Jan. 18, 1955 H. O. JONES 2,700,141

DETACHABLE UNDERWATER ELECTRICAL CONNECTOR

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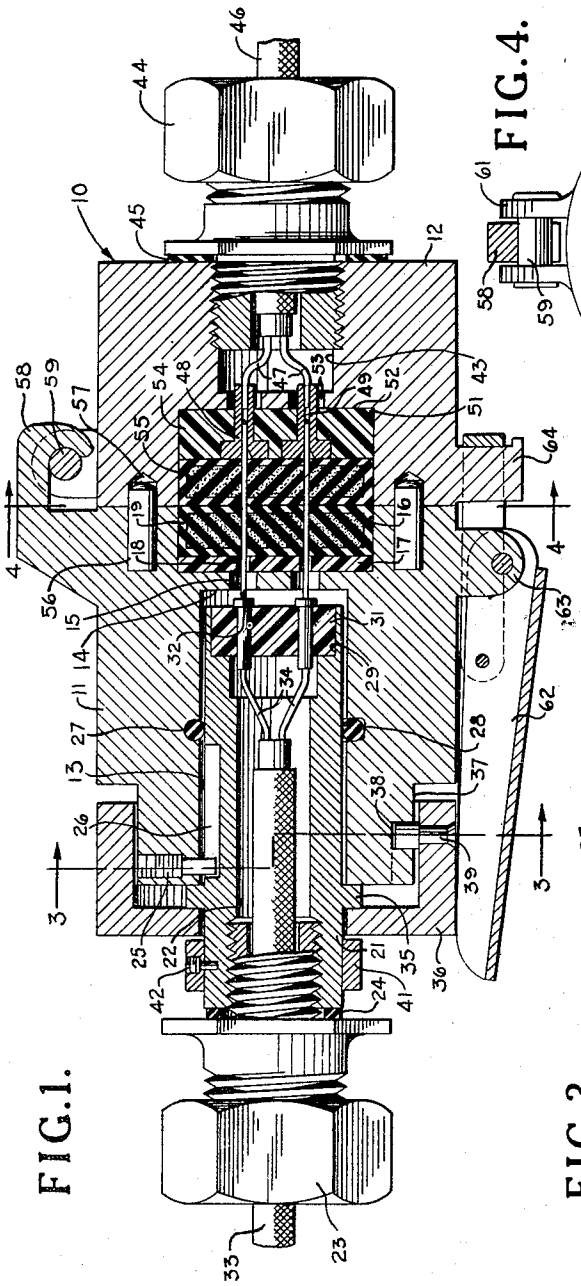


FIG. 1.

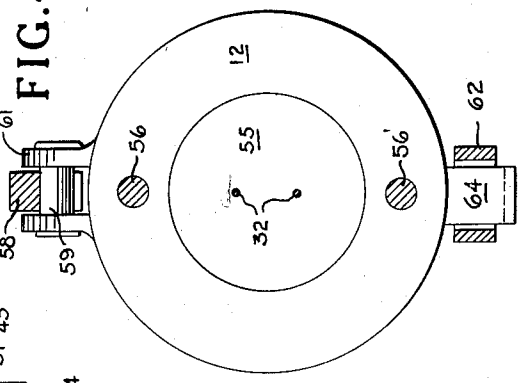


FIG. 4.

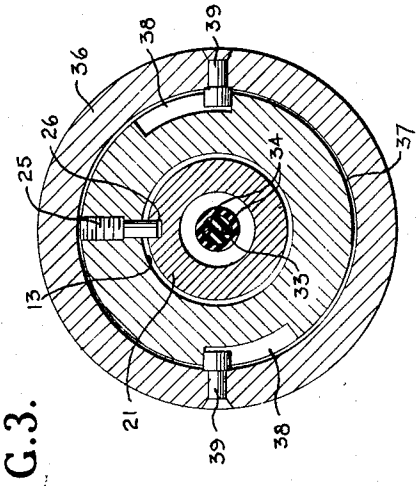


FIG. 3.

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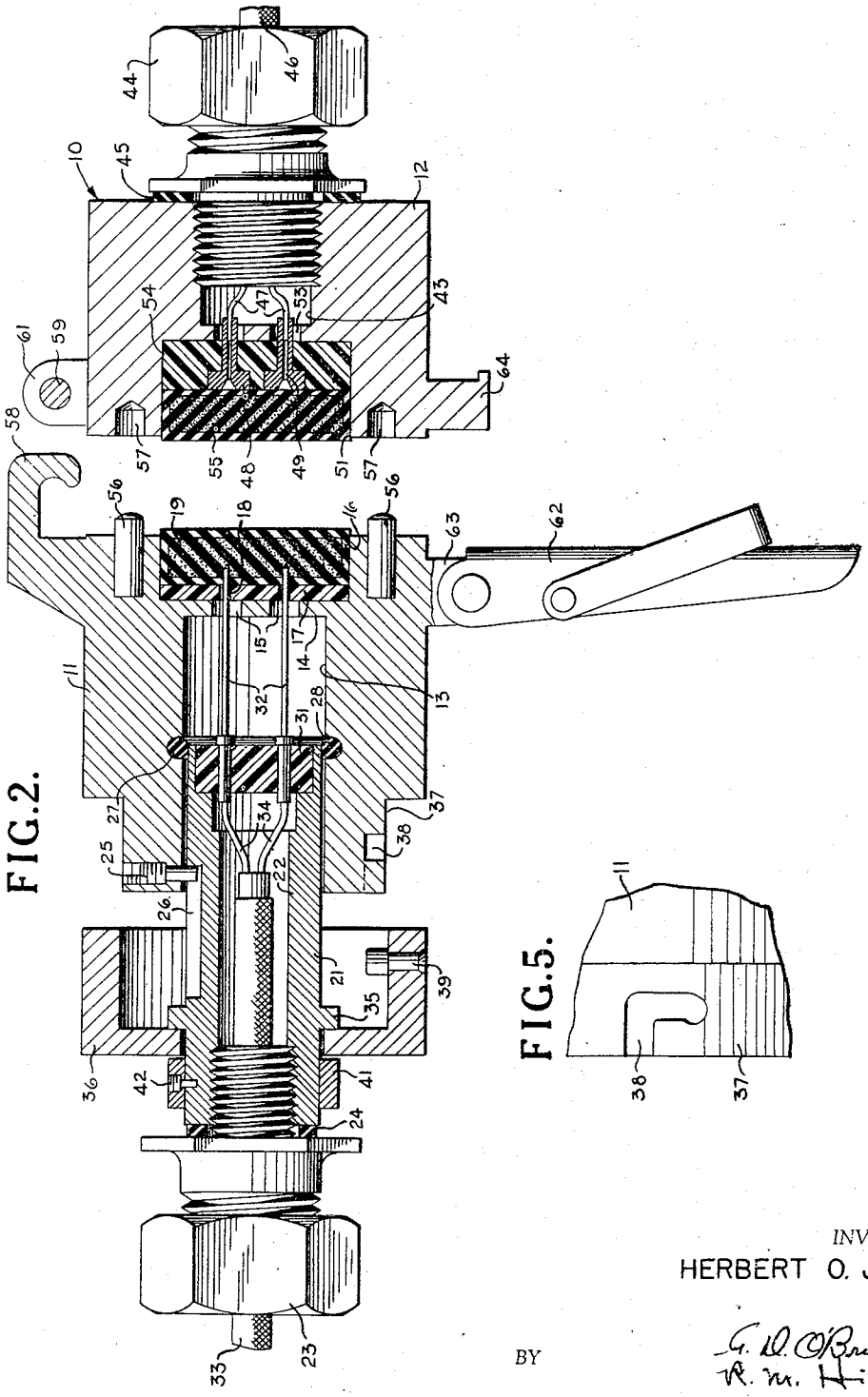


FIG.2.

FIG.5.

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DETACHABLE UNDERWATER ELECTRICAL CONNECTOR

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4 Claims. (Cl. 339—96)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be used by or for the Government of the United States for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to electrical connectors and more particularly to leakproof electrical connectors having a pair of separable members which may be connected and disconnected repeatedly under water without causing the retractable and fixed contact members thereof to be brought into contact with moisture during such operations.

Prior art devices are undesirable for underwater connection and disconnection for the reason that the contacts are not protected against moisture when the devices are disconnected, thus causing current leakage and subsequent loss of efficiency in the connections.

The present invention obviates the disadvantages of the prior art devices through the use of movable and fixed electrical contacts and puncturable discs or gaskets containing a sealing compound and mounted in adjacent faces of a pair of watertight separable members, the movable contacts puncturing and moving through the discs to make electrical connection with the fixed contacts. The movable contacts are withdrawn from the discs when the electrical connection is broken, the sealing compound closing, against the entry of moisture, the openings in the discs left by the movable contacts. The electrical contacts both movable and fixed are now completely sealed against moisture and the separable members may be separated without danger of wetting the contacts.

An object of the present invention is to provide a new and improved separable electrical connector which may be disconnected under water without having the electrical connections thereof come into contact with water.

Another object is to provide a new and improved waterproof connector for electrical circuits in which the circuit is broken and the electrical conductors sealed against the ingress of moisture prior to separating the two outer housings thereof.

A further object is to provide a waterproof connector for electrical circuits which is readily connected or disconnected under water with a minimum of time consuming operations and in which the electrical connections are protected at all times against moisture.

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 sectional view of the connector of the present invention, the separable sections being shown connected;

Fig. 2 is a view similar to Fig. 1 and showing the separable sections disconnected;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 1; and

Fig. 5 is an elevation of the reduced portion of one of the separable members and showing one of the bayonet slots formed therein.

Referring more particularly to the drawings the connector of the present invention is indicated generally at 10 and comprises a pair of separable complementary members 11 and 12. Member 11 is provided with an axial bore 13 which is closed by a wall 14 at the inner end thereof. Wall 14 is provided with a plurality of small

bores 15 opening into a larger recess 16 having mounted therein an insulating disc member 17 having a plurality of bores 18 in alignment with bores 15. Recess 16 also contains a sealing disc 19 which contains within the outer skin portion thereof any well-known sealing compound such, for example, as the unvulcanized rubber used in puncture-proof tires and inner tubes.

Slidably mounted in bore 13 is a cylinder 21 having a longitudinal bore 22 therethrough. Threaded into bore 22 at the outer end thereof is a packing gland assembly 23, a gasket 24 being interposed between the gland 23 and the cylinder 21.

A screw pin 25 is threaded through member 11 and extends into groove 26 of cylinder 21 to limit the longitudinal movement thereof. Bore 13 is provided with a circumferential groove 27 for the reception of an O ring gasket 28 which contacts cylinder 21 to prevent leakage of water between the cylinder and bore 13. Cylinder 21 has mounted in an enlarged portion 29 of bore 22 an insulating member 31 which supports a plurality of prongs 32. The prongs 32 normally extend through bores 17 and 18, through sealing disc 19 and into member 12, as will be described hereinafter. A cable 33 extends through gland 23 and bore 22 where the conductors 34 thereof are secured to the prongs 32.

Cylinder 21 is provided with a circumferential bead 35 the inner face of which normally abuts the outer face of member 11. In order to maintain cylinder 21 in fixed position as shown in Fig. 1, a cap 36 engages the outer face of bead 35 and is secured on reduced end 37 of member 11 by a pair of bayonet slots 38 formed in the end 37 and a pair of slot engaging pins 39 mounted in the cap 36. In order to prevent longitudinal motion of cap 25 with respect to cylinder 21, the cap is interposed between bead 35 and a retaining ring 41 which is secured on cylinder 21 by set screw 42.

Member 12 is provided with an axial bore 43 which threadedly receives packing gland 44, a gasket 45 being mounted between gland 44 and member 12. A cable 46 passes through gland 44 and into bore 43. A pair of conductors 47 of cable 46 are secured individually to female socket members 48 which have bores 49 for the reception of prongs 32. An enlarged recess 51 is provided in the face of member 12 which is adjacent to member 11 and is separated from bore 43 by wall 52. Wall 52 is provided with a pair of orifices 53 through which sockets 48 pass. Recess 51 receives a disc member 54 of insulating material and which supports the sockets 48. Mounted exteriorly of member 52 and in recess 51 is a sealing disc 55 similar to disc 19, discs 19 and 55 being of such size as to extend a distance outside of the respective recesses 16 and 51 so that when members 11 and 12 are brought into face adjacency the discs are compressed thus to prevent leakage around the discs. The discs may be cemented in watertight relation with the recesses. Aligning pins 56 are mounted in member 11 and extend into bores 57 in member 12 thus maintaining proper alignment of the members.

The members 11 and 12 are clamped together by means of hook 58 attached to or made integral with member 11 which hooks over pin 59 mounted in ears 61 on member 12 on one side thereof and by lever clamping device 62 pivoted on ear 63 of member 11 and which engages ear 64 of member 12 on the other side thereof.

In operation the connector of the present invention may be connected and disconnected repeatedly under water without leakage of water into the electrical connections and conductors within members 11 and 12 by reason of the self-sealing feature of the discs 19 and 55 and the particular arrangement of the mechanical parts. In order to disconnect the connector, cap 36 is removed from member 11 pulling cylinder 21 outwardly until the end of groove 26 bears against pin 25 as shown in Fig. 2 of the drawings. This action withdraws prongs 32 from sockets 48, sealing disc 55 and part-way through or, if desired, entirely through sealing disc 19. When prongs 32 are removed from discs 19 and 55, the sealing compound contained therein seals the openings through which the prongs have passed thus sealing the discs against entry of water or gases.

After a short interval to permit setting of the sealing

compound the clamping device 62 is released and the members 11 and 12 are separated.

In connecting the members 11 and 12 together, the members are clamped together by clamping device 62, hook 58 and associated parts. This operation slightly compresses discs 19 and 55 which forms an effective water seal therebetween. Cap 36 is brought into engagement with reduced portion 37, the bayonet slot and pin connection therebetween being turned to the locked position thereof. The movement of cap 36 moves cylinder 21 toward wall 14, prongs 32 moving through bores 15 and 18, through sealing discs 19 and 55, and into socket 48, thus completing the electrical connection between the two members 11 and 12. It will thus be seen that during the entire operation of connecting and disconnecting the connector 10 neither the prongs 32 nor the sockets 48 come into contact with water, the prongs 32 being withdrawn from sockets 48 and the discs 19 and 55 are sealed prior to disconnecting the members 11 and 12.

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 and desired to be secured by Letters Patent of the United States is:

1. A separable underwater connector for electrical circuits comprising, in combination, a pair of separable sections having faces adapted to abut, means for tightly clamping said sections together, each of said sections respectively having an axial bore and a recess, walls in said sections interposed between said bores and said recesses, compressible self-sealing rubber gaskets mounted in said recesses, said rubber gaskets having contained therein a rubber sealing compound, a cylindrical member slidably mounted in the axial bore of one of said sections, a ring gasket mounted within the bore of said one of said sections and engaging said cylindrical member for preventing leakage of water therebeyond, a plurality of contact prongs mounted on the cylindrical member and extending from the inner end thereof, a plurality of contact sockets fixedly mounted in the other of said sections, and cooperating pin means on the one and the other sections respectively for positioning said sections to align said prongs with said sockets, said prongs being adapted to puncture and pass through said gaskets to engage the sockets when the cylindrical member is moved in a direction toward the sockets and to be withdrawn from the sockets and the gaskets when the cylindrical member is moved in a direction away from the sockets, the sealing compound contained within the said gaskets sealing the openings therein as the prongs are withdrawn thereby to render each of said sections continuously watertight.

2. A connector for underwater operation comprising, in combination, a pair of separable casings for said connector, mutually aligned recesses formed in abutting faces of said casings, rubber discs set in watertight relation in each of said recesses, said discs being of slightly greater thickness than the depth of said recesses, said discs having contained therein a rubber sealing compound, a plurality of prong members slidably mounted in one of said casings, means within said one casing for limiting the extent of movement of said prong members, and a plurality of female sockets fixedly mounted in the other of said casings for receiving said prong members, said plurality of prongs having sufficient length to extend through said discs and into said sockets when the casings are in abutting relation and the electrical connection is made, said prongs being withdrawable from said sockets through both said disks while said casings are maintained in abutting relation, the openings left in the discs when said prongs are withdrawn being sealed by said sealing compound thereby to render both said separable casings watertight and the prongs and sockets contained therein dry.

3. A connector for underwater connection and disconnection comprising, in combination, a pair of separable members for said connector and having faces adapted to abut, means for clamping said members together at the abutting faces thereof, each of said members having a recess formed in the abutting face thereof, a self-sealing gasket mounted in each of said recesses to prevent entry of water therein, longitudinally slidable contact means mounted in one of said members and adapted to puncture said gaskets, said one member having means for limiting the extent of the sliding of said contact means, fixed contact means mounted in the other of said members and adapted to receive said slidable contact means after the gaskets have been punctured, and means for withdrawing said slidable means from said fixed means and from said gaskets to permit both said gaskets to close and to seal the openings left by said slidable contact means as the slidable means is withdrawn thereby to maintain said contact means dry.

4. Sealing apparatus for an underwater connector comprising, in combination, a pair of watertight members, means for separably fastening said members together, movable contact means mounted within one of said members, means within said one member for limiting the extent of movement of said movable contact means, fixed contact means mounted within the other of said members, and puncturable self-sealing discs mounted in adjacent faces of said members and between said fixed and movable means, said movable means being adapted to puncture said discs to engage said fixed means and to be withdrawn from engagement with said fixed means and from one of said discs and at least through the surface of said other disc to a position within said one of said members, said discs by reason of the self-sealing maintaining at all times both said members watertight and the movable and fixed contact means dry.

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