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SEPARABLE ELECTRICAL CONNECTION

Filed Nov. 12, 1959

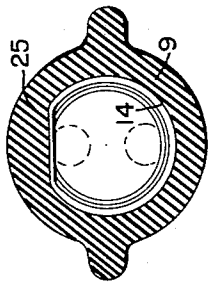


FIG.5

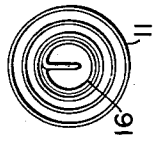


FIG.7

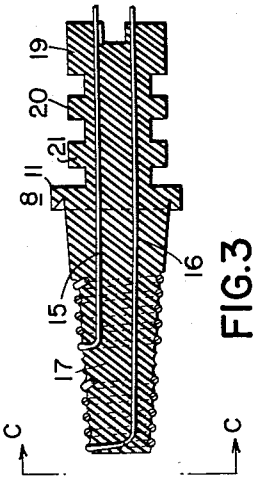


FIG.3

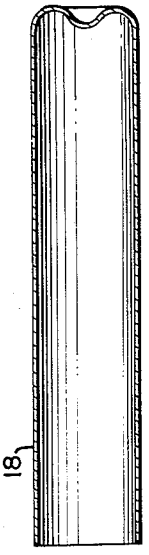


FIG.4

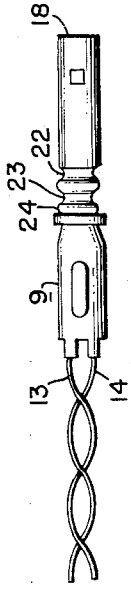


FIG.1

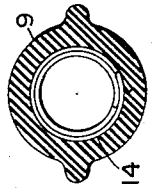


FIG.6

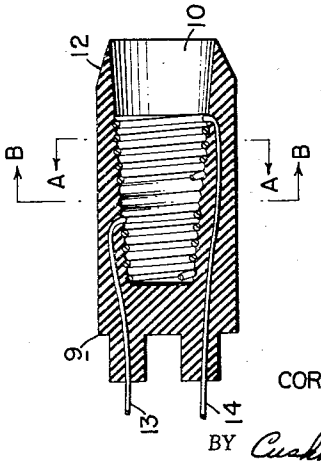


FIG.2

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SEPARABLE ELECTRICAL CONNECTION

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3 Claims. (Cl. 339—61)

The problem of connecting two electrical conductors in such a way as to introduce into the circuit a minimum of resistance has received considerable attention in the past. The provision of such a connection is particularly important in low-voltage electric circuits, such as are used for example in hearing aids and in firing electric detonators.

Electric detonators, as now manufactured, have conductors of the required length attached to them, but, as the length of conductor required varies considerably in use, this results in both manufacturers and users maintaining large stocks of detonators differing only in the length of the conductors, which is uneconomic and dangerous. Furthermore, special precautions must be taken in transporting detonators, and, with conventional detonators, the attached conductors must necessarily be treated in the same special way, so that unnecessarily high freight is paid for the transport of the conductors.

It would therefore be advantageous if the conductors could be stored and transported separately from the detonators and connected at the location of use, however no known electrical connection ensures a sufficiently low resistance under the adverse conditions of moisture, dust and the like frequently experienced in mines.

It is accordingly the object of the present invention to provide a separable electrical connection having an extremely low electrical resistance.

In order to achieve this object the present invention provides a connection for two electrical conductors, comprising a socket formed from insulating material and having a recess of circular cross-section with one of the conductors wound in a spiral around the internal surface of the recess; and a plug shaped from insulating material to fit within the recess and having the other conductor wound around the external surface of the plug in a spiral of such diameter and pitch that the spiral portions of the conductors can be engaged as a male and female thread.

For connecting two multiple electric cables, the present invention provides a connection comprising a socket formed from insulating material and having a recess of circular cross-section with the conductors of one cable wound in separate mutually insulated spirals around the internal surface of the recess; and a plug shaped from insulating material to fit within the recess and having the conductors of the other cable wound around the external surface of the plug in separate mutually insulated spirals of such diameter, pitch and location that the spiral of each conductor can be simultaneously engaged with the spiral of the corresponding conductor of the other cable as a male and female thread to form a continuous conductor insulated from the other conductors.

In use, the connection is made by inserting the plug into the recess and then rotating the plug and socket relatively to each other to screw the conductors together.

The plug and recess are preferably formed with a matching taper so that the conductors are pressed more tightly together as they are screwed into one another.

By making either the plug or socket, but preferably the socket, from resilient material of less rigidity than the socket or plug respectively, it is possible to seal the connection against water, dust and other contaminants.

Resilient synthetic resins, for example polythene or polyvinyl chloride, are particularly suitable materials from which to make the plug and the socket.

One practical arrangement of a connection according to the present invention for connecting a twin-core cable to an electric detonator will now be described with reference to the accompanying drawings. In these drawings:

Fig. 1 is an elevation of the assembled detonator and connection.

Fig. 2 is a sectional elevation on a larger scale of the socket of Fig. 1.

Fig. 3 is an elevation on the same scale as Fig. 2 of the plug of Fig. 1.

Fig. 4 is an elevation on the same scale as Fig. 2 of the detonator before attachment to the connection.

Fig. 5 is a cross-section to larger scale on the line A—A of Fig. 2.

Fig. 6 is a cross-section on the line B—B of Fig. 2.

Fig. 7 is a cross-section on the line C—C of Fig. 3.

Referring now to the drawings, the connection comprises a polythene plug **8** and a socket **9** composed of softer polythene. Both the plug **8** and socket **9** are of circular cross-section. The socket **9** has a tapered recess **10** into which the plug **8** fits, the flange **11** bearing against and surrounding the bevelled portion **12** of the socket **9** to seal the interior of the recess **10**. Twin conductors **13** and **14** each have bared end portions, wound spirally on the internal surface of the recess **10**, the conductors being maintained separate from each other.

The plug **8** has one end of each detonator wire **15** and **16** wound over its tapered portion **17** in spirals matching the spirals of the conductors **13** and **14**, the other end of the wires **15** and **16** being attached to the conventional flat pair of conductors between which is connected the conventional resistance wire having the initiating composition applied to it. Alternatively the conventional resistance wire may be connected across the wires **15** and **16**, and the initiating composition applied directly thereto.

The conventional aluminum detonator casing **18** fits over the initiating composition, and flanges **19**, **20** and **21** of the plug **8**, to abut against the flange **11** on the right hand side as viewed in Fig. 3, and is crimped in the annular recesses between the pairs of flanges **19** and **20**, **20** and **21**, and **21** and **11**, as shown at **22**, **23** and **24** in Fig. 1.

As shown at **25** in Fig. 5, the circular turn of wire **14** of second-largest diameter is straightened inwardly over portion of its length to provide a turn of relatively reduced diameter which, when the connection is assembled, presses very tightly against the corresponding turn of wire **15** on the plug. The circular turn of wire **13** of second-largest diameter is likewise straightened over portion of its length, to press in similar manner against the corresponding turn of wire **16**.

The plug **8** is produced by injection moulding, the wires **15** and **16** being bent to shape and placed in position in the mould, whereupon molten polythene is injected. The projecting ends of the wires **15** and **16** are then soldered to a conventional pair of conductors to which the detonating composition has been applied, the plug is inserted in the detonator, and the casing **18** is crimped over the flanges **19**, **20** and **21** to provide the assembled detonator ready for dispatch to the user. The fact that the conductors **13** and **14** are not attached to the detonators renders them easier and less bulky to pack than the detonators at present used.

The socket **9** is also produced by injection moulding,

the conductors **13** and **14** being bent to shape and placed in position in the mould prior to the injection of molten polythene. The conductors **13** and **14** may be made of various lengths, so that it is not necessary to retain stocks of detonators provided with different lengths of conductors. The conductors, having no explosive components, can be stored and transported without special precautions.

In use, the detonator is attached to the conductors at the location of use by screwing the plug **8** into the socket **9** to provide a large area of firm contact between the conductors **13** and **14** and the wires **16** and **15** respectively, and to seal, by engagement of the flange **11** with the bevelled portion **12** of the socket **9**, the contacting portions against moisture, dust or other contamination.

Instead of polythene, other insulating materials could be used, polyvinyl chloride being particularly suitable.

The connections according to the present invention can obviously be applied to other uses, and may be designed to conduct large electric currents.

We claim:

1. A connection for two multiple electric cables, comprising a socket formed from insulating material and having a recess of circular cross-section with the conductors of one cable wound in separate mutually insulated spirals around the internal surface of the recess; and a

plug shaped from insulating material to fit within the recess and having the conductors of the other cable wound around the external surface of the plug in separate mutually insulated spirals of such diameter, pitch and location that the spiral of each conductor can be simultaneously engaged with the spiral of the corresponding conductor of the other cable as a male and female thread to form a continuous conductor insulated from the other conductors.

2. A connection according to claim 1, wherein the plug and recess are formed with a matching taper.

3. A connection according to claim 1, wherein the socket is made from resilient material of less rigidity than the plug.

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