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ARCLESS HIGH VOLTAGE CABLE CONNECTORS

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FIG. 1.

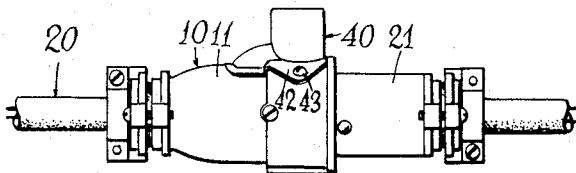


FIG. 6.

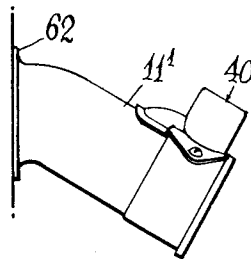


FIG. 2.

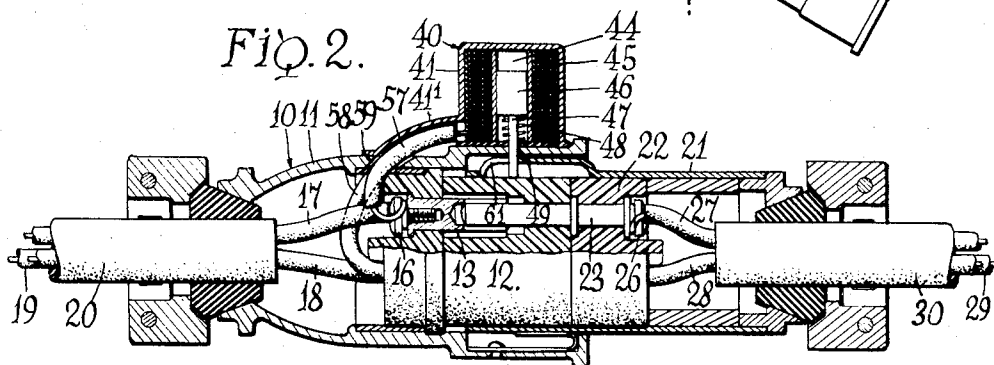


FIG. 3.

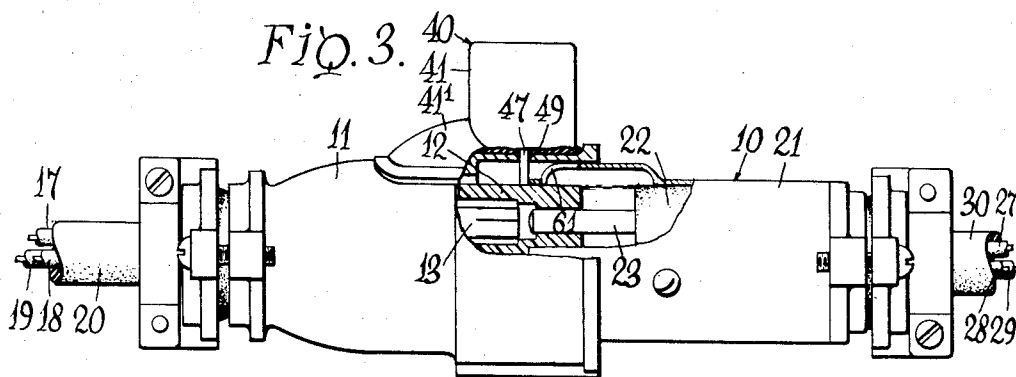
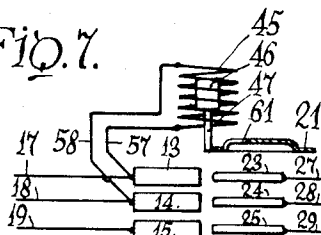
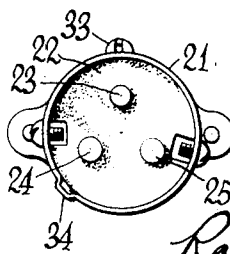
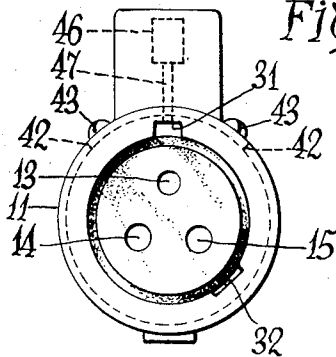


FIG. 4.

FIG. 5.

FIG. 7.



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ARCLESS HIGH VOLTAGE CABLE CONNECTORS

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6 Claims. (Cl. 317-11)

My invention relates to cable connectors and more particularly to high voltage cable connectors.

Prior cable connectors have been provided with various types of mechanical locks which while they prevent accidental disengagement of the male connector part from the female connector part they are open to the objection that they do not prevent intentional engagement and disengagement of said parts when the current is on.

The disadvantage of allowing the connector parts to be engaged and disengaged while the current is on is that, even when considerable care is exercised in engaging and disengaging such connectors there is usually some arcing between said parts, and when less care is exercised the arcing is more serious and may result in total or partial destruction of the connector and injury or shock to the person involved. Furthermore when such prior connectors are engaged and disengaged with the current on in the presence of inflammable or explosive materials any degree of arcing may cause a serious and costly fire or an explosion.

The objects of my invention are to provide an arcless high voltage cable connector which cannot be accidentally or intentionally engaged or disengaged when the current is on; to provide an arcless cable connector with a current responsive means which, when the current is on, automatically operates to prevent either engagement or disengagement of the connector parts and when the current is off, automatically operates to allow arc-free engagement and disengagement of the connector parts; and to provide a simple, inexpensive and safe current responsive means which may be readily adapted for use in combination with present and older designs of high voltage cable connectors and which will act automatically to prevent arcing between such connector parts.

In the drawing:

Figure 1 is a side elevational view of a high voltage cable connector constructed in accordance with the principles of my invention.

Figure 2 is a longitudinal sectional view of the connector shown in Figure 1 and shows how the connector parts are fully interengaged to conduct current therebetween and are prevented from being disengaged by an element of the current responsive means when the current is on.

Figure 3 is a view similar to Figure 2 but shows how the element of the current responsive means prevents full current conducting interengagement of the connector parts when the current is on.

Figure 4 is an end elevational view of the female part of the connector.

Figure 5 is an end elevational view of the male part of the connector.

Figure 6 is a side elevational view of a female connector part adapted for connection to a panel or wall, and;

Figure 7 is a wiring diagram of the connector shown. Referring now to the drawing it will be seen that my improved high voltage cable connector generally designated by the numeral 10 includes a female connector part

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11 having secured therein an insulating plug 12 rigidly carrying a plurality of spaced current conducting terminal sockets having their outer end spaced inwardly from the outer end of the plug 12. In the present instance the plug 12 carries three sockets designated 13, 14 and 15 and the inner end of the sockets are each provided with a wire attaching screw 16 by means of which the sockets are each connected respectively to one end of a common return or ground wire 17 and to the end of the current conducting wire 18 and 19 of a three wire cable 20. The other ends of the wire 17 are grounded and the other ends of the wires 18 and 19 are operatively connected to a source of current so that the current is conducted to the part 11.

The connector 10 also includes a male connector part 21 having secured therein an insulating plug 22 rigidly carrying a number of current conducting terminal pins 23, 24 and 25 equal to the number of and spaced to be engaged respectively in the sockets 13, 14 and 15. The outer ends of the pins 23, 24 and 25 extend beyond the plug 22 and their inner ends are each provided with a wire attaching screw 26 serving to secure to each pin respectively one end of a common return or ground wire 27 and one end of the current conducting wires 28 and 29 of a three wire cable 30. The other end of the wires of cable 30 are operatively connected to whatever electrical motor or apparatus that is to be electrically operated in the usual manner, so that when the male and female parts of the connector are properly engaged current from the source flows through the cable 20, the connector 10 and the cable 30 to operate said motor or apparatus.

To insure that the pins 23, 24 and 25 may be engaged only in the proper sockets 13, 14 and 15 the female part 11 may be provided with suitable spaced grooves 31 and 32 in which the tongues 33 and 34 formed on the male part 21 are engageable to properly align the pins for engagement in their sockets.

It will be apparent that the male and female parts of the connector described above may be disengaged either intentionally or accidentally and engaged at will and that upon each engagement and disengagement of these parts, more or less arcing will occur therebetween when the current is on. This arcing may be of sufficient intensity and duration to partially or completely destroy the connector, or may cause it to explode and injure the user, or may cause a costly fire or explosion when it occurs in the vicinity of combustible materials. Furthermore when the current is on, a person grasping the parts 11 and 21 to engage or disengage them, may receive a more or less powerful electrical shock.

Therefore the main purpose of my invention is to provide shock and explosion proof arcless high voltage cable connectors.

Generally stated the desired result is obtained by providing one part of my cable connector with a current responsive means which is formed, arranged and combined therewith in such a manner that when the current is turned on it flows through said means and moves and holds a normally retracted element in an extended position preventing either disengagement from or engagement in the one connector part of the other connector part as long as the current is on; and when the current is turned off the element is moved to its retracted position to allow free engagement and disengagement of said connector parts.

More specifically the female part 11 as best shown in Figure 2 is provided with a current responsive means preferably in the form of a solenoid unit generally designated by the numeral 40. The solenoid 40 preferably comprises a tubular housing part 41 formed with ears 42 secured to the female part 11 as by screws 43 as shown in Figures 1 and 4; a tubular core 44 concentric with the

housing and provided with a suitably insulated wire winding 45; a plug 46 slidably mounted in the core 44 and formed with a reduced extension pin 47; and a helical compression spring 48 encompassing the pin 42 and acting against the plug 46 to resiliently hold it at the outer end of the core 44 as indicated by broken lines in Figure 4. The inner end of the pin 47 which passes through a hole 49 in the part 11 is thus resiliently held in a retracted position allowing the male part 21 to be freely engaged with and disengaged from the female part 11.

The winding 45 has one of its ends connected by a conductor wire 57 to the ground wire 17 and has its other end connected by a conductor wire 58 to either the wire 18 or the wire 19. The wires 57 and 58 being extended through an opening 59 in the part 11 and adjacent the solenoid 40 are preferably encased by an extension 41' of the housing 41. The wires 57 and 58 serve to complete a circuit for the solenoid which when the current is turned on is energized, overcomes the spring, moves the pin 47 from its retracted position and holds it in an extended position (Figures 2 and 3).

As shown in Figure 2 the cables 20 and 30 are connected together by the fully engaged male and female parts and the former is formed with a short slot 61 to more readily receive the inner end of the pin 47. This simple pin and slot connection between the connector parts effectively prevents accidental or intentional disengagement of said parts as long as the solenoid is energized.

Figure 3 illustrates that when the current is on the pin 47 is held in its extended position and prevents contact between the sockets 13, 14 and 15 and the mating pins 23, 24 and 25 of the male and female parts of the connector thus preventing arcing between said sockets and pins. It will be apparent that, since the pin 47 is located so as to be inaccessible for manual manipulation, the only way to make or break a current conducting engagement between the conductor parts is to shut off the current and thereby cause de-energization of the solenoid and movement of the pin 47 by the spring 48 to its retracted position. It will be equally apparent that when pin 47 is retracted the connector parts may be safely connected and disconnected because the current is off and there is no possibility of my connector arcing and causing electrical shock, injury, fire or an explosion.

The construction of the female connector part 11' shown in Figure 6 is essentially the same as that shown in the other figures except that it is provided with a flange 62 by means of which it may be secured to a panel, wall or other surface.

It should be understood that the illustrated and described forms of my invention are intended to exemplify its principles and that various modifications, rearrangements and combinations of its component parts may be made within the scope of the appended claims.

Wherein I claim:

1. An arcless high voltage cable connector comprising a connector part operably connected to a source of electrical energy by a plurality of insulated wires, a current responsive solenoid means carried by said connector part, conductors operably connecting said solenoid means to said wires, whereby said solenoid means is energized when current flows through said wires and conductors, said solenoid means including a plug element movable from a retracted position and held in an advanced position by the flow of current through said means, said plug element in its advanced position being positioned to prevent circuit making engagement and circuit breaking disengagement of said connector part with a mating connector part when the current is on, thereby preventing arcing between said connector parts.

2. An arcless high voltage cable connector as set forth in claim 1 wherein the plug element is moved to and resiliently held in its retracted position by resilient means when the current is turned off, thereby allowing the connector parts to be freely engaged and disengaged without arcing.

3. An arcless high voltage cable connector as set forth in claim 1 wherein the solenoid means, its current conductors and the plug element are encased by a housing to prevent tampering therewith.

4. An arcless high voltage cable connector as set forth in claim 1 wherein the solenoid means has a central tubular core in which the movable element is slidably mounted for movement to and from its retracted and advanced positions.

5. An arcless high voltage cable connector as set forth in claim 4 wherein the movable plug element of the solenoid means is moved to and resiliently held in its retracted position by a helical compression spring acting thereagainst.

6. An arcless high voltage cable connector as set forth in claim 5 wherein the inner end of the movable element of the solenoid is reduced to provide a shoulder and a pin slidable through an opening in the first connector part, said pin being interengageable with the mating connector part to prevent engagement or disengagement of and arcing between said parts when the current is on, and wherein the spring embraces the pin and acts between the shoulder and said means to move and hold said element in its retracted position when the current is off, thereby allowing safe non-arcing engagement and disengagement of said connector parts.

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