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S. N. BUCHANAN

2,160,694

WIRE CONNECTOR

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2 Sheets-Sheet 2

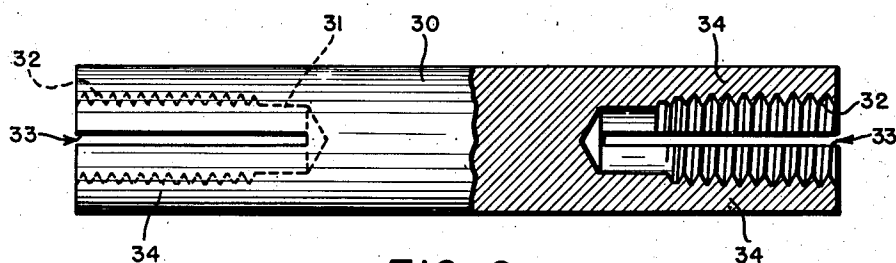


FIG. 6

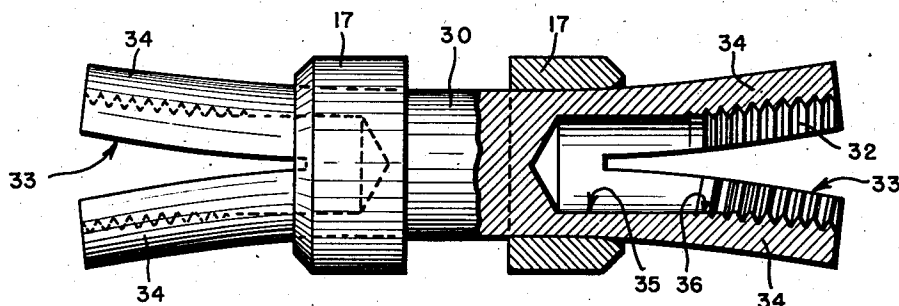


FIG. 7

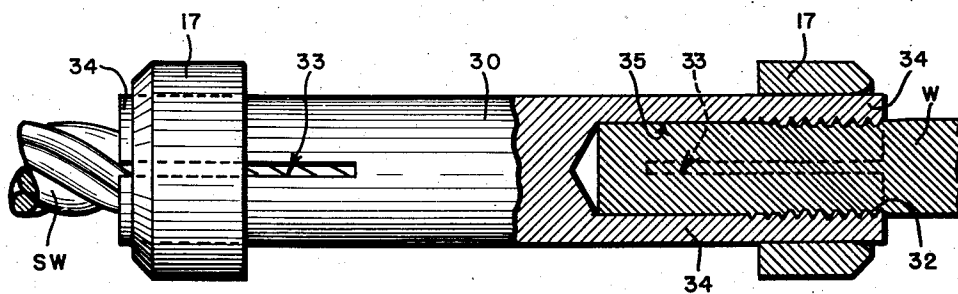


FIG. 8

INVENTOR.

STEPHEN N. BUCHANAN

BY *Bohleber & Fedbetter*
ATTORNEYS

UNITED STATES PATENT OFFICE

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WIRE CONNECTOR

Stephen N. Buchanan, Elizabeth, N. J., assignor
to The Thomas & Betts Co., Elizabeth, N. J.,
a corporation of New Jersey

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2 Claims. (Cl. 287—75)

The invention relates to a solderless wire connector which provides a contractile wire gripping or clamping means and a cooperating connector member or sleeve which is forcibly moved axially thereon so that the contractile clamping means is contracted and grips a wire therein solely through the contraction thereof. This wire connector requires no solder and retains the parts together so that they are not vibrated loose and obtains electrical connection solely through the gripping of the wire when the contractile clamping member contracts thereupon. Two forms of solderless wire connectors are illustrated and described herein. The first form of wire connector is shown and described in my copending application Serial No. 2,317 so that this application is a continuation in part of the earlier filed case.

An object of the invention is to construct new and novel forms of solderless wire connectors.

Another object is to produce a new and novel method of constructing solderless wire connectors.

Other objects of the invention will be more apparent from the following description taken in connection with the accompanying drawings, showing some preferred embodiments of the invention, in which:

Figures 1 through 5 show one form of the wire connector.

Figure 1 is a view in longitudinal section showing a solderless wire connector of the invention being assembled with a pair of pliers, which connector is adapted to secure the ends of two wires together. Such a solderless wire connector is shown in position preparatory to gripping a wire therein and in position in the jaws of the pliers preparatory to forcibly moving the operating sleeve or bushing over the contractile fingers to contract the latter upon a wire.

Figure 2 shows an end view of the pliers and the wire connector in front elevation preparatory to clamping a wire therein.

Figure 3 is an exploded view, partially in section, of the wire connector.

Figure 4 is an assembled view of the connector of Figures 1 and 2 with slidable bushings retained upon the center cylindrical portion of the wire connector and with the flexible fingers at the end thereof expanded preparatory to receiving the end of a wire, in which spread position the bushings are inseparably retained upon the wire connector.

Figure 5 is an end view of the wire connector showing the spread apart fingers thereof.

Figures 6 through 8 show another form of

solderless wire connector which differs somewhat from that shown in Figures 1 through 5.

Figure 6 is a plan view of a double ended wire connector, with one end of the wire connector in section, showing the initial steps in the manufacture of the wire connector of this other form.

Figure 7 is a plan view of the finished wire connector with one end thereof in section in order to more clearly show the construction. The wire connector in this figure is ready to receive a wire to be clamped therein.

Figure 8 is a plan view of the wire connector, with one end thereof in section, showing the connector gripping a wire therein.

Solderless wire connectors are rapidly being adopted, particularly in maritime trade, for the three important reasons which will now be given. The first reason is that generally the space within which wire connections can be made on board ship is very limited, and a solderless connection of the type shown herein takes up considerably less space than the equivalent soldered connection, or the equivalent solderless connection utilizing screw threads on an operating nut or means to obtain the clamping action. The second reason is the greater speed with which a solderless connection can be made with the tool or pliers used with connectors of the invention. The third reason is in case of fire there is no danger of the connection being broken as in a soldered connection where the solder melts at a comparatively low temperature which permits the wire to be pulled free or separated from its connection.

The wire connector shown in Figures 1 through 5 is a double ended wire connector adapted to grip the end of two wires in order to couple them together. The wire connector has a body member 10 which is shown as being a single integral member, although it is not necessary that this part be integral. The body member has initially a uniform diameter or dimension throughout its length and is preferably made from bar or rod stock. Each end of the body or clamping member 10 has a plurality of flexible fingers or contractile means 11. The contractile means or fingers 11 are formed preferably by first drilling a bore 12 in each end of the clamping member, which bore is smaller than the wire to be received therein. The bore forms a wire passage.

The bore 12 preferably is provided with serrations 13 formed by threading the bore, which serrations bite into the wire in order to establish good electrical contact therewith and also to more firmly grip the wire therein. The serrations may

be of any form, but screw threading of the bore is the simplest way to provide them.

A plurality of longitudinal or axial slots 14 extend inwardly from each end of the clamping or body member in order to provide the contractile means or fingers 11. The contractile fingers or means are thereafter spread apart, as will appear more fully hereinafter, so that the wire receiving bore 12 is enlarged and a wire having a diameter greater than the diameter of the bore 12 may be inserted therein. The arms are also spread so that a tapering outer surface is provided upon each contractile finger. Contraction of the fingers causes the latter to grip a wire which has been inserted within the bore. Since the bar is of uniform diameter and the bore 12 is made by drilling, the fingers 11 have a uniform thickness throughout their length.

An operating means, such as a contracting sleeve or bushing 17, has a bore 18 therethrough so that the bushing may be received upon the body or clamping member 10 and is slidable thereupon. One end of the bore 18 is rounded at 19. Two such contracting or operating bushings are slipped onto the body member 10 so that the rounded end 19 of the bore of each bushing faces towards its respective end of the body member. The contractile means or fingers 11 are then spread apart for the double purpose of enabling a wire having a diameter greater than that of the wire receiving bore 12 to be received therein and for inseparably retaining the bushings assembled upon the body or body member.

In order to render the contractile fingers 11 more flexible and render slotting more easily performed, holes 20 may be drilled through the body member 10 at a point spaced from the end thereof. The slots 14 extend to these holes. The two ends of the body member may carry a counterbore 23, if desired, which receives the insulation of the wire W and thereby provides a neater appearing connector.

In securing the end of a wire within the connector, the wire W is inserted within the tapered bore 12 thereof formed by spreading the fingers 11, as shown in Figure 2, and then the wire connector is inserted between the jaws J of the pliers so that one jaw engages the bushing or operating means 17 and the other jaw engages the end of the fingers 11. Upon pressing the handles of the pliers together, the jaws move together and force the bushing axially relatively to the connector body or member so that the bushing rides upon the outspread fingers 11 and contracts them to grip the wire W. A wire is shown gripped in the solderless connector at the lower end of the connector shown in Figure 1. The rounded end 19 of the bore 18 in the bushing 17 facilitates movement thereof upon the fingers 11 and prevents scoring and cutting between the two parts when moved relatively to each other in order to grip the wire W between the fingers.

The bushing 17 in contracting the fingers 11 provides a tight fit between the contracting fingers and the bushing so that the latter is retained upon the end of the body member. The fact, too, that the wire W is larger than the wire receiving bore 12 in the end of the body member, makes the fit between the bushing and the body member or fingers a drive fit, even though the bushing passed easily over the fingers when initially assembled upon the body member.

The second form of construction shown in Figures 6 through 8 is much like that shown in

Figures 1 through 5. This second form of wire connector is double ended and adapted to secure the ends of two wires therein or to couple the ends of two wires together both electrically and physically.

The second form of wire connector includes a body member 30. The body member is formed by taking a piece of stock, preferably cylindrical, and cutting it to the proper length to form a connector blank. The blank is then drilled to form a bore or hole 31 which is smaller than the wire to be inserted in the wire connector. The bore is preferably tapped so that a thread 32 is formed therein. This thread is not intended for use as a screw thread, but merely to provide sharp serrations or cutting teeth for more securely gripping the wire to be clamped therein. The serrations may be dispensed with if desired. The tapping of the hole is the easiest method of forming these biting teeth and they also can be formed on an automatic or semi-automatic machine which substantially reduces the manufacturing cost of the wire connectors.

The blank is then slotted with slots 33 dividing the end of the blank into preferably two fingers 34. This is accomplished by making one slotting cut through each end of the blank. Obviously, more than two fingers are contemplated, as desired.

The contracting bushings, which are the same as the bushings 17, are then slipped over the end of the blank to the center portion thereof between the ends of the slots 33. The fingers 34 are then spread apart so that the end of the body or body member 30 is tapered or generally conical as shown in Figure 7. The spreading apart of the fingers inseparably retains the bushings upon the connector and also enables a wire to be inserted therein. In this spread apart position of the arms 34, a second and larger drill is passed into the wire receiving bore and the bore is extended beyond the end of the bore 31 formed by the small drill, to form a wire receiving bore 35 which is at least as great as the diameter of the wire to be received therein. The finished connector is then ready to receive a wire to be clamped therein.

Since the larger drill was used only after the contractile fingers 34 had been spread apart, only the inner end of the bore has been enlarged since the drill obviously cannot enlarge the bore of the fingers after they have been spread apart. The fingers, therefore, retain their original bore throughout a substantial length thereof, and smaller than the wire to be received therebetween, which diameter is determined with the fingers in contracted position. In other words, the fingers have a uniform thickness for a substantial length thereof, or the length thereof not cut by the larger drill. The larger bore 35 is extended farther into the end of the body member 30 than the smaller bore 31, so that the end of the wire may be projected well into the bore and the fingers when contracted will grip the wire as far from the end thereof as possible. This reduces the possibility of shearing the surface of wire under a heavy pull and withdrawing the wire from the connector. It will also be noted that since the fingers 34 are spread outwardly, the larger bore 35 provides a gradually decreasing series of serrations 36 at the inner end of the bore which reduces the strain on the wire gripped therein adjacent the end of the wire.

In order to clamp a wire in this connector, the wire W is inserted into the bore 35 until the

end of the wire engages the end of the bore. The bushing 17 is then forced, such as by the pliers shown in Figures 1 and 2, onto the conical or tapered portion formed by the spread apart contractile fingers 34 so that the fingers are contracted upon the wire. Due to the fact that when the fingers are so contracted the bore at the serrations is smaller than the wire, the serrations on the inner surface of the fingers bite into the surface of the wire to firmly clamp the wire in the wire receiving bore. The serrations also establish good electrical contact with the wire. Because of the contracting of the fingers produced by the bushing 17, the bushing is also firmly held upon the outside diameter of the end of the body member 30 or the end of the contractile fingers 34, as discussed in connection with the form shown in Figures 1 through 5. The wire connectors described are just as effective in clamping either a stranded wire SW or a solid wire W.

Although the connectors particularly shown and described herein are double ended connectors, it is to be understood that a single ended wire connector is contemplated. In one aspect of the invention, therefore, the spread apart fingers at one end of the wire connector are stop means for preventing the operating bushing from being removed at this end so that when the fingers are spread apart at the other end, the bushing 17 is then inseparably retained upon the connector or body member.

Various modifications will occur to those skilled in the art in the configuration, composition and disposition of the component elements going to make up the invention as a whole, as well as in the selective combination or application of the respective elements, and no limitation is intended by the phraseology of the foregoing description or illustrations in the accompanying drawings.

What is claimed is:

1. A wedge-on solderless wire connector comprising a body member, a plurality of contractile clamping fingers having a uniform thickness for a substantial length thereof, the fingers projecting from the end of the body member and at an angle with respect to the surface of the center

of the body member, the clamping fingers forming a conical wire receiving bore in the end of the body member and terminating at the inner end thereof into a cylindrical bore having a diameter at least as great as that of the wire to be received therein, the clamping fingers when contracted forming a cylindrical outer surface and throughout the aforesaid substantial length forming a cylindrical bore having a diameter substantially less than the diameter of wire to be clamped therein, and an operating means carried by and forcible axially on the body member and engaging the angularly projecting fingers to contract the same inwardly to a cylindrical shape and grip a wire in the wire receiving bore formed by the fingers.

2. A double-ended wedge-on solderless wire connector comprising a body member, a plurality of contractile clamping fingers having a uniform thickness for a substantial length thereof, the fingers projecting from both ends of the body member and at an angle with respect to the surface of the center of the body member, the contractile fingers forming a conical wire receiving bore in each end of the body member and when contracted forming a cylindrical outer surface and cylindrical wire receiving bore, the outer surface of the fingers being smooth, the clamping fingers terminating at the inner end thereof into a cylindrical bore having a diameter at least as great as that of the wire to be received therein, the clamping fingers when contracted forming a cylindrical outer surface and throughout the aforesaid substantial length forming a cylindrical bore having a diameter substantially less than the diameter of wire to be clamped therein, and an operating means for the contractile fingers at each end and carried upon the center of the body member, the inner surface of the operating means being smooth, each operating means being forcible axially over the angularly projecting fingers at its respective end of the body member to contract the same inwardly to a cylindrical shape and grip a wire in the wire receiving bore formed by the fingers.

STEPHEN N. BUCHANAN.