

March 13, 1945.

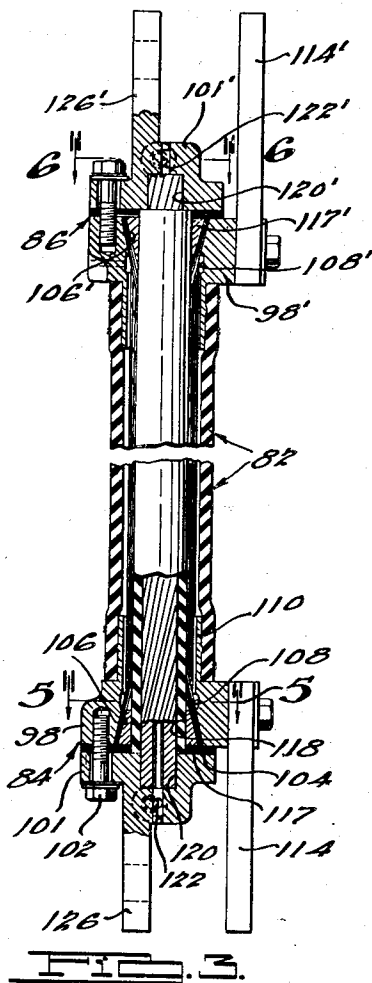
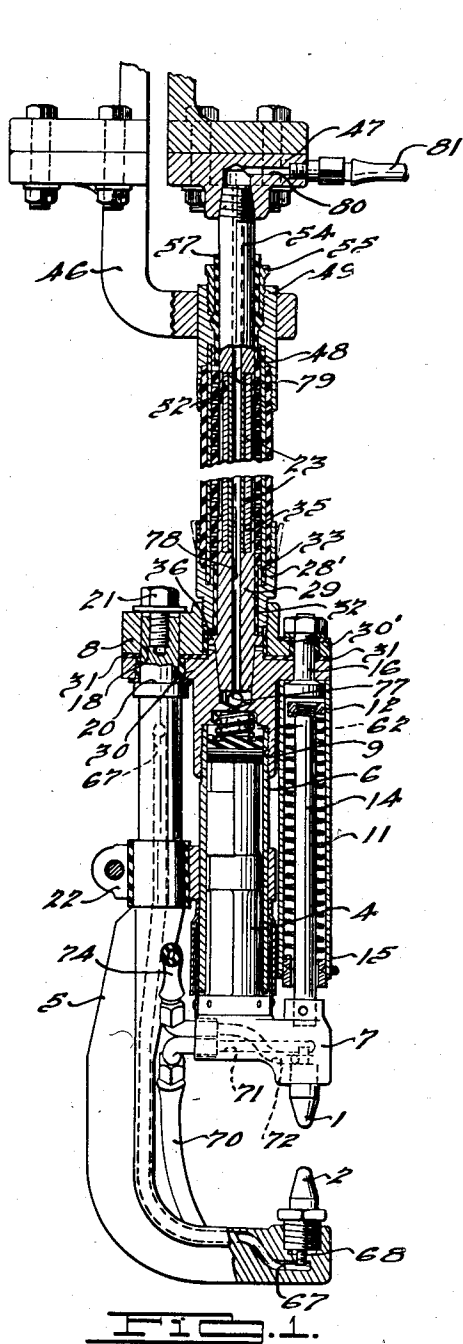
H. PURAT

2,371,185

CABLE CONNECTOR

Original Filed Dec. 13, 1940

2 Sheets-Sheet 1



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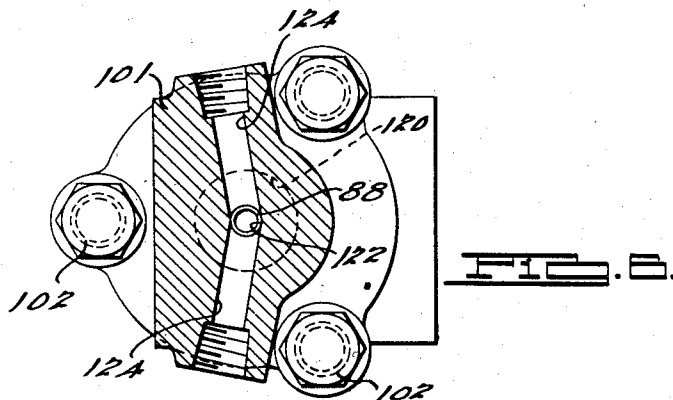
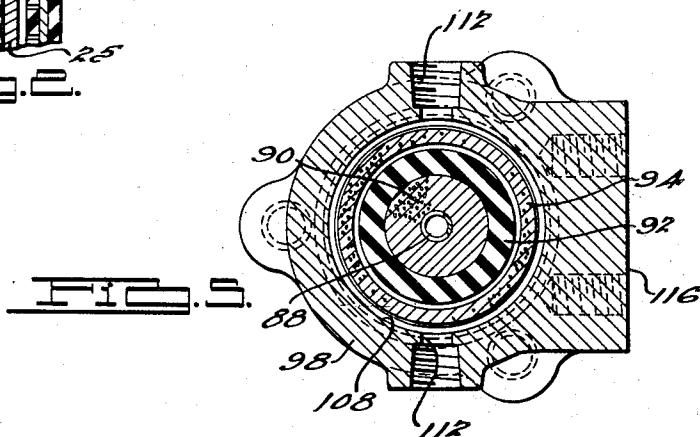
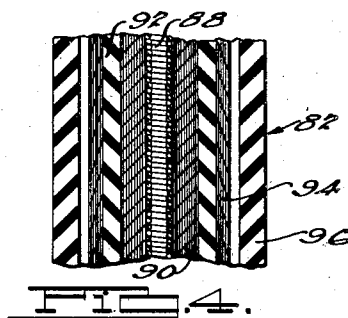
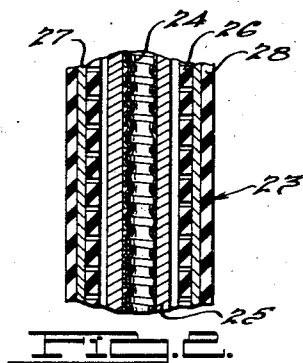
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2,371,185

CABLE CONNECTOR

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Original application December 13, 1940, Serial No. 369,930. Divided and this application November 23, 1942, Serial No. 466,689

1 Claim. (Cl. 174-19)

The present invention relates to electric welders and particularly relates to improved cable constructions adapted for use on such welders.

The present application is a division of applicant's copending application, Serial No. 369,930, filed December 13, 1940.

One of the primary objects of the present invention is to provide improved cable constructions which provide the electric conductors between the transverse conductors to the electrodes and which are more flexible than prior constructions so that they may be more readily manipulated.

Another object of the invention is to provide an efficient construction by which the conductors forming a part of the cable construction may be maintained at a relatively low temperature by the circulation of water therethrough, yet which does not interfere with the manipulation of the welder.

Other objects of the invention will become apparent from the following specification, the drawings relating thereto and the claims hereinafter set forth.

In the drawings, in which like numerals are used to designate like parts in the several views throughout:

Figure 1 is a longitudinal sectional view with parts in elevation of a portable welder having a cable construction according to the present invention associated therewith;

Fig. 2 is a fragmentary, enlarged, longitudinal, sectional view of the cable construction, illustrated in Fig. 1;

Fig. 3 is a longitudinal sectional view of a modified form of cable construction and showing such cable connected at its ends to the connecting means for connection with the transformer secondary and the welding electrodes;

Fig. 4 is a fragmentary, enlarged, longitudinal cross-sectional view of the cable illustrated in Fig. 3;

Fig. 5 is a cross-sectional view taken substantially along the line 5-5 of Fig. 3; and

Fig. 6 is a cross-sectional view taken substantially along the line 6-6 of Fig. 3.

Referring to the drawings and referring particularly to Figs. 1 and 2 thereof, in which one embodiment of the invention is illustrated, a pair of welder electrodes 1 and 2 are mounted, one on a reciprocable piston 4 and the other on a bracket 5. The piston 4 is located in a cylinder 6 and is actuated by pressure of a fluid, preferably liquid, to cause the electrodes 1 and 2 to press the work during the welding operation.

The electrode 1 is located on an arm 7, which extends laterally from the piston 4, and the end part of the bracket 5 extends substantially parallel to the arm 7 to dispose the electrodes 1 and 2, axially offset, with respect to the piston of the cylinder and the welder.

A head 8 of the cylinder forms a base for assembling the parts of the welder. The head 8 has a tapped socket 9 in which a threaded end of the cylinder may be located to secure the cylinder to the head. A resilient means, that contacts with the cylinder pressure to reciprocate the piston within the cylinder, is connected to the head. An electrode supporting bracket of the desired form, such as the bracket 5, is also connected to the head. One end of each of the conductors is connected to the head in a manner that will be pointed out in detail hereinafter.

For producing the return movement of the welder electrode 1, subsequent to a welding operation, a spring 11 is interposed between a head or nut 12, formed on or secured to the end of a rod 14 and the end part of a sleeve 15. The rod 14 is connected to the arm 7 of the piston. The spring surrounds the rod 14 and is located in the sleeve 15 which is secured to the head 8 by bolts 16.

The end of the bracket 5, which supports the end of the electrode 1, is tapered and fits into a tapered opening 18 formed in the head 8. It is also provided with an annular shoulder 20 that engages the head when the tapered end is drawn into the head by the bolt 21. The bracket 5 may also be further secured by a split ring clamp 22, which is connected to the central part of the cylinder 6.

The head 8 of the welder is connected to a source of supply of electric current by means of a cable construction, generally indicated at 23, constructed according to the present invention. Such cable construction includes a central, helically wound, flexible, tubular member 24, which is formed with overlapping flanges, so that the member is flexible in all directions and so that it is pervious to the passage of fluid, such as water, through the overlapping joints of the adjacent convolutions which form the side wall thereof. A stranded electric conductor 25 surrounds the central member 24, engaging the outer surface thereof. A pervious insulating member 26 surrounds the stranded conductor 25 in spaced relation thereto and may be formed of suitable material, such as rubber or composite rubber and fabric material, provided with apertures through the wall thereof. Another

stranded electric conductor 27 surrounds the insulating member 26 in contact with the outer surface thereof. The elements of the cable, above described, are concentrically arranged with respect to each other; and in the manufacture of such cable those elements, above described, may be formed and assembled and another insulating member 28 may thereafter be placed in surrounding relationship to the stranded member 27, and may either bear thereagainst or be spaced therefrom, also in concentric relationship.

The stranded conductors 25 and 27 are connected to the head by coaxially disposed tubular connectors 28' and 29. The connector 28' may be initially flared outwardly, as indicated by the broken lines in Fig. 1, so that the end of the cable may be readily inserted in position; and such member 28' may thereafter be pressed inwardly to secure the cable to the head.

Water, which forms the cooling medium, may be directed through the electrodes and through the central tubular member 24 for maintaining the electrodes and the conductors at a relatively low temperature. Such water passes through the pervious central member 24, through the stranded member 25, and through the apertures in the insulating member 26 into member 27. It is recognized that this introduces a short in the secondary when the primary is closed; but the current is present in the secondary for such a short time and the resistance is so much higher across the short than across the welding electrodes that the proper welding operation is not disturbed.

The head 8 of the welder is formed of two separable sections 30 and 30' that are separated by electric insulating sheet material 31. The head sections are clamped together by suitable means such as bolts 16 and 21. The end part of conductor 27 is located in a socket 33, formed in the connector 28'; and such end may be suitably secured within the socket by a soldering or sweating operation. The head section 30' is tapered and the connector 29 is threaded therein.

The connector 29 is provided with a socket 35, which receives the end of the stranded conductor 25. Such end may be secured thereto by a soldering or sweating operation.

The lower end of the connector 29 is preferably tapered and is located in a tapered opening formed in the head section 30. The connector 29 is also provided with a shoulder 36, which is engaged by the end of the connector 28 when it is screwed into the head part 30' to force the tapered end into the opening formed in head section 30. The connectors 28 and 29 are insulated from each other by suitable insulating material 32, and the bracket 5 is also electrically insulated from the head section 30 by a suitable bushing of insulating material.

The electrode 2 is electrically connected through the bracket 5 with head section 30'; and the conductor 27 is connected to such head section 30' through connector 28. The electrode 1 is electrically connected through the piston 4, the cylinder 6, the head section 30 and the connector 29 to the stranded conductor 25, whereby the welding current may be caused to flow through the conductors and the work, when the electrodes are pressed against the work by the operation of the cylinder and the piston.

The other ends of the conductors 27 and 25 are similarly connected to the terminals 46 and 47, respectively, of the secondary of the transformer, which constitutes the source of supply of the welding current. The end of conductor 27 is se-

cured in a socket 48 formed in a connector 49, which is secured to the terminal 46 in electric contact therewith.

The end of conductor 25 is also secured within a socket 52 formed in the end of a connector 54 which is coaxially disposed in the connector 49. The terminal 47 has a tapped opening, and the opening 54 is threaded for securely threading it to such terminal. The connector 49 is provided with a packing ring or sleeve 55, and an insulating tube 57 is located between the connector 54 and the sleeve and also between the connectors 54 and 49. Thus, the current induced in the secondary flows through the conductors 27 and 25 to the connectors 28 and 29, respectively, which are in turn connected, respectively, through the bracket 5 to the electrode 2 and through the cylinder 6 and the piston 4 to the electrode 1.

The piston 4 is formed to efficiently complete the circuit from the cylinder 6 to the electrode 1, as clearly disclosed in Martin Patent No. 2,193,977, in which a welder such as that here illustrated is disclosed in detail. The piston 4 is operated hydraulically by pressure transmitted by oil or other liquid, which is connected with the head 8 through an opening 62 located above the head of the piston 4 for admission of the liquid to the cylinder. The pipe leading to such opening is, of course, connected to a suitable means for producing a high hydraulic pressure and thereby produce a proper welding pressure. Also, any well known means known in the art may be automatically or manually operated to complete the primary circuit and cause the welding current to flow to the electrodes 1 and 2 through the work when the work is subjected to the welding pressure.

To maintain the electrodes and the conductors cool, a cooling liquid, such as water, is conducted through the connectors, the cable and the electrodes. In the structure illustrated, water from a suitable source is conducted into a passageway 67 formed in bracket 5, which leads to the interior of the welding electrode 2 by means of the tube 68. The liquid passes outwardly through a passageway formed in the bracket and through a conduit 70 to the arms 7 of the piston 4, where it is connected to a passageway 71 through which the liquid flows to the electrode 1 and then flows from the electrode 1 through a passageway 72 and a conduit 74 connected to the arm 7 of the piston. The conduit 74 is connected to the head 8 of the cylinder and is introduced through an opening 77 formed in the head 8 at a point located near the end of the cylinder 26. The liquid then flows through the coaxial opening 78 formed in such connector into the central member 24. The member 24 is pervious to the passage of liquid through the wall thereof, so that such liquid seeps out through the stranded conductor 25 to cool such conductor. The liquid then passes outwardly through an axial opening 79 formed in the connector 54 and outwardly through a passageway 80 formed in terminal 77 and then outwardly through a connection to a conduit member 81 to either a suitable reservoir or a point of discharge.

Referring to Figs. 3 through 6, another embodiment of the invention is illustrated in which another form of welding cable is generally indicated at 82, having one of its ends connected to the electrodes of a welding gun by means of a connector, generally indicated at 84, and having its other end connected to the secondary of the transformer through a connector, generally indi-

cated at 86. The connectors 84 and 86 are similar in construction to each other, so that a detailed description of one will suffice for both.

The cable 82 comprises a central member 88, which is formed of a spiral spring and which is generally tubular in form and of such a construction so that the wall thereof is perforate between the convolutions of the spring. Water, or a similar cooling fluid may, therefore, pass through the wall between such convolutions, so that the fluid seeps through the surrounding strands of a stranded conductor 90, which corresponds to the conductor 25 in the embodiment above described. An insulating member 92 surrounds the stranded conductor 90 and engages the outer surface thereof. Such a member 92 is imperforate and may be formed of rubber or a composite rubber and fabric material. Another stranded conductor member 94 surrounds the member 92 and bears thereagainst. Such member 94 corresponds to the conductor 27 in the embodiment above described. The elements so far described are concentrically arranged with respect to each other and after such elements have been formed in the assembled positions described, another insulating member 96 is positioned in surrounding relationship to the stranded member 94 and preferably in spaced relation thereto to provide an annular space therebetween. The member 96 is also concentrically arranged with respect to the other elements.

The connector 84 is formed in separable sections 98 and 101, which are bolted together by means of bolts 102, but which are electrically insulated from each other by means of suitable insulation 104.

The section 98 is formed with an axial, tapered opening 106 therethrough, having an annular chamber 108 communicating at the inner edge with a tubular extension 110. Diametrically opposed tapped openings 112 are provided through the wall of section 98 and communicate with the annular chamber 108. Either one of such tapped openings is adapted to have attached thereto a fitting for connecting one of the cooling water conduits thereto; and, as such fitting is usually attached to one of the openings, the other opening is plugged up. Both openings are provided for convenient accommodation to different set-ups. A connector 114 is suitably secured to a flattened face 116 of the section 98 for electrical connection to the one electrode of the welder gun.

The central member 88, the stranded member 90 and the insulating member 92 are passed through the opening 106 of section 98. As the walls of the opening 106 are tapered, the stranded section 94 is flared, so that it contacts the tapered wall. A sleeve member 117, having the outer wall thereof tapered corresponding to the taper of the aperture 106 and having an inner axial opening 118, is then positioned within the section 98 so that the outer tapered surface thereof bears against the inner surface of the stranded member 94 and urges it into contact with the tapered opening 106. The members 88, 90 and 92 pass through the central opening 108. When the section 101 is drawn into position by the bolts 102, it will be seen that an efficient contact is obtained due to the wedge action of the member 117 against the flared ends of the stranded member 94.

The section 101 is provided with an axial recess 120, which receives the end of the stranded member 90 and member 88 therein. Such end

may be secured within the socket 120 by a soldering or sweating operation. An axial passageway 122 is also formed in section 101 in alignment with the passageway formed through member 88. A pair of oppositely disposed transverse passageways 124 are formed in member 101 and communicate with passageway 122. The outer ends of passageways 124 are tapped for the reception of a conduit fitting for the passage of fluid through either one of the conduits 124, passageway 122 and the passageway formed by the member 88.

When the conduit fitting is attached to one side only of the member 101, as is usually the case, the other side may be plugged up. Both sides are provided with passageways, the same as the passageway 112 in section 98, so that the structure may be conveniently accommodated to different set-ups. The outer end of passageway 122 is also plugged up.

The member 101 is also formed with an axially extending projection 126, which provides the connection for the other electrode of the welding gun.

As stated above, the connectors 84 and 86 are the same in construction and the corresponding elements of connector 86 have been indicated by primed numerals for the purpose of identification. It is to be understood that the connectors 114' and 126' are suitably connected to the respective terminals of the secondary of the transformer.

As in the embodiment described above, a suitable source and suitable conduits are provided for passing a cooling fluid, such as water, through the cable to maintain the conductors at a properly low temperature. Such cooling fluid is also passed through the welding electrodes, as in the embodiment described above. The cooling water may be circulated so that it passes first through the central member 88, passing outwardly through the wall thereof into contact with the stranded conductor 90, and then passed back through the space between the conductor 94 and the insulating member 96 so that it engages the strands of this conductor. This is the preferable circulating path since the center of the cable is the hottest, but the circulation could be through the outer space and back through the inner member 88, if desired.

The cooling fluid may be passed into the central member 88 through a conduit attached to the unplugged passageway 124 at one end of the cable and passed out through the corresponding passageway 124 at the other end of the cable. The returning fluid enters passageway 112 at such other end, into the annular space 108, into the space between the conductor 94 and member 96, and into annular chamber 108', and out through the corresponding passageway 112. It will thus be seen that the present construction provides an efficient means for effectively cooling both of the stranded conductors 90 and 94.

Formal changes may be made in the specific embodiments of the invention illustrated and described without departing from the spirit and substance of the invention, the scope of which is commensurate with the appended claim.

What is claimed is:

A cable connector for attachment to an end of an electric cable in which such cable has a pair of telescopically arranged conductor portions which are insulated from each other and has means defining at least one passageway for passing coolant through the cable, said connector

comprising first and second sections, said first section having an opening therein adapted to receive the outer conductor therein and being electrically connected to the outer conductor, an annular member received within said opening and between which and said first section said outer conductor is wedged, said second section having an axial recess therein adapted to receive the

inner conductor therein and being electrically connected to the inner conductor, at least one of said sections having a coolant passage communicating with said passageway through which coolant may be introduced to the latter, and means for securing said sections together in abutting relationship but insulated from each other.

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