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WATERPROOF ELECTRICAL CONNECTOR ADAPTER

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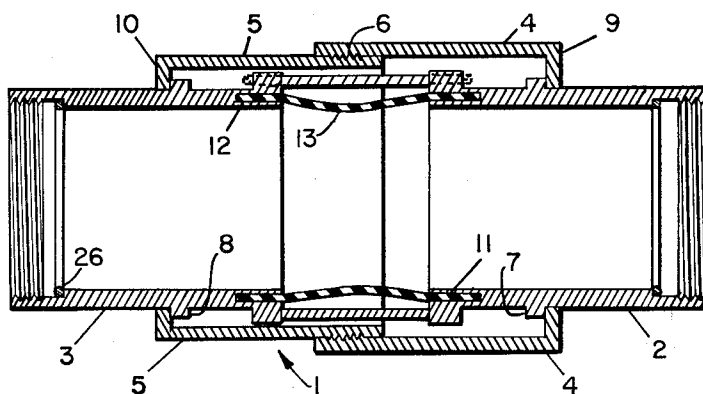


FIGURE 1

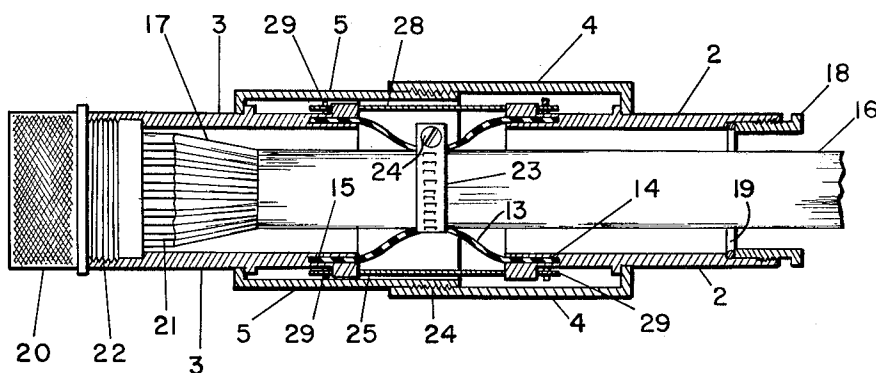


FIGURE 2

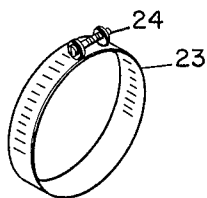


FIGURE 3

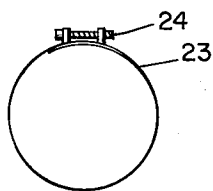


FIGURE 4

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3,096,134 WATERPROOF ELECTRICAL CONNECTOR ADAPTER

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This invention relates to electrical coupling devices and more particularly to a connector adapter incorporating an automatic seal member with a continuously adjustable cable clamp to permit the use of the connector adapter in presence of aqueous atmospheres without the danger of moisture or deleterious vapors coming in contact with the cable terminations enclosed therein to impair the operation of the cables in electrical circuits.

There have been many developments in the art of electrical connector adapters and, broadly speaking, there have been many forms of cable connectors, splicers, and quick disconnects. However, these devices have not fully met the requirements of a leakproof cable connector adapter which can be used under water in areas of high humidity, or in fluids in general, without such media affecting the electrical properties of the cable terminations and the transmission currents, and also the service life of the connector. The present invention is a result of development work in the rather specialized field of electrical connector adapters or quick disconnect types of such connectors used in programmed rocketry and missile technology, wherein such connectors will be subject to various types of fluid or humid environments.

It is an object of this invention to provide a casing having therein a tubular resilient means extended circumferentially at both ends and sealed in metal coupling rings; said means being compressed at its midsection because of the extended states of its terminal portions to form a self-sealing section around a cable extending therethrough for attachment to said casing.

A further object of the invention is to provide a means by which a cable is held firmly within the connector without the danger of harmful pressure on said cable, to eliminate a cause of possible distortion of the conductor strands therein, which would produce an undesirable short circuit or an impairment in the impedance of the cable conductors carrying current therethrough.

Another object of the invention is to provide peripheral grooves in oppositely positioned coupling rings of a cable connector adapter, in which grooves the ends of a sealing tubing are intimately bonded, thereby rendering the cable connector adapter leakproof against water, vapor, or any other fluid atmosphere.

A still further object of the invention is to provide a moisture-proof electrical cable connector adapter in which an adjustable clamp is disposed peripherally of a sealing tubing to prevent any sliding of cables disposed within the tubing and to permit any size of cable or group of cables smaller than the internal diameter of the tube to be accommodated in said electrical connector adapter.

The novel features characteristic of this invention are set forth with particularity in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment, taken together with the accompanying drawing, in which:

FIG. 1 is a cross-sectional view of the waterproof electrical connector adapter, showing details of the housing and its component parts;

FIG. 2 is the cross-sectional view of the waterproof electrical connector adapter in normal use with a cable passing therethrough and showing the details of the seal-

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ing tubing, its terminal connections to the connector, and the adjustable clamp positioned in place around said tubing;

FIG. 3 is one form of the adjustable clamp, part of the connector adapter; and

FIG. 4 is another form of the adjustable clamp, part of the connector adapter.

Referring now to the drawing, FIG. 1 illustrates the connector adapter casing or housing body 1 comprising collars 2 and 3 held together by annular sleeves 4 and 5 telescopically secured to each other by screw-thread engagement 6 formed correspondingly in each of the sleeves 4 and 5. Collar 2 is provided, on its periphery, with an annular shoulder 7, and collar 3 is provided similarly with an annular shoulder 8, so that the two collars 2 and 3 can be moved toward each other to an operational position by internal flanges 9 and 10 of the respective sleeves 4 and 5 when said sleeves are screwed together. Threaded support posts 28 and limiting nuts 29 hold the respective halves separated. Each of the collars 2, 3 contains an annular groove at its terminal portion facing one another; a groove 11 is provided at the terminal portion of collar 2 and a groove 12 is similarly provided at collar 3. This arrangement represents the assembled position of the connector with no cable therein.

Prior to mounting the connector to the terminal end of a cable, a resilient tubular member 13 is secured to the two collars 2, 3, illustrated in FIG. 2, as follows:

A short length of undersize rubber tubing 13 is stretched diagonally at both ends 14, 15; end 14, for example, has had a bonding material applied thereto, such as rubber cement or the like; it is then inserted into the groove 11, wherein it is permanently sealed; the other end 15 has also had applied thereto said bonding material and is inserted into groove 12 and sealed therein. The diameters of the grooves 11 and 12 being larger than that of the tubing, the bonded portions of the tubing are expanded and make a tight fit in the grooves. Both ends thus being stretched, the midsection of tubing 13 is constricted to a diameter considerably smaller than the terminal portions 14, 15. This arrangement of the tubing 13 provides an effective seal around a cable passing therethrough for connection to the receptacle portion of the casing. This condition is illustrated in FIG. 2.

In normal application, the connector is used as a terminal connection of a cable 16 containing a plurality of insulated current-carrying conductors 17, and is attached to cable 16 in the manner illustrated in FIG. 2. Cable 16 is first inserted through the centering nut 18, flat washer 19, which also serves as a centering means, collar 2, and tubing 13, and is extended to the terminal end of collar 3 adjacent to receptacle 20, which is provided with solder wells 21 to which the individual conductors 17 of cable 16 are secured as by soldering or attachment by some other suitable method. Receptacle 20 and collar 3 are correspondingly provided with screw threads 22 so that they can be engaged together to complete the connector assembly.

After receptacle 20 is screwed firmly on collar 3, the sleeves 4 and 5 are pulled apart by unscrewing one from the other so as to expose the adjustable clamp 23. Screw 24 on adjustable clamp 23 is then tightened with a screwdriver so that tubing 13 is hermetically sealed to cable 16. Sleeves 4 and 5 are brought together and screwed tightly to each other at their corresponding screw engagements 24. Several threaded support posts 25 spaced around the assembly hold the sleeves 4 and 5 in spaced relation to each other. For balance and uniformity, a similar support post 28 on the opposite side of the assembly is also provided. Nuts 29 hold posts 25 and 28 in place. Now the centering nut 18 is screwed to collar

2 with the flat centering washer 19 therebetween. An O-ring 26 may be inserted, when desired, between receptacle 20 and collar 3, to make a hermetic seal at the receptacle end. This arrangement firmly holds connector 1 and cable 13 together, and in addition, renders the connector leakproof so that it can be employed in fluid environments without the danger of short-circuiting the cable conductors or changing the impedance values thereof in any manner.

From the foregoing description, it will be evident that the invention herein disclosed provides a simple but very effective connector embodiment which is adapted to hold a multi-conductor cable firmly in place and to effect a leakproof seal, which may be easily released when desired. The cable is firmly held in position by means of a resilient tubing and an adjustable clamp by firm pressure on the cable which holds it tightly therein without undue risk of modifying the impedance of the connectors therein, or damaging any part of the cable. It will be understood, however, that the embodiment shown in the drawing is only illustrative, and changes or modifications may be made to the various structures thereof without departing from the spirit and scope of the invention hereinbefore described and claimed below.

I claim:

1. A waterproof electrical connector comprising a tubular casing incorporating two detachable halves held together by means of annular sleeves disposed thereupon and having screw engagements for fastening said halves one to the other; an electrical receptacle means having a plurality of solder wells therein secured to one end of said casing; and a cable provided with a plurality of insulated conductors therein passing through said casing, said conductors being attached to said solder wells to

form an electrical outlet plug; and a tubular resilient member with its ends circumferentially stretched and sealed to said halves of said casing, forming a constricted portion at its midsection, said constricted portion of said tubular member hermetically gripping the cable passing therethrough to form a leakproof seal between said cable and said casing so as to permit said casing to be employed in a fluid atmosphere.

2. A waterproof electrical connector comprising a tubular casing made of two detachable halves held together by annular sleeves disposed thereupon and having screw engagement portions for fastening said sleeves to one another; electrical receptacle means having a plurality of solder wells therein being secured to one end of said casing; and an electrical cable having a plurality of insulated conductors therein passing through said casing, said conductors being attached to said solder wells to form an electrical connector; a tubular means within said casing and surrounding said cable being secured to the detachable halves of said casing to form a constricted portion at its midsection, thereby to grip said cable tightly in said casing; an adjustable clamp disposed around said constricted portion of said tubular means to firmly hold said tubular means and said cable together; and a holding means at the end of said casing opposite to said receptacle to maintain said cable in spaced relation to said casing and form a hermetic seal thereon, whereby said electrical connector may be used in a fluid atmosphere.

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