

[54] **HIGH PRESSURE ELECTRICAL
FEED-THROUGH FITTING**

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[21] Appl. No.: **183,176**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 114,138, Feb. 10,
1971, abandoned.

[52] U.S. Cl. **339/94 A, 174/12 R, 174/18,
339/117 R**

[51] Int. Cl. **H01r 13/52**

[58] Field of Search **339/94, 117;
174/12 R, 18**

References Cited

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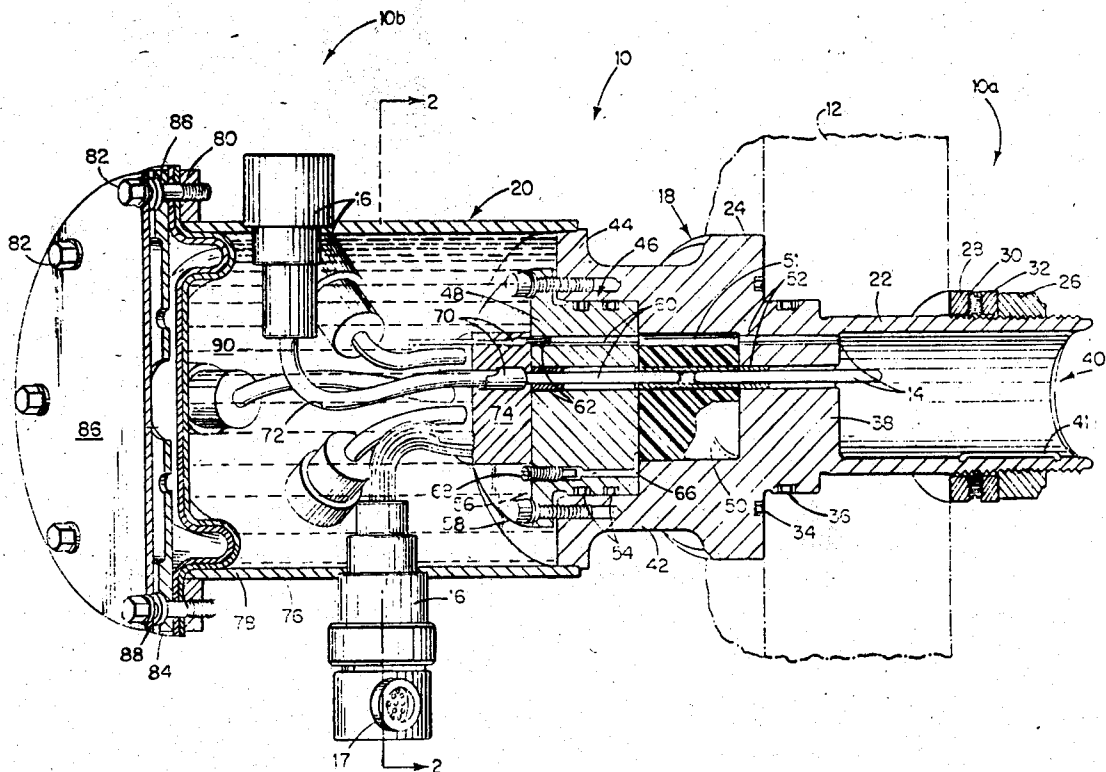
Primary Examiner—Joseph H. McGlynn

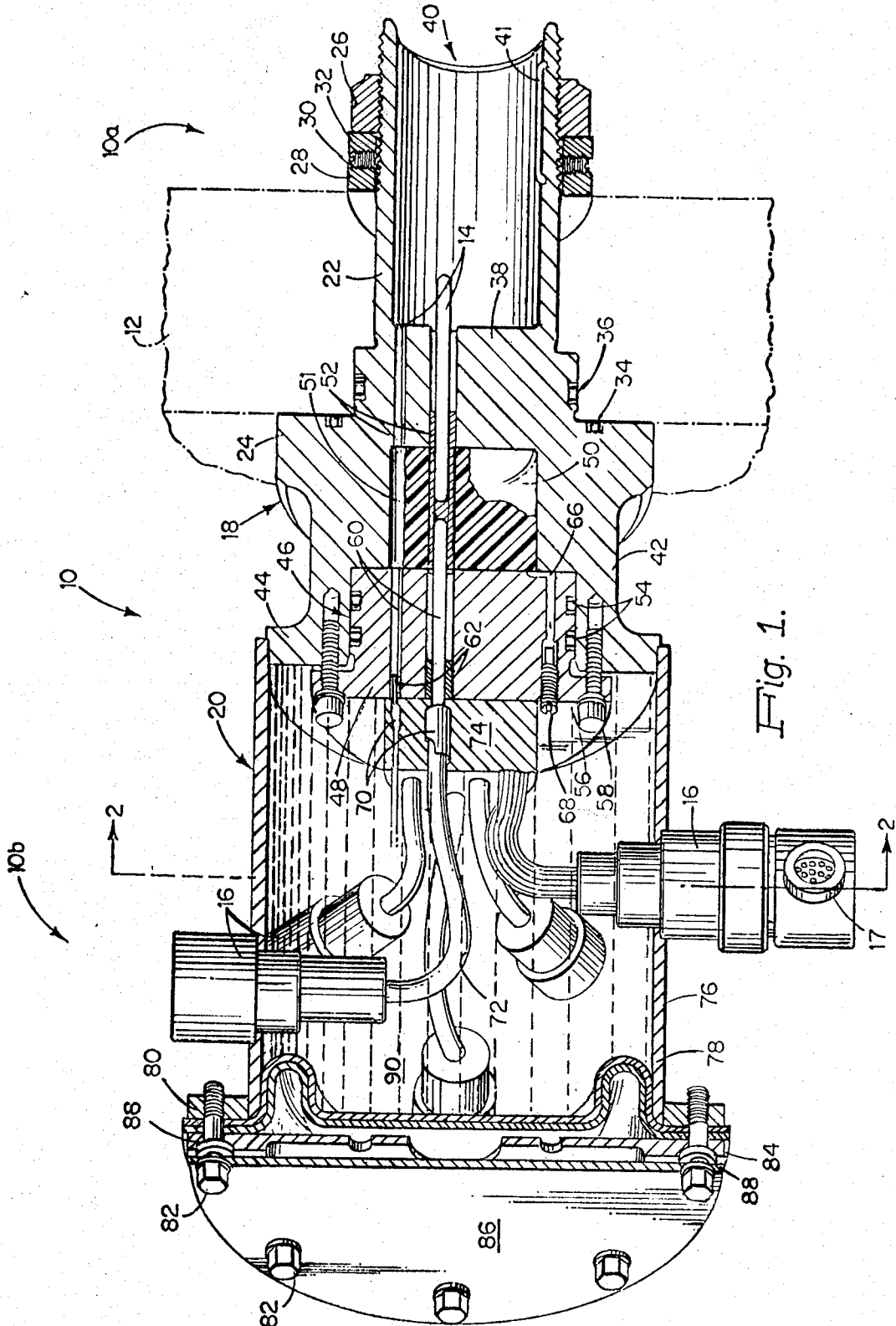
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[57] **ABSTRACT**

A high pressure electrical feed-through fitting, such as for providing connections between electrical cables in an underwater environment and the interior of a vessel, has a pressure-barrier section that feeds electrical conductors through the vessel hull and seals the ambient underwater pressure from the vessel interior. The electrical conductors pass from the pressure-barrier section to the interior of a closed, fluid-filled junction box section that has a diaphragm wall element which flexes to maintain the pressure within the junction-box section at a known level relative to the ambient pressure. A pressure biasing element can maintain a pressure differential between the interior of the junction box section and the ambient.

15 Claims, 3 Drawing Figures





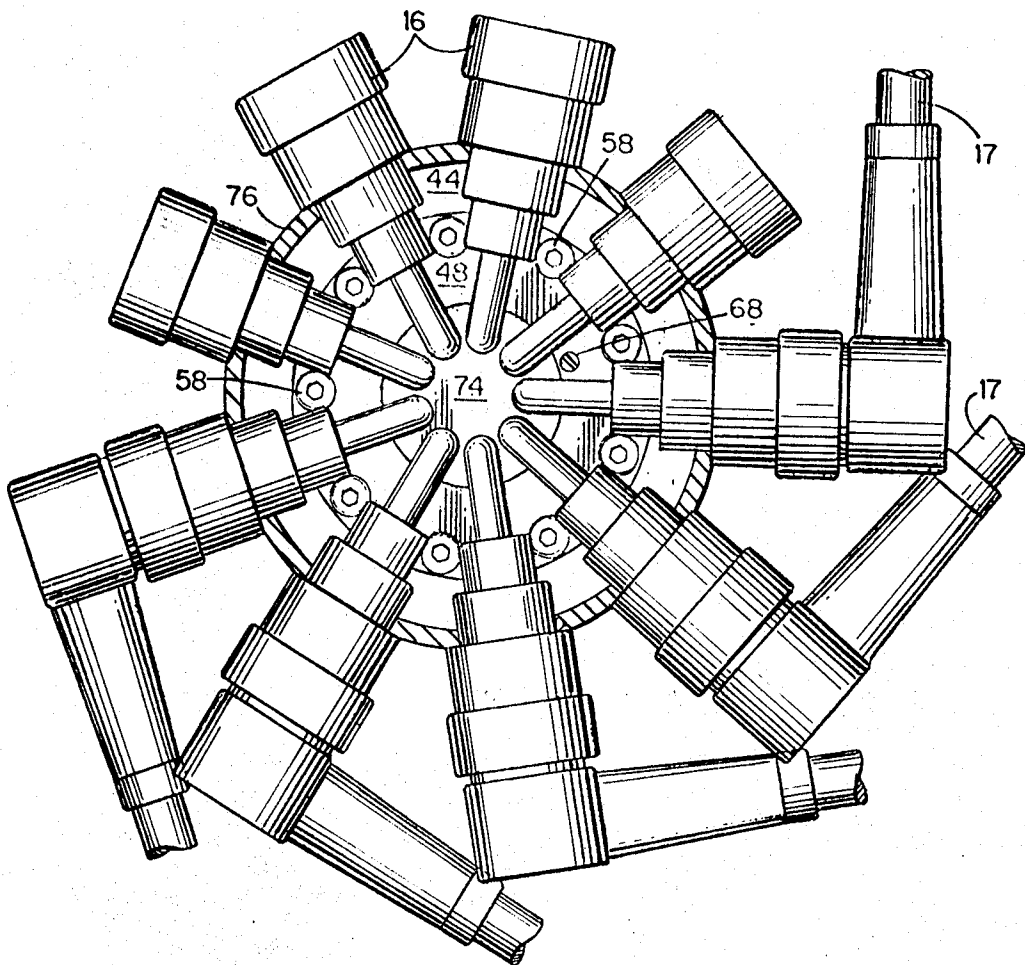


Fig. 2.

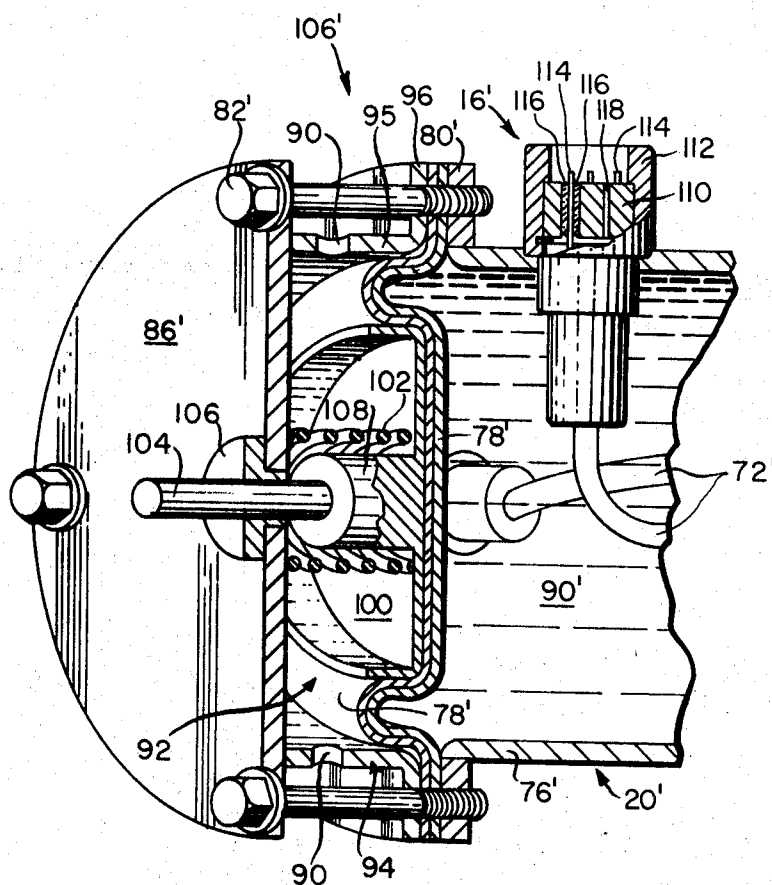


FIG. 3

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HIGH PRESSURE ELECTRICAL FEED-THROUGH FITTING

This application is a continuation-in-part of pending application Ser. No. 114,138 filed Feb. 10, 1971, and now abandoned, for "High Pressure Electrical Feed-Through Fitting" and assigned to the assignee hereof.

BACKGROUND OF THE INVENTION

This invention relates to an electrical feed-through connector for providing electrical connection through a pressure hull, such as between a liquid side and a gas side. The connector is useful, for example, in effecting a connection through the hull of a marine vessel from the vessel interior to cables in an underwater environment.

An object of the invention is to provide a marine electrical feed-through connector that is easy to assemble and yet provides a reliable and secure pressure seal for the vessel hull. A particular object is to provide such a connector for interconnecting two or more separate cables disposed outside a marine vessel with electrical equipment in the vessel.

Another object is to provide a feed-through fitting of the above character having a junction-box exposed to an underwater environment for relatively facile connection and disconnection of underwater cables without in any way dismantling the fitting.

It is also an object of the invention to provide a marine electrical feed-through connector of the above character that provides a secure pressure-tight closure for the electrical feed-through in the vessel wall and provides corrosion and like protection for the external portions thereof, and still requires relatively little heavy-weight structure as is normally required to withstand the large pressures encountered in deep underwater environments.

A more general object of the invention is to provide an electrical feed-through connector for connecting electrical conductors from one side of a pressure vessel to the other side of the vessel and having the above features; and in particular for use when the fluid on one side of the vessel is a liquid.

A further object of the invention is to provide an electrical fitting of the above character having a relatively simple and hence low-cost construction.

Another object of the invention is to provide an electrical junction box that maintains a selected pressure differential between an incompressible fluid filling the box and a varying ambient pressure.

It is also an object of the invention to provide an electrical junction box for use in an undersea or other liquid environment and which supplies a selected liquid to the electrical connectors which are exposed to that environment for purposes such as electrical insulation and pressure balancing.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

SUMMARY OF THE INVENTION

The electrical feed-through connector of the invention is secured to a vessel hull or like wall and feeds conductors through the wall, preferably within a hull-penetrating tube. These conductors extend within the fitting to the other, outer end thereof where they connect to several electrical connector elements that are accessible from outside the fitting for connection with

cables located in a high-pressure, typically liquid, environment.

A bulkhead or pressure-barrier section of the fitting includes the hull-mounting elements. It further has a pressure-barrier wall that blocks the high pressure on one side of the hull from the lower pressure on the other side. The electrical conductors pass through this barrier wall with pressure-tight seals and connect to corresponding conductors carried by a connector body removably seated in the pressure-barrier section of the fitting with a further pressure-tight seal.

A junction-box section of the fitting provides a fluid-tight enclosure that seals onto the pressure-barrier section with the connector body feeding the conductors therein into the junction-box section, where they connect to cable connectors that pass through the walls of the junction-box section to the high-pressure environment. A diaphragm element in the wall of the junction-box section flexes to minimize the pressure differential across it with the result that the pressure within the junction-box section is nearly equal to the high ambient pressure. Alternatively, the diaphragm element can maintain the pressure in the junction-box section of the connector at a selected level above the high ambient pressure.

An electrically insulating and relatively incompressible fluid such as oil fills the enclosure of the junction-box section. This fluid protects the electrical and other elements within the enclosure from corrosion and other environmental damage.

With this construction of the junction-box section of the fitting, it can be made of relatively light-weight materials, for no great pressure differentials develop across it. Further, this construction of the junction-box section provides secure support for the externally accessible connector elements, and provides protection for the outer end of the fitting pressure-barrier section which it covers, as well as for the other elements within the enclosure which it forms.

The junction-box section can further have a biasing element acting on the diaphragm to maintain the pressure within that section significantly above the ambient for all values of the ambient pressure. This ensures that any leakage in the junction-box section is outward from within the section. Further, where capillary passages are provided in the electrical feed-through connectors of the junction-box section, this upward bias of the pressure within the junction-box section will cause a minute flow of the liquid therein to ooze out through these passages. This liquid can protect outer surfaces of the connectors against corrosion, and provide pressure balance in the connector structure.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts exemplified in the construction hereinafter set forth, and the scope of the invention is indicated in the claims.

BRIEF DESCRIPTION OF DRAWINGS

For a fuller understanding of the nature and object of the invention, reference should be had to the following detailed description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a side plan view, partly broken away, of a marine electrical feed-through connector according to the invention;

FIG. 2 is a cross-sectional view of the fitting of FIG. 1, taken along section line 2—2; and

FIG. 3 is a fragmentary sectional view of a modified construction of the FIG. 1 fitting.

DESCRIPTION OF ILLUSTRATED EMBODIMENT

FIG. 1 shows a marine electrical fitting 10 according to the invention having an inner end 10a within a vessel hull 12 and an outer end 10b disposed outside the hull in an underwater environment. The fitting has electrical conductor pins 14 exposed at the inner end for connection to the equipment within the vessel. Adjacent to the outer end of the fitting several connector elements 16, i.e., either plugs or receptacles, extend through the fitting wall for connection to cables 17 leading through the underwater environment to other equipment.

The fitting provides electrical connections between the contacts of the connector elements 16 and the conductor pins 14, provides a secure fluid-tight seal closing the hole in the hull 12 through which the fitting inner end passes, and provides reliable protection of the conductors therein from physical damage, as well as from corrosive and other damage in the underwater environment.

More particularly, the fitting 10 has a pressure-barrier section 18 that provides the conductor feed-through into the vessel interior and a junction-box section 20, sealed onto the outer end of the barrier section, which supports the connector elements 16 and provides a protective enclosure for the conductors passing from the barrier section to the connector elements. The illustrated fitting has two axially-spaced rows of connector elements 16.

The pressure-barrier section 18 has a tube 22 passing through a hole in the hull 12 from a shoulder 24 that abuts the outer surface of the hull 12. The cylindrical outer wall of the tube 22 is threaded at the inner end of the fitting to receive a nut 26. The threaded engagement of nut 26 onto tube 22 clamps a washer 28, by means of a Bellville or like spring 30 and a bearing washer 32, against the inner surface of the hull and thereby clamps the fitting 10 onto the hull 12. The sealing surface of the shoulder 24 is recessed to receive a sealing O-ring 34 and the cylindrical outer surface of the tube 22 is recessed to seat a further O-ring 36 that bears against the vessel hull 12. The two O-rings 34 and 36 thus provide a two-stage seal between the inside of the vessel and the underwater environment outside it.

As further shown in FIG. 1, a bulkhead-like wall 38 spans across the pressure-barrier section 18 closing it adjacent the function of the tube 22 with the shoulder 24. Inward from this wall, the tube is hollow and forms part of a connector receptacle 40 for receiving a mating connector plug (not shown) carrying contacts that engage the conductor pins 14. A key 41 for orienting this connector plug is provided on the inner surface of tube 22.

Outward from the shoulder 24 and wall 38, the pressure-barrier section 18 of the fitting 10 has a hollow tubular wall 42 that is radially enlarged at its outer end to form a flange 44. The cylindrical inner surface of the wall 42 forms a seating recess 46, for receiving a connector body 48, and an inner chamber 50 extending from the recess 46 to the other outer side of the wall 38.

Thus the illustrated pressure-barrier section 18 is an elongated tubular element with the tube 22, wall 38,

chamber 50 and seating recess 46 in axial, end-to-end alignment, extending outward from the inner end 10a of the fitting.

The tube 22, wall 38 and wall 42 with flange 44 are preferably made in a one-piece construction, as illustrated, of metal or other rigid material. The pins 14, which extend through the barrier section wall 38 and protrude a short distance beyond either side thereof, are hermetically sealed to the wall by way of seals 52 of glass, ceramic or other electrically insulating and pressure sealing material. The seals 52 thus secure the conductor pins in the wall 38 and insulate the pins from the wall and hence from each other. Further, they provide pressure-tight closures capable of withstanding the pressure differentials to which the hull 12 is to be subjected.

A support plug 51 of insulating material is seated, preferably with a clearance fit, in the chamber 50. Contact sleeves 64—64 are embedded in the plug 51 and telescopically connect over the ends of the conductor pins 14 which protrude into the chamber 50.

The connector body 48 is a cylindrical plug having circumferential recesses in its cylindrical outer wall and which seats O-rings 54—54 that sealingly engage the inner, recess-forming surface of the tubular wall 42. The connector body 48 has a flange 56 at its outer end partly overlying the flange 44 and through which threaded fasteners 58—58 pass for threadably engaging the wall 42. Further, the conductor pins 60—60 extend through the connector body 48 and are sealed to it and insulated from it by seals 62—62 which can be similar to the seals 52. The set of conductor pins 60 are axially aligned with the set of conductor pins 14 carried in the wall 38. With this arrangement, when the connector body 48 is seated in the recess 46 as shown, the conductor pins 60 thereon slidably engage the contact sleeves 64 seated onto the conductor pins 14. The sleeves thus function as two-ended sockets interconnecting the conductor pins 14 and 60. As also shown, a vent passage 66 can be provided passing through the connector body 48 between the inner chamber 50 and the outer end of the fitting pressure-barrier section and carries a needle valve 68 for closing the passage.

In the assemblage of the connector body 48 into the seating recess 46, the plug 51 is first fitted in the chamber 50 with the connector sleeves 64 seated on the conductor pins 14, and the needle valve 68 is threadably retracted to open the passage 66. As the connector body is then plugged into the seating recess 46, the connector sleeves 64 interconnect the corresponding conductor pins 14 and 60. After the connector body is seated fully in the recess 46, the threaded fasteners 58 secure the assemblage together and the needle valve 68 is threaded inward to close the passage 66. The passage is thus open during assembly to vent the chamber and is closed after assemblage to seal the chamber 50. Once closed tight in this manner, the atmosphere in the inner chamber remains at the atmospheric pressure present during assembly. It should be noted that the passage 66 and valve 68 are optional, since the plug 51 fills most of the volume of chamber 50.

With further reference to FIG. 1, the outer ends of the conductor pins 60 are secured, by way of crimped or solder connections 70 or the like, to insulated conductors 72 that extend to and connect with the inner ends of the contacts of the connector elements 16. An insulative encapsulation 74 encloses the juncture of the

conductors 72 with the outer ends of the conductor pins 60.

In addition to the connector elements 16 and the conductors 72, the junction-box section 20 of the illustrated fitting 10 has a cylindrical wall 76 closed at the fitting outer end 10b with a diaphragm 78. The illustrated wall 76 extends along the aforementioned axis of the sections of the pressure-barrier section 18, and has the connector elements mounted on and passing therethrough with sealed junctures. The inner end of the cylindrical wall is secured with a fluid-tight seal onto the outer peripheral surface of the flange 44. A further flange 80 is secured to the wall 76 at the fitting outer end and the diaphragm 78 is clamped to this flange with bolts 82 that thread into holes in the flange 80. A perforate protective plate 84 overlays the diaphragm 78 and a cover plate 86 in turn overlays the plate 84. The bolts 82 pass through the plates 86 and 84 to clamp them to the flange 80, together with the diaphragm 78. However, spacers 88, illustratively washer-like elements carried on the bolts, are disposed between the plates 84 and 86 to provide free passage for the environmental fluid, typically water, between the outer side of the diaphragm and the underwater or other environment.

With this construction, the environmental pressure outside the fitting 10 is applied directly to the outer side of the diaphragm 78, and the diaphragm accordingly flexes to minimize the pressure differential across it. Oil 90 or another electrically insulative and essentially incompressible fluid fills the interior of the junction section 20 and hence it is subjected by way of the diaphragm 78 to the environmental pressure. That is, there is essentially no pressure differential between the interior of the junction-box section and the underwater environment, and hence across the cylindrical wall 76 and the diaphragm 78. The perforate plate 84 blocks solid materials from the diaphragm and the outer cover plate 86 further protects the diaphragm from physical damage.

The junction-box section 20 thus provides a lightweight and fluid-tight enclosure over the outer end of the pressure-barrier section 18, and particularly over the juncture of the connector body 48 with the flange 44. Further, the junction-box section encloses the conductors 72 and the connections thereof to the conductor pins 60. This construction protects the enclosed portions of the fitting from physical abuse and damage as well as from corrosion and other deterioration. However, it is relatively light in weight and can be fabricated at relatively low cost because it does not have to sustain a significant pressure differential.

FIG. 2 illustrates the manner in which a number of electrical cables 17 are connected to the connector elements 16. The illustrated conductors 17 are fitted with right-angle connector elements that mate with the connector elements 16. Although the connector elements are joined to the wall 76 with fluid-tight seals, each connector element can be provided with an internal capillary-like orifice to "leak" oil 90 from within the junction-box section 20 to the closed space between the interfitted surfaces of the connector elements 16 and the mating connector elements on the cables 17. This leaked oil pressure balances the interface and provides supplemental electrical insulation.

Although the invention is described with particular reference to a marine hull fitting, it is not so limited. The fitting can be used in other applications including,

by way of example, in the wall of a pressure vessel having an internal pressure higher than the external pressure. Also, the diaphragm on the junction-box section of the fitting can be constructed to maintain the pressure within the junction-box section at a selected level above the ambient pressure, rather than nearly equal to it. Further, although the illustrated fitting mounts to the hull with the tube 22 that passes through the hull, other structures can be used to mount the fitting to the hull with a pressure-tight seal. As one such structure, the shoulder 24 can form a flange which is bolted or otherwise clamped to the side of the hull from which the fitting extends.

FIG. 3 shows a modified construction of the FIG. 1 fitting 10 and in which a resiliently biased piston assembly 92 bears against the outer surface of diaphragm 78' to maintain a small positive pressure within the junction box section 20' relative to the ambient pressure at all times. Elements in FIG. 3 corresponding to elements of fitting 10 in FIG. 1 bear the same reference numeral as in FIG. 1 with the addition of a prime; thus the FIG. 1 diaphragm 78 is identified in FIG. 3 and 78'.

The diaphragm 78' as illustrated spans across the outer end of the cylindrical wall 76' of the junction-box section 20' and the diaphragm periphery is seated on the flange 80'. A spacer 94, having a cylindrical section 95, has a flange 96 conforming to the flange 80' and which seats over the periphery of the diaphragm to clamp it between these two flanges. The cylindrical section of the spacer extends outwardly from the flange 96 substantially in line with the axial extension of the cylindrical wall 76' for a distance sufficient to accommodate the flexing diaphragm 78' and the piston assembly 92. Further, the cylindrical section is perforated with holes 98 to allow free passage of sea water or other ambient fluid therethrough to subject the outer surface of the diaphragm 78' to the ambient pressure.

A protective cover plate 86' is seated over the spacer 94 abutting the outer end of the cylindrical section. Bolts 82' extend through the cover plate 86' and flange 96 on the spacer 94 and thread into holes in the flange 80' to clamp the cover plate in place and thereby clamp the spacer flange against the flange 80' to hold the diaphragm 78 in place.

The piston assembly 92 includes a piston 100 seated against the central portion of the diaphragm 78' and a coil spring 102 compressed between the piston and the diaphragm plate 86'. The spring acting on the piston urges the diaphragm inward with a force in addition to the force of the ambient pressure. Hence the pressure within the junction-box section 20', and to which the oil 90' there is subjected, exceeds the ambient pressure for all values of the assembly pressure, by a relatively uniform amount determined by the piston assembly 92. As noted, this assures that any leakage from the junction-box section is outward so that the ambient fluid does not enter the fitting. Further it enhances a capillary-like oozing of the oil 90' through a capillary leak provided in each connector element 16', as discussed below.

With further reference to FIG. 3, a stem 104 extends axially outwardly from the center of the piston 100 within the coil spring 102 and within a hole through the cover plate 86' to extend outward beyond the cover plate. A bushing 106 is secured to the cover plate 86' at the stem-passing hole and the stem 104 slidably moves back and forth within the bushing as the dia-

phragm flexes. This slidable seating of the stem 104 within bushing 106 aids in maintaining alignment of the piston 100. The length of the stem 104 which protrudes beyond the cover plate 86' serves as an indicator of the position of the diaphragm 78' and hence serves as indicator of the amount of oil 90' within the junction-box section 20'. Typically the cylindrical wall 76' of the junction-box section is fitted with a fill port and a bleed port (not shown) of conventional configuration for pumping the oil into the junction box section and for topping up the oil thereafter, without requiring disassembly.

The illustrated piston assembly has an enlarged base section 108 on the stem 106 along a portion of the stem length between the piston and the cover plate 86'. The shoulder at the outer end of this enlarged section 108 interfeerably abuts against the underside of the cover plate 86' when the maximum desired volume of oil 90' is pumped into the junction-box section, and otherwise serves to limit the outward flexure of the diaphragm 78'. The enlarged section further maintains relative alignment of the piston 100 with the spring 102.

As also shown in FIG. 3, each connector element 16' has a header 110, typically of metal, secured within the connector tube 112. Contact pins 114, connected at their inner ends to the conductors of the cable 72', pass through the header 110 within glass-to-metal seals 116. With this and other connector structure known in the art, each connector element 16' provides a fluid-tight seal between the interior of the junction-box section and the underwater or other environment outside it, except for an intentionally provided capillary leak. In the illustrated connector 16' this leak is provided by a bore 118 through the header 110. The bore can be formed, by way of example, by sealing a hollow pin to the header with a glass-to-metal seal identical to that used for the contact pin 114; the inner diameter of the hollow pin being selected as desired. By way of illustrative example, a fitting of the type shown in FIG. 1 and having the piston assembly 92 shown in FIG. 3, and further having eleven connector elements 16 on the junction box section, has a piston assembly 92 that maintains a positive internal pressure within the junction box section of three to five pounds per square inch in excess of the ambient pressure, and the capillary bore 118 in each connector element has a diameter in the order of 0.005 to 0.007 inch.

With a small internal positive pressure of this nature in the junction-box section and the capillary leak in each connector element, the oil 90' within the junction box section flows outward through each capillary bore at a low velocity to the interface on the connector element 16' and the mating connector element affixed to it. The oil at this interface pressure balances the connector structure. This pressure balancing enables each connector element to be constructed with thinner walls and hence have lighter weight than otherwise, thereby adding to the light weight characteristic of the pressure-compensated junction-box section which the invention provides. It should be noted that in use the outer end of each connector element 16' is either closed with a cap or closed by mating with another connector element. Thus oil 90' leaks out through each bore 118 only until it fills the small closed volume at the outer end of the connector element.

It will thus be seen that the invention attains the objects set forth above, among those made apparent from

the preceding description. Since certain changes may be made in the above construction without departing from the scope of this invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative rather than in a limiting sense.

It is also to be understood that the following claims are intended to cover all the generic and specific features of the invention herein described, and all statements of the scope of the invention, which as a matter of language, might be said to fall therebetween.

Having described the invention, what is claimed as new and secured by letters patent is:

1. A hull-penetrating marine electrical connector comprising

A. a wall forming a chamber having an opening and carrying a diaphragm element movable to diminish the pressure differential across it,

B. at least one electrical connector element passing through said wall for connection to a mating connector element outside a chamber,

C. A connector body carrying first electrical connection conductors connected at one end thereof and within said chamber to said connector element,

D. A hull-penetrator

1. having an outer end for connectably receiving said connector body,

2. having hull-penetrating tubing means extending from said outer end to an inner end and for passing within a hull hole, and

3. having a pressure-barrier sealingly spanning said tubing means intermediate said inner and outer ends thereof,

E. second electrical connection conductors passing through said pressure-barrier with pressure-tight seals and connectably engaged with said first connection conductors when said connector body is assembled with said penetrator, so that said interconnected connection conductors provide electrical paths from adjacent said penetrator inner end to said connector element,

F. means securing said penetrator to said opening of said chamber-forming wall and thereby sealing said opening, and

G. electrically insulating and substantially incompressible fluid filling said chamber.

2. A connector as defined in claim 1 in which said penetrator is secured to said chamber-forming wall with said connector body disposed within said chamber opening for feeding said first conductors to said connector element by way of said chamber opening.

3. A connector as defined in claim 1 in which said penetrator has a recess therein intermediate said outer end and said pressure-barrier and sealed closed by said connector body connectably received at said penetrator outer end, so that said recess provides a fluid-tight further chamber between said outer end of said penetrator and said pressure-barrier.

4. A connector as defined in claim 3 further comprising plugable electrical connection means disposed in said penetrator recess for electrically interconnecting said first connection conductors with said second connection conductors.

5. A connector as defined in claim 1 in which said penetrator further has a shoulder extending outwardly peripherally about said tubing means for abutting engagement with the outer side of the hull about the seal-

ing therethrough, and has sealing means for engaging the hull and sealing the hull-penetrator junction closed against fluid passage.

6. A connector as defined in claim 1

A. in which said means for securing said penetrator to said chamber-forming wall includes a flange on said penetrator adjacent said outer end thereof, and

B. said penetrator has a tubular recess disposed radially inward from said flange and for seating said connector body connectably received onto said penetrator.

7. A connector as defined in claim 1 in which said chamber-forming wall is tubular and forms said chamber with a tubular shape with said diaphragm element at one end thereof and said opening at the opposite end thereof.

8. A connector as defined in claim 1 in which said penetrator has a tubular recess at said outer end thereof for connectably receiving said connector body seated in said recess with tubular sidewalls of said recess sealingly engaged with said connector body.

9. A connector as defined in claim 1 further comprising liquid-pervious cover means secured to said chamber-forming wall and overlaying said diaphragm element for protecting said diaphragm element from damaging physical abuse from without said chamber.

10. A connector as defined in claim 1 further comprising pressure-biasing means for maintaining a selected pressure differential between the interior of said chamber and the environmental fluid outside said chamber-forming wall.

11. A connector as defined in claim 10 in which said biasing means acts on said diaphragm element to maintain said pressure differential.

12. A connector as defined in claim 1 in which

A. said connector element has means forming a fluid-passing aperture therein between the interior of said chamber and the exterior of said chamber-forming wall, and

B. said chamber is fluid-tight except for said connector element aperture.

13. A connector as defined in claim 1

A. in which said connector element has means forming a fluid-passing aperture between the interior of said chamber and the exterior of said chamber-forming wall,

B. in which said chamber is fluid-tight except for said connector element aperture, and

C. further comprising means for maintaining a selected positive pressure within said chamber relative to the ambient pressure outside said chamber-forming wall.

14. An electrical feed-through connector comprising

A. tubular mounting means extending along an axis between inner and outer ends thereof and for mounting to a vessel wall to disposed said inner end in communication with a low pressure side of said wall and with a pressure-tight seal therewith and to dispose said outer end in communication with a high member of said wall,

B. a bulkhead member closing said mounting means

between said ends thereof,

C. a junction-box having fluid-tight walls and an opening into the interior thereof,

d. a diaphragm element in said junction-box walls deflectable in response to a selected pressure differential across said walls,

E. fluid-tight means securing said junction-box adjacent the periphery of said opening to said mounting means adjacent the outer end thereof and providing a passage for electrical conductors between the outer side of said bulkhead member to said junction-box opening,

F. plug means closing said passage and forming with said junction-box a fluid-tight chamber within said junction-box,

G. an electrically insulating liquid substantially filling said chamber within said junction-box,

H. at least one electrical connector element passing through said junction-box with a fluid-tight seal therewith, and

I. electrical conductor means connected at one end and within said junction-box to said connector element and passing through said plug means with a fluid-tight seal and through said bulkhead member with pressure-tight seal to at least adjacent said inner end of said mounting means.

15. A high pressure electrical feed-through fitting comprising

A. a wall forming a fluid-tight chamber having an opening, and carrying a diaphragm element movable to reduce selectively the pressure differential across it,

B. at least one electrical connector element passing through said wall with a fluid-tight seal for connection to a mating connector element outside said chamber,

C. a connector body carrying first electrical connection conductors connected at one end thereof and within said chamber to said connector element,

D. a hull mount

1. having an outer end for connectably receiving said connector body,

2. having hull-mounting means extending from said outer end to an inner end and for securing to said hull with a pressure-tight connection, and

3. having a pressure-barrier sealingly spanning thereacross intermediate said inner and outer ends thereof,

E. second electrical connection conductors passing through said pressure-barrier with pressure-tight seals and connectably engaged with said first connection conductors when said connector body is assembled with said hull mount, so that said interconnected connection conductors provide electrical paths from adjacent said penetrator inner end to said connector elements,

F. means securing said hull mount to said opening of said chamber-forming wall and thereby sealing said opening, and

G. electrically insulating and substantially incompressible fluid filling said chamber.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,750,088 Dated July 31, 1973

Inventor(s) Albert G. Berian

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Abstract, line 10, "sectin" should be --section--.

Column 3, line 52, "function" should be --junction--.

Column 6, line 48, "disphragm" should be --cover--.

Column 6, line 53, "assembly" should be --ambient--.

Column 7, line 15, after "86' " insert -- . --.

Column 8, line 21, after "outside", change "a" to --said--.

Column 8, line 36, "connectiably" should be --connectably--.

Column 8, line 68, "seal-" should be --hole--.

Column 9, line 1, delete "ing".

Column 9, line 31, "environemental" should be

--environmental--.

Column 9, line 54, "feed-though" should be --feed-through--.

Column 9, line 57, "disposed" should be --dispose--.

Column 9, line 61, delete "member" and insert --pressure
side--.

Column 10, line 4, "d." should be --D.--.

Signed and sealed this 27th day of August 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

UNITED STATES PATENT OFFICE
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