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ELECTRICAL CONNECTING UNIT

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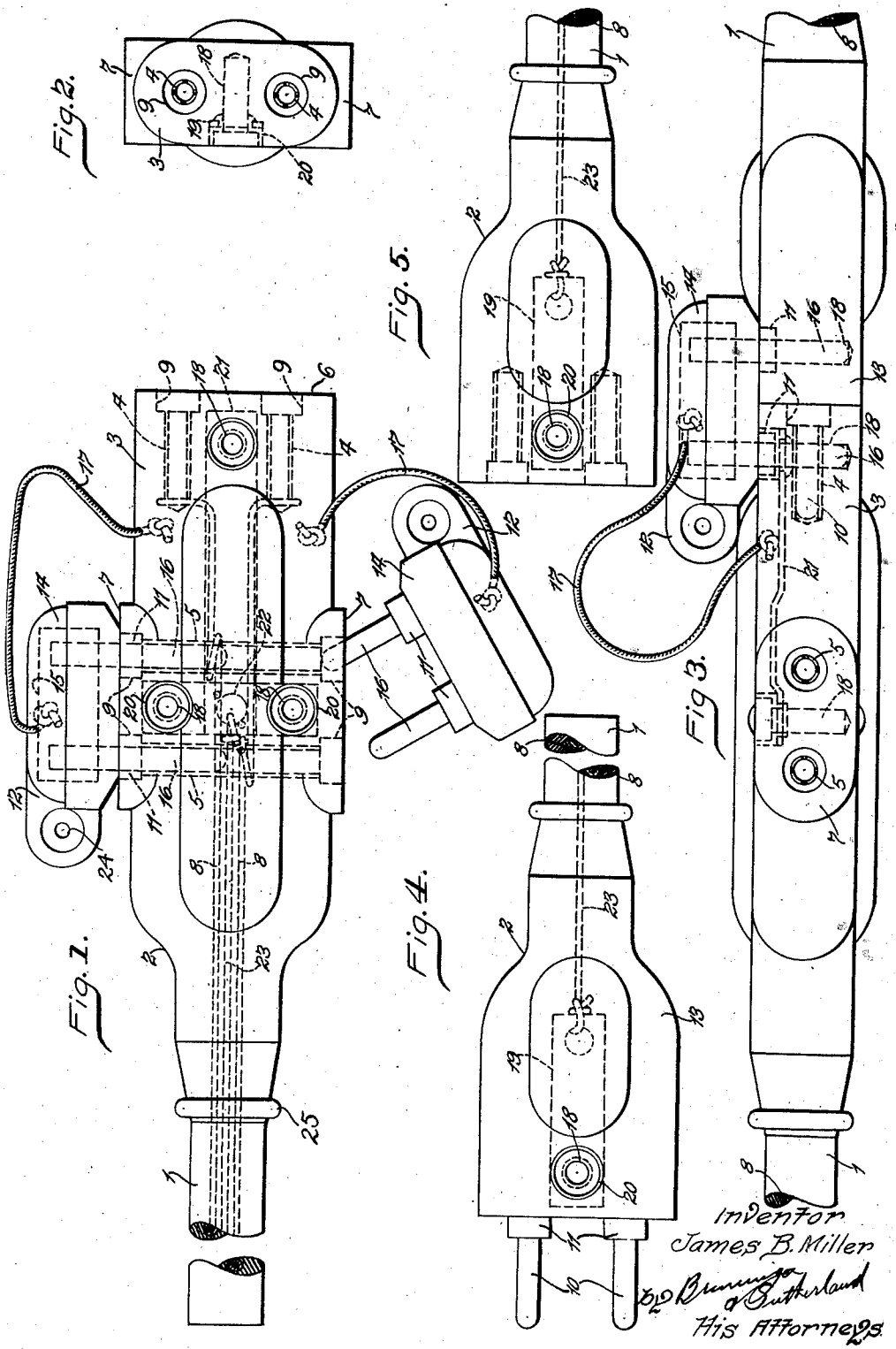


Fig. 2.

Fig. 5.

Fig. 3.

Fig. 1.

Fig. 4.

Inventor
James B. Miller
By Brumbaugh & Sutherland
His Attorneys

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ELECTRICAL CONNECTING UNIT

James B. Miller, Webster Groves, Mo., assignor to Mines Equipment Company, St. Louis, Mo., a corporation of Missouri

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9 Claims. (Cl. 173—334)

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This invention pertains to devices for running temporary electric circuits, such for instance as may be used for temporary lighting or power circuits on construction jobs, in mines and in other places where temporary circuits must be set up in a substantial manner, and so as to have a high factor of safety. More particularly, the invention pertains to connecting devices for making releasable electrical connections for power and lighting circuits.

In many such temporary installations, the circuits must be run in places where they are liable to come in contact with water and moisture. One of the objects of this invention, therefore, is to provide a connecting device which may be completely protected against damage or short circuit due to the entrance of water or moisture.

Another object is to provide a connector which will be useful as part of an extension cable unit for extending a circuit from one place to another, and which at the same time may provide for tapping in branch circuits.

Another object is to provide such a connecting device capable of withstanding rough usage without damage to the device and without danger of having the temporary connections pulled apart.

Another object is to provide a novel structure for such a device which will not only be resilient and resistant to damage from impact but which will be mechanically strong against forces to which it may be subjected.

Further objects will appear from the following description taken in connection with the accompanying drawing, in which:

Figure 1 is a plan view of a cable connector embodying this invention;

Figure 2 is an end view of Figure 1;

Figure 3 is a side view of the connector of Figure 1, shown attached to a complementary connector and the two mutually engaged connectors locked together in accordance with this invention;

Figure 4 is a plan view of a plug connector of a form complementary to the socket connector of Figure 1; and

Figure 5 is a similar view of a socket connector having a single pair of sockets.

Referring to the drawing, 1 indicates a cable-forming part of an extension unit, equipped with an end connector, indicated generally at 2. The connector 2 is of the plug-socket type, whereby circuit connections may be made simply by inserting one or more contact plugs into complementary sockets so as to make the necessary contact connection.

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In this specification and the appended claims, the terms "plug-socket connector" or "plug-socket contact" will be used to designate a unit in which the contact members may be either plugs or sockets, or in some cases one or more of each.

The connector 2 is constructed with a body 3 of resilient material, such as molded soft rubber. Molded into the body 3 are one or more plug-socket contacts 4 and 5. In the device of Figure 1, these are all socket contacts. Under certain circumstances, however, the unit may be made up with one or more plug contacts. The sockets 4 are placed so that the complementary plug contacts can be inserted from the end 6 of the body 3. The sockets 5 are arranged transversely of the body 3 and are accessible for insertion of the complementary plugs from side faces 7 of the molded body. The conductors 8 of the cable 1 are connected to the contacts 4 and 5, as indicated in broken lines in Figure 1.

The contacts 4 and 5 are embedded in the molded rubber of the body 3, as are also the conductors 8. At the ends of the contacts 4 and 5, the body 3 is formed with recesses 9, usually of circular form surrounding the entrance opening of each contact. As will be seen from Figure 4, the complementary plug contact elements indicated at 10 are similarly molded into the body 13 of the plug connector. Around each of the contacts 10, a projection 11 is formed on the rubber body and arranged for a sealing fit in one of the recesses 9 when the plug 10 is inserted in a socket 4 or 5. Accordingly, when the connectors are thus in engagement with each other to establish a circuit, each mutually engaging pair of contacts is sealed against moisture.

It will be noted that a length of cable 1, equipped on one end with a plug connector, such as shown in Figure 4, and on the other with a connector such as shown in Figures 1, 2 and 3, provides a unit, a plurality of which may be used to run almost any kind of power or lighting circuit. By plugging the connector 13 into the end sockets 4, the circuit may be extended lengthwise to any distance by simply adding units. At the same time by inserting the plug 13 of an additional unit into one of the side sockets 5, a branch circuit can be tapped in at any junction point. In this way circuits may be worked out to supply almost any ordinary demand.

In order to provide for sealing any of the contact pairs of Figure 1, when not engaged by a plug connector, a sealing element 12 is provided. This element is provided with a body 14 of in-

sulating material. This body may be constructed entirely of rigid material, such as, "Bakelite." However, an advantageous construction is to mold this body of soft rubber, surrounding a rigid body 15 of such material as "Bakelite." Molded into the body 15 is a pair of pins 16 of the same shape, size and spacing as the plug contacts 10. Sealing projections 11 may be formed on the body 14 around the pins 16. One of these sealing elements 12 may then be plugged into each pair of socket contacts 4 or 5 when no other plug connector is in engagement therewith. These sealing elements, therefore, provide for sealing these contacts against moisture. In order that the elements 12 may not become separated from body 3, flexible cords 17 may be provided. These cords may each be molded, one end into the body 14 and the other end into the body 3, and thus provide flexible means for securing the elements to the body but permitting the same to be plugged into the adjacent pair of sockets 4 or 5 to form a seal. In the embodiment illustrated the element 12 is further provided with an eye 24 and the body 3 with a collar 25, so that if any of the cords 17 should be broken, a new cord may be tied at one end in the eye 24 and at the other around the shank of the body 3 behind the collar 25.

In order to insure against accidental separation of connector bodies 3 and 13, when in mutual engagement with each other, each connector may be provided, adjacent its end face which engages with the other, with a recess or socket 18 adapted to receive one of the pins 16. These recesses 18 may be so located that when the connectors are engaged, as shown in Figure 3, the element 12 may be assembled with one of its pins 16 in a recess of each connector, the body of the element 12 spanning the junction between the two connectors and providing a tie between them. This arrangement, therefore, provides an interlock between the mutually engaged connectors to prevent them being separated accidentally.

In order to reenforce the body of the connector against the pull which may be imposed upon it by this interlocking device, a rigid reenforcing element 19 is embedded in the rubber body. This element is preferably in the form of a steel plate having sufficient extent within the body so as to be securely anchored against the pull of the interlocking device. The outer end of the element 19 is preferably provided with a terminal perforation aligned with a recess 18 so that when the pin 16 is inserted it interlocks also with the plate 19. If desired, this terminal perforation may have mounted therein a metallic cup 20 adapted to receive the sealing projection 11 of the element 12.

In the arrangement of Figure 1, the reenforcing element may take the form of T-shaped plate 21 extending from the recess 18 at the end socket rearwardly with the cross arms thereof extending to the corresponding recesses for the side sockets at the faces 7. Accordingly, when any plug connector is engaged with any one of these socket connectors, the locking element 12 may be applied, as described, and will then lock the connectors together. Any pull which may now be exerted to pull the connectors apart will be transmitted by the element 12 to the reenforcing plate 21. This plate, therefore, serves to take up the internal stress produced by such a pull and to reenforce the material of the body 3 so as to prevent it from yielding elastically. Since such yielding would tend to distort the body 3, and thereby put additional stresses upon the element 12, the elements 21 and 19 thus serve not only to reenforce the body 3 but also to protect the element 12 against unusual distorting stresses.

As the cable 1 is usually provided with a filler cord running along the conductors 8, each element 19 and 21 may be provided with a perforation 22, and this filler cord, indicated at 23, may be securely tied to the reenforcing element through this perforation. By this arrangement any pull on the locking element 12 is transmitted through the plate 19 or 21 directly to the filler cord, and both the body of the connector and the conductors 8 are relieved of any internal stresses which may be set up by such a pull.

It will be seen, therefore, that this invention provides a structure for plug-socket connectors of this type such as to render the same practically safe against damage under extremely rough handling. The resilient body is capable of yielding under impact and even of bending or other distortion under certain conditions. The contacts molded therein are thus protected from shock to a great extent. The device of Figure 1 may be provided with any number of plug-socket connectors and any desired number of sets, such as the pairs shown in Figure 1 at the different faces 6 and 7. Accordingly, a circuit can be extended in any direction, or side circuits may be tapped off by simply inserting a complementary plug connector attached to the appropriate extension cable unit. All such complementary plug connectors may be locked in engagement by the use of the element 12, and all unused contacts are sealed against moisture by the application of an element 12. Preferably each connector, as shown in Figure 1, is equipped with a combination sealing and locking element 12 for each of its connection terminals. The provision of the reenforcing element to take up the stress of a pull by the locking element prevents distortion and possible rupture of the rubber body 3 under such stress.

While the invention has been described with reference to an embodiment forming a unitary combination, it will be understood that individual features or subcombinations thereof may be useful for themselves without reference to other features or the complete combination. The employment of such individual features or subcombinations is contemplated by this invention when within the scope of the appended claims.

It is obvious also that various changes may be made in the details of construction or operation within the scope of the appended claims without departing from the spirit of this invention, and that the invention is not limited to the specific details shown or described.

The invention having been described, what is claimed is:

1. A plug-socket connector combination of the character described, comprising: a socket connector having a body, a socket contact housed in said body, and means on said body engageable with external locking means; a plug connector having a body, a plug contact housed therein, and engageable with said socket contact, and means on said plug connector body engageable with external locking means; and a locking device having means engageable with said lock-engageable means on both said bodies when said plug and socket connectors are in engagement with each other to lock the same against accidental disengagement, said bodies having mutually engage-

able sealing means, and said locking device having sealing means engageable with said sealing means on one of said bodies when not in engagement with the other to provide a water-tight enclosure for the contact thereof.

2. A plug-socket connector combination of the character described, comprising: a socket connector having a resilient body, a socket contact molded in said body, and rigid reinforcing means molded in said body and arranged for engagement with external locking means; a plug connector having a resilient body, a plug contact molded therein and engageable with said socket contact, and rigid reinforcing means molded in said plug connector body and arranged for engagement with external locking means; and a locking device having means engageable with said lock-engageable means on both said bodies when said plug and socket connectors are in engagement with each other to lock the same against accidental disengagement.

3. A plug-socket connector combination of the character described, comprising: a socket connector having a resilient body, a socket contact molded in said body, and rigid reinforcing means molded in said body and arranged for engagement with external locking means; a plug connector having a resilient body, a plug contact molded therein and engageable with said socket contact, and rigid reinforcing means molded in said plug connector body and arranged for engagement with external locking means; and a locking device having means engageable with said lock-engageable means on both said bodies when said plug and socket connectors are in engagement with each other to lock the same against accidental disengagement, said bodies having mutually engageable resilient sealing means, and said locking device having sealing means resiliently engageable with said sealing means on one of said bodies when not in engagement with the other to provide a water-tight enclosure for the contact thereof.

4. A plug-socket connector of the character described, comprising, a resilient body, a pair of plug-socket contacts embedded therein adapted for engagement with corresponding contacts of a complementary connector, a sealing element having contacts complementary to said first contacts and engageable therewith, sealing means on said element operating upon such engagement to seal said first contacts, and means on said body arranged for locking engagement with one of said contacts of said sealing element to interlock mutually engaged connectors.

5. A plug-socket connector of the character described, comprising, a resilient body, a pair of plug-socket contacts embedded therein adapted for engagement with corresponding contacts of a complementary connector, a sealing element having contacts complementary to said first contacts and engageable therewith, sealing means on said element operating upon such engagement to seal said first contacts, means on said body arranged for locking engagement with one of said contacts of said sealing element to interlock mutually engaged connectors, and rigid reinforcing means embedded in said body adjacent said lock-engagement means.

6. A plug-socket connector of the character described, comprising, a resilient body, a pair of plug-socket contacts embedded therein adapted for engagement with corresponding contacts of a complementary connector, a sealing element having contacts complementary to said first contacts and engageable therewith, sealing means on said element operating upon such engagement to seal said first contacts, means on said body arranged for locking engagement with one of said contacts of said sealing element to interlock mutually engaged connectors, and flexible means securing said element to said body.

7. In combination with a plug-socket connector of the character described having a resilient body, a plurality of plug-socket contacts embedded therein adapted for engagement with corresponding contacts of a complementary connector, and means for engaging connector-interlocking means; a sealing element having insulated contacts complementary to certain of said first contacts and engageable therewith, and sealing means on said element operating upon such engagement to seal certain of said first contacts, said interlock-engaging means being positioned relatively to similar means on the complementary connector for engagement by said insulated contacts so that said sealing element functions as said connector-interlocking means.

8. In combination, a plug-socket connector of the character described having a resilient body, a set of plug-socket contacts embedded therein adjacent the end thereof adapted for engagement with corresponding contacts of a complementary connector so as to extend a circuit endwise of said body, one or more sets of similar plug-socket contacts arranged laterally of said body for engagement with a complementary connector so as to extend a circuit laterally of said body, and means for engaging connector-interlocking means arranged in cooperative relation to one or more of said sets; and a sealing element having insulated contacts engageable with certain of said plug-socket contacts to provide a seal therefor, and engageable with said interlock-engaging means so as to function as said connector-interlocking means.

9. In combination, a plug-socket connector of the character described having a resilient body, a set of plug-socket contacts embedded therein adjacent the end thereof adapted for engagement with corresponding contacts of a complementary connector so as to extend a circuit endwise of said body, one or more sets of similar plug-socket contacts arranged laterally of said body for engagement with a complementary connector so as to extend a circuit laterally of said body, and means for engaging connector-interlocking means arranged in cooperative relation to one or more of said sets; and an interlocking element engageable with said last means of mutually engaged connectors to lock them together.

JAMES B. MILLER.