




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
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 Connector for electrically connecting an elongate conductor to a termination post.

 An electrical connector comprises a deformable contact member having a male end for acceptance of, for example, one or more lead wires and a deformable female end for acceptance of, for example, a box mount termination post. The connector further comprises a pre-oriented recoverable sleeve surrounding the contact, whereupon heating, the sleeve recovers, releasably trapping the lead wires against the male end and converging the legs of the female end thereby releasably trapping the post within the contact member.

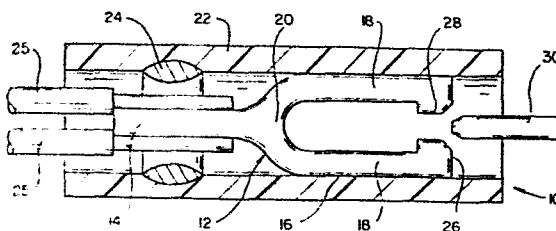


FIG. 1

Description  
Electrical Connector

TITLE MODIFIED  
see front page

This invention relates to an electrical connector suitable for electrically connecting an elongate conductor to a termination post, and to a method of forming an electrical connection using the connector, and especially to a connector  
5 comprising a recoverable sleeve.

The present invention provides a connector for electrically connecting at least one generally elongate conductor to a termination post, the connector comprising a pre-oriented recoverable sleeve, and an electrically conductive contact  
10 member disposed within the sleeve, the contact member having a non-deformable male end providing a stem, and a deformable female end having two spaced apart legs with a crotch area between the legs, the contact member and the sleeve being  
15 arranged so as, in use, to receive said at least one conductor within the sleeve laterally of the male end of the contact member and to receive the termination post within the female  
20 end of the contact member, with the crotch area between the legs defining a stop for insertion thereof, whereby recovery of the sleeve is arranged to urge said at least one conductor and the stem into contact with each other, and to converge  
the legs into contact with the termination post inserted therebetween.

Although the connector of the present invention is suitable for connecting one or more elongate conductors to a  
25 termination post, it is to be understood that the contact member of the connector is also suitable for receiving in its female end another type of electrically-conductive member.

The connector of the present invention envisages that  
30 the pre-oriented recoverable sleeve may be a heat-recoverable polymeric sleeve, preferably a heat-shrinkable polymeric sleeve.

A heat recoverable article is an article the dimensional configuration of which may be made substantially to change when subjected to heat treatment.

5 Usually these articles recover, on heating, towards an original shape from which they have previously been deformed but the term "heat-recoverable", as used herein, also includes an article which, on heating, adopts a new configuration, even if it has not been previously deformed.

10 In their most common form, such articles comprise a heat-shrinkable sleeve made from a polymeric material exhibiting the property of elastic or plastic memory as described, for example, in US patents 2027962; 3086242 and 3957372. As is made clear in, for example, US patent 2027962, the original dimensionally heat-stable form  
15 may be a transient form in a continuous process in which, for example, an extruded tube is expanded, whilst hot, to a dimensionally heat-unstable form but, in other applications, a preformed dimensionally heat stable article is deformed to a dimensionally heat unstable form in a separate stage.

20 In the production of heat recoverable articles, the polymeric material may be cross-linked at any stage in the production of the article that will enhance the desired dimensional recoverability. One manner of producing a heat-recoverable article comprises shaping the polymeric  
25 material into the desired heat-stable form, subsequently cross-linking the polymeric material, heating the article to a temperature above the crystalline melting point or, for amorphous materials the softening point, as the case may be, of the polymer, deforming the article and cooling the  
30 article whilst in the deformed state so that the deformed state of the article is retained. In use, since the deformed state of the article is heat-unstable, application of heat will cause the article to assume its original heat-stable shape.

In other articles, as described, for example, in British patent 1440524, an elastomeric member such as an outer tubular member is held in a stretched state by a second member, such as an inner tubular member, which, upon heating weakens and thus allows the elastomeric member to recover.

In use of the connector, one or more generally elongate conductors such as lead wires may be inserted into one end of the unrecovered sleeve adjacent the male end of the contact member. The other end of the sleeve and the contact member may be arranged to receive a termination post such as a box mount terminator pin which may be pushed into intimate contact with the deformable female end of the contact member. The lead wire(s) may be pushed into abutting relation with the contact member, while the terminator pin may be pushed into an interference fit with the deformable female end of the contact. The sleeve may then be recovered.

As a result of the properties of pre-oriented recoverable sleeves as described, for example, with reference to heat recoverable polymeric sleeves in US patent 3086242, the sleeve conforms to the shape of the articles disposed therein. In this way the lead wire and the post are snugly fitted to the male and female ends of contact member respectively providing a good electrical connection.

The connector may comprise solder or other fusible material. For example, in one embodiment, the connector comprises a quantity of solder within the sleeve adjacent the male end of the contact member thereby enhancing electrical connection between the elongate conductor and the male end of the contact member. The contact member of the connector may also have a solder preform covering the legs and crotch area. However, where the connector comprises no solder or other fusible material, the connector has the advantage of being readily reusable while achieving a good electrical contact. The nature of the recoverable materials is such

that the recovered sleeve retains its shape after recovery and the deformable contact member maintains a constant force upon an article inserted between the legs thereof, but does not collapse after removal of the article. Thus when solder  
5 or other fusible material is not used the article may be removed easily. Further, since the sleeve retains its recovered shape even after removal of the article inserted therein, another article of approximately equal size may be reinserted into the contact member. When, for example, the post  
10 and/or elongate conductor are removed from the sleeve (with some considerable force), the sleeve retains its recovered shape. Thus a post or lead wire of substantially the same size may be reinserted into the sleeve. Of course it will be appreciated that stranded wire of substantially the same  
15 size would have to be modified in some way in order to accomplish reinsertion.

Preferably the free ends of the legs of the contact member of the connector comprise gripping means comprising inwardly-facing opposed flanges for gripping the surface of  
20 the termination post thereby to enhance electrical contact between the female end of the connector and the post.

In one embodiment, a generally tuning-fork-shaped contact member is used, comprising an elongated, non-deformable male end and a deformable female end having a pair of legs  
25 defining a U-shaped socket with the legs joined at the crotch of the U. The post is typically inserted into the female end. After recovery it will be appreciated that the legs converge and exert a force on the post due to the force of the recovered sleeve.

30 The present invention also provides a method of electrical connecting an elongate conductor to a termination post using a connector according to the present invention.

Embodiments of connector each in accordance with the present invention will now be described, by way of example, with reference to the accompanying drawings wherein:-

Figure 1 is a cross-sectional view of a first embodiment of connector before recovery of the sleeve;

Figure 2 is a cross-sectional view of a second embodiment of connector after recovery of the sleeve;

Figure 3 is a cross-sectional view of the connector of Figure 2 after the articles inserted in the connector have been removed; and

Figure 4 is a cross-sectional view of a third embodiment of connector.

Referring to the drawings, Figure 1 shows a connector 10 for use in connecting two lead wires 25 (partially stripped) to a box mount termination connection post 30.

The connector includes a partially deformable electrically conductive contact member 12. The contact member 12 has a non-deformable male end 14 and a deformable female end 16. The female end has two spaced apart legs 18 joined at a crotch zone 20, the male end 14 and the female end 16 also being joined at the crotch zone 20.

The connector 10 also includes a pre-oriented, heat-recoverable sleeve 22. The sleeve is of a unitary nature and homogenous.

The legs 19 of the contact member are generally parallel forming a U-shape, and in conjunction with the male end 14, define a tuning-fork-shape to the contact member 12.

The legs 18 each have a free end 26 which comprises inwardly facing flanges which define gripping means for releasably gripping the post 30, and thereby enhancing the electrical contact. The gripping means 28 are spaced away from free ends 26 and towards the crotch region 20 of the contact member 12.

The sleeve 22 contains an annular solder ring insert 24. In applications where it is not important that the lead wires 25 are readily releasably connected to the contact 12, the solder insert 24 may be added to enhance electrical contact. As the sleeve recovers, the solder insert 24 flows, providing the lead wires 25 with a relatively permanent contact with the male end 14 wherein heat must be applied to melt the solder that has flowed from the solder ring 24 if it is desired to release the formed connection to reuse the connector.

Figure 2, shows a solderless connector 10 in the recovered state. This connector is readily reusable since no solder is used and hence no heat need be applied in order to release the formed connection. The sleeve has conformed generally to the shape of the articles disposed therein in accordance with the properties of heat-recoverable materials.

The sleeve portion 32 adjacent the male end 14 of the contact member conforms to the shape of the partially stripped lead wires 25 such that the partially stripped ends 34 are brought into contact with the male end 14, providing good electrical contact. The portion of the sleeve 36 adjacent the legs 18 of the female end 16 of the contact member 12 conforms to the shape of the legs 18, thereby asserting a continuous force upon the legs 18 forcing the legs closer together. Particularly, the gripping means 28 of the legs 18 are brought closer together. When a post such

as 30 is inserted into the female end 16 of the contact member, it is pushed against the crotch zone 20 of the contact member 12 which serves as a stop means for insertion of the post 30.

5           Figure 3, shows the recovered connector 10 of Figure 2 ready for reuse. The sleeve 22 retains its shape after recovery. Thus, the lead wires 25 may be removed from the male end 14 of the contact member 12. Additionally, the post 30 may be removed from the female end 16 of the contact  
10 member 12 without damage to the connector 10, the legs 18 or the post 30. After removal, lead wires or posts of substantially the same size may be readily reinserted to provide the necessary electrical contact since the sleeve maintains its recovered shape.

15           If the connector 10 shown in Figure 1 is used, where the solder insert 24 is included, only the post 30 may be removed without further heating. As will be appreciated, the legs 18 remain in the deformed condition, and are retained in tension by the recovered sleeve. Thus, if a  
20 user desires to shift the connector 10 from one location to another, he can do so without further reheating or other additional steps, as long as the posts 30 are of substantially the same size as is normal in box mount terminators.

          Figure 4, shows a connector which has a semi-permanent post  
25 connection. In this embodiment, the free ends 26 of the legs 18 includes confronting gripping means 28 which have a coating of reflowed tin 40. Of course, the reflowed tin is not necessarily restricted to the area indicated by numeral 40, but could cover the entire contact member 12 or any  
30 portion thereof. During heat-recovery of the sleeve 22 the reflowed tin 40 melts and contacts the post 30 as the legs 18 are moved into increased contact with the post 30 by the recovering sleeve 22. After recovery, the connector cools

and the reflowed tin 40 solidifies causing a semi-permanent contact. The contact member 12 also includes a solder or other fusible material preform 41 which similarly flows and cools and solidifies during the process of heat recovery of the sleeve 22. It will be appreciated that the semi-permanent connector embodiment described above may be removed from post 30 upon reheating. In this case, as the connector is removed, recovery of the sleeve continues due to the reheat forcing the free ends 26 of the legs 18 closer together.

5

10 The semi-permanent connector is now ready to accept another post. However, it will be appreciated that the reinsertion force required in this embodiment is greater because the free ends 26 of the legs 18 have been brought closer together as a result of the sleeve recovering on reheating. The post

15 30 has an outwardly radially extending annulus 42. The heat-recoverable sleeve conforms to the shape of objects disposed therein during recovery, thus the portion of the sleeve 44 adjacent the annulus 42 is displaced. The displacement together with the annulus 42 prevents or at

20 least hinders removal of the post 30 from the connector 10.

It will be appreciated that any or all of the features described above with reference to the specific embodiments may be combined in a connector according to the present

25 invention.

CLAIMS

1. A connector for electrically connecting at least one generally elongate conductor to a termination post, the connector comprising a pre-oriented recoverable sleeve, and an electrically conductive contact member disposed  
5 within the sleeve, the contact member having a non-deformable male end providing a stem, and a deformable female end having two spaced apart legs with a crotch area between the legs, the contact member and the sleeve being arranged so as, in use, to receive said at least one conductor within  
10 the sleeve laterally of the male end of the contact member and to receive the termination post within the female end of the contact member with the crotch area between the legs defining a stop for insertion thereof, whereby recovery of the sleeve is arranged to urge said at least one conductor  
15 and the stem into contact with each other, and to converge the legs into contact with the termination post inserted therebetween.

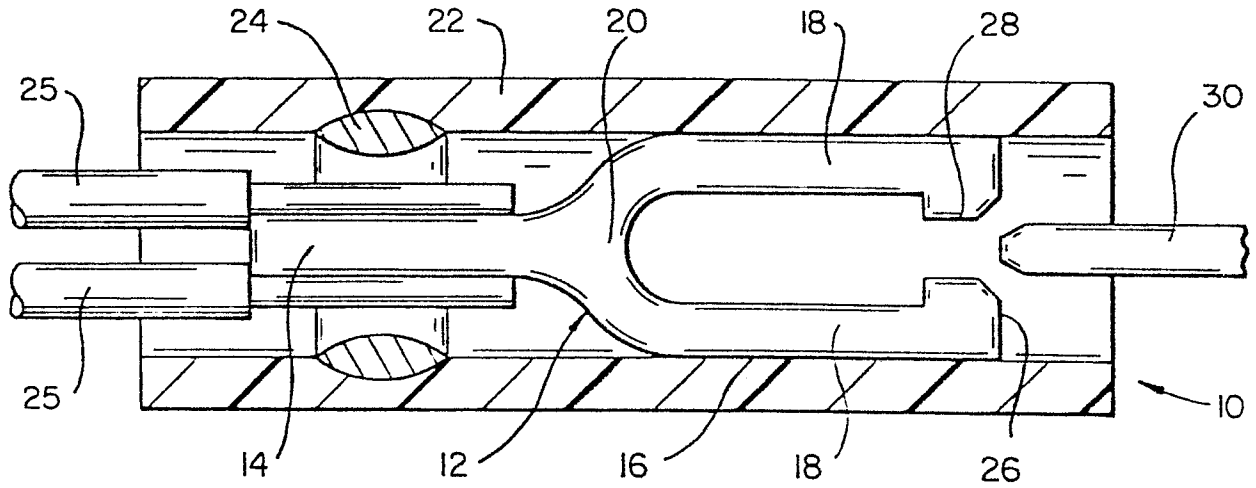
2. A connector according to Claim 1, wherein the free ends of the legs of the contact member comprise gripping  
20 means comprising inwardly-facing opposed flanges for gripping the surface of the termination post thereby to enhance electrical contact between the female end of the connector and the post.

3. A connector according to Claim 2, wherein the the legs  
25 are substantially equal in length and wherein the flanges are spaced inwardly from the free ends of the legs by a substantially equal amount.

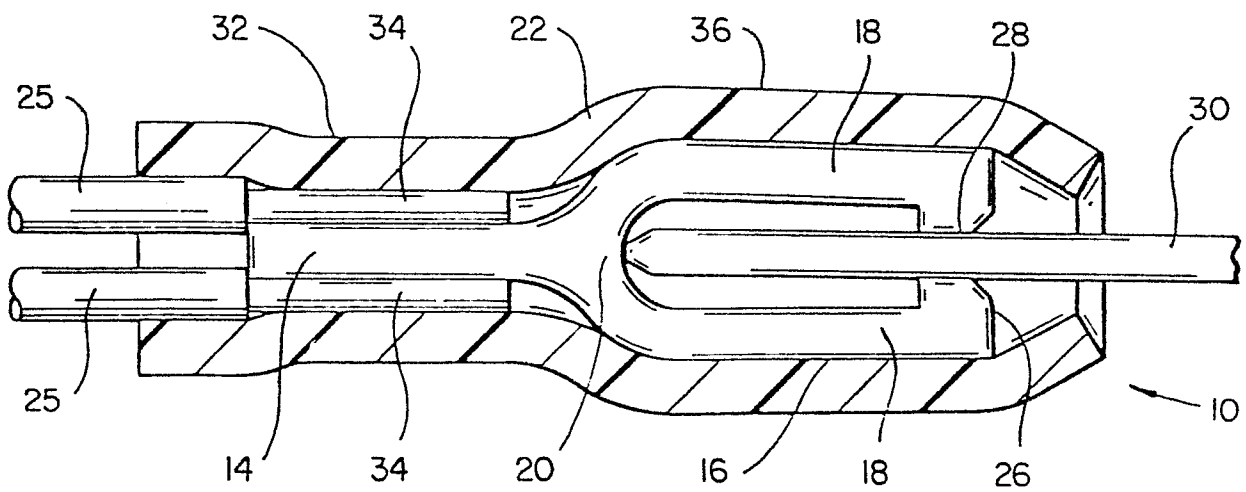
4. A connector according to Claim 2 or 3, wherein the the opposed flanges of the gripping means have a quantity of  
30 reflowed tin thereon that is arranged to flow upon heating, in use, to connect the post and the contact member legs.

5. A connector according to any preceding claim, wherein the contact member is generally tuning-fork-shaped, having an elongate male end and a generally U-shaped female end, the legs extending generally parallel to each other and being spaced apart by the crotch area which joins the legs and the male end.
6. A connector according to any preceding claim, comprising a quantity of solder within the sleeve adjacent the male end of the contact member thereby to enhance electrical connection between the elongate conductor and the male end of the contact member.
7. A connector according to Claim 6, wherein the solder is in the form of an annular ring that is embedded in the inner surface of the sleeve.
8. A connector according to any preceding claim, wherein the contact member has a solder preform covering the legs and crotch area.
9. A connector according to any preceding claim, wherein the sleeve comprises a heat-recoverable polymeric material.
10. A method of electrically connecting at least one generally elongate conductor to a termination post using a connector according to any preceding claim.

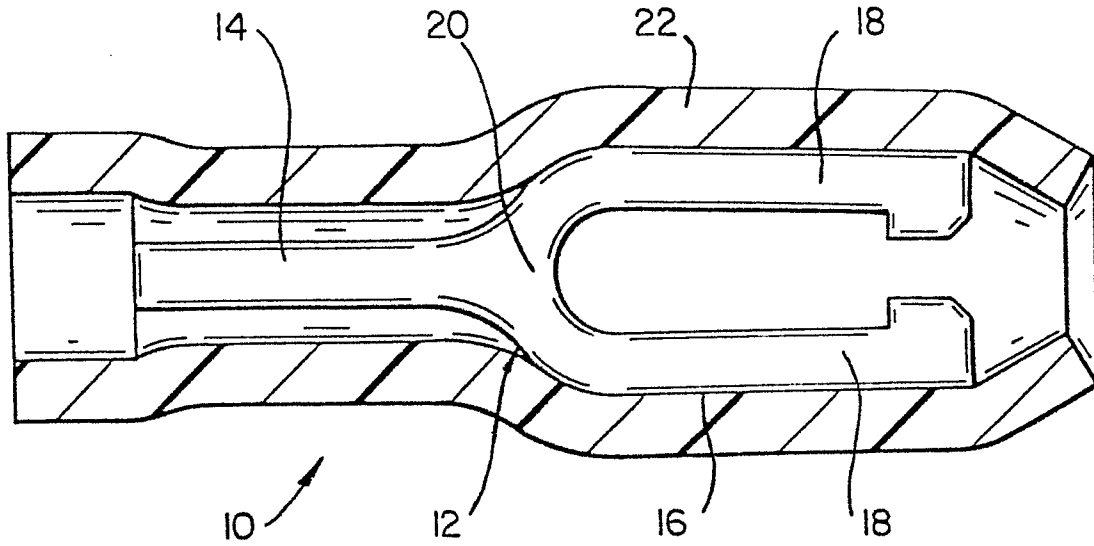
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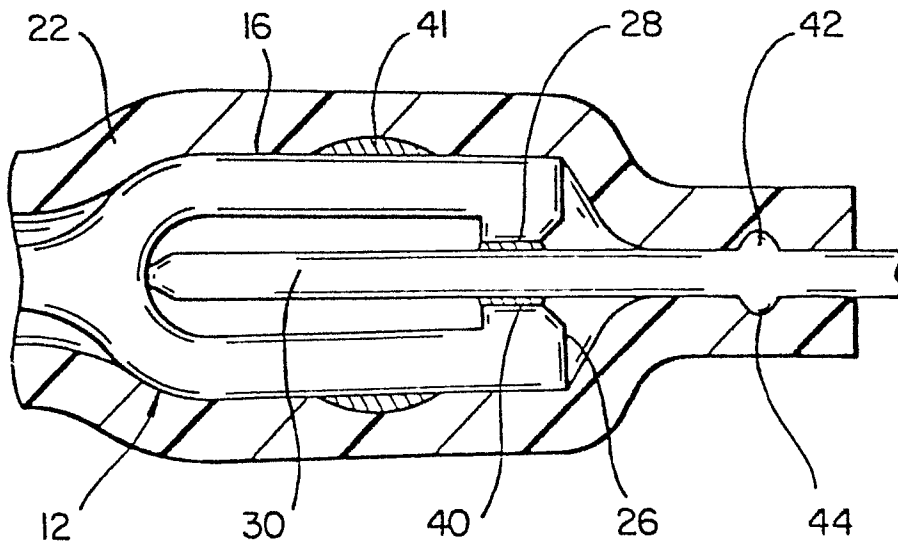
FIG\_1



FIG\_2



FIG\_3



FIG\_4