United States Patent

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[54] **UNDERWATER ELECTRICAL CONNECTOR APPARATUS**
7 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** ..... **339/89 M,** 174/93
[51] **Int. Cl.** **H01r 13/54**
[50] **Field of Search** 339/89, 90, 94; 174/21, 21.1, 22, 93

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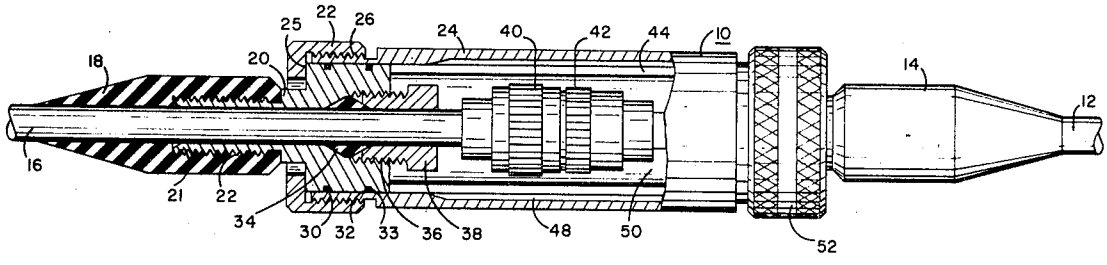
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ABSTRACT: An underwater electrical connector apparatus comprising a sealed housing in which electrical lines are electrically connected by an electrical connector, and which housing has a cylindrical shape with cylindrical end seals, through which electrical lines pass, which seals are drawn together by end collars with an insulating spacer sleeve that fits around the electrical connector and correctly spaces the seal members to achieve correct connection of the electrical lines, and which structure allows the housing to be entirely removed slidably from the structure while maintaining electrical connection of the electrical connector.



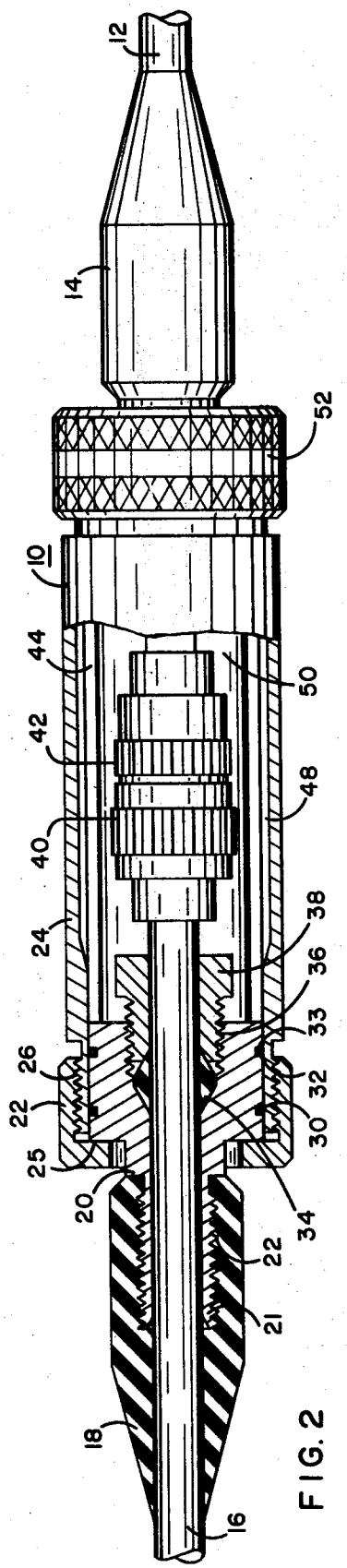
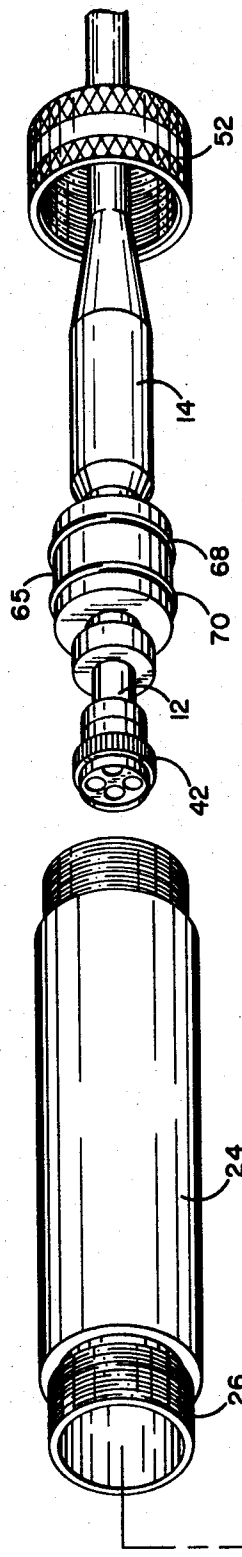


FIG. 2



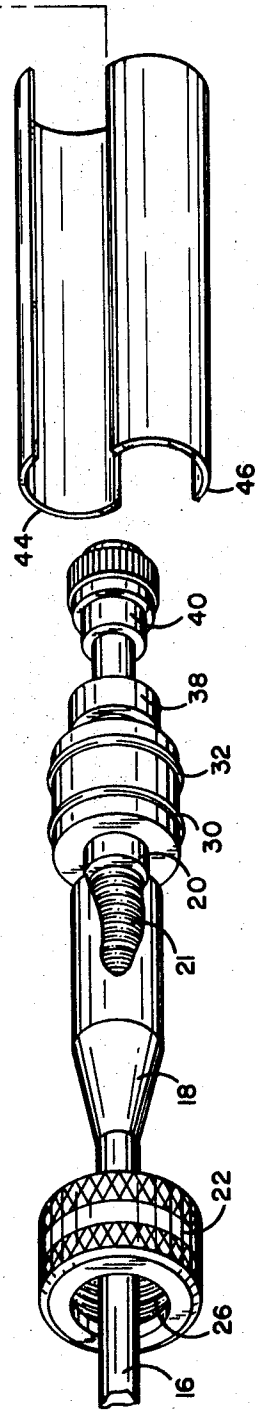


FIG. 1

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UNDERWATER ELECTRICAL CONNECTOR APPARATUS

SUMMARY OF THE INVENTION

An exemplary embodiment of this invention comprises a sealed housing that has a hollow cylindrical housing with cylindrical end seals that close off the open ends of the cylindrical housing. Collars threadably engage the ends of the cylindrical housing and abut against the end seals forcing them inwardly into the cylindrical housing and against a spacer sleeve. The spacer sleeve fits between the inner side surfaces of the seals and in the cylindrical housing and holds the seals at a given spacing within the housing. The end seals have openings therein through which electrical lines pass to the electrical connector. A threaded projection on each end seal coacts with a connector secured to the electrical line outside the sealed housing for positioning the end seals and the housing relative to the connector. The sides of the end seals adjacent the spacer sleeve have packing connections that seal the electrical line passage on the inside of the housing.

The spacer sleeve comprises a pair of half-cylindrical shaped, insulating members that when joined together have an outer circumference that is only slightly smaller than the inside diameter of the housing. The spacer sleeve functions to hold the end seals at given positions, which end seals employ O-rings or the like to seal the end openings in the housing. The spacer sleeves also insulate the electrical connector from contact with the outer housing, which housing may be made of brass or other suitable materials that are corrosion resistant.

Thus the combination of the end seals and cylindrical housing provide a water sealed environment in which electrical lines may be connected by a substantially state of the art electrical connector. The housing structure may be easily and quickly disassembled to inspect or repair the electrical connector. The inner diameter of the housing is slightly larger than the outside diameter of either the seals or the sleeve. thus allowing the sleeve to be quickly and easily removed once the collar member is loosened.

It is therefore an object of this invention to provide a new and improved underwater electrical connector apparatus.

It is another object of this invention to provide a new and improved underwater electrical connector apparatus that allows electrical connections to be made in an underwater environment by substantially state of the art electrical connectors.

It is another object of this invention to provide a new and improved underwater electrical connector apparatus that may be placed in use and then be brought to the surface of the water and quickly disassembled to inspect, repair or replace the electrical connector and then be quickly reassembled and placed back into service under the water.

It is another object of this invention to provide a new and improved underwater electrical connector apparatus that is relatively inexpensive to construct, is simple in operation, is rugged in construction, and that allows the use of a state of the art, surface-type electrical connector.

Other objects and many advantages of this invention will become more apparent upon a reading of the following detailed description and an examination of the drawings wherein like reference numerals designate like parts throughout and in which:

FIG. 1 is an exploded view with parts in section of an underwater electrical connector apparatus of this invention.

FIG. 2 is a side view with parts in section and parts broken away of the embodiment of the underwater electrical connector apparatus of FIG. 1.

Referring now to FIGS. 1 and 2, a pair of electrical lines 12 and 16, which may comprise multiple conductors or a single conductor, are electrically connected through a known electrical connector having connecting parts 40 and 42. This electrical connection is made within a sealed environment 50 in a sealed housing 10. The sealed housing 10 has a cylindrical housing member 24 that may be made of brass or other suitable noncorrosive materials. Positioned in each end of the cylindrical housing member 24 are cylindrical end seals 20 and 65 that may be made of brass or other suitable metals that are noncorrosive in sea water. Each of the end seals 20 and 65 have a pair of circumferential grooves 33 in which are positioned O-rings 30, 32, 68 and 70 that seal the space between the outer surface of the seals and the inner surface of the cylindrical housing 24. A spacer sleeve, having half cylindrical parts 44 and 46, fits in the cylindrical volume of the housing member 24, Each of the collars 22 and 52 have a radially inward shoulder that abuts against the outer edge of the seals 20 and 65 forcing the cylindrical end seals 20 and 65 into abutting contact with the sleeve 44 and 46. This assures correct spacing of the end seals 20 and 65 within the cylindrical housing member 24, that has a sufficiently large internal diameter that the housing member can slide throughout its length over each of the end seals 20 and 65.

Each of the seals 20 and 65 are secured to the electrical lines 16 and 12 through a rubber mounting 18 that threadably engages by threads 22 a threaded projection 21. Also the opening through each of the cylindrical seals, as for example seal 20, is sealed by a rubber packing insert 34 that is compressed by a packing gland 38 that engages threads 36 of the seal 20.

The internal surface of the housing member 24 has a cylindrical recess 48 therein that allows ease in sliding the sleeve members 44 and 46 into position within the housing 24. The sleeve members 44 and 46 provide an insulated surface within the metal housing 24 for the connector parts 40 and 42. It may be observed that the combined length of the spacer sleeves 44 and 46 and the end seals 20 and 65 slightly exceed the length of the housing member 24. Thus the collars 22 and 52 pull the internal members together with sufficient force to provide a rigid internal structure and that assures electrical connection of the connector parts 40 and 42.

In operation, housing member 24 and end collars 22 and 52 are slidably moved over at least one of the end seals, as for example end seal 20. The spacing sleeves 44 and 46 are then inserted in the volume of the housing member 24. The other cylindrical seal 65 is then inserted in the other end of the housing member 24 and the couplings 22 and 52 are threadably tightened to tighten the structure together substantially as illustrated in FIG. 2. This assembly provides insurance that an operable electrical connection exists between electrical connector parts 40 and 42, prior to sealing the sealed housing. Should difficulty later occur in the electrical connection, the the housing 10 is removed from the water and the sealed housing is disassembled in the manner previously described. The connector is repaired or replaced and the housing 10 is again placed in operation in the water.

Having described my invention, I now claim.

1. An underwater electrical connector apparatus comprising, an electrical connector for connecting abutting electrical lines, end seals secured to each of said lines leading to said electrical connector,

a housing for enclosing said electrical connector and said end seals in a sealed environment underwater,

collar means at each end of said housing being movable longitudinally for holding said end seals in said housing and holding said electrical lines electrically connected by said electrical connector,

rigid spacer sleeve means for fitting inside of said housing and abutting against said end seals for holding said end seals at a given spacing within said housing,

said collar means each comprise collars having a radially inward projecting shoulder that abuts against one side of said seals,

said collars engage said housing to force said cylindrically shaped seals against said spacer sleeve means,

and said cylindrical housing has an inside diameter slightly greater than the outside diameter of said seals allowing said housing to be slidably moved throughout its length over said seals.

2. An underwater electrical connector apparatus as claimed in claim 1 in which,

the center portion of said housing has a slightly larger inside diameter than the inside diameter of said housing adjacent its ends, for facilitating insertion of said spacer members into said housing.

3 An underwater electrical connector apparatus as claimed in claim 1 in which,

said spacer sleeve means has a length sufficient to cause end portions of said seals to project beyond the ends of said housing,

said seals having openings therethrough for passing lines to said electrical connectors,

said seals being rigidly secured to said lines,

and said collar means abutting the ends of said seals forcing said seals against said spacer sleeve means and forcing said connector into a connected position in the sealed environment of the sealed housing.

4. An underwater electrical connector apparatus as claimed in claim 1 in which,

each of said seals have an opening therethrough for passing electrical lines that are connected by said electrical connector,

and the side of said seals adjacent said spacer sleeve means have packing gland means for sealing the space between said electrical lines and said opening in said seal.

5. An underwater electrical connector apparatus as claimed in claim 4 in which,

each of said seals have a threaded end portion that threadably engages a connector portion secured to each of said lines.

6. An underwater electrical connector apparatus as claimed in claim 4 in which,

each of said cylindrical shaped seals have at least one groove around its outer circumference, and O-ring means for fitting into said groove and providing a sealed connection between the outer surface of said seals and the inner surface of said housing.

7. An underwater electrical connector apparatus as claimed in claim 1 in which,

said spacer sleeve means comprises a pair of half cylindrical spacer members of insulating material.