

United States Patent

Ruth

[15] 3,654,588

[45] Apr. 4, 1972

[54] ELECTRICAL WIRE CONNECTOR

[72] Inventor: Fred N. Ruth, 7159 S. Missiondale, Tucson, Ariz. 85706

[22] Filed: Feb. 5, 1970

[21] Appl. No.: 8,962

[52] U.S. Cl. 339/89 R, 339/257, 339/277 R

[51] Int. Cl. H01r 13/54

[58] Field of Search 339/5, 8, 47-49, 339/88-90, 188, 193, 257, 277, 211-213

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[57] ABSTRACT

The connector includes a pair of electrical insulating housing elements having central openings and threadedly engageable one with the other. Each element is provided with an electrically conductive disc to which is secured a wire received within the associated opening, the disc butting a shoulder portion of the element. To effect an electrical connection, the elements are threaded one to the other with the discs being clamped between the respective shoulders in engagement with one another to form an electrical connection. In one form, the openings through the elements are tapered and the elements circumferentially scored at axially spaced positions whereby the ends of the elements can be removed to accommodate wires of enlarged diameter or larger gauge. In a further form, a pair of insulating elements having respective disc portions are threadedly engaged within a body which also threadedly receives a third element having a disc portion. In final securement, the first pair of discs are clamped against the third disc to provide an electrical connection therewith.

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15 Claims, 5 Drawing Figures

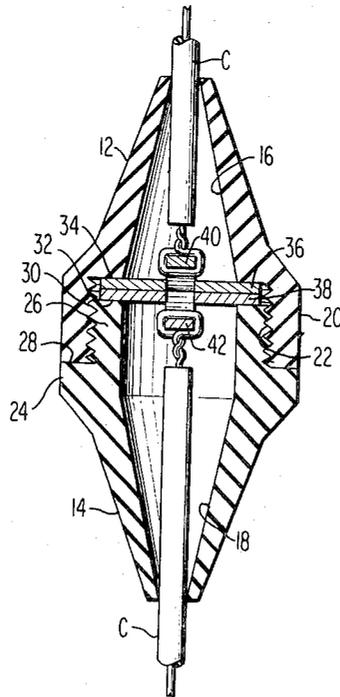


FIG1

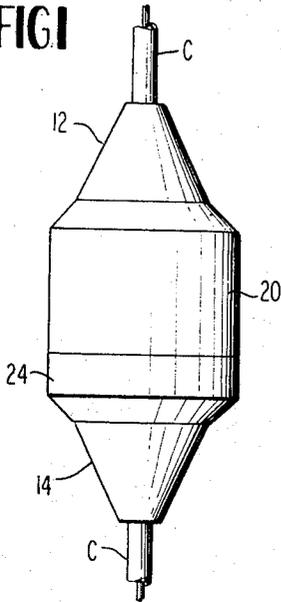


FIG2

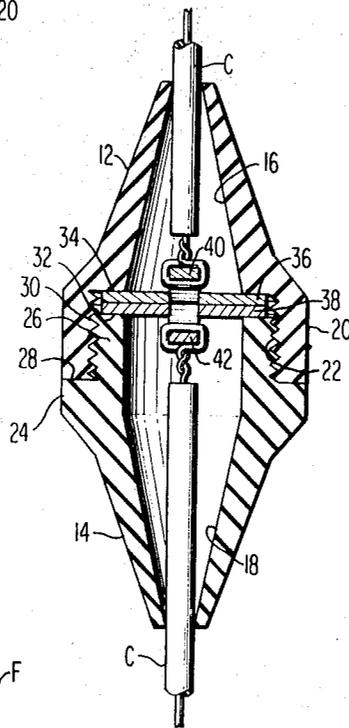
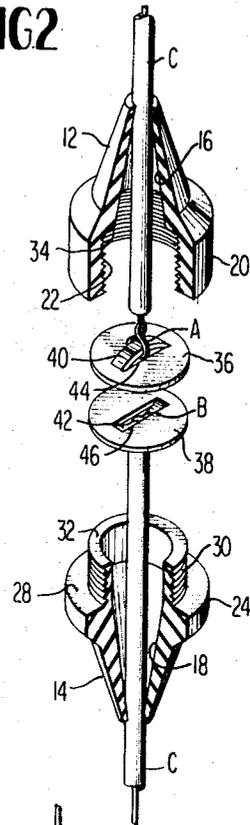


FIG3

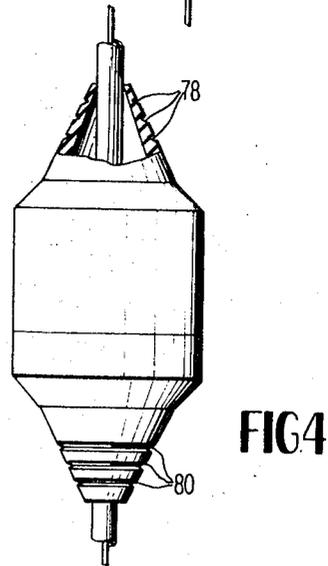


FIG4

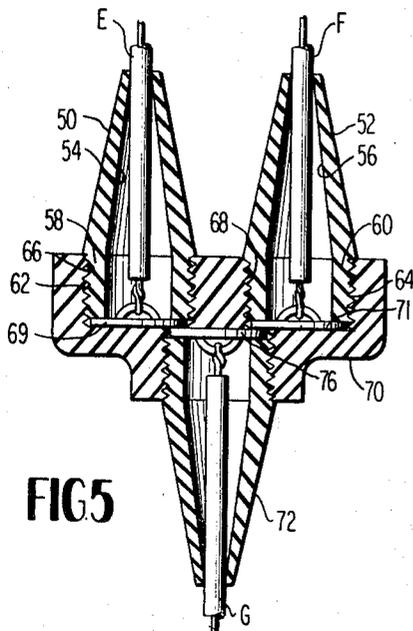


FIG5

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ELECTRICAL WIRE CONNECTOR

The present invention relates to an electrical connector and particularly relates to a connector for joining one or more electrical wires to another electrical wire.

Connectors for joining ends of wires in electrically conductive relation one with the other have been proposed in the past. One such connector is described and illustrated in U.S. Pat. No. 2,931,009. In that patent, a conductor cable is secured, as by brazing, within the central opening of a connecting element formed of electrically conductive material, one end of which is externally threaded. A second electrical cable is similarly secured within a central opening in another connector element which is also formed of an electrically conductive material, the second element having a bevelled flange about its outer face. An internally threaded split nut is disposed about the second connector element with the bevelled flange thereof engaging a corresponding bevelled shoulder on the nut, whereby, when the first connector element is threaded into the nut, the faces of the connector elements butt one another. To ensure an electrical connection between the element, a locking screw carried by the nut is tightened to circumferentially contract the nut whereby the second element is cammed toward the first element. While this type of connector is effective to provide the electrical connection between the ends of the cables, it is not fully enclosed by insulating material necessitating additional parts should it be desired to electrically insulate the connection. The foregoing described connector is also somewhat expensive to manufacture and cannot be readily adapted to receive electrical wires of different gauges. Moreover, the connector disclosed in that patent is not easily adaptable for common use, for example, in wiring electrical light fixtures, in the absence of special tools, for example a soldering gun to secure the wires or cables to the connecting elements.

Other types of electrical connectors are known. For example, electrical wire connectors are also described and illustrated in U.S. Pat. Nos. 2,595,057 and 1,836,480. However, these connectors are expensive in construction and generally do not provide the simplicity and reliability that is afforded by the present electrical connector. Moreover, none of the above discussed connectors are adaptable to accommodate wires of various gauges, i.e., having enlarged diameters, or to simultaneously electrically connect two or more wires to a signal wire.

The present invention eliminates and minimizes the above discussed disadvantages and shortcomings of known electrical wire connectors and provides a novel, improved electrical wire connector having various advantages and features in comparison with such prior connectors. Particularly the present invention comprises a pair of elongated insulating housing elements each having a central opening extending axially therethrough for receiving an electrical wire and an annular shoulder adjacent one end. Each element is provided with a disc formed of electrically conductive material to which is secured the free end of the electrical wire received through the opening. Upon attachment of the wire of the disc, the disc can be disposed to bear against the annular shoulder by pulling the wire in a direction away from the element. One of the elements is internally threaded while the other element is externally threaded. By threadedly engaging the elements one to the other with the discs disposed between the shoulders, the discs can be clamped between the shoulders in electrical contact one with the other. The insulating housing elements can be formed of any suitable insulating material such as plastic or rubber and can thereby be of molded one piece construction.

A significant aspect of the present invention is that the connector hereof can be adapted to receive larger gauge electrical wires, i.e. wires having larger diameters. To this end, the central opening through each of the elements is tapered as to converge from the end defining the shoulder and containing the disc toward the end receiving the wire. The elements are circumferentially scored or perforated at axial spaced positions about the ends of the elements having the smaller diameter opening whereby end portions of the insulating elements can

be readily broken or snapped off to provide an opening of a selected larger diameter. Accordingly, where enlarged diameter wires are to be electrically connected one to the other, end portions of the elements are broken off about selected score lines or perforations to provide an enlarged opening adjacent one end of the elements. The score lines can be provided with suitable indicia to indicate the diameter of the wire which can be accommodated by breaking the end portion of the element extending outwardly of that score line or perforation.

A further significant aspect of the present invention is the provision for electrically connecting a pair of wires to a third single wire. To this end, a pair of insulating housing elements each having a disc to which the respective electrical wire is connected are threadedly received within a housing body. Each disc is clamped between the annular shoulder on the end of the element and a portion of the body. A third element having a disc to which is also attached an electrical wire is screwthreaded into the body from its opposite sides. When the elements are finally secured to the body, marginal portions of the disc carried by the element on one side of the body lie in engagement with lateral portions of the discs carried by the pair of elements on the other side of the body, whereby an electrical connection is formed between the pair of wires and the single wire.

Accordingly, it is a primary object of the present invention to provide a novel and improved electrical wire connector.

It is another object of the present invention to provide a novel and improved electrical wire connector which is simple in construction and which can be inexpensively manufactured.

It is still another object of the present invention to provide an electrical connector for joining the wires to electrical contact in which the connection is completely electrically insulated.

It is a further object of the present invention to provide an electrical connector which can readily and easily be adapted for connecting wires of larger gauges, i.e. wires having larger diameters.

It is a further object of the present invention to provide an electrical wire connector wherein two or more wires can be readily and easily electrically connected to a single wire.

These and further objects and advantages of the present invention will become more apparent upon reference to the following specification, appended claims and drawings wherein:

FIG. 1 is a perspective view of an electrical wire connector in final assembly;

FIG. 2 is an enlarged, cross sectional perspective view thereof with the parts illustrated in exploded juxtaposition one to the other;

FIG. 3 is a longitudinal cross sectional view thereof;

FIG. 4 is a fragmentary cross sectional view of an end portion of one of the insulating elements disclosing a further form of the present invention;

FIG. 5 is a longitudinal cross sectional view disclosing still another embodiment of the present invention.

Referring now to the drawings, particularly to FIGS. 1-3, there is disclosed one form of an electrical wire constructed in accordance with the present invention and comprising a pair of insulating elements 12 and 14, each having a central opening 16 and 18 respectively. Elements 12 and 14 are electrical insulators and are preferably formed of a plastic or rubber material. Each of the insulating elements 12 and 14 is preferably frusto-conical in shape with element 12 having an enlarged based portion 20 which is internally threaded, as at 22. Element 14 includes a surrounding flange portion 24 set back from end portion 26 to form an annular shoulder 28. End portion 26 comprises a cylindrical sleeve which is externally threaded as at 30. For reasons hereinafter set forth, end portion 26 of element 14 includes an annular shoulder or face 32 and element 12 also has an annular shoulder or face 34 inset from its end portion inwardly of the threaded portion 22.

Each of elements 12 and 14 is provided with a wafer or disc-like connector 36 and 38, respectively, and formed of an electrically conducting material. The disc or wafers 36 and 38

have a diameter such that, when they are coaxially arranged relative to elements 12 and 14, their peripheral edge portions bear against shoulder portions 32 and 34. Means are provided on each of the discs for connecting an electrical wire in electrical conductive relation therewith and comprise central strips 40 and 42 struck from the central portions of the respective discs to project from one side thereof. The struck strips leave respective slots 44 and 46 in the disc. It will be appreciated that, by providing strips of disc material projecting from the disc on one side thereof, there is thus formed a loop providing a fixture about which an electrical wire can be attached to the disc in electrically conductive relation therewith. As seen in FIG. 2, electrical wires A and B, having respective insulating sheaths C and D and bared end wire portions, are received through the perspective loops with the ends of the bared wire portions being suitably secured to the main body of wire as by wrapping thereabout. To further ensure both mechanical and electrical connection between the wires discs, the loops with the wires attached thereto are then preferably pressed toward the respective discs.

To assemble the electrical connector, the wires A and B are preferably inserted or threaded through the respective central openings 16 and 18 of elements 12 and 14 prior to connecting elements 12 and 14 one to the other and to such an extent that the length of the wires inserted through the elements exceed the lengths of the respective elements. The wires are then secured to the respective discs 36 and 38 as previously set forth and each wire and its associated insulating element can be pulled in opposite directions whereby the disc secured to such wire seats on the corresponding shoulder. For example, once wire A has been inserted through opening 16 of element 12 and connected to disc 36, wire A can be pulled upwardly relative to element 12 as seen in FIG. 2 whereby disc 36 seats on the shoulder 34. By pulling wire B similarly, disc 38 can seat on shoulder 32.

To form the electrical connection between wires A and B, insulating elements 12 and 14 are threadedly engaged one with the other to clamp discs 36 and 38 between respective shoulder portions 34 and 32. As illustrated in FIG. 3, discs 36 and 38 are thus clamped against one another in electrical contact whereby an electrical connection is provided. It is significant that the foregoing connection and the insulation of such connection is provided with the parts that can be readily simply, easily, and expensively manufactured. For example, the elements 12 and 14 can be formed of molded plastic and the discs or wafers 36 and 38 can be stamped of sheet metal with the connecting strips 40 and 42 being formed by simple stamping operation.

Referring now to FIG. 4, it is a particular feature of the present invention that the central opening 16 and 18 through insulating elements 12 and 14, respectively, can be selectively enlarged to accommodate electrical wires of enlarged diameters or gauges. To this end, the central openings 16 and 18 are internally tapered, the walls of the opening converging toward the distal or free ends of the elements 12 and 14. The distal end portion of each of the insulating elements 12 and 14 is provided with a plurality of external perforations arranged in a circular pattern at axially spaced positions along the insulator element. For example, there is illustrated in FIG. 4 three circular external perforations or score lines 78 which are axially spaced one from the other. It will be noted that the internal diameter of the opening 16 at each of the score lines increases as the inner walls of opening 16 diverge one from the other. Suitable indicia can be provided about the outer face of the insulating elements to indicate the diameter of the opening at each of the score lines, if desired.

Accordingly, when a wire having a diameter larger than the diameter of the opening at the distal end of the insulator element is to be employed, the diameter of that wire is first ascertained and, by utilizing the indicia about the insulating element, one or more of the end portions can be broken off from the insulating element to provide an end opening having a selected diameter corresponding to the diameter of the opening required by the particular wire to be connected.

It is a further feature of the present invention that a pair of electrical wires can be readily and easily connected to a third electrical wire. To this end there is provided a pair of insulating elements 50 and 52 having central openings 54 and 56 and having a generally frusto-conical shape. The base portions 58 and 60 of elements 50 and 52 are externally threaded as at 62 and 64 respectively, for threaded connection with a pair of female sockets 66 and 68 respectively, formed within a body or housing 70. Discs or wafers, of the type previously described, are also provided for connection with a pair of electrical wires E and F.

On the opposite side of body 70, there is provided a central female socket for receiving a third insulator element 72 having the same general configuration as the elements 50 and 52. A disc or wafer 74 is also provided insulator element 72 for electrical connection with a third wire G.

To effect the electrical connection between the pair of wires E and F and the single wire elements 50, 52 and 72 in a manner previously described in connection with the embodiment of FIGS. 1-3. The insulator elements are then threadedly engaged within their respective internally threaded sockets and, as illustrated in FIG. 5, the inner marginal portions of the discs 69 and 71 engage the marginal portions of the disc 76 on opposite sides thereof. It will be appreciated that discs 69 and 71 are clamped against disc 76 when elements 50, 52 and 72 are finally secured within body 70. The body 70 is preferably formed of an insulating material such as rubber or plastic and may be formed integrally with element 72.

It will thus be appreciated that the objects of the present invention have been fully accomplished and that there has been provided an insulated connector for quick and ready electrical connection between a pair of wires and which connector can be simply, readily, easily, and inexpensively manufactured. Moreover, the present invention is adapted to provide an electrical connection for wires having enlarged diameters. Further, there has been provided a simple, readily usable and inexpensive connector for making electrical contact between a pair of wires and single wire.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A connector for electrical wires comprising first and second elements formed of electrical insulating material, each element having an opening and a shoulder portion; a pair of electrical conductive discs, each disc including a tab portion for attaching an electrical wire to each of said discs in an electrical conductive relation therewith, said tab portion projecting from the plane of said disc for receiving a portion of the wire between said tab portion and said disc, said tab portion being movable towards said disc to clamp and retain said wire in electrical conductive relation with said disc; said openings being adapted to receive the respective wires, and means for securing said first and second elements one to the other with said discs engaging one another between their respective shoulder portions in electrical conductive relation each with the other.

2. A connector according to claim 1 wherein the shoulder portion carried by each of said elements precludes passage of the associated disc in one direction through the opening of the corresponding element.

3. A connector according to claim 1 wherein said elements and said wires are coaxially aligned in end-to-end relation one with the other in final securement.

4. A connector according to claim 1 wherein each of said shoulder portion includes annular surfaces facing toward one another when said elements lie in final securement.

5. A connector according to claim 1 wherein said first element is internally threaded adjacent one end portion thereof with said shoulder portion comprising an annular face lying inwardly of said threaded end portion; and said second element is externally threaded adjacent one end portion thereof with the associated shoulder portion comprising an annular face about the one end portion of said second element; said first and second threaded portions lying in threaded engagement each with the other with said discs being clamped between said shoulder portions in electrical contact each with the other.

6. A connector according to claim 1 including a third element formed of electrically insulating material said third element having an opening and a shoulder portion; a third electrically conductive disc, said disc including a tab portion for attaching an electrical wire to said disc in an electrical conductive relation therewith, said tab portion projecting from the plane of said disc for receiving a portion of the wire between said tab portion and said disc said tab portion being movable towards said disc to clamp and retain said wire in electrically conductive relation with said disc; said third opening being adapted to receive the third wire, means carried by said third element for securing said third element in electrically conductive relation with at least one of said pair of discs.

7. A connector according to claim 1 wherein at least one of said elements is elongated with its shoulder portion lying adjacent an end portion thereof, the opening associated with said one element converging toward the end portion of said element, and means for enlarging the diameter of the opening adjacent said other end portion of said one element to a selected diameter.

8. A connector according to claim 7 wherein said enlarging means includes score lines about said one element at axially spaced positions therealong indicative of selected diameters for said opening whereby selected end portions of said one member outwardly of said score lines can be removed to obtain an opening of selected diameter.

9. A connector for electrical wires comprising first and second elements formed of electrical insulating material, each element having an opening in the shoulder portion; a pair of electrically conductive discs, means for attaching an electrical

wire to each of said discs in electrical conductive relation therewith, said openings being adapted to receive the respective wires; said first element being internally threaded adjacent one end portion thereof with said shoulder portion comprising an annular face lying inwardly of said threaded end portion, said second element being externally threaded adjacent one end portion thereof with the associated shoulder portion comprising an annular face about the one end portion of said element, said first and second threaded portions lying in threaded engagement each with the other with said discs being clamped between said shoulder portions in electrical contact each with the other.

10. A connector according to claim 9 wherein the shoulder portion carried by each of said elements precludes passage of the associated disc in one direction through the opening of the corresponding element.

11. A connector according to claim 9 wherein said elements and said wires are coaxially aligned in end-to-end relation one with the other in final securement.

12. A connector according to claim 9 wherein each of said discs includes a tab portion for connecting the associated electrical wire thereto.

13. A connector according to claim 12 wherein said tab portion projects from the plane of said disc for receiving a portion of the wire between said tab portion, and said disc, said tab portion being movable toward said disc to clamp and retain said wire in electrically conductive relation with the disc.

14. A connector according to claim 9 wherein at least one of said elements is elongated with its shoulder portion lying adjacent an end portion thereof, the opening associated with said one element converging towards the other end portion of said element, and means for enlarging the diameter of said opening adjacent said other end portion of said one element to a selected diameter.

15. A connector according to claim 14 wherein said enlarging means includes score lines about said one element at axially spaced positions therealong indicative of selected diameters for said openings whereby selected end portions of said one member outwardly of said score lines can be removed to obtain an opening of selected diameter.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,654,588

Dated April 4, 1972

Inventor(s) Fred N. Ruth

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In Column 1, line 6, "roposed" should read --proposed--;
lines 20-21, "element" should read --elements--; line 57,
"of the disc" should read --to the disc--.

In Column 2, line 19, "sides" should read --side--;
line 32, "to" should read --in--.

In Column 3, line 15, "perspective" should read
--respective--; line 19, "discs," should read --and discs,--;
line 45, "expensively" should read --inexpensively--; line 51,
"opening" should read --openings--.

In Column 4, line 18, "wire elements" should read --wire G,
the wires are inserted within the respective insulating
elements--; in line 74, Claim 4, "portion" should read
--portions--.

Signed and sealed this 10th day of October 1972.

(SEAL)

Attest:

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Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

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