

May 26, 1970

J. C. RAY

3,514,528

INSULATION PIERCING CONNECTOR FOR WIRES

Filed Nov. 13, 1967

2 Sheets-Sheet 1

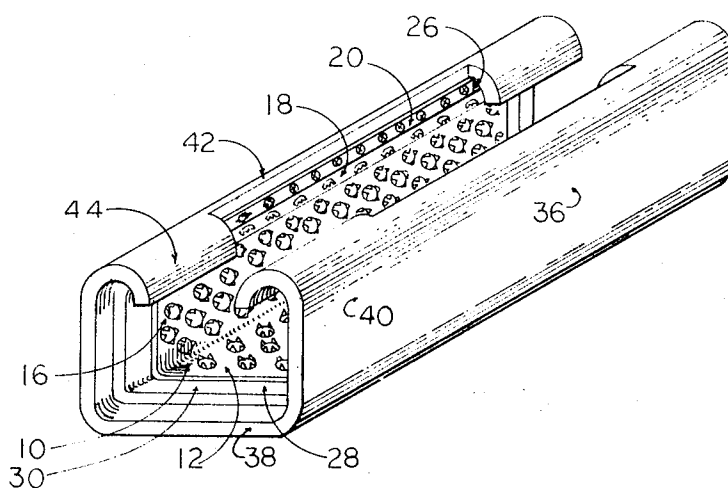


FIG. 1

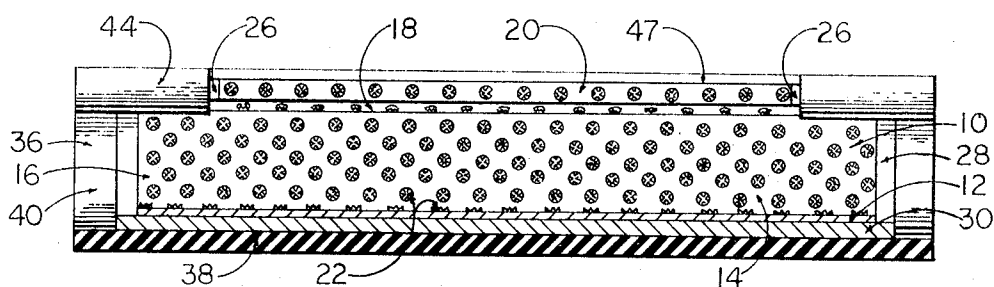


FIG. 2

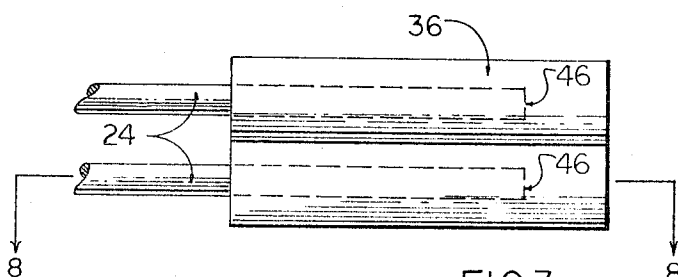


FIG. 3

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2 Sheets-Sheet 2

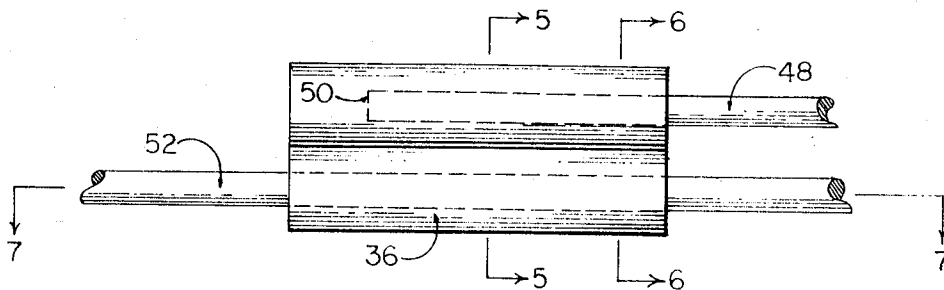


FIG. 4

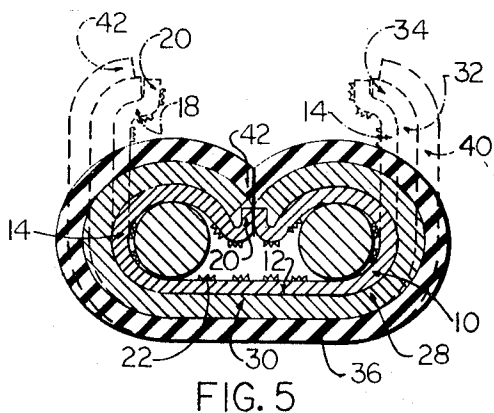


FIG. 5

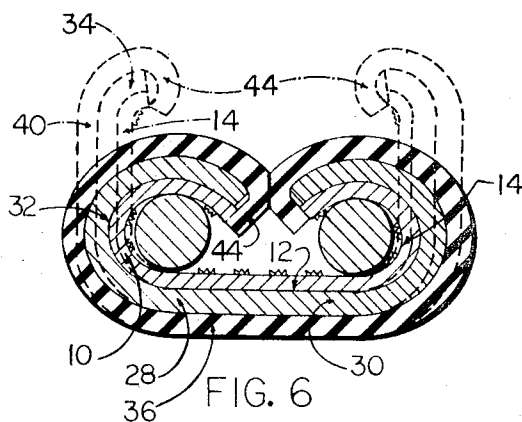


FIG. 6

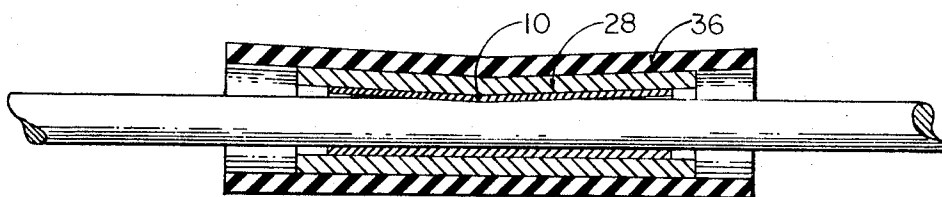


FIG. 7

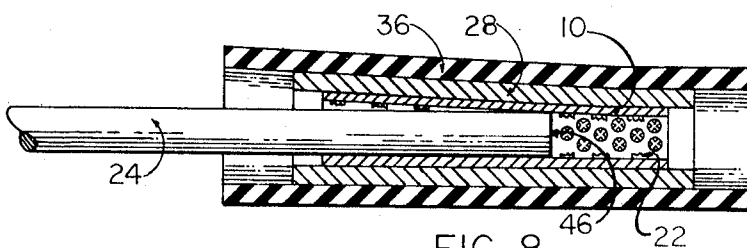


FIG. 8

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3,514,528

INSULATION PIERCING CONNECTOR FOR WIRES
Jimmy C. Ray, Rte. 2, Box 33, Denison, Tex. 75020
Filed Nov. 13, 1967, Ser. No. 682,364

Int. Cl. H02g 15/08

U.S. Cl. 174—84

4 Claims

ABSTRACT OF THE DISCLOSURE

A three-layer connector for wires has a U-shaped configuration in cross section before use. The layers include a resilient metal interior conducting part, a ductile metal intermediate part, and an insulator outer part. Either of the wings of the U may be bent over independently to attach the connector to one or two wires and additional wire may be connected by bending the other wing down. The wings are bent simultaneously in many installations.

CROSS-REFERENCE TO RELATED APPLICATIONS

The subject matter of this application is adapted to be used in a system as disclosed in my copending application filed Feb. 7, 1966, in the U.S. Patent Office, Ser. No. 525,506. No claim of priority is made.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to an electrical connection of wires and more particularly to a connector for insulated communication wires.

Description of the prior art

Graff et al., in U.S. Pat. 3,064,072, issued Nov. 13, 1962, discloses a three-part connector wherein a pair of wires are inserted into a closed cup. The wires to be connected are moved axially into the cup (or the cup moved axially onto the wires).

Collier, U.S. Pat. 3,194,877, issued July 13, 1967, and Jugle, U.S. Pat. 3,242,256, issued Mar. 22, 1966, and Thompson, U.S. Pat. 3,303,266, issued Feb. 7, 1967, disclose connectors having the basic open U-shaped configuration and cross section.

SUMMARY OF THE INVENTION

I have invented a connector having the advantages of the Graff et al., three-element conductor in that a good solid connection can be made. The ductile intermediate metal portion has the same thermal expansion as the wires being connected and, therefore, with the expansion and contraction of the parts due to temperature changes, there is not a tightening or loosening of the joint. The wire to be spliced is moved transverse the connector to place the wire in the connector, therefore, greatly speeding the process.

Furthermore, I have designed the connector so that the wings may be folded over a wire to connect one or more wires to the connector separately. Therefore, several connectors may be attached to several wires of one

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cable by bending over one wing to the one wire. Thereafter, the splice may be completed by bending over the other wing of the connector to a wire of another cable.

Bridges may be made wherein a connector is attached to a wire and thereafter a running wire may be bridged into it, again using the wing-at-a-time connection. For certain automatic operation the connector has a plurality of small perforated indentions from the inter-resilient element so that there is no necessity for careful orientation of the wires before the crimping of the connector. In this regard it is noticed that in all cases the connector is crimped with a tapered crimp, i.e., the connector at the end of the wire has a closer bite together than at the end of the connector through which the wire extends.

An object of this invention is to electrically connect two or more wires together.

Other objects are to achieve the above with a device that is sturdy, compact, durable, lightweight, efficient, simple, safe, versatile, and reliable, yet inexpensive and easy to manufacture, install, and maintain.

Still further objects are to achieve the above with a method that is safe, rapid, lightweight, efficient, and inexpensive, and does not require skilled people to install, adjust and maintain.

The specific nature of the invention, as well as other objects, uses, and advantages thereof, will clearly appear from the following description and from the accompanying drawing, the different views of which are not necessarily to the same scale.

DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a connector according to this invention.

FIG. 2 is a longitudinal sectional view of the connector.

FIG. 3 is a plan view of the connector crimped to two wires forming a butt splice.

FIG. 4 is a plan view of the connector crimped to two wires forming a bridge splice.

FIG. 5 is a cross sectional view through the middle of a splice as would be seen on line 5—5 of FIG. 4, with the connector shown in the position before crimping in dotted lines.

FIG. 6 is a cross sectional view through the end of a splice as would be seen on line 6—6 at FIG. 4, with the connector shown in the position before crimping in dotted lines.

FIG. 7 is a longitudinal sectional view through a bridge splice as would be seen on line 7—7 of FIG. 4.

FIG. 8 is a longitudinal sectional view through a butt splice as would be seen on line 8—8 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring specifically to the drawing, the innermost metal member, insert 10, includes web 12 at the bottom and two wings 14 on each side of the web, thus forming a U-shaped configuration in section. The wings have a lower straight part 16, which are bent at right angles to the web 12. Flange 18 is above the part 16 and angled inwardly at about 45° thereto. Above the flange 18, the wing 14 terminates with lip 20, which is at right angles to the web 12, therefore parallel to the part 16 of the

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wings. As illustrated, the lip 20 is quite narrow. The insert 10 is made of a hard resilient noncorrosive conductive metal and has a plurality of tanged perforations 22 throughout. The tangs of these perforations 22 form a contact point to contact wire 24 which is inserted into the connector. There is a row of perforations in the flange 18 and a row in the lip 20. On each end of the lip 20 there is a notch 26 for purposes that will be described later.

Intermediate metal member, sleeve 28 of U-shaped configuration, surrounds the insert 10. The sleeve includes web 30, the inside width of which is equal to the outside width of the insert web 12. Extending from right angles on either side of the web 30 are wings 32, the inside of which contact the outside of the wings 14 of the insert 10. The top of the wings 32 are capped with flange 34 which lays along on top of the flange 18 and the edge of the flange 34 butts against the lip 20 (FIG. 5). The sleeve 28 is constructed of a ductile metal, it is thicker than the insert 10. Therefore, the sleeve 28 furnishes the strength holding the insert 10 in contact with the wire 24. Also, the coefficient of thermal expansion of the sleeve 28 is the same as for the wire 24 and, therefore, the sleeve 28 holds the tangs of the perforations 22 firmly embedded in the wire 24 and there is no slippage or change in the relationship due to a difference in thermal expansion and contraction.

Insulating jacket 36 of U-shaped configuration, made of suitable plastic, surrounds the sleeve 28. By "plastic" I means any of those synthetic or resin materials which are adapted by their insulating properties as well as certain physical structural properties as will be described hereinafter. Inasmuch as the material of the jacket itself forms no part of this invention and will be well known to those skilled in the art, it is not further described here. The jacket 36 has web 38 the interior width of which equals the exterior width of the sleeve web 30. However, the jacket 36, including the web 38 thereof, is longer than the sleeve 28 and longer than the insert 10. It will be noted that the sleeve 28 is slightly longer than insert 10. When the connection is complete to a wire, the jacket 36 insulates the connector so there is no possibility of chance electrical contact with the sleeve 28 or insert 10. Wings 40 of the jacket 36 are at right angles to either side of the web 38 and are in contact with the outside of the sleeve wings 32.

The top of each wing 40 terminates with short flange 42 which extends over the sleeve flange 34. On each end of each wing 40, collar or tab 44 wraps around sleeve 28 and insert 10, as seen in the drawing. This collar or tab 44 fits or correlates with notch 26 to securely position the insert 10 with respect to the jacket 36.

The term "butt splice" as used herein will indicate a connection of two wires with each wire terminating within the connector (FIG. 3). To make a butt splice, the two wires 24 to be electrically connected are placed parallel to one another with their ends 46 even or nearly so. Then the two wires are moved transversely of their length into the connector so that the wires 24 extend at least half the length of the insert 10 and preferably a little more. However, the ends 46 of the wires 24 should not extend beyond the end of the insert 10. Generally speaking, the wires 24 will be lying side by side and contacting the web 12 of the insert 10. Then the connector is crimped so that the wings 40, 32, and 14, are flattened down against the wire and extend along and above the web. As seen in FIG. 8, there is a taper to the crimping mechanism so that the connector is crimped with the wings closer to the web at the end of the connector containing the ends 46 of the wires. The tangs of the perforations 22 pierce through the insulation upon the wires 24 and pierce the surface of the metal of wire 24 itself, thereby making a good electrical connection. Inasmuch as the operation of the tanged perforation into the metal is well known to the art as disclosed in the Graft Pat. 3,064,072, noted above, it will not be further described here.

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FIG. 5 and FIG. 6 would also represent section through a butt splice. When the crimp is completed upon the wires, the lips 20 are facing one another and in contact with one another and the insulation of the jacket 36 along the flange 42 forms a butt relationship so that the connection is completely insulated.

When the wires 24 are placed in the connector, they are moved transverse of their length. Also, although normally the wires will be placed in the connector so that they are parallel and both lie along the bottom web 12 of the insert 10, it is not essential that they be placed in such a neat arrangement, i.e., if the wires should be slightly twisted or one on top of the other, a good connection will still be made. This is the purpose of having perforations along the lips 20 and the lips folding down to meet one another. Therefore, if both wires were right in the middle of the connector and slightly twisted around one another, the tangs of perforations 22 will make good electrical contact.

The term "bridge splice" as used herein means a splice wherein two wires are connected together. (FIG. 4 for example), one wire 48 terminating with its end 50 within the connector, and the other wire 52 extends through the connector, but electrical contact is made with the wire. To make a bridge splice, the first wire 48 is placed within the connector, moving the wire transverse to its length and placing the wire within the insert 10 along in a corner formed between the web 12 and one of the wings 14. The end would be within the insert 10 and the wire would extend along a considerable portion of the insert 10 and preferably about three-fourths of the length of the insert 10. Then one wing only is folded over, forming good electrical contact with this one wire. Thereafter, the second wire 52 is placed in the connector with the wire extending out on each end of the connector. The wire is placed in contact with the web 12 and the other wing 14. Then that wing is crimped down and the connection is complete. In the bridge splice it will be obvious that if one of the wires were wanted to be disconnected, there is sufficient flexibility to the material of the jacket 36 that one of the ends of wire 52 may be cut within the confines of the nondeformed jacket so that the jacket reassumes its normal shape to insulate the wire where cut.

In a crimp as seen in FIG. 7, a crimping tool would be used having a hammer having a lower portion in the middle and tapering upward on both sides against a flat anvil and, therefore, the crimp would be lower at the center and more strain exerted as between the tangs of perforation 22 and the wire 52 than towards the ends.

It would be apparent that the embodiment shown is only exemplary and that various modifications can be made in operation, construction, materials, and arrangement within the scope of the invention.

I claim as my invention:

1. A connector for splicing insulated wire comprising
 - (a) a U-shaped insert
 - (i) made of resilient metal
 - (ii) having a plurality of tanged perforations therein,
 - (b) a U-shaped sleeve
 - (i) made of ductile metal
 - (ii) contacting the outside of the insert, and
 - (c) a U-shaped jacket
 - (i) made of insulating material
 - (ii) contacting the outside of the sleeve,
 - (d) the wings of the insert extending beyond the wings of the sleeve forming a lip with perforations therein; so that when the wings are crimped in over a pair of wires in the connector the lips butt against one another as does the edges of the jacket.
2. The invention as defined in claim 1 with the additional limitation of
 - (e) notches in the wings of the insert and
 - (f) tabs on the wings of the jacket

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(b) in the notches so that the elements are securely held in the proper relationship.

3. The invention as defined in claim 1 with the additional limitation of

(e) the top of the wings of the sleeve having flanges 5 that angle inward.

4. The invention as defined in claim 3 with the additional limitation of

(f) notches in the wings of the insert and

(g) tabs on the wings of the jacket

(h) in the notches so that the elements are securely held in the proper relationship.

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10 DARRELL L. CLAY, Primary Examiner

U.S. Cl. X.R.

29—628; 174—87; 287—109; 339—97, 276