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2,635,133

BENT TUBE DEAD-END CONNECTOR

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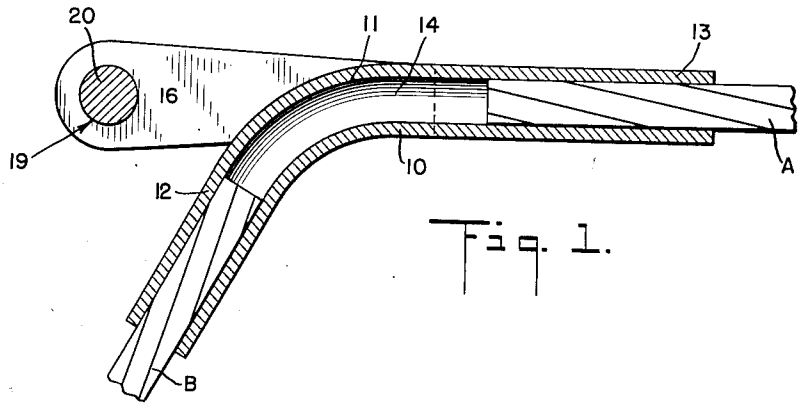


Fig. 1.

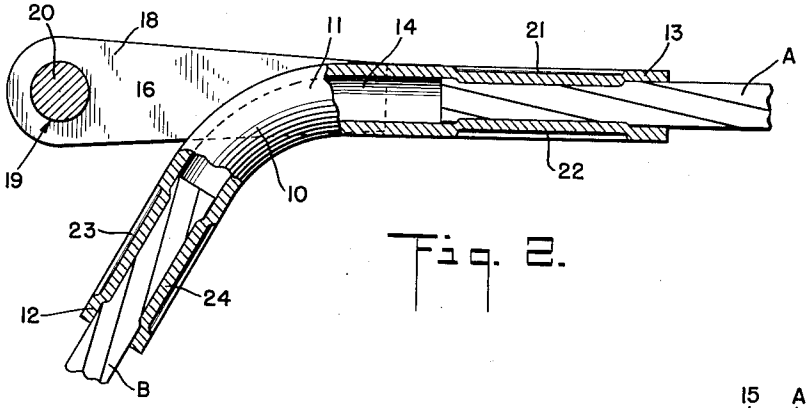


Fig. 2.

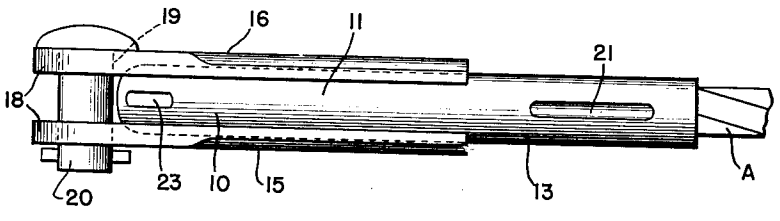


Fig. 3.

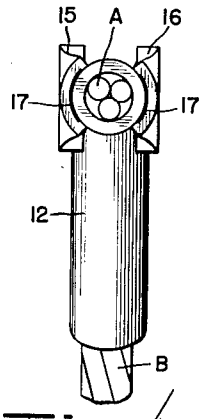


Fig. 4.

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BENT TUBE DEAD-END CONNECTOR

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7 Claims. (Cl. 174—94)

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The invention relates in general to an electric connector for suspending a cable to a support and specifically relates to a connector, sometimes called a dead end connector, for securing the end of a main cable in position anchored to supporting and tensioning members and for connecting a tap line mechanically and electrically to the connector and thus therethrough to the main cable. This application constitutes a companion to an application of Martin D. Bergan, Serial No. 39,676, filed July 20, 1948.

The invention also relates to certain improvements in the technique of fabricating the dead end connectors herein featured and to the methods of applying them to their associated cables.

It is usual practice in this art as disclosed in the patents to Varney, 1,746,879 and 1,793,293, and in the patent to Carlson, 1,758,218, to provide a connector of two separate parts, each part including a tube of conductive metal, one crimped on the main cable and the other crimped on a tap wire. The two parts are then clamped to each other through flat-faced clamping plates and disposed to locate the tap wire so as to depend from the main cable at an angle thereto as is usual in such devices. The use of clamps in such cases means, of course, that there is formed a joint or gap across the electric path provided by the two-part connectors. Joints, even the best of joints, in such connectors interpose a resistance to the conductivity of the current in passing from the main cable to the tap wire. There is thus interposed in all known forms of dead end and similar forms of connectors a resistance different with different forms of connectors and differing in the squeeze pressures across the joint at points where the interposition of any resistance has been most objectionable.

The primary object of the invention is to avoid the ohmic resistance heretofore imposed by dead end and similar forms of connectors by reason of joints therein between the separable parts and, on the contrary, to provide a curved, continuous and thus uninterrupted electric path of high conductive value through the connector from one to the other cable or conductor.

It is also common practice as disclosed in the above-identified patents to employ as the main cable a type formed of a plurality of strands of conductive metal usually of copper or aluminum. The cable is connected to a tower or other support in such way as to suspend the cable under tension in a catenary form and the connection between the cable and the support is usually by means of a fitting provided with a clevis.

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Of course, this clevis-forming and cable-supporting part of the connector must be strong and rigid to resist deformation when subjected to such strains as connector and cable supports are often subjected, particularly in stormy and icy weather.

As the known forms of dead end connectors must thus possess structural strength capable of resisting any distortion from strains imposed thereon under severe operating conditions, they have been made up of a tough metal, usually a copper alloy, capable of maintaining their initial rigidity, but such metals do not possess a very high degree of conductivity. Conductivity, then, heretofore had to be sacrificed in the known devices in order to obtain the required structural strength.

The present disclosure features the forming of a cable support and specifically a cable support of the type known as a dead end connector of two parts made of materials of different tensile strengths and each selected to meet the requirements of the associated part and connected to form as an article of manufacture a single complete and mutually reinforced unit. One of the parts is a rugged suspensory capable of anchoring the cable to a suitable support, and the other part is a current-carrying tubular splicing sleeve capable of being compressed or crimped or otherwise distorted on to the cables or wires to be spliced thereby and, of controlling importance, capable of a high degree of conductivity.

The invention thus features the use of a highly conductive metal to form the splicing sleeve for electrically connecting the conductors without regard to any factor of strain-resisting capacity in the relatively frail sleeve and the use of a strain-resisting material for use as the more rugged suspensory element without regard to any factor of current conductivity in the suspensory.

Broadly, the objective is obtained by using a splicing tube or sleeve of a high degree of conductivity, preferably of copper and sufficiently ductile so that it can be bent into an elbow or similar angled shape without rupture and with its ends exposed for distortion into a crimping engagement with a conductor or conductors in its bore and which conductive tube is reinforced at its bend by a more or less massive and rugged form of suspension which does not even have to possess any degree of conductivity and might even be made of a non-conductive material, such as a plastic or ceramic.

Various other objects and advantages of the invention will be in part obvious from a consider-

ation of the method features of the disclosure and from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one method of practicing the invention, and the invention also consists in certain new and novel modifications of the preferred method and other features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawing:

Fig. 1 is a sectional view taken in the longitudinal medial plane of a dead end connector of a Greek gamma or pistol-like form in side elevation constituting a preferred embodiment of the invention with the main cable and tap wire in place but before the connector has been secured to the conductors and which form of the invention is intended to be used in those situations where the tap wire is separate from the main cable;

Fig. 2 is a view similar to Fig. 1 with the main cable and tap wire in place and with the opposite sides of the splicing tube crimped thereon;

Fig. 3 is a plan view looking down upon the device shown in Fig. 2, and

Fig. 4 is an end view of the showing in Fig. 2, looking at the same from the right-hand side.

The dead end connector is intended to connect a longitudinally extending main cable or conductor A to a depending tap cable or wire B. The connector is formed primarily of two main parts, more or less permanently connected. One part is formed of a long, tubular splicing sleeve or tube 10 formed of highly conductive metal such as copper, bent into elbow form, and the other part is formed of two side cheeks brazed to the sleeve 10 and forming a rugged suspensory embracing the elbow sleeve 10 at its bend. The suspension includes a clevis-forming extension and which suspensory, while capable of functioning as such, is not necessarily made of conductive metal but is made of some strong type of metal.

The sleeve or tube 10 was originally a straight length of ductile, drawn commercial tubing bent into the elbow form to provide a crotch 11 and two substantially straight end portions 12 and 13 disposed at an obtuse angle to each other. The tube is capable of being distorted by conventional crimping apparatus into a crimping engagement with the conductors A and B in its bore 14. In one embodiment of the invention tube 10 is formed of a high grade of copper selected for its high conductive value.

The suspensory is formed of a pair of side cheeks 15—16, each pre-cast to shape in the form of flat rugged plates. The cheeks are disposed in upstanding parallel relation on the two opposite uniplanar sides of the tube 10 and have their inner faces machined to provide curved, shallow, concaved channels 17 to provide seats in which are fitted the opposite sides of the tube in the part thereof at the crotch 11 as shown in Fig. 4. In the illustrated case the side cheeks 15—16 are formed of heavy bronze plates, one-quarter of an inch thick and are brazed at the channel seats 17 to the tube 10, as indicated by the heavy curved lines at 17 in Fig. 4. These cheeks, of course, have materially greater strain-resisting properties than does the conductive tubular sleeve 10.

The portions of the cheeks which project rearwardly beyond the tube 10 coact to constitute a clevis-forming extension 18. Each cheek is provided with a bolt-hole 19, one aligned with the other. The cheeks thus form a clevis for suspending the device from a bolt 20 forming part of a suitable support or a part of the usual tensioning means used with such devices. In the instant case the end 13, fashioned to receive the main cable A, is in prolongation of the suspensory 18 and is relatively long compared with the end 12 designed to receive the depending tap wire B.

In mounting the connector in place a free end of the main line or cable A is inserted into the bore of the end 13 for a distance to extend beyond the portion which is to be crimped, as shown at the right of Fig. 1 or until stopped by the curvature of the crotch 11. The end 13 is then crimped on to conductor A by any of the usual crimping tools employed in this art and in the instant case two long crimps or indentations 21 and 22 are shown in Fig. 2 on opposite sides of the tube end 13. Similarly, a free end of the tap wire B is inserted into the bore of the end 12 until stopped by the curvature of the crotch 11. The end 12 is then crimped on to the inserted end of the conductor B and in the instant case two long crimps or indentations 23 and 24 are shown on opposite sides of this end of the tube 10. It is within the scope of the disclosure to otherwise crimp or distort the tube ends on to the conductors therein as by the more modern practice of distorting the tube from its initial cylindrical form into a plurality of closely positioned hexagonal deformations.

The one-piece copper elbow forms an uninterrupted electric path of high conductive value connecting the main cable with the depending tap wire and is formed solely with regard to its capacity as an electric conductor. Being of one-piece, ohmic resistance within its outline is thus kept to a minimum. The elbow is directly and permanently connected to the conductors in such way, as by crimping, to minimize ohmic resistance between the elbow and the conductors and in this way take advantage of that form of connecting a highly workable form of connector to its conductors.

While there is thus featured a more or less easily distortable electric connector in the elbow feature, on the other hand the suspensory can be made of any rugged material with a complete disregard to any electric conductivity capacity, and, as a matter of fact, conductivity in the suspensory part is objectionable in the art of dead end connectors.

I claim:

1. A dead end fitting comprising a preformed one-piece tubular sleeve of highly conductive metal bent into an elbow form and including two substantially straight end portions disposed at an obtuse angle to each other and a curved crotch portion integrally connecting the end portions, a suspension for supporting the sleeve with both end portions of the sleeve projecting beyond the suspension, said suspension extending in prolongation of one of the end portions of the sleeve and comprising a pair of upstanding rugged, stiff cheek plates disposed in parallel, transversely-spaced apart relation with their inner ends complementarily contoured and fitted to opposite sides of the sleeve at its crotch portion and secured thereto and with their outer ends provided with aligned bolt holes, a main cable inserted in that end portion which is in prolongation of the suspension, and a tap wire inserted in the other end portion and depending from the suspension, and said end portions of the sleeve being each indented in the parts thereof projecting beyond the

suspension to crimp the same permanently on to the main cable and tap wire, respectively.

2. A dead end connector comprising two units formed of materials of different tensile strength, one unit comprising a one-piece preformed tubular sleeve of highly conductive malleable metal forming an uninterrupted hollow electric path therethrough from end to end and fashioned to connect electrically the spaced-apart ends of bare conductors inserted in its ends, said sleeve having an elbow form and including substantially straight end portions disposed at an obtuse angle to each other and a curved crotch portion integrally connecting the end portions, the end portions having their exteriors of cylindrical form and exposed for machine operation thereon, each end portion providing a bore with a circularly continuous wall for engaging the entire perimeter of bare conductive cables inserted therein when said end portions are crimped onto such cables, a suspension for supporting the sleeve comprising a pair of upstanding rugged, stiff cheek plates, formed of a material of greater tensile strength and of less conductive capacity than the highly conductive and malleable material of the sleeve, said cheek plates disposed in parallel, transversely-spaced-apart relation with the inner faces at their inner ends contoured to provide a two-dimensional area of engagement with the opposite arcuate sides of the sleeve at the crotch portion and secured thereto over a material area thereof to reinforce the crotch portion and with the other ends of the cheek plates projecting beyond the sleeve and provided with an element of an attaching means for securing the connector to a support.

3. A dead end connector including a bent tube of elbow form of highly conductive malleable metal forming in all cross sections thereof a solid annular ring, each end portion being exposed and deformable into a crimping engagement with the bare end of a conductor therein, and a rugged suspension of greater resistance to deformation than the tube, with one end of the suspension snugly engaging the tube adjacent its crotch portion to reinforce the same and its other end projecting from the tube and provided with means for attaching the connector to a support, the tube and the part of the suspension engaging the same having curvilinearly complementary and extensive interengaging areas of contact extending for a material degree of arc distance about the exterior of the tube at its crotch.

4. A dead end connector including a ductile, metal tubing having a high degree of conductivity, of elbow form and whose end portions are each exposed and fashioned to be deformed into a crimping engagement with a conductor therein, a suspensory having one end thereof engaging a mid-portion of the elbow adjacent its crotch to reinforce the same over a material area thereof, said suspensory formed of a material having

greater resistance to distortion and a less degree of conductivity than the ductile metal tubing.

5. A dead end connector comprising a copper tube of elbow shape and forming in all cross sections thereof a solid, annular ring, and a bronze casting having a portion thereof secured to the outer side of the tube at a mid-length portion thereof and in spaced relation to the ends of the tube, leaving the end portions of the tube each straight for a material portion of one-half of the length of the tube and exposed for deformation into a crimping engagement with any conductor therein, and another portion of the casting spaced from the tube and provided with means for attaching the connector to a support.

6. A dead end connector comprising a thin-walled copper tube circular in all cross sections and bent into elbow shape, having relatively high conductive capacity and relatively low structural resistance to becoming deformed, and a rigid structure having relatively high resistance to becoming deformed and relatively low conductivity compared to the copper tube, said rigid structure having a part thereof engaging an arcuate portion of the tube at its crotch portion to reinforce the same and another part thereof spaced from the tube to provide a support for the connector, both ends of said tube projecting beyond the part so reinforced and exposed for engagement by crimping apparatus to be deformed into a crimping engagement with conductors in the exposed ends of the tube.

7. The device defined in claim 6 and wherein the rigid reinforcing structure is in the form of two upstanding preformed plates spaced apart, each provided with preformed curved inner faces engaging the outer face of the tube on the opposite arcuate sides thereof and each permanently secured to the tube over the curved contracting area provided by the outer perimeter of the copper tube.

CARROLL A. BADEAU.

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