar 21 each includes an outwardly projecting wall 35. The walls define boundaries to interconnected areas wherein a lock bar 36 on the cover 26 is releasably retained. When the cover is lowered into an enclosing relation with pedestals 29, the lock bar 36 is first received within an entry recess 37. The cover is then rotated to the left as one views Figure 3, to move the locking bar into a holding recess 38 wherein the bar is moved downwardly toward nut 25 against the lower portion of wall 35. The cover is then rotated to the right as one views Figure 3 whereby the locking bar moves into a locking recess 39. This tortuous path of travel by the locking bar deters unauthorized and unintentional removal of cover 26 from the test station apparatus 20.

Figures 4 and 5 illustrate a modified form of terminals and protective cover for one side thereof. The terminal block 30, pedestals 29 and collar 21 are the same as previously described. An array of openings in the terminal block support terminal assemblies 40. Each terminal assembly includes a threaded shaft 41 having a socket

opening 42 in one end to receive a lead of a test meter. A plastic sleeve 43 forms an insulative covering on a metal nut 44 which engages the threaded shaft 41. Metal washers 45 carrying plastic sleeves 46 are located at opposite sides of the terminal block 30 on shaft 41. A nut 47 secures the bare end of a test lead on the free end of shaft 41 and secures the terminal assembly to the terminal block. It is preferred to arrange the terminal assemblies so that all the test leads are located at a common side of the terminal block. A plastic protective cover 48 is semicircular and includes a semicircular lip 49 extending downward from the bottom wall 30. The lip 49 extends into a segment of the annular opening 28 at one side of the terminal block 30. The bottom wall 50 is supported upon the wall 27 of the collar 21. An upper wall 51 of the cover 48 includes parallel slots 52 with a projection 53. The projection has a notched end for locking engagement in an opening in the terminal block 30. The area of the top wall between slots 52 is elastically deformable to unlock the projection 53 from the block 30 for removal of cover 48.

Figure 6 illustrates another manner in which a connector according to the invention may be used. A connector 20 including cover 26 is connected by a short length of a plastic pipe conduit 55 to a rectangular base 56. The base is made from plastics material such as molded polycarbonate resin and includes a plurality of openings 57 arranged to pass test leads into the conduit 55. The base is used for free-standing support of the test station within an opening provided in a concrete block 58 located below ground level. A pipe 59 with a removable cover 60 extends from the concrete block to ground level to protectively house the free-standing test station.

WHAT WE CLAIM IS:

1. A connector for mounting on a pipe end to receive electrical leads from a pipe, which connector comprises a collar having a cylindrical side wall for enclosing the pipe end, with a screw thread on the surface of the side wall and slotted openings at spaced peripheral locations therethrough and an end wall with an opening therein for the passage of leads therethrough; pedestals extending from the end wall of the collar on opposite sides of the opening, and supporting a terminal block which traverses the opening, terminals being provided on the block to receive leads from the pipe; and a screw-threaded -nut member for mating engagement with the collar side wall to clamp the connector to a pipe end.

2. A connector according to Claim 1 wherein the nut member comprises a collet nut adapted to pass onto a pipe end, the slotted openings in the collar defining a

70

75

80

85

90

95

100

105

110

115

120

125

130

61

collet chuck for compressive engagement with the pipe and by the collet nut, the pipe end thus providing a support for the connector.

5 3. A connector according to claim 1 or 2 wherein the collar, pedestals and terminal block comprise a unitary plastics member.

10 4. A connector according to any preceding claim wherein some of the terminals project from each of the two face surfaces of the terminal block.

5. A connector according to any preceding claim including a cover for enclosing the terminals on the terminal block.

15 6. A connector according to Claim 5 wherein the cover is mounted on the collar.

20 7. A connector according to Claim 5 wherein the cover includes a lock bar, and wherein the collar wall defines a tortuous path of travel for the lock bar between locked and unlocked positions.

25 8. A connector according to any of Claims 4 to 6 wherein the terminals are provided on one side only of the block and wherein the cover is adapted to releasably engage the terminal block to retain the cover enclosing the terminals on the one side of the terminal block.

30 9. A connector according to Claim 8 wherein the other side of the terminal block is exposed, and wherein portions of the terminals extend through the terminal block to the other side and are provided with an insulative covering.

35 10. A connector according to any preceding claim mounted on a pipe which pipe comprises a tubular plastics conduit and anchor means for supporting the conduit in a body of earth.

40 11. A connector according to Claim 10 wherein the anchor means comprises a rod extending outwardly from the conduit at the end remote from the connector.

45 12. A connector according to Claim 10 wherein the anchor means comprises a plastics tube projecting from diametrically-opposed sides of the conduit at the end remote from the connector.

50 13. A connector according to Claim 11 or Claim 12 wherein the remote end of the conduit includes aligned openings in the side wall thereof for supporting the anchor means.

55 14. A connector according to Claim 10 wherein the anchor means comprises a plate member mounted on the end of the conduit remote from the connector.

60 15. A connector according to Claim 14 including a sleeve on the conduit supporting the plate member.

65 16. A connector according to Claim 14 wherein the plate member supports the remote end of the conduit and has openings therein for the passage of electrical leads therethrough.

17. A connector as claimed in claim 1 and substantially as described herein with reference to and as illustrated by Figures 1 Figure 3; or Figures 4 and 5 of the accompanying drawings.

70

For the Applicants,
LLOYD WISE, BOULY & HAIG,
Chartered Patent Agents,
Norman House,
105-109 Strand,
London, WC2R OAE.

75

Printed for Her Majesty's Stationery Office,
by Croydon Printing Company Limited, Croydon, Surrey, 1980.
Published by The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.

