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Masterson et al.

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[54] **ADAPTOR FOR MODIFYING CONNECTOR TO ACCOMMODATE SMALLER CONDUCTORS**

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[73] Assignee: **General Cable Corporation,** New York, N.Y.

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[52] **U.S. Cl.** ..... **174/87,** 29/628, 29/630 F, 174/84 C, 339/98, 339/276 R

[51] **Int. Cl.** **H02g 15/08**

[58] **Field of Search** ..... 174/87, 84 C, 94 R, 90; 339/97 R, 97 C, 98, 223 R, 276 R; 29/628, 630 F

[56] **References Cited**

UNITED STATES PATENTS

3,566,006 2/1971 Metcalf ..... 174/87 X

Primary Examiner—Darrell L. Clay

[57] **ABSTRACT**

Communication cables are connected together by inserting end portions of insulated conductors into connectors having inwardly projecting tangs, and the connectors are then compressed to grip the wires and force the tangs to cut through the insulation and part way through the wires to hold the wires firmly in the connector and in an electrical circuit with each other. Such standard connectors could not be used with wires smaller than No. 26 AWG. This invention places an adaptor in the connector as a stop to limit the flattening of the connector against the wires, and to prevent the connector sleeve from closing tight enough to cut through wires as small as No. 28 AWG. The range of wire sizes that the connector can be used for is thereby extended.

9 Claims, 7 Drawing Figures

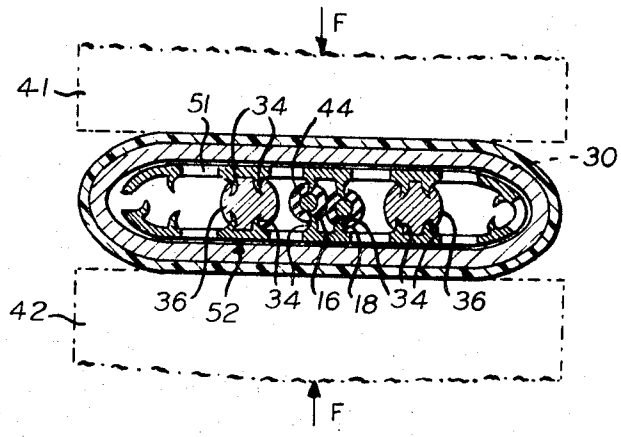


FIG. 1.

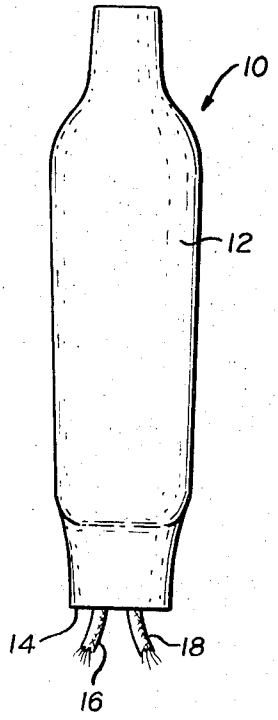


FIG. 2.

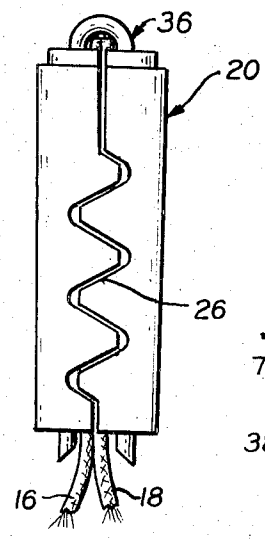


FIG. 3.

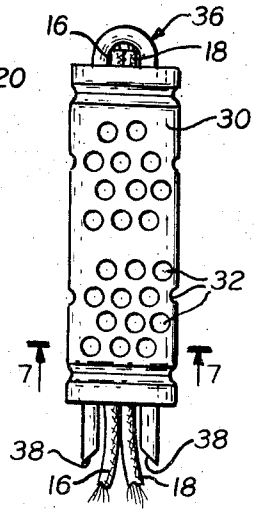


FIG. 4.

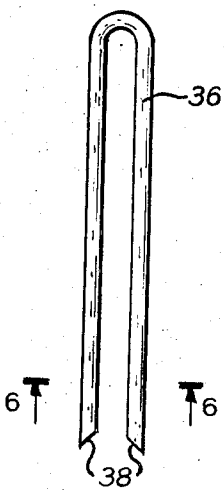


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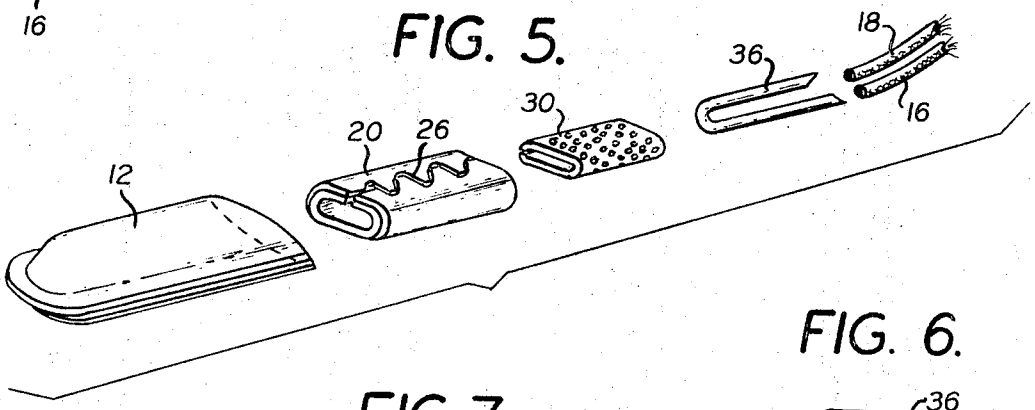


FIG. 6.

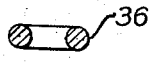
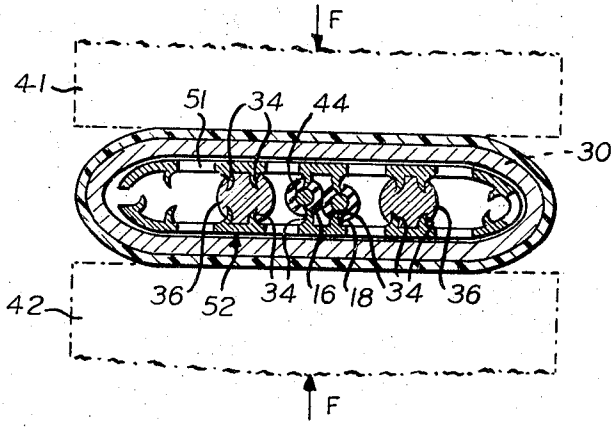


FIG. 7.



ADAPTOR FOR MODIFYING CONNECTOR TO ACCOMMODATE SMALLER CONDUCTORS

BACKGROUND AND SUMMARY OF THE INVENTION

Communication cables, such as are used for telephones, are made with large numbers of pairs of small wires, and it is advantageous to use small wires because this increases the number of circuits for a cable of given size. In practice, however, No. 26 wire has been the smallest size in general use for telephone work and the reason for this has been that No. 28 wire breaks easily when being handled for connections and standard "B connectors" could not be used with No. 28 wire because the connectors frequently cut all the way through the wires.

The invention extends the range of wire sizes with which standard connectors can be used by inserting an adaptor into the inner sleeve of the connector. With this adaptor, the standard connector can be used with No. 28 wire; and cut through and breaking is not as common with the No. 28 wire as was formerly the case with No. 26 wire.

The invention is important at this time because the installation of more conduits for telephone cables in cities is very expensive, yet there is demand for more circuits. By pulling out the old cables with No. 26 wire and installing new cables with No. 28 wire, the number of circuits that can be obtained in an existing conduit is increased up to approximately 50 percent and with great saving in cost as compared with installing new conduits.

In the preferred construction of this invention, the adaptor is a stop installed in the inner sleeve of the connector to resist deformation of the connector beyond a predetermined limit during the crimping process. The connector is a sleeve into which the wires that are to be connected are inserted. The adaptor can be soft copper wire of approximately No. 19 AWG and the wire is bent to the shape of a thin letter U. The wires to be connected are inserted into the open part of the U and the connector is then compressed to bring tangs of the sleeve into contact with the adaptor and the wires to be connected. The soft malleable material of the adaptor is gripped by tangs of the sleeve and at the same time the adaptor acts as a stop to limit the inward displacement of the sides of the sleeve so that the cut through of the tangs on the wires is limited and the wires are not completely severed by the tangs.

One outstanding advantage of the invention is that it does not require new connectors. It expands the range of wire size for which standard connectors already in general use are suitable.

Other objects, features and advantages of the invention will appear or be pointed out as the description proceeds.

BRIEF DESCRIPTION OF DRAWING

In the drawing, forming a part hereof, in which like reference characters indicate corresponding parts in all the views;

FIG. 1 is an elevation of a standard connector with which the adaptor of this invention is combined;

FIG. 2 is an elevation of the connector shown in FIG. 1 but with the plastic envelope removed to expose the outer sleeve of the connector;

FIG. 3 is an elevation of the connector shown in FIGS. 1 and 2 but with the outer sleeve of FIG. 2 removed to expose the hard metal inner sleeve which grips the wires to connect them;

FIG. 4 is an elevation of the adaptor which is used in the sleeve shown in FIG. 3 to extend the range of wire sizes for which the connector can be used;

FIG. 5 is an exploded, isometric view of the adaptor shown in FIG. 1 and illustrating the structure shown in FIGS. 2, 3 and 4;

FIG. 6 is a sectional view taken on line 6—6 of FIG. 4; and

FIG. 7 is a greatly enlarged sectional view taken on the line 7—7 of FIG. 3.

DESCRIPTION OF PREFERRED EMBODIMENT

FIG. 1 shows a connector **10** which includes a plastic envelope **12** which covers the connector and which has an open lower end **14** through which wires **16** and **18** extend into the connector. These insulated wires **16** and **18** are the wires which are joined together by the connector **10.**

FIG. 2 shows the connector **10** with the envelope **12** removed so as to expose a soft metal outer sleeve **20** which consists of a shell **22** folded in a tubular shape, and having a seam along the line **26.** This line **26** is straight along part of its length and has projections and recesses along other parts of its length so that projections of one side of the seam fit into the recesses on the other side to keep the opposite edges of the sleeve from moving longitudinally (up and down in FIG. 2) with respect to one another. The plastic envelope **12** is applied over the sleeve **20.**

FIG. 3 shows the connector when the sleeve **20** is removed. An inner sleeve **30,** which is made of hard metal, has numerous openings **32** formed in both sides. These openings **32** are made by piercing the material of the inner sleeve **30** and displacing the material from the openings so as to form tangs **34,** best shown in FIG. **7.**

FIG. 3 shows the insulated wires **16** and **18** extending for the full length of the inner sleeve **30.** Tangs from the different openings **32** extend through the insulation of the wires **16** and **18** and cut into the paired wires within the insulation when the inner sleeve **30** is flattened. The connector thus far described is a conventional "B connector" and is described in U.S. Pat. No. 3,507,977.

This invention modifies the standard connector by inserting an adaptor **36** into the inner sleeve **30.** This adaptor, shape of which is best shown in FIG. **4,** is of a size to fit into the inner sleeve **30** and to extend across the width of the sleeve before the perforated sides of the sleeve are collapsed into contact with the wires **16** and **18.**

The adaptor **36** is preferably made of soft copper wire of No. 19 gauge (AWG). The adaptor **36** is in the shape of a thin letter U, which is in an inverted position in the drawing. The open end of the U is at the end of the inner sleeve **30** through which the wires **16** and **18** are inserted into the connector. In the preferred construction, the lower ends of the adaptor **36** have tapered faces **38** which provide a flaring entrance for easier insertion of the wires **16** and **18** into the lower end of the sleeve **30.**

The wires **16** and **18** are pushed up into the inner sleeve **30** as far as they will go and the curved portion at the end of the adaptor **36** serves as a stop to limit the

movement of the wires **16** and **18** into the sleeve **30.** The type of connector to which this invention relates is supplied by the manufacturer with the inner sleeve **30** permanently enclosed in the outer sleeve **20,** as shown in FIG. **7.** FIGS. **3** and **5** show the inner sleeve **30** removed from the outer sleeve for clearer illustration of the construction.

After the adaptor **36** and the wires **16** and **18** have been inserted into the connector, the sleeve **30,** surrounded by the outer sleeve **20,** is pressed between the jaws **41** and **42** (FIG. **7**) of a closing tool which is conventionally a ratchet clamp with a spring for limiting maximum pressure exerted on the connector. FIG. **7** shows in phantom clamping jaws **41** and **42** exerting a maximum force F which compresses the connector and in doing so flattens the inner sleeve **30** so as to cause the tangs **34** to pierce insulation **44** and cut into the metal of the wires **16** and **18.**

FIG. **7** shows how the adaptor **36,** which originally fit loosely into the sleeve **30,** acts as a stop to limit distortion of the cross-section of the sleeve **30.** The cross-section of the sleeve **30** is distorted to permit its flat faces to move closer together so that the tangs **34** can move into contact with and pierce the wires **16** and **18** and the surfaces of the adaptor **36.** Thus the adaptor **36** is anchored in the sleeve **30** while serving as a stop to prevent the tangs **34** from cutting through the wires **16** and **18.**

With the sides of the sleeves **30** pressed firmly against the adaptor **36,** the force F available from the ratchet clamping tool cannot move the front and back faces of the sleeve **30,** designated generally by the reference characters **51** and **52,** any closer together. Thus the adaptor **36** limits the percentage of cut through by the tangs **34** on the wires **16** and **18;** and even though the wires **16** and **18** are **28** gauge, the sleeve **30** cannot be flattened enough to cause the tangs **34** to sever the wires **16** and **18.**

The shape of the adaptor **36,** as shown in FIG. **4,** has proved to be advantageous in practice because the closed end of the adaptor **36** where the opposite sides merge into the curved section provides a stop for limiting the extent of the wires into the connector. Also, even though the inside of the inner sleeve **30** is to a large extent obstructed by having the adaptor **36** in the sleeve, the tapered end faces **38** provide a flaring entrance so that the wires can be inserted into the sleeve just as easily as if the adaptor **36** was not there.

It will be understood, however, that the adaptor **36** can be made with other shapes. It can be made in two parts with each part located along a different side of the sleeve but with no connection between the parts; or the connection can be other than that shown. The essential feature of the connector **36** is that it be of a size that can be inserted into the sleeve into which the wires **16** and **18** are to be placed; and that the adaptor **36** be made of material which resists the pressure of the clamping tool after the tangs **34** have pierced the wires **16** and **18.** It is not essential that the adaptor **36** be made of metal or that it be a conductor of electricity since it is not a necessary part of the circuit joining the wires **16** and **18.**

It is not essential that the tangs **34** cut into the material of the adaptor **36.** The extent to which the tangs can pierce the adaptor **36** depends upon the hardness of the material and those that do pierce the adaptor are likely to be bent inwardly. In the preferred construction, the lengths of the tangs **34** are approximately 13 mils. Wire diameters for No. 26 and No. 28 AWG wire are 15.9 and 12.6 mils, respectively. The tangs have a mean cut-through of the wire of approximately 53 percent with standard deviations of approximately 17 percent.

The preferred embodiment of the invention has been illustrated and described, but changes and modifications can be made and some features can be used in different combinations without departing from the invention as defined in the claims.

What is claimed is:

1. An electrical connection comprising a flattened inner metal sleeve enclosing the ends of wires that are connected together in an electric circuit, tangs extending inwardly from the sleeve and engaging and going into the wires securing the wires therein and connecting the wires in an electric circuit with one another, adaptor means within the sleeve, said adaptor means including abutment material adjacent to the wiers but not one of the wires that are connected together in the electric circuit, the abutment means being of a cross-section larger than that of the wires and constituting a stop limiting the flattening of the sleeve causing the tangs to contact with said wires and preventing cut-through of the wires by the tangs, and an outer sleeve fitting over the flattened inner sleeve.

2. The connection described in claim **1** characterized by the tangs being formed of metal displaced by piercing openings through a side of the inner sleeve, both the wires being secured in the sleeve by being pierced by the tangs, and electrical insulation surrounding the outer sleeve.

3. The connection described in claim **2** characterized by the tangs extending inward from flattened sides on both sides of the inner sleeve and the adaptor being soft wire of larger gauge than the wires that are connected.

4. The connection described in claim **1** characterized by the adaptor being a piece of soft wire shaped in the form of a narrow U with the sides of the U extending through the sleeve between the sides of the sleeve and the wires that are connected together by said connector, with the bent end of the U being at the other end of the sleeve from that through which the wires are originally inserted into the inner sleeve and having tapered faces at the free ends of the U in angular relation that provide a flaring entrance between them for the wire to enter the sleeve.

5. The connection described in claim **1** characterized by the inner sleeve being a metal that is a good conductor of electricity, the tangs being formed of material displaced from openings pierced through flattened sides at both the top and bottom of the inner sleeve and having a length of about 13 mils, the wires to be connected being wire of No. 26 and No. 28 gauge (AWG) with insulation on the wire pierced by the tangs, the tangs having a mean cut-through of the wire of approximately 53 percent with standard deviations of approximately 17 percent, the adaptor being a length of soft copper wire of No. 19 gauge (AWG) with the length of the copper wire bent to the shape of a narrow U, the insulated wires being located side by side at a region approximately mid way across the width of the inner sleeve and the sides of the U being located beyond the insulated wires in the direction of the width of the inner

sleeve, the copper wire of the adaptor serving as the stop.

6. The connection described in claim **1** characterized by the tangs being formed of metal displaced by piercing openings in both sides of the inner sleeve, the outer sleeve having a seam with adjacent edges extending generally lengthwise of the inner sleeve and having said edges shaped to interlock with one another to prevent each edge of the outer sleeve from moving lengthwise of the inner sleeve independently of the other edge.

7. The connection described in claim **6** characterized by the inner sleeve being made of hard metal and the outer sleeve being made of soft metal.

8. The connection described in claim **6** characterized by an outer envelope of electrical insulating material that fits over the outer sleeve and that holds the outer sleeve in assembled relation with the inner sleeve.

9. The connection described in claim **8** characterized by the outer envelope being of generally tubular shape and closed at its upper end and made of plastic that stretches to fit over the outer sleeve, said outer envelope being longer than the sleeves and the adaptor, and said outer envelope contracting at its lower end under the lower ends of the sleeves and adaptor to fully insulate the connector.

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