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ARC TIGHT CABLE CONNECTOR

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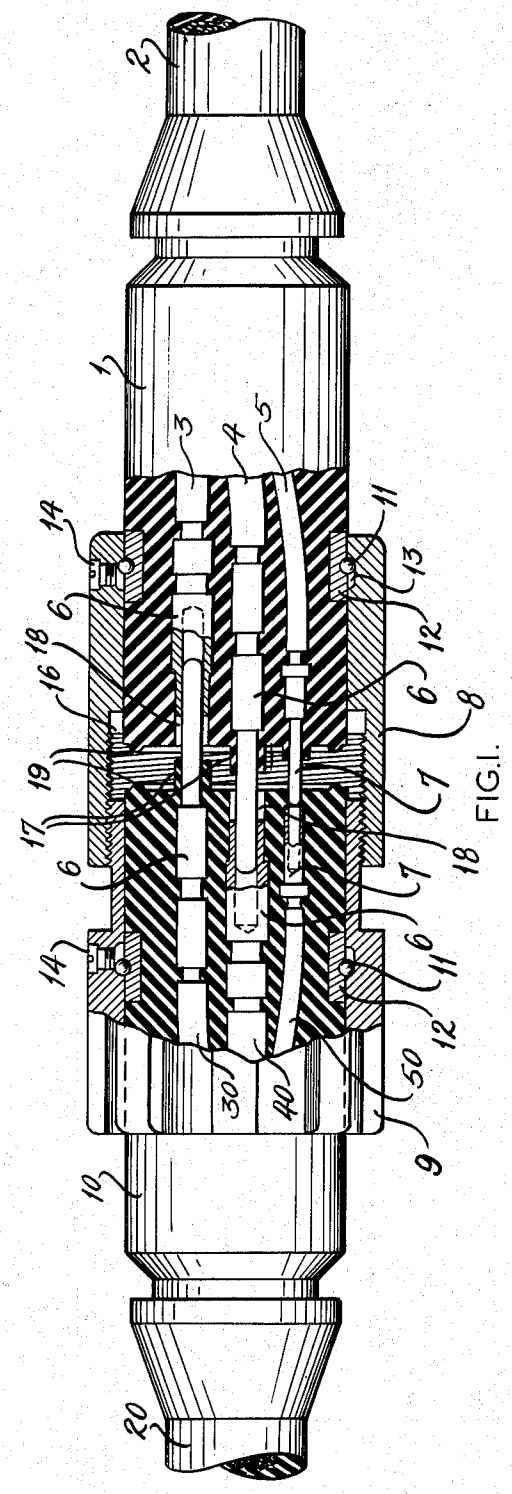


FIG. 1.

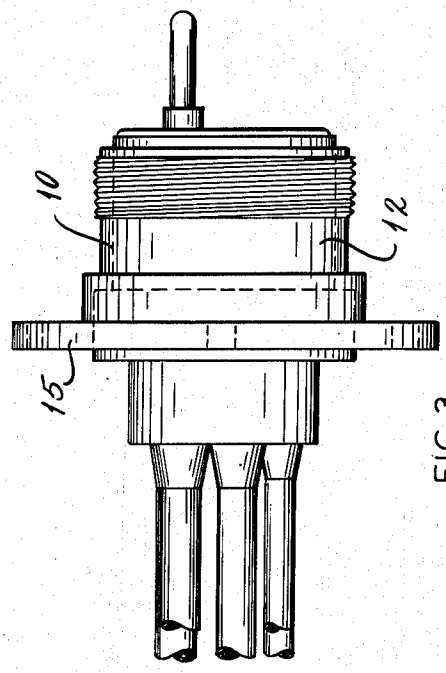


FIG. 3.

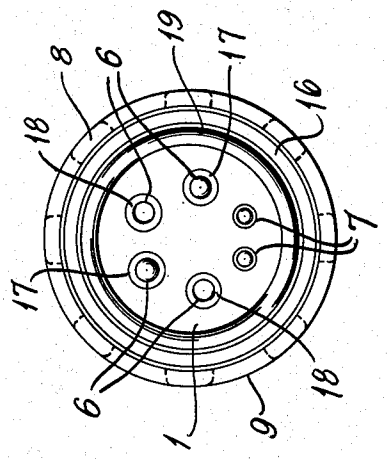


FIG. 2.

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ARC TIGHT CABLE CONNECTOR

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2 Claims. (Cl. 173—328)

1

This invention pertains to electrical connectors of the plug-socket type such as may be used as cable connectors for electrically and mechanically connecting different lengths of cable to each other or by which such a length of cable may be connected to a stationary connector such as may be provided at the source of power supply or on a machine.

One of the objects of this invention is to provide a connector of this type which may be used safely in locations where an explosion hazard exists as, for instance, where the atmosphere contains a mixture of air and an inflammable gas. Such hazards are frequent in mines and similar locations.

Another object is to provide such a connector in which the contacts are housed in an enclosure adapted to separate them from the ambient atmosphere at the time when any live circuit in the connector is made or broken.

Further objects will appear from the following description, in which an illustrative embodiment of the invention will be set forth. It is understood, however, that the invention is susceptible of various embodiments within the scope of the appended claims, without departing from the principles or the spirit of the invention.

In the accompanying drawings Figure 1 is a view, partly in section, of a complementary pair of connectors embodying this invention. Figure 2 is an end view of the right hand or plug connector shown in Figure 1, and Figure 3 is a view illustrating the manner in which a stationary connector may be mounted.

Since in most connectors of this type one member of a pair will be provided with plugs and the other with sockets and since the construction and functioning of both of these is the same except for this difference in the contacts, the term connector will be used hereinafter to designate a connector of either type or one which, as in some cases, contains both plugs and sockets.

Referring now to the accompanying drawings, 1 designates the body of the connector. This may be of any suitable insulating material. Rubber provides a very effective material for this purpose, the contacts being molded in the rubber body in a manner well known in the art.

In the embodiment illustrated the connector and the cable 2 to which it is connected, carry not only the wires of a power circuit but also those of a control circuit for operating relays and similar devices for controlling the power circuit. In Figure 1, the wires of the power circuit, are indicated at 3 and 4. Only one of the wires of the control circuit is shown in Figure 1 indicated at 5.

In the complementary connector, the body is indicated at 10 connected to a cable 20. The power wires are indicated at 30 and 40 and the

2

control circuit wire at 50. The end of each of these conductors is equipped with a contact, all of which contacts for the power circuit being referred to by the numeral 6. These may be plugs or sockets, as the case may be. A contact for the control circuit is indicated at 7.

In the embodiment illustrated, the contacts 7 for the control circuit are so positioned with relation to the contacts 6 for the power circuit that the control circuit contacts of the complementary connectors do not engage each other until after the power circuit contacts have made contact with each other so as to close the power circuit. Accordingly, the control device which may be connected to the contacts 7 cannot operate to close the power circuit until that circuit has been closed at the contacts 6. Similarly said control devices will operate to open the power circuit before the contacts 6 are disengaged when separating the two connectors. This insures that the only make and break of a live circuit possible in connecting or disconnecting the complementary connectors takes place at the contacts 7. In order to insure that any spark generated in the opening or closing of the control circuit at the contacts 7 may not set up a fire hazard, an enclosure is provided for these contacts during the making or breaking operation. Such enclosure in the embodiment illustrated is provided by a pair of screw collars 8 and 9, one on each of the complementary connectors. These collars are arranged to be rotatable on the bodies 1 and 10 respectively. Each may be secured in place by a ball-bearing comprising a row of balls 11 arranged to run in a groove in a metal collar 12 providing a ball race for the bearing. A similar groove 13 in the outer collar provides the outer race for the bearing. The outer groove 13 may be made wider than the balls so as to permit a certain amount of endwise movement of the collar 8 or 9 relative to the body. The collars 12 may be molded in the body of the connector or, as is sometimes preferable, a groove to receive the collar is molded in the body and the collar being split into two halves is assembled in the groove. The outer collar 8 or 9 is then slipped over the collar 12 to hold the latter in place. The balls 11 may then be inserted by a suitable opening in the outer collar closed by a plug 14 in any suitable manner.

Where the connector is to be mounted on a stationary mounting, the body may be formed as indicated in dotted lines in Figure 3 and the outer collar 12 formed with a suitable flange 15 adapted for mounting in any usual manner upon a suitable support.

In the operation of this connector when a circuit is to be extended by a section of cable 2 or 20, the contacts 6 of the two connectors are first

engaged with each other to close the power circuit. It is convenient in most cases to provide one of the connectors with all plugs, except one, and the other with all sockets except one. In the arrangement shown in Figure 2 a four wire power circuit is indicated having three plugs and one socket. A two-wire control circuit having two plugs 7 is also indicated. Having one of the contacts of the type complementary to the others, serves to identify the separate conductors in the connector and the attached cable so as to insure that the desired polarities are maintained throughout the circuit, or, as in three-phase circuits, the same direction of rotation of connected motors may be maintained. In the four wire arrangement of Figure 2 the socket may identify a ground wire. Thus, there is only one way in which the contacts may be put together and, accordingly, it is impossible to interchange the wires of the circuit. The arrangement of the wide groove 13 permits the collars 8 and 9 to be retracted relatively to the contacts so that the latter may be guided visually to their proper relation when the initial engagement of the power contacts is made. When the power contacts of the two complementary connectors have been engaged, the collars may be slipped toward each other and are then in position for engagement of their threads. The wide groove 13 now also provides extra travel for the collars relative to the contacts so that a considerable number of threads may be engaged before the contacts 7 are ready to make the control circuit. This, therefore, provides a space 16 within the enclosure provided by the two collars 8 and 9 which is entirely separated by those collars from the ambient atmosphere. This space is relatively small so that if it should contain an explosive mixture, the ignition of such mixture by a spark at the contacts 7 would cause no hazard as the explosion of such a minute quantity of the mixture would easily be contained and smothered within the enclosure 16 and the threaded engagement of the collars 8 and 9 renders the enclosure secure against being opened by any pressure developed by such an explosion.

Once the control contacts have been engaged and the threads of the collars started in engagement with each other, said collars may be screwed up toward each other, thereby drawing the bodies 1 and 10 together and forcing the contacts 6 into full engagement with each other. The bodies 1 and 10 may be provided with upstanding collars 17 of the body material, such as rubber, arranged to enter complementary recesses 18 at the mating socket so as to provide a moisture seal. Similarly the bodies may be provided with circumferential beads 19, which engage each other under pressure when the collars 8 and 9 are fully screwed up, thereby providing an additional water seal.

It will be seen, therefore, that the invention accomplishes its objects in providing a connector which may handle a power circuit capable of carrying a heavy load and which will insure that in engaging or disengaging complementary connectors there is no possibility of making or breaking the power circuit under load since the control contacts insure the operation of the control devices in such manner that the power circuit is dead while its contacts are being engaged or disengaged. The invention may be applied to connectors for circuits carrying a light load in which a separate control circuit is unnecessary. In such a case, the control circuit wires 5 and 50 and their contacts 7 will be omitted. In such a case, however, the grooves 13 may be arranged to permit engagement of the threads of the collars 8 or 9 before the power contacts 6 come together so as to provide the sealed enclosure 16 at the time such contacts are engaged or disengaged. In such a case a dummy pilot plug and socket may be provided to insure proper polarity.

Having thus described the invention, what is claimed is:

1. A connector of the character described, comprising an insulating body, one or more contacts carried by said body, a screw collar on said body mounted for rotation on said body, provided on its inner surface with a wide radial race and constructed and arranged for cooperation with an externally threaded complementary connector to draw the mating contacts of the two connectors together, and positioned to provide an inclosure exteriorly of the opposing faces of said connectors to separate said contacts in circuit making and breaking position from the ambient atmosphere, and a race on said body complemental to but narrower than the race on said collar to provide, when assembled, an anti-friction bearing which permits retraction of said collar, to facilitate initial engagement of said contacts.

2. A connector of the character described comprising an insulating body provided with a circumferential groove forming a radial ball-bearing race; one or more contacts carried by said body; a screw collar on said body mounted rotatably on said body, said screw collar being provided on its inner surface with a groove forming a radial ball-bearing race complementary to the race on said body, and being constructed and arranged for cooperation with a threaded complementary connector to draw the mating contacts of the two connectors together, and positioned to provide with said complementary conector an inclosure exteriorly of the opposing faces of said connectors to separate said contacts in circuit making and breaking position from the ambient atmosphere; at least one of said complementary races being sufficiently much wider than the diameter of ball bearings in said races to provide, when assembled, an anti-friction bearing which permits retraction of said collar, to facilitate initial engagement of said contacts.

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