

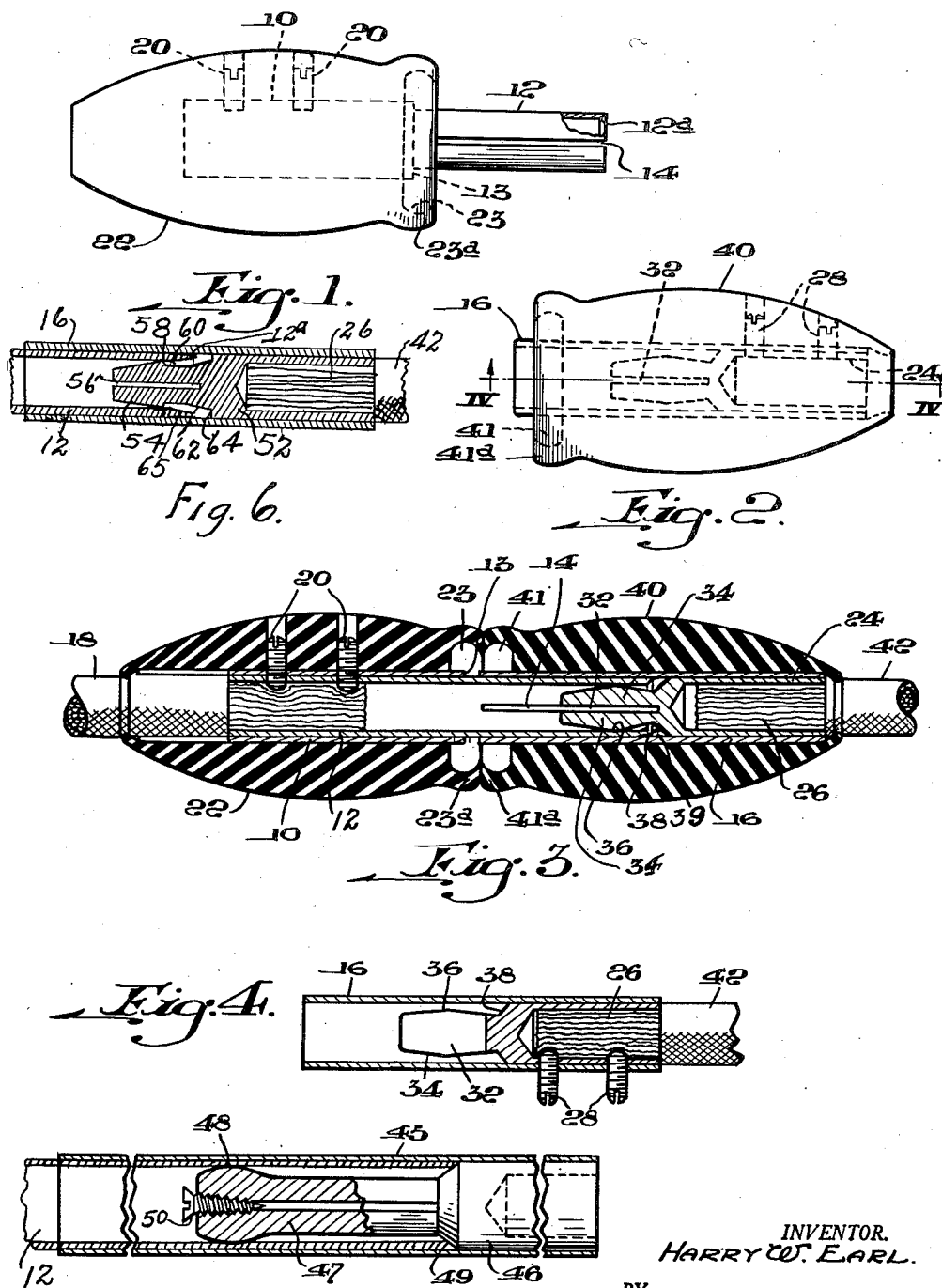
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H. W. EARL

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ELECTRICAL CONNECTOR

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INVENTOR.
HARRY W. EARL.

BY

Christy, Parmelee and Strickland
his ATTORNEYS.

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ELECTRICAL CONNECTOR

Harry W. Earl, South Miami, Fla.

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This invention relates to separable electrical connectors. More particularly the invention relates to electrical connectors for use in industrial applications where separable connectors are required for equipment using heavy currents.

The present invention is for a connector of the type having two parts designed to be attached to the ends of two cables or conductors to be joined, and having telescopically interfitting parts through which the electrical connection is made. According to the present invention, the contacting areas of the interfitting parts are extensive, and provision is made for holding the surfaces in tight frictional contact with one another so as to reduce electrical losses and provide a good current conducting path.

The primary object of the present invention is to provide an electrical cable connector which may be readily connected and disconnected, and which when connected will provide a large, tight surface contact that will conduct heavy amperage electrical currents without substantial heating, and which will be safe.

With this and other objects in view, the invention consists in the separable connector as hereinafter illustrated and described and particularly defined in the appended claims.

The various features of the invention are illustrated in the accompanying drawings, in which:

Fig. 1 is a view in side elevation of the male unit of the preferred connector;

Fig. 2 is a view in side elevation of the female unit of the connector;

Fig. 3 is a longitudinal sectional view of the two units in cooperating engagement;

Fig. 4 is a horizontal sectional view of the female unit taken on line IV—IV of Fig. 2, with the rubber handle omitted;

Fig. 5 is a view similar to Fig. 4 of a slightly modified construction and with the expander shown in elevation and rotated 90° from the position shown in Fig. 4; and

Fig. 6 is a horizontal sectional view of a modified form of the female connecting unit.

The separable electrical connector of the present invention is particularly adapted for connecting conductors which preferably are made up in the form of a series of strands of wire twisted into a cable, and the cable is covered with a good insulation, but may be otherwise used. As previously indicated, the connector is comprised of two parts designated as male and female units, and each is connected to a cable end to be joined.

Referring to Figs. 1 and 3, the male unit comprises a tubular metal body 10 into which is fitted and permanently secured a longer tubular member 12, thereby forming a plug element with a shoulder 13 intermediate its ends. The projecting end portion of the tube 12 has two or more longitudinally-extending slits reaching from the open end to a point near the shoulder 13. In smaller connectors there may be but two diametrically opposite slots, but in larger connectors I prefer to provide three of them equally spaced around the tube. These slots give

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radial resilience to the extension 12. The end of a stranded cable 18 from which the insulation has been stripped is inserted into the opposite end of the assembly, and screws 20 threaded through the walls of the concentric tubes 10 and 12 are provided to firmly clamp this end of the cable inside the tube 12.

A rubber or rubber-like insulating grip 22 is frictionally fitted over the tube 10 and is longer than the tube 10, so that the grip encloses the end of the cable 18 and only the slotted extension of the tube 12, projecting from the opposite end of the assembly, is exposed. The screws 20 are accessible through openings in the insulating sleeve, and projecting as they do into this sleeve, prevent the insulating sleeve from stripping or sliding on the metal tube 10, but they are countersunk deeply enough so that one cannot touch them. The end of the grip or insulating sleeve which faces toward the slotted extension of the connector is cupped out or recessed at 23, providing an endwise compressible extension 23a at this end of the grip.

The female unit is shown more particularly in Figs. 2, 3 and 4. This unit is comprised of an outside tubular member 16 having a plug 24 soldered or frictionally driven into one end. This plug is counterbored at the rear or outer end to provide a socket to receive the bared end of cable 42. Screws 28, similar to screws 20, clamp the cable in the socket. Projecting forwardly from the end of the body is an expander plug 34 which is bifurcated or slit longitudinally as indicated at 32 to give the expander resilience in a radial direction. In smaller connectors the inherent resilience of the metal may be relied upon, but in some instances, an adjustable expander, as hereinafter described, may be desirable. The expander tapers or bulges from the forward or left-hand end as viewed in Fig. 4 to a point 36 of maximum diameter, and then decreases in diameter, terminating at a shoulder 38, the shoulder preferably having a slight rearward bevel. In Figs. 2 to 4 inclusive I have shown the expander having its point of largest diameter approximately midway between the ends, but in some instances, especially in larger connectors, this point may be close to the front end of the plug as shown in Fig. 5.

The female unit has a rubber or rubber-like insulating grip 40 thereon which is the exact counterpart of the grip 22, and the end which confronts grip 22 has a cavity 41, similar to 23, and a thin projecting flange 41a similar to 23a. This grip cooperates with the screws 28 in the manner hereinbefore described as to screws 20.

The tube 12 has an outside diameter such as to provide a close fit inside the tube 16, and the bulge of the plug or expander 34 is such that it slightly spreads the extension 12 when the two parts are telescoped together. The expander thus forces the exterior of the tube 12 into parallel full surface contact with the interior of tube 16. The two parts can be shoved together preferably with a twisting motion for the shorter connections until the end of the tube 12 is opposite a cavity 39 in the expander 34 with the tube 12 compressed between the tube 16 and expander 34 a beveled end 12a of the tube is flexed inwardly toward the bottom of the cavity 39 to make a tighter connection.

When the two parts of the connector are pushed completely together, the extensions 23a and 41a of the rubber grip contact and compress endwise, making a tight joint which is resiliently closed by the compression of the rubber.

With the construction outlined above, the connector members may be pushed into and pulled out of contact with one another for connecting and disconnecting the cables, and with the resilience of the connection provided by the slitted tube 12 and slitted expander 34, the parts are yieldably held in firm connection so that they provide a large area of inter-facial contact, and friction will hold

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the two units against any accidental separation. In other words, it requires a distinct use of a twisting force in order to connect and disconnect the connectors. The construction provides a good electrical contact so that when high current densities are passed through the cable, there will be substantially no heating or undue power loss in the connector. The plug 34 is recessed well back into the tube 16 so that initial telescoping of the parts can be easily and quickly accomplished, and the strong friction between the parts is broken before final separation takes place. If the connector, after use, becomes too loose, a screw driver or other instrument may be driven into the slot 32 to slightly spread the expander, and thus increase the pressure with which it spreads the tube 12 when the units of the connector are forced together.

In the construction shown in Fig. 5, I have shown a modification of the female unit of the connector which may be desirable in some instances, and may be used in place of the arrangement shown in Figs. 2 to 4 inclusive. In this view, 45 designates the tubular sleeve of the female unit with the expander plug body 46 driven or soldered into one end. It has a reduced expander 47 projecting forwardly through a part of the length of the tube. The expander, which is bifurcated, has a reduced outer or forward end with a bulge 48 close to the end, and behind this the expander is of reduced section, terminating at the beveled shoulder 49.

While the resilience of the expander may in smaller connectors be adequate, in larger connectors it may be desirable to provide a means for adjustably spreading the expander, and to this end I have a tapered screw 50 threaded into a tapered socket in the end of the expander. A slight turn of this screw will controllably spread the expander to produce the desired spreading of the tube 12 of the male member. This screw can be adjusted without taking the unit apart.

The expander plug 46 of Fig. 5 is preferably used with a long connector and with this expander plug the beveled end of the tube 12 is moved past the bulge 48 and against the shoulder 49 to make a more effective contact and a tighter connection of the parts.

In Fig. 6 is shown a modified form of expander plug 52 which has an expanding bevel 54 with a slit 56 at its front end. At the end of the taper is a bulge 58 behind which is a cavity 60. From the rear end of the cavity the plug has an inclined face 62 back to a shoulder 64. The plug of Fig. 6 is preferably used with a smaller connector and the diameter of the bulge 58 is such that the end of tube 12 will be located opposite the cavity 60 when the parts are properly connected. At the connection of the bulge 58 with the cavity 60 the bulge corner is rounded to facilitate the flexing movement of the end 12a of the tube 12 when connecting and disconnecting the

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male and female parts of the connector. The tube 12 has an inclined face 65 which can make a tight connection with the expander bevel 62 if it is desired to force the end of the tube 12 against the shoulder 64.

The preferred form of the invention having been thus described, what is claimed as new is:

1. A separable electrical connector of the character described comprising a male and a female unit, said male unit having a hollow insulated handle portion, a hollow metal tube within said handle portion and extending outwardly beyond one end thereof, the outermost end portion of said extension having its inside walls tapering outwardly, means on the inner end of said hollow metal tube for electrical connection to a power cable, the outwardly extending portion of the metal tube having slots extending inwardly from the end thereof and in opposite walls of the tube, the female unit having a hollow insulated handle portion, a hollow metal tube within said female handle portion for reception of the slotted end of the tube of the male unit, an expander plug secured within the tube of the female unit intermediate the ends thereof, said expander plug having a rear base portion secured within the female unit and a forwardly extending portion disposed wholly in spaced relation to the surrounding metal tube of the female unit for engaging within the entering tube of the male unit, said forwardly extending plug portion having a transverse slot extending inwardly from its forward end and a peripheral portion which is of largest diameter intermediate the ends of said slot, said peripheral portion tapering longitudinally of said plug in both directions from said portion of largest diameter.

2. The electrical connector as defined in claim 1 wherein the slotted metal tube extending from the male unit has resilient engagement with the tube of the female unit causing initial compression of the slotted opening in the male tube as the male and female units are assembled and the initial clearance between the greatest diameter of the slotted expander plug of the female unit and the inside of the tube of the female unit is less than the untapered thickness of the walls of the entering tube of the male unit.

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