

[54] **ELECTRICAL CONNECTOR**

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339/188 C, 339/218 M

[51] Int. Cl. **H01r 13/54**

[58] Field of Search 339/90, 94, 186, 187, 188,
339/189, 218

[56] **References Cited**

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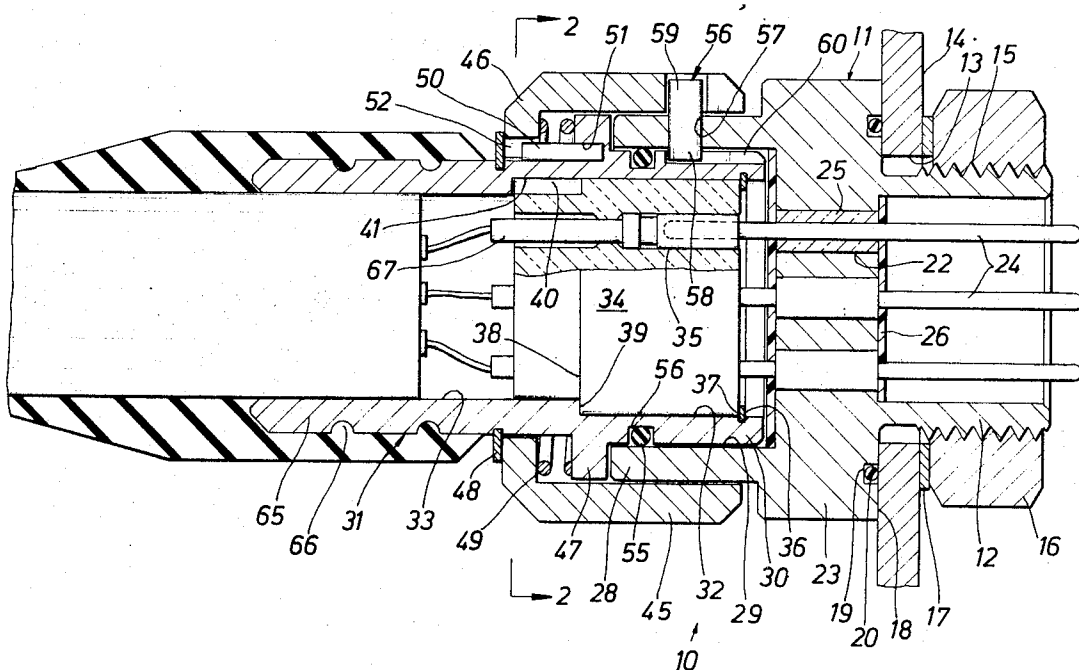
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[57] **ABSTRACT**

In accordance with an illustrative embodiment of this invention, an electrical connector of the bulkhead type includes a receptacle body adapted to be fixed to a bulkhead and carrying pin contacts with glass seal insulation, a connector body carrying the pin sockets and having an annular end section that sealingly fits within a companion end section of the receptacle body, a locator pin extending radially through the wall of the receptacle body end section so that an inward portion thereof fits within an external groove of the connector body end section to rotationally align the pins and sockets, and a locking sleeve rotatably mounted on the connector body and having a bayonet slot that engages the outward portion of the locator pin to couple the receptacle and connector bodies together.

13 Claims, 3 Drawing Figures



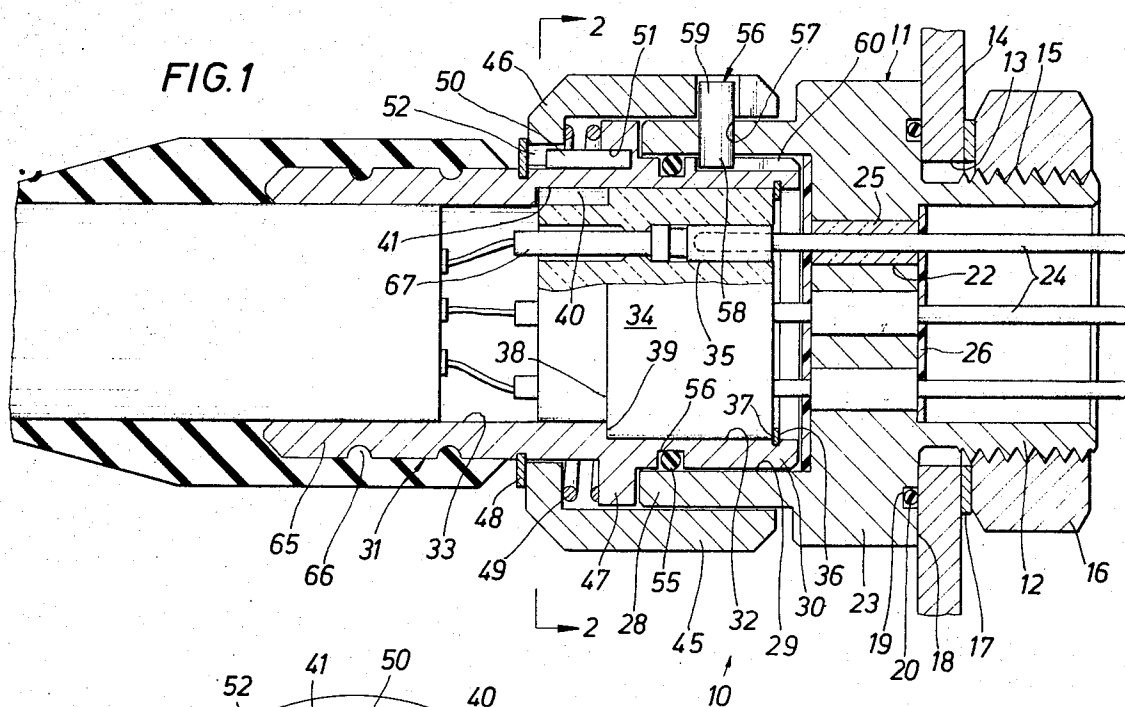


FIG. 1

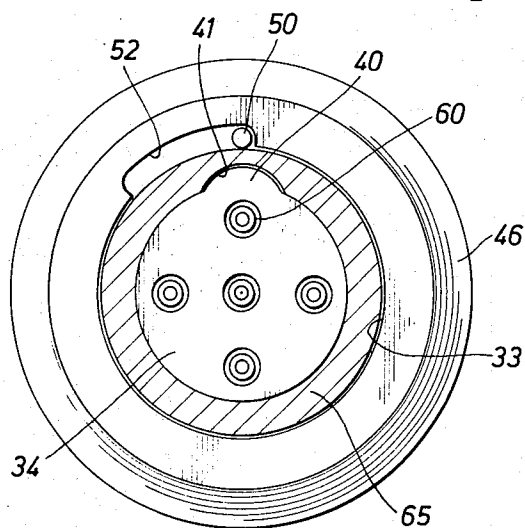


FIG. 2

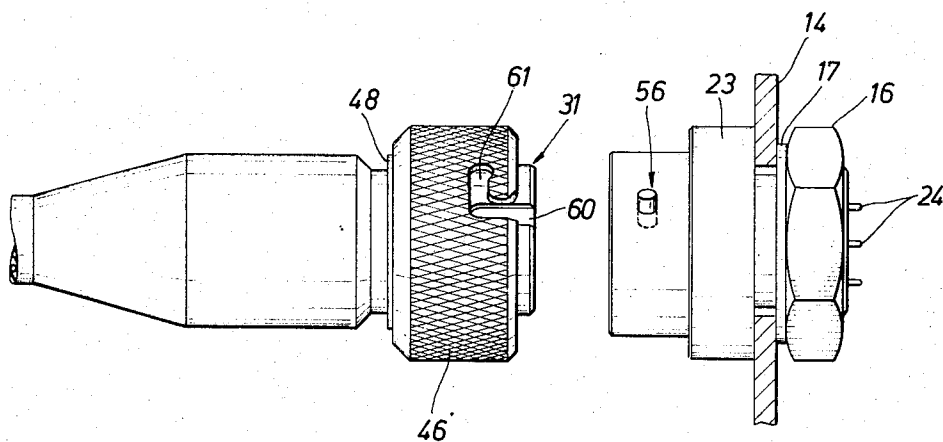


FIG.3

ELECTRICAL CONNECTOR

This invention relates generally to electrical connectors, and more particularly to a bulkhead connector having a new and improved pin and socket alignment and quick connect and disconnect coupling mechanism.

For bulkhead connectors it is desirable to provide electrical connections between a hostile environment such as high pressure sea water and a protected environment behind the bulkhead. Thus the receptacle which is attached to the bulkhead must be adequately sealed to prevent leakage. Moreover, the contact region for the pins and socket should be sealed off to protect the parts from corrosion damage and electrical shorting due to water entry. There is a further need in this type of device for a simple, reliable and foolproof mechanism for aligning the pins in the receptacle for engagement in the sockets in the mating connector so that the parts can be mated with maximum dispatch, together with a coupling to lock the parts together against inadvertent departure. Although a number of prior art mechanisms exist for this purpose, there is a need for a reliable foolproof structure which is also simple and requires a minimum number of parts for economy in manufacture.

It is an object of this invention to provide a new and improved connector of the bulkhead type which when made up is sealed off with respect to the outside environment, and incorporates a unique pin alignment and connector coupling mechanism which satisfies the need existing in the prior art.

This and other objects are attained in accordance with the concepts of the present invention through the provision of a receptacle body adapted for leak proof attachment to a bulkhead or the like and carrying pin contacts which are sealed and insulated from the body by glass cylinders. The receptacle body has an outer annular end section into which is inserted the adjacent end section of a connector body carrying the pin sockets. An O-ring seal between the end sections provides a fluid tight interfit. The end section of the receptacle body carries a radially disposed pin which extends both inwardly and outwardly thereof, and the inner portion is adapted for reception in a longitudinally extending groove in the connector end section to align the pins and sockets in the proper rotational attitude for insertion one within the other. A locking sleeve rotatably mounted on the connector body has a bayonet slot which engages the outer portion of the aligning pin so that a partial turn of the locking sleeve will serve to lock the receptacle and connector bodies together.

The invention has other objects and advantages which will become more fully apparent in connection with the following detailed description of a preferred embodiment, taken in conjunction with the appended drawing in which:

FIG. 1 is a detailed sectional side view of the electrical connector assembly;

FIG. 2 is a cross-section taken on line 2-2 of FIG. 1; and

FIG. 3 is a view in side elevation of the two halves of the connector prior to make up.

Referring initially to FIG. 1, a bulkhead connector assembly 10 in accordance with the principles of the present invention is shown in cross-sectional detail. A

receptacle body or shell 11 of generally annular configuration has a threaded section 12 sized for reception within an opening 13 in a bulkhead 14 and has external threads 15 onto which a nut 16 and a washer 17 are positioned to fix the body 11 to the bulkhead. The rearwardly facing surface 18 is provided with an encircling groove 19 containing an O-ring 20 that seals the body 11 with respect to the bulkhead. A plurality of apertures 22 are formed in the transverse section 23 of the body 11 in any one of a number of more or less symmetrical arrangements. Each aperture 22 receives a typical contact pin 24 which is electrically insulated from, and sealed with respect to, the body by a glass cylinder 25. The cylinders 25 are initially sized to provide close tolerance fits with the pins 24 and the apertures 22, and after assembly the glass is fired in an appropriate manner to cause it to flow and provide a tight seal. The front and rear faces of the transverse section 23 internally of the body are coated with a substance 26 such as silicone to provide further sealing and insulation for the pins and glass cylinders. The outer end section 28 of the body 11 has an internal bore 29 that is sized to slidably receive the end section 30 of a connector body or shell designated generally at 31.

The connector body 31 has an internal bore with stepped diameter wall surfaces 32 and 33 and has inserted therein a wafer 34 carrying a plurality of pin sockets 35, the wafer being retained by a suitable snap ring 36 that fits within a groove 37. The wafer 34 has a stepped diameter to provide a shoulder 38 which abuts a companion shoulder 39 within the body 31. To rotationally position the wafer 34 and thus the sockets 35 within the body 31, an upper portion 40 of the forward section of the wafer is formed in a bulbous fashion as shown in FIG. 2 and fits with a mating recess 41 in the body beyond the shoulder 39.

A locking sleeve 45 is rotatably mounted on the connector body 31 and has an inwardly thickened section 46 at one end which is confined for limited longitudinal movement between an outwardly directed flange 47 and a stop ring 48. A compressed coil spring 49 urges the locking sleeve 45 in a rearward direction. A stop pin 50 is fixed within a bore 51 on the flange 47 and has its free end extending within an arcuate recess 52 in the thickened section 46 of the sleeve 45, the stop pin functioning to limit rotation of the sleeve with respect to the body to an angular value such as 45° as shown in FIG. 2.

As previously mentioned, the end section 30 of the connector body 31 is slidably fitted within the end section 28 of the receptacle body 11, and an O-ring seal 55 is received within an external annular groove 56 to provide a fluid tight interfit which serves to protect the pins and sockets from corrosion damage and shorting due to water entry or the like. A locking pin 56 is force fitted or otherwise fixed within a radially directed aperture 57 in the end section 28 and has an inner portion 58 extending inwardly beyond the inner wall surface thereof and an outer portion 59 extending outwardly beyond the outer wall surface thereof. The end section 30 of the connector body 31 is provided with a longitudinally extending groove 60 which receives the inner portion 58 so that the pin and groove function to rotationally align the contact pins 24 for insertion into the sockets 35. Moreover, the outer portion 59 of the pin

56 is engaged by a bayonet slot 61 formed in the locking sleeve 45 so that the outer portion and slot function to lock the connector body 31 to the receptacle body 11 in a quick connect and disconnect fashion.

In operation, the receptacle body 11 is fixed to the bulkhead 14 by the nut 16 and the environment inside the bulkhead remain sealed off due to the O-ring 20, the glass seal insulators 25 and the silicone sheaths on the front and rear surfaces of the transverse section 23. The desired connections can be made between electrical conductors and the ends of the pin contacts 24 which preferably extend beyond the threaded fitting 12 as shown in FIGS. 1 and 3. The connector body 31 is mated with the receptacle body 11 by inserting the end section 30 within the end section 28, the sockets 35 being aligned for engagement by the pin contacts 24 by the coaction between inner portion 58 of the pin 56 and the groove 60. As the connection is made, the outer portion 59 of the pin 56 enters the bayonet slot 61, whereupon a partial turn of the locking sleeve 45 will lock the connector body to the receptacle body.

The receptacle and connector bodies 11 and 31 and the locking sleeve 45 are preferably made of a corrosion resistant material such as stainless steel, and the wafer 34 is preferably made of a hard plastic material such as diallyl phthalate. The outer end portion 65 of the connector body 31 can be provided with external annular grooves 66 to facilitate attachment by molding or the like of the outer sheath of the electrical cable having conductors connected to the ends 67 pin sockets 35 by crimping and soldering in a typical manner.

It will now be apparent that a new and improved bulkhead type electrical connector has been disclosed having a unique pin and socket alignment and connector coupling mechanism which is simple and foolproof in operation and economical to manufacture. The connector assembly is arranged such that the electrical connectors are sealed off to protect against hostile environments. It should be expressly understood that although the present invention has been disclosed in connection with a bulkhead type device, the principles of the present invention are applicable for incorporation in other types of electrical connectors.

Since certain changes or modifications may be made by those skilled in the art without departing from the inventive concepts involved, it is the aim of the appended claims to cover all such changes or modifications falling within the true spirit and scope of the present invention.

I claim:

1. An electrical connector apparatus comprising: first and second bodies, said first body having an annular end section sized to fit within an end section of said second body; locator means on the outer one of said end sections and having an inner portion extending radially inwardly thereof and an outer portion extending radially outwardly thereof; groove means in the inner one of said end sections adapted to receive said inner portion to rotationally align said bodies; and locking means on said first body cooperable with said outer portion to releasably lock said bodies together.

2. The connector apparatus of claim 1 wherein said locator means is constituted by a pin extending through the wall of said outer end section.

3. The connector apparatus of claim 2 wherein said locking means comprising a rotatably mounted sleeve having a bayonet channel to provide for locking in response to a partial turn of said sleeve.

4. The connector apparatus of claim 3 further including seal means between said end sections to provide a fluid tight interfit.

5. An electrical connector apparatus comprising: first and second bodies, said first body carrying a plurality of pin contacts and having an annular first end section surrounding said contacts; a second body carrying a plurality of pin sockets adapted to be mated with said contacts and having an annular second end section sized to fit within said first end section; a locator pin extending radially through the wall of said first end section and having an inner portion extending inwardly of the inner wall surface thereof and an outer portion extending outwardly of the outer wall surface thereof; groove means in the outer wall surface of said second end section adapted to receive said inner portion of said locator pin to rotationally align said bodies; and a locking sleeve mounted on said second body and having channel means adapted to engage said outer portion of said locator pin to lock said bodies together.

6. The connector apparatus of claim 5 further including means for insulating and for sealing said contact pins with respect to said first body, and a seal between said end sections to provide a fluid tight interfit.

7. The connector apparatus of claim 6 further including wafer means disposed within said second body for carrying said pin sockets, and means for rotationally fixing said wafer means within said second body.

8. The connector apparatus of claim 7 wherein said fixing means comprises a projection of said wafer means engaging in a companion recess in said second body.

9. An electrical connector apparatus adapted for use in bulkhead applications comprising: a first shell body having means for providing a fluid tight coupling through a bulkhead or the like, said shell body including a transverse mid-section carrying contact pins and an annular first end section surrounding said contact pins; a second shell body carrying pin sockets adapted to mate with said contact pins, said second shell body having an annular second end section sized to fit within said first end section; locator means on said first end section and having an inner portion extending radially inwardly thereof and an outer portion extending radially outwardly thereof; groove means formed longitudinally of said second end section and adapted to receive said inner portion of said locator means to rotationally align said shell bodies and thus said contact pins and said sockets for proper reception; and locking means on said second shell body having means cooperable with said outer portion of said locator means to releasably lock said shell bodies together.

10. The connector apparatus of claim 9 further including glass cylinder means for sealing and insulating said pin contacts with respect to said transverse mid-section, and seal means between said end sections to provide a fluid tight interfit.

11. The connector apparatus of claim 10 further including layers of silicone on the front and rear wall surfaces of said mid-section to provide additional sealing of said contact pins with respect to said first shell body.

12. The connector apparatus of claim 9 wherein said locator means is constituted by a pin fixed through the wall of said first end section.

13. The connector apparatus of claim 12 wherein said locking means comprises a rotatably mounted sleeve having a bayonet channel to provide for locking in response to a partial turn of said sleeve.

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