March 8, 1955 R. W. MINTO 2,703,870

ELECTRICAL CONNECTOR

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FIG. 1.

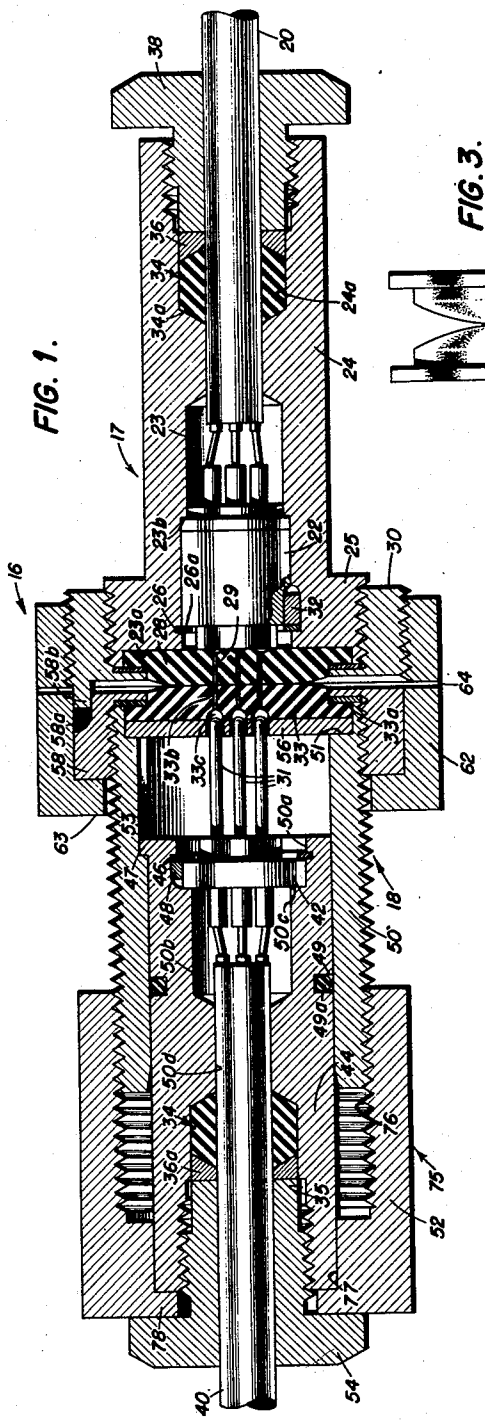


FIG. 3.

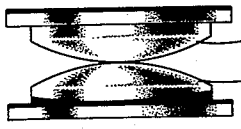
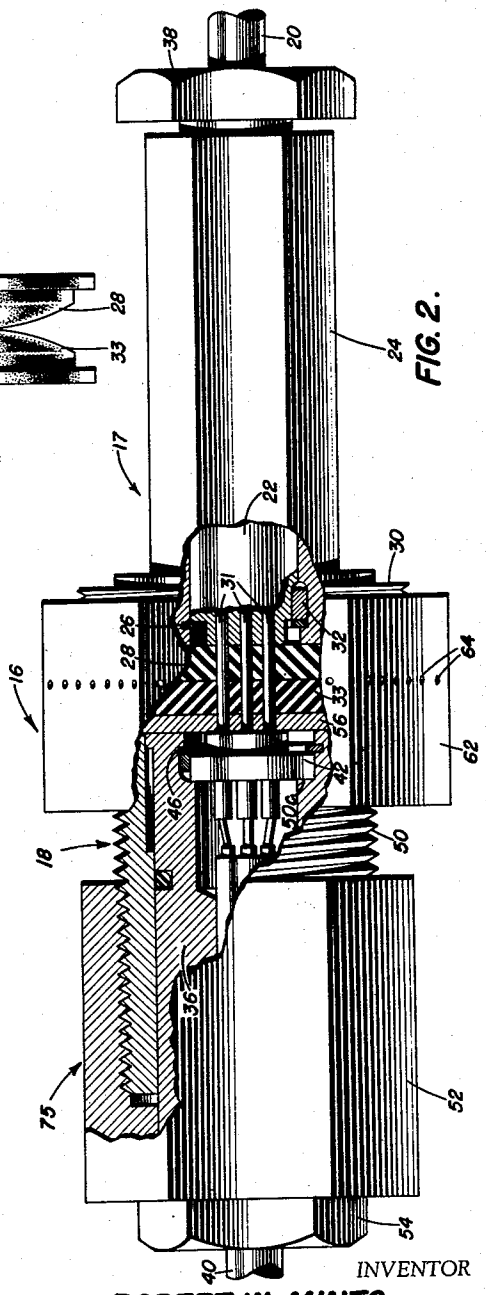


FIG. 2.



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ELECTRICAL CONNECTOR

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2 Claims. (Cl. 339—94)

The present invention relates generally to cable connecting devices, and more particularly to an improved watertight electrical connector. Prior art electrical connectors are difficult to assemble under water. Moreover, it is extremely difficult, if not impossible, to maintain a watertight seal after the parts of such a connector have been assembled.

One of the principal objects of this invention, therefore, is to provide an electrical connector which will enable electric cables to be quickly joined under water, and which will maintain said cable joint watertight.

Another object of the invention is to provide an electrical connector which will be economical to manufacture and will be reliable in operation.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description, when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a longitudinal section through the electrical connector of the present invention, particuluarly illustrating the parts in unassembled position;

Fig. 2 is a side elevation, partly in section, illustrating the connector with the parts in assembled position; and

Fig. 3 is a detail elevation showing the sealing disks employed.

In accordance with the invention, a watertight electrical connector is provided to enable electric cables to be interconnected under water, and to maintain a watertight connection for said cables. The essence of the invention resides in the use of a pair of disks of soft rubber or other suitable material, to prevent entry of water into either part of the connector prior to assembly, but to allow the passage of connecting pins in one part of the connector into a receptacle in the other part thereof after the parts have been placed in cooperative relationship.

The connecting pins are adapted to penetrate the rubber disks, through sealable orifices, in much the same manner as a hypodermic needle penetrates the rubber stopper of a serum bottle. After the connecting pins have been withdrawn from the disks, the orifices close, thus restoring the water seal to each separate part of the connector. The surfaces of the rubber disks are generally hemispherical in shape so that as said disks are pressed together during assembly of the connector, any water trapped between them will be expelled radially through apertures formed in an annularly spaced series in a coupling nut which holds the parts of the connector in assembled relationship.

Referring now to the drawings in more detail, the electrical connector which constitutes the present invention is shown generally at **16**, and comprises a pair of mating parts **17** and **18**. The parts **17** and **18** support, respectively, the end portions of cables which are to be connected together, said cables being indicated at **20** and **40**.

The cable **20** has a plurality of conductors connected to a receptacle **22** which receives connecting pins **31** of a plug **42**, as will be described in more detail hereinafter. The part **17** includes a cylindrical housing **24** having an enlarged, threaded head **25** at its inner end. The housing **24** is formed with a relatively deep cylindrical recess **23**, to receive the receptacle **22** therein, and with a relatively shallow recess **23***a*, the purpose for which will be made evident presently. The recess **23** is shouldered, as shown at **23***b*, to provide a seat for the outer end of the receptacle **22**. A key **32**, fitting in mating grooves in the recess **23** near the open end thereof and in the inner end portion of the receptacle **22**, limits said receptacle against rotation in the recess, and a retaining ring **26**, which engages in a suitable groove near the inner end of the recess **23** and bears against a shoulder **26***a* on the receptacle **22**, limits said receptacle against inward displacement.

To provide a seal for the housing **24** and the receptacle **22** a generally hemispherical soft rubber disk **28** is utilized. The disk **28** is fitted snugly in the relatively shallow recess **23***a* with its curved surface projecting inwardly, that is, away from the receptacle **22**, and is held in place in said shallow recess by a threaded retaining ring **30** which is screwed on the head **25**. Formed in the disk **28** in positions to confront the jaws of the receptacle **22** are self sealing orifices **29**.

The outer end of the housing **24** is formed with an internally threaded axial bore **24***a* which receives a packing gland **34**, said gland being constituted by a sealing ring **34***a*, a packing ring **36** and a packing nut **38**. The sealing ring **34***a* fits snugly about the cable **20** and thus provides a watertight seal therefor.

The part **18** of the improved connector includes an externally threaded shell or sleeve **50** which is formed at its inner end with a relatively shallow recess **51**. A groove **53** is provided in the inner surface of the sleeve and extends longitudinally, from the recess **51**, substantially one third the length of said sleeve. Movably mounted in the sleeve **50** is a body **44** which is limited against rotation with respect to the sleeve **50** by a tongue **47**, slidably engageable in the groove **53**. Said tongue **47** and groove **53** also cooperate to limit movement of the body **44** in the sleeve **50**. Near the mid-point of the body **44** there is provided an annular groove **49** which has mounted therein a preferably rubber sealing ring **49***a*. Thus it will be seen that the body **44** is mounted for limited longitudinal movement within the sleeve **50**, and that the ring **49***a* effectively prevents entry of water into the inner end of the sleeve **50**.

Mounted in the relatively shallow recess **51** in the end of the sleeve **50** is a preferably metal stripper plate **56** having apertures alined to receive therethrough the pins **31** of the plug **42**. Also positioned in the recess **51** is a generally hemispherical soft rubber disk **33**, similar to the disk **28**. The disk **33** is provided with a flange **33***a* and with orifices **33***b* alined with the orifices **29** and with the openings in the stripper plate **56**, said orifices **33***b* each having a guide socket **33***c*. An internally threaded retaining ring **58** holds the disk **33** and the stripper plate **56** in operative position in the recess **51**. The ring **58** is formed with a groove **58***a* to receive an orienting tongue **58***b* on the ring **30**.

The body **44** has extending from its inner end a relatively shallow axial recess **50***a* which communicates with a relatively deep recess **50***b*. The recess **50***b* is of smaller diameter than the recess **50***a*, and thus defines a shoulder **50***c*, against which is seated the rim of the plug **42**, said plug being held in place by a retaining ring **46** and being held against rotation by a key **48** which is similar to the key **32**.

The end portion of the cable **40** extends through an axial bore **50***d* and has its several conductors connected to the pins **31**. The bore **50***d* communicates with a bore **35**, similar to the bore **24***a*, which receives a packing gland **34** having a sealing ring **35***a*, a packing ring **36***a* and a packing nut **54**.

At **62** is shown a coupling nut which surrounds the ring **58** and is screwed on the ring **30**. As best seen in Fig. 1, the nut **62** is freely rotatable about the ring **58** and has a flange **63** which engages the rear end face of said ring for holding the parts **17** and **18** together. Openings **64**, arranged in an annular series about the nut **62**, permit expulsion of any water present between the parts **17** and **18** during assembly.

The numeral **75** indicates an operating nut including a relatively thin internally threaded portion **76** which is screwed on the sleeve **50**, and a relatively thick portion **77** rotatable about the outer end portion of the body **44**. At its outer end the nut **75** is formed with an internally projecting flange **78** which bears against the end wall of the body **44**, between said end wall and the packing nut **54**. It will be seen that by rotating the operating nut **75** on the sleeve **50**, the body will be shifted within said sleeve

for forcing the pins 31 of the plug 42, initially in the openings in the stripper plate 56, through the orifices 33*b* and 29 and into the jaws in the receptacle 22.

In operation, when it is desired to connect a pair of cables, such as the cables 20 and 40, the parts 17 and 18 are first moved into engagement and properly oriented with the tongue 58*b* extending into the groove 58*a*. The nut 62 is then screwed on the ring 30, when the hemispherical faces of the disks 28 and 33 will be substantially flattened by interengagement. The operating nut 75 may then be rotated on the sleeve for engaging the pins 31 in the jaws of the receptacle 22, as described hereinabove. If the connection is made with the parts 17 and 18 submerged, the disks 28 and 33 will effectively prevent the entry of water into either of said parts, and any water trapped between the parts 17 and 18 will be expelled through the openings 64.

When it is desired to separate the parts 17 and 18, the operating nut 75 is rotated for retracting the plug 42, with the pins 31 thereon within the sleeve 50. The pins will be withdrawn from the receptacle 22 and through the orifices 29 and 33*b* which orifices will automatically seal. Distortion of the disks 28 and 33 will be prevented by the action of the stripper plate 56. It will thus be seen that a cable connector has been provided which will enable a pair of electric cables to be joined under water, and to maintain a watertight joint after connection.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. An electrical connector for connecting two cables together, comprising two mating parts, one part being located on the end of each of said cables, a plug having pins thereon and located in one of said mating parts and connected to one of said cables, and a receptacle in the other of said mating parts and connected to the other of said cables, means for holding the mating parts together, and at least two self-sealing means with mating convex surfaces located between said mating parts and arranged to prevent the entrance of a fluid into either of said mating parts, said holding means having a plurality of apertures provided therein for the escaping of said fluid, said plug being movable when the connector is assembled for forcing said pins through said self-sealing means into said receptacle to form an electrical connection between said cables, said self-sealing means maintaining a fluid tight connection for said connector.

2. An electrical connector for connecting two cables together, comprising two mating parts, one part being located on the end of each of said cables, a plug having pins thereon and located in one of said mating parts and connected to one of said cables, a receptacle in the other of said mating parts and connected to the other of said cables, coupling means for holding the mating parts together, and two self-sealing rubber means with spherical surfaces, one each located on the mating faces of said mating parts and arranged to prevent the entrance of a fluid into either of said mating parts, said coupling means having a plurality of apertures provided therein for the escaping of said fluid, said plug being movable when the connector is assembled for forcing said pins through said self-sealing rubber means into said receptacle to form an electrical connection between said cables, said self-sealing means maintaining a fluid tight connection for said connector by said self-sealing means being compressed to force said fluid through said apertures.

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