

[54] **ASSEMBLY TOOL FOR REPLACEMENT OF
WIRE SEAL, ELECTRICAL CONTACT**

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[51] Int. Cl. **H05k 13/00**

[58] Field of Search 29/203 H, 235, 630 A, 401,
29/DIG. 34

[56] **References Cited**

UNITED STATES PATENTS

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[57] **ABSTRACT**

The tool enables replacement of a defective individual seal at the wire end of an electrical contact without the need to remove and/or shorten the cable from the contact. The tool comprises a shaft having at one end a tubular portion into which the contact is inserted. The other end of the tool is tapered to permit the replacement seal to be slipped onto the tool. Intermediate its ends, the tool is provided with a portion of increasing taper from the seal receiving end to the tubular end. Thus, the seal may be slipped over the seal receiving end and slid along the shank of the tool and expanded onto the tubular end. When the contact with its attached cable is placed within the tubular end, the seal may be slipped from the tubular end and onto the contact and cable.

7 Claims, 10 Drawing Figures

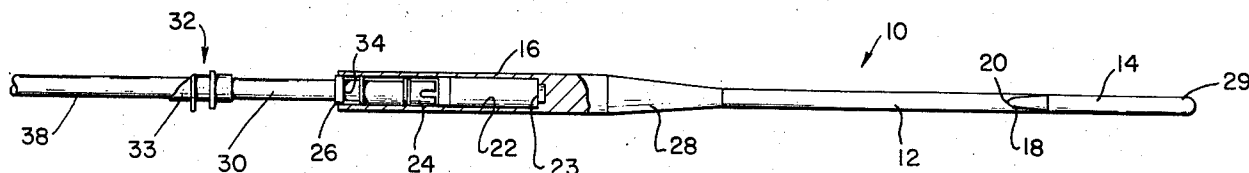


Fig. 4.

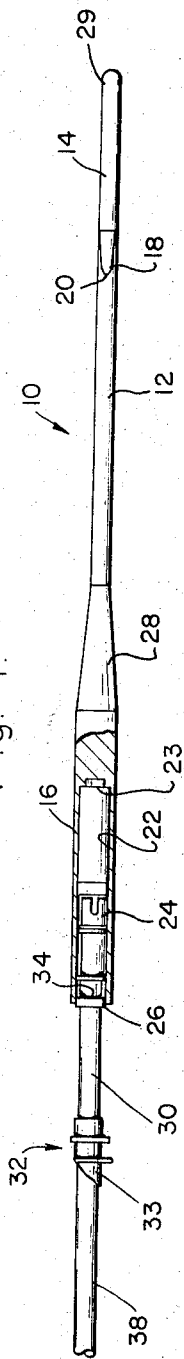


Fig. 2.

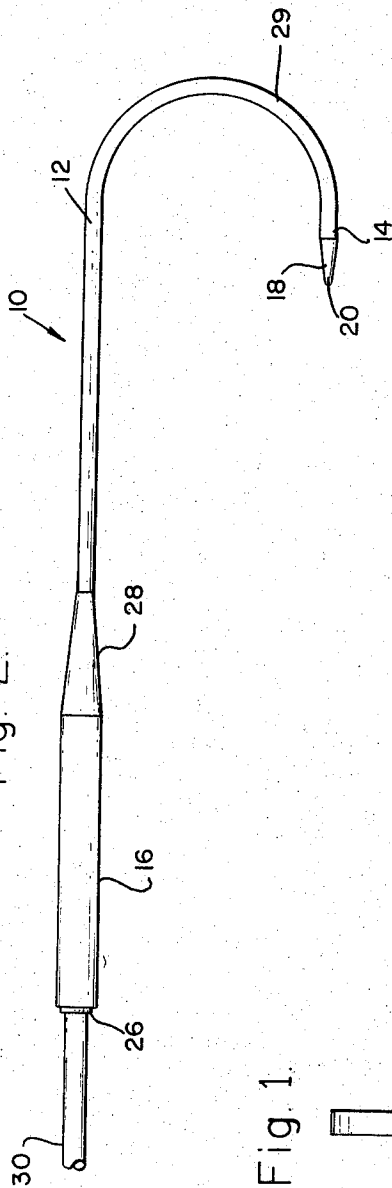


Fig. 1.

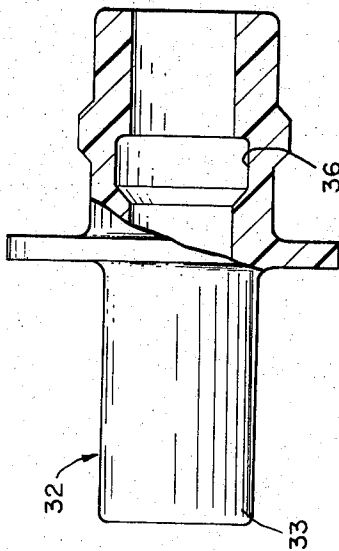


Fig. 3.

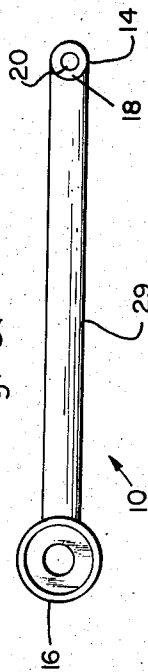


Fig. 5(a).

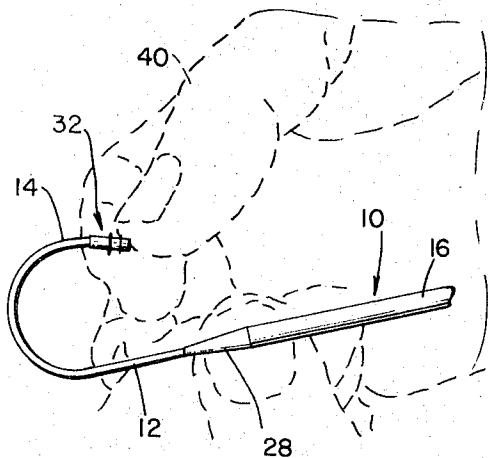


Fig. 5(b).

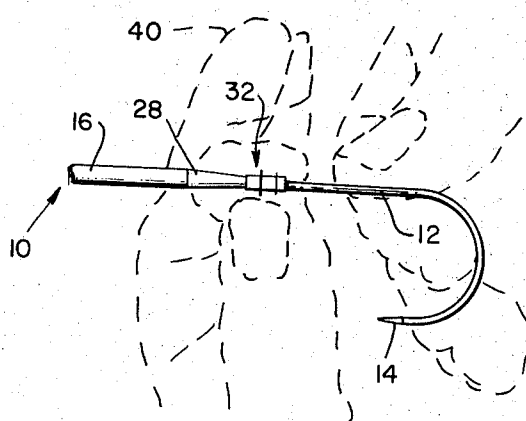


Fig. 5(c).

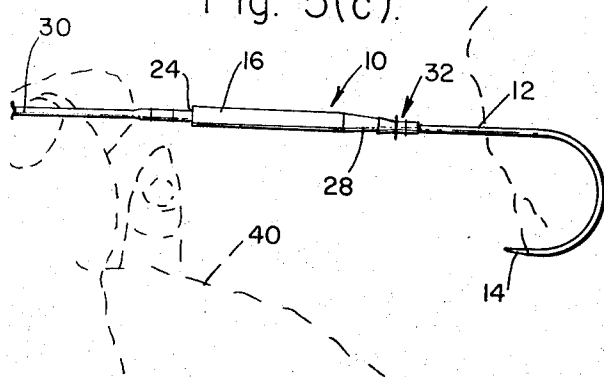


Fig. 5(d).

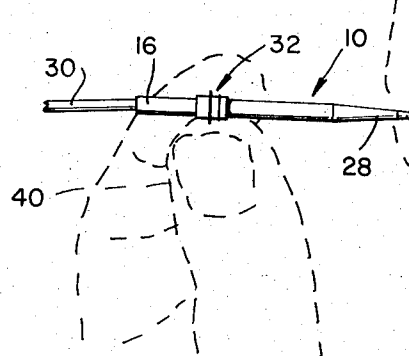


Fig. 5(e).

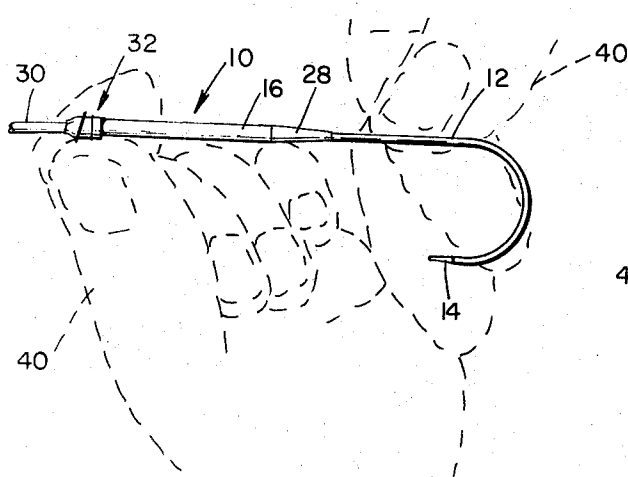
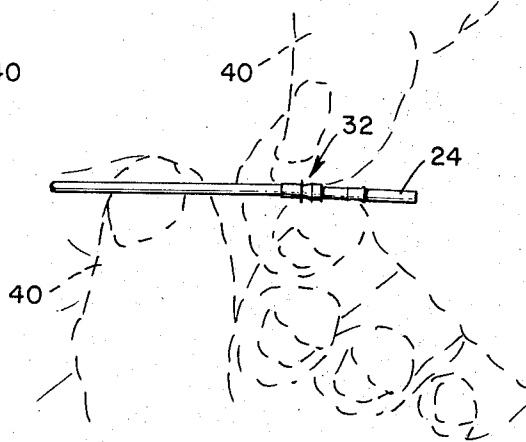


Fig. 5(f).



ASSEMBLY TOOL FOR REPLACEMENT OF WIRE SEAL, ELECTRICAL CONTACT

BACKGROUND OF THE INVENTION

The present invention relates to a tool and method for replacement of an individual seal at the wire end of an electrical contact without removing a cable therefrom.

In copending patent application Ser. No. 240,501, filed Apr. 3, 1971, now U.S. Pat. No. 3,792,416, issued Feb. 12, 1974, for example, there is disclosed a resilient pressure-sensitive wire seal used in conjunction with an electrical contact. Ordinarily, in assembly of the seal thereon, the seal is placed on the cable and the cable wire is then mechanically secured to the contact in electrical coupling therewith, after which the seal is slid into insulative engagement with the contact and the cable. If it should occur that this seal must be replaced, for example, if the seal becomes damaged, some means or method is required in order to replace the seal. It is possible, of course, to cut the existing contact from the cable and to attach a new contact with a seal to the wire. In some situations, this is not a practical solution. For example, the contact may have been usable but, with cutting of the cable, the contact is no longer usable, thus leading to waste. Also, the wire length to the contact may be so critical that the wire cannot be properly cut from the contact for replacement. Although this critical wire length may be due to the lack of available wire, usually this criticality results from excessive strain that occurs on the wire which has been shortened vis-a-vis other wires by even as little as one-eighth inch when the wiring harness is removed.

SUMMARY OF THE INVENTION

The present invention avoids these and other problems by permitting a defective seal to be replaced by a new seal without disassembling the cable from its attachment to its electrical contact, by use of a special tool and the method of using the tool. This tool comprises a shaft having one end which is tapered to receive the replacement seal and a second end which is formed in tubular shape to receive the contact. The depth of the tubular end is such as permit substantially the entire length of the contact to be received therein so that, when a seal is slid over the seal-receiving end and onto the tubular end, the seal may be slid off the tubular end and onto the cable, whereupon removal of the cable and the contact from the tubular end will permit the seal to contract about the wire receiving end of the contact and the cable. The tool may be further provided with a section adjacent the tubular end of increasing taper towards that end so as to enable expansion of the resilient seal, and to permit it to contract onto the cable and the contact.

It is, therefore, an object of the present invention to provide a tool and method for placing a seal on a contact without removing the cable from the contact.

Another object is to avoid shortening of the length of the cable for purposes of replacement of the seal.

It is another object of the invention to provide a simple assembly tool.

Another object of the invention is to provide a method for replacement of a wire seal.

Other aims and objects as well as a more complete understanding of the present invention will appear from the following explanation of exemplary embodiments and the accompanying drawings thereof, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 depicts in partial cross-section a resilient pressure-sensitive wire seal exemplifying the type of individual seal to be used in conjunction with the present invention;

FIG. 2 is a side view of the present invention with a contact and its attached cable inserted therein;

FIG. 3 is an end view of the present invention;

FIG. 4 is a top view of the present invention in partial section showing the contact and its attached cable inserted into the tool; and

FIGS. 5(a)-(f) depict the method of placing a seal, such as that depicted in FIG. 1, onto a contact with its attached cable.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1-4, a tool 10 comprises a shank or shaft 12, preferably of solid round stock, having a seal-receiving end 14 and a tubular contact-receiving and seal dispensing end 16. Seal receiving end 14 is tapered at 18 to a rounded point 20. Contact-receiving and seal dispensing end 16 is provided with an internal bore 22 of sufficient depth and diameter to receive an electrical contact 24 therein. Although contact 24 is depicted as a socket contact, it is to be understood that the present invention is as suitable for use with a pin contact. As shown in FIGS. 2 and 4, the contact is sufficiently received within bore 22 and abuts against bore end 23 so that only a small end portion of the contact is shown, as indicated by indicium 26. Joining shaft 12 and tubular end 16 is a tapered portion 28, whose taper increases from seal-receiving end 14 towards tube end 16. The tool is rounded at portion 29 to facilitate handling of the tool.

Contact 24 normally is provided with a cable 30 secured thereto by having its wire soldered, crimped or otherwise attached within the wire-receiving end of the contact. Normally, a seal 32 is secured to the contact in latching engagement therewith between a recessed end 34 of the contact and a recessed interior 36 of the seal (see FIG. 1). As shown in FIG. 4, seal 32 is displaced from sealing engagement with its contact 24, having been pushed somewhat back on cable 30. It is broken away at 38 to indicate that this seal is damaged and that it is desired to replace this seal with a good seal as shown in FIG. 1, in the manner indicated with reference to FIGS. 5(a)-(f).

It is to be understood that, although a particular seal 32 has been illustrated as being used with the present invention, this seal, as disclosed in copending patent application, Ser. No. 240,501 (U.S. Pat. No. 3,792,416), is only disclosed for purposes of describing and illustrating the operation and use of the present invention. Thus, any seal of a similar type may be used as a replacement seal utilizing the tool described herein. Illustrations of other types of seals which are capable of being handled by the tool and method of the present invention are shown in copending patent application, Ser. No. 283,606, filed Aug. 24, 1972, and U.S. Pat. Nos. 3,328,746, 3,077,572 and 3,609,636.

The method of placing a replacement seal 32 on a contact 24 with its cable 30 attached thereto is now described with reference to FIGS. 5(a)–5(f). As shown in FIG. 5(a), an operator grips tool 10 with his fingers 40 with one hand and slides seal 32 onto tool 10 from its seal receiving end 14 with his other hand, tapered portion 18 enabling easy placement of the seal on the tool. If desired, a lubricant, such as a silicone, may be applied to the tool to further facilitate sliding the seal over the tool. The seal is initially engaged on the tool with its cable gripping end 33 first being placed over point 20 and slid upon the end over tapered portion 18.

Seal 32 is slid further along shank 12 of tool 10, as shown in FIG. 5(b) until it meets tapered portion 28 at which point it is expanded as it is moved onto tubular portion 16, as depicted in FIGS. 5(c) and 5(d). At or prior to this time, as shown in FIGS. 5(d)–(e), the contact with attached cable 30 is placed within bore 22 of the tubular contact receiving end 16 until it abuts against bore end 23. Then, gripping both cable 30 and tool 10 by fingers 40, as shown in FIG. 5(e), seal 32 is manipulated off the end of contact receiving end 16 and partly onto the cable, thereby permitting preliminary engagement of the seal with the cable. By holding the seal on the cable in a finger gripping manner, removal of the tool from contact 24 permits the seal to slide off the tool end and to contract about contact wire-receiving end 26 and within recessed end 34 of the contact, as shown in FIG. 5(f). At this point, the contact with its replaced seal is now ready for placement or replacement within a connector body.

Although the invention has been described with reference to a particular embodiment thereof, it should be realized that various changes and modifications may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. An assembly tool for replacement of a defective wire seal with a new resilient wire seal on an electrical connector contact having a cable receiving end and a mating contact receiving end and having a cable secured to the contact within the cable receiving end comprising:

- a rod having a seal receiving end, a shank and a seal dispensing end;
- said seal receiving end having a rounded portion terminating in a taper decreasing from said shank to a rounded point; and
- said seal dispensing end comprising a tube extending from said shank in an increasing taper;
- said tube having an internal axial bore for receiving the contact receiving end and terminating in a bore end for limiting receipt of the contact therein, said shank and said seal receiving end having a diameter substantially equal to the internal diameter of the wire seal and said tube having a diameter greater than the internal diameter of the wire seal,

whereby the new wire seal is slidable onto said rod over said rounded point and onto said seal receiving end and further slidable along said shank and onto said tube, and released from said seal dispensing end onto the cable of the contact previously positioned within said tube and abutting against said bore end.

2. An assembly tool for placing a resilient seal on an electrical contact and on a cable already electrically and mechanically secured to the contact without requiring disassembly of the cable from the contact and without damage to the resilient seal comprising:

a shaft having means defining a bore at a first end for receiving the electrical contact and a portion of the cable secured thereto, seal receiving means at a second end for receiving the seal, and means securing said seal receiving means to said means for enabling the seal to be moved from said receiving means, over said bore means and onto the contact and the cable.

3. An assembly tool for replacement of a defective wire seal with a new resilient wire seal on an electrical contact and a cable engaged to the contact without disengagement of the cable from the contact, comprising:

a shaft having opening means at a first end for receipt of the electrical contact with its engaged cable, and seal receiving means at a second end for receipt of the new resilient seal and for enabling transfer of the new seal from said receiving means, over said opening means and onto the contact and its attached cable.

4. An assembly tool as in claim 3 wherein said shaft is provided with means curved intermediate said first and second ends for facilitating holding of said tool during the receiving and moving of the seal.

5. An assembly tool as in claim 3 wherein said opening means is provided with a diameter greater than the diameter of said seal receiving means and further including at least one tapered portion joining said opening means and said seal receiving means for expanding the seal as it is moved onto said opening means.

6. An assembly tool as in claim 3 wherein said first end includes means defining a bore opening at said opening means for receiving the electrical contact and a means defining an end terminating said bore means for limiting receipt of the contact and its engaged cable in said bore means.

7. An assembly tool for enabling placement of a seal on an electrical contact and its engaged cable without disengagement of the cable from the contact comprising means for receiving the contact and its engaged cable, means for receiving the seal and means for enabling transfer of the seal to the contact and its engaged cable.

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