# United States Patent

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[54] **TOOL FOR APPLYING ELECTRICAL TERMINALS**
**5 Claims, 8 Drawing Figs.**


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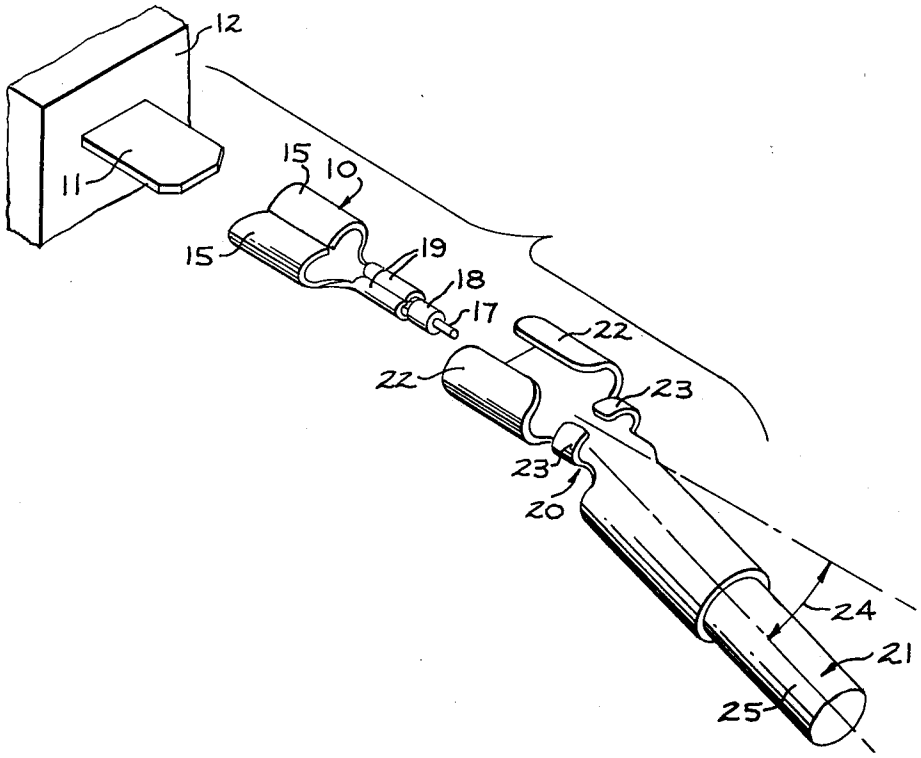
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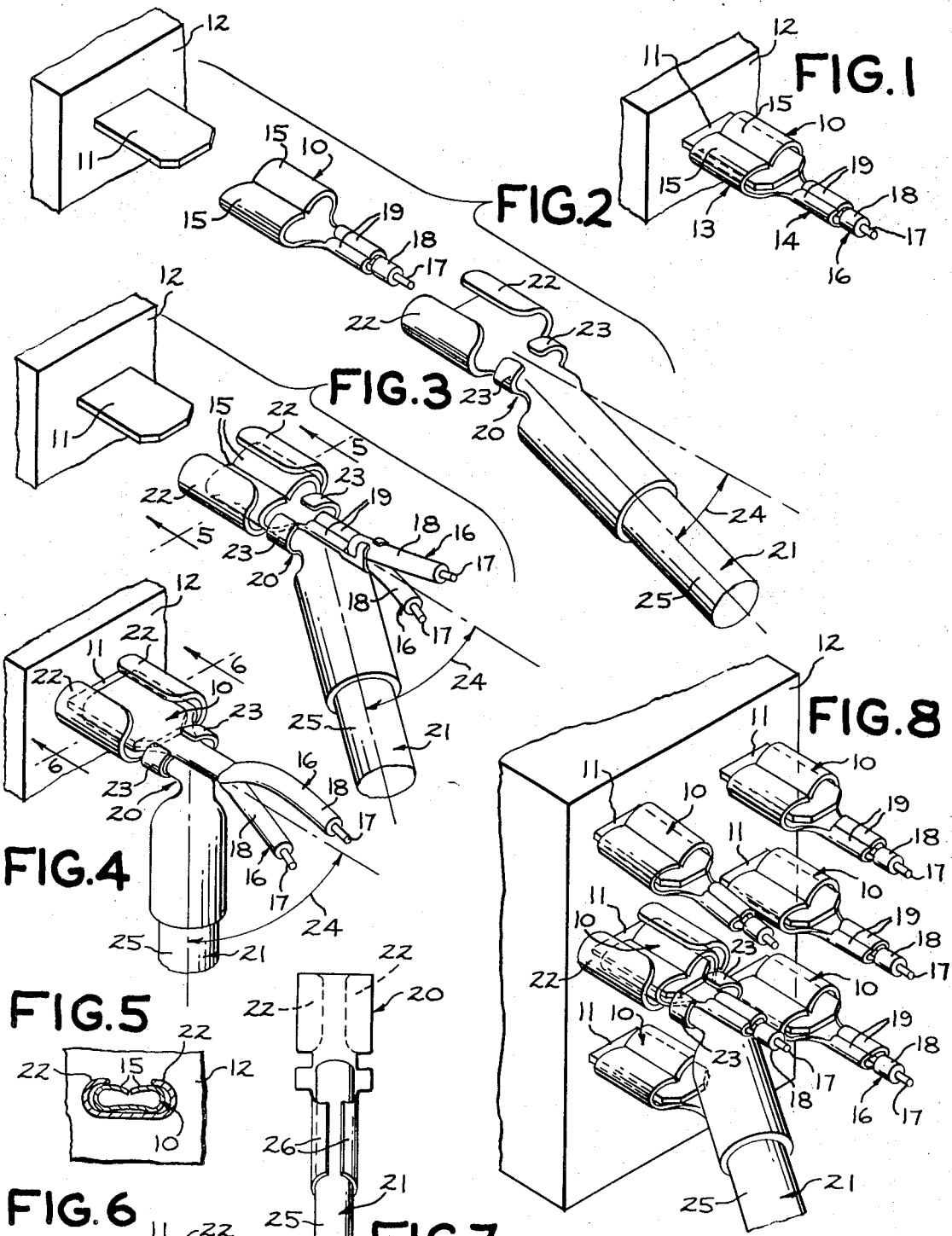


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**ABSTRACT:** A tool is provided for installing female electrical terminals onto male electrical terminals, the tool comprising a head member having opposed sidewall portions which encompass the female terminal sufficiently to limit the deformation thereof during installation, and having at least one stop portion to limit the relative movement of the female terminal and the head member. An elongate handle is secured to the head member and disposed at an angle thereto sufficient to minimize interference with any electrical conductors secured to the female terminal.




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# TOOL FOR APPLYING ELECTRICAL TERMINALS

## BACKGROUND OF THE INVENTION

This invention relates generally to a tool adapted to install wire-carrying female electrical terminals upon male electrical terminals.

The use of wiring harnesses having conductors which terminate in standardized female electrical terminals has become commonplace in many arenas of mass production. Switches, pilot light, gauges, motors and the like are commonly adapted for connection to such wiring harnesses by the provision of male electrical terminals which extend rigidly outwardly from such devices. These male terminals may then be connected to the wiring harness by installing the appropriate harness female terminals onto the male terminals, it being understood that the female terminals are adapted to frictionally retain their position on the male terminals once installed.

Difficulties arise in installing the female electrical terminals on devices having a large number of male terminals extending outwardly therefrom in closely spaced arrangement, which arrangement may leave insufficient manipulating room for the human hand. A variety of terminal installation tools have been proposed to overcome this problem. However, most such tools have been found to be inadequate for various reasons, primarily because they do not limit the deformation of the female terminal during installation onto the male terminal, whereby the female terminal may deform so as to mate loosely with the male terminal leaving a faulty connection. A further difficulty arises in that such prior installation tools frequently interfere with one or more of the electrical conductors secured to the female terminal, whereby such conductors, and frequently the terminals themselves, have to be deformed in order to permit the employment of the tool.

It is therefore an object of may invention to provide a tool adapted to install a wire-carrying female electrical terminal onto a male electrical terminal enabling a proper electrical connection therebetween.

It is a further object of my invention to provide such a tool which limits the deformation of the female electrical terminal during installation onto a male electrical terminal.

It is still a further object of my invention to provide such a tool which minimizes interference with the electrical conductors connected to the female terminals whereby no deformation of such conductors or the terminal is required in order to use the tool.

## SUMMARY OF THE INVENTION

Briefly stated, in accordance with one aspect of the present invention, there is provided a tool adapted to releasably engage and carry a female electrical terminal comprising a shank having a wide portion and a narrow portion, the wide portion being adapted to engage a male electrical terminal, and the narrow portion being adapted for connection to at least one electrical conductor. The tool comprises a head member and an elongate handle secured to the head member and disposed at an angle thereto. Opposed sidewall portions are formed integral with the head member and are adapted to at least partially encompass the wide portion so as to limit the deformation of the wide portion as the female electrical terminal is installed over a male electrical terminal. At least one stop portion is formed integral with said head member and is adapted to engage the end of the wide portion adjacent its juncture with the narrow portion to limit the relative movement of the female electrical terminal and the head member. The angle between the head member and the elongate handle is adapted to minimize interference by the handle with the electrical conductor connected to the female electrical terminal.

## BRIEF DESCRIPTION OF THE DRAWING

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed the invention will be better understood from the following description of the preferred embodiments taken in conjunction with the accompanying drawing, in which:



FIG. 1 is a perspective view of a female electrical terminal installed upon a male electrical terminal, the female terminal being of the type which may be readily installed by my tool;

FIG. 2 is a perspective view showing the terminals of FIG. 1 prior to the installation of the female electrical terminal onto the male electrical terminal, and showing a first embodiment of the tool of my invention approaching engagement with the female terminal;

FIG. 3 is a perspective view similar to FIG. 2 showing a second embodiment of my tool in engagement with the female terminal prior to its installation onto the male electrical terminal;

FIG. 4 is a perspective view similar to FIG. 3 showing a third embodiment of my tool in engagement with the female terminal, the female terminal being shown inverted from the position of FIG. 3 and in engagement with the male terminal;

FIG. 5 is a sectional view taken along line 5–5 of FIG. 3;

FIG. 6 is a sectional view taken along line 6–6 of FIG. 4;

FIG. 7 is a bottom view of the tool of FIG. 2 illustrating various details thereof; and

FIG. 8 is a perspective view of a terminal block having a plurality of closely spaced male electrical connectors extending outwardly therefrom onto which have been installed female electrical terminals, the tool of FIG. 3 being shown in engagement with one of these female terminals.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawing, and initially to FIG. 1 thereof, there is illustrated a female electrical terminal **10** of the type adapted for use with the tool of my invention, the female terminal **10** being shown installed upon a male electrical terminal **11** which extends outwardly from a supporting casing wall **12**. The female terminal **10** may comprise a shank having a wide portion **13** and a narrow portion **14**, the wide portion **13** having opposed resilient gripping portions **15** formed adjacent one end of the shank and integral therewith. The resilient gripping portions **15** are adapted to engage a male electrical terminal and to frictionally retain the position of the female terminal upon the male terminal once installed thereon. The narrow portion **14** is adapted, adjacent the other end of the shank, for connection to at least one electrical conductor **16** which may comprise a wire **17** having an insulating cover **18** formed coaxially therewith. The narrow portion **14** may be provided with opposed tabs **19** which are crimped into electrical contact with the wire **17**, or with other suitable conductor-engaging means which may be secured both to the wire **17** and the insulation **18**.

As previously stated, it is desirable to provide a tool for installing such a female electrical terminal upon a male terminal wherein the tool is operative to limit the deformation of the female terminal during installation thereby assuring an operable electrical connection, and wherein the interference by the tool with electrical conductors secured to the female terminal being installed is minimized. In accordance with my invention, as shown in FIG. 2, such a tool is provided comprising a head member **20** having an elongate handle **21** secured thereto. In the arrangement of FIG. 2, head member **20** is shown approaching engagement with female terminal **10** and prior to the installation of female terminal **10** onto male terminal **11**.

The head member **20** of my tool has opposed sidewall portions **22** formed integral therewith, the sidewall portions **22** being adapted to slip over the opposed resilient gripping portions **15** of terminal **10** and to partially encompass the resilient gripping portions **15** so as to limit the deformation thereof as the female terminal **10** is installed over male terminal **11**. Also formed integrally with head member **20** are

opposed stop portions **23** adapted to engage the resilient gripping portions **15** at the juncture of the wide portion **13** and narrow portion **14** of the female terminal **10** to limit the relative movement of the female terminal **10** and head member **20**.

The engagement of female terminal **10** and head member **20** may be better understood by referring to FIG. **3** wherein the opposed resilient gripping portions of terminal **10** are partially encompassed by opposed sidewall portions **22** and engaged by opposed stop portions **23**. In this position, it may be seen that opposed sidewall portions **22** are adapted to limit the opening or outward deformation of resilient gripping portions **15**, and stop portions **23** are adapted to carry female terminal **10** in a direction approaching male terminal **11**.

The deformation limiting function of opposed sidewall portions is not defeated by an inversion of female terminal **10** from the position of FIGS. **1—3**. Turning to FIG. **4** it will be seen that female terminal **10** is inverted whereby resilient gripping portions **15** face downwardly rather than upwardly. A comparison of the operation of head member **20** is the situations of FIGS. **3** and **4** is better illustrated by referring to FIGS. **5** and **6**, FIG. **5** being taken in section from FIG. **3**, and FIG. **6** being taken in section from FIG. **4**. In both FIGS. **5** and **6** it will be seen that sidewall portions **22** are operative to limit the opening or outward deformation of resilient gripping portions **15**, FIGS. **4** and **6** showing the female terminal **10** installed over male terminal **11**.

It is a significant feature of my invention that elongate handle **21** is disposed at an angle **24** to head member **20**, the angle **24** being adapted to minimize interference by the handle with such electrical conductors **16** as may be secured to the female terminal **10**. FIGS. **2—4** illustrate three possible embodiments of my device wherein angle **24** is varied to minimize interference with electrical conductors **16** and to augment installation from various positions of access. In FIG. **2**, angle **24** is shown as approximately 30°, the handle **21** being disposed in coplanar relation to head member **20**. In FIG. **3**, angle **24** is shown greater than 30° with handle **21** being disposed out of coplanar relation to head member **20**. The embodiment of FIG. **4** features angle **24** approximating 90° and in coplanar relation to head member **20**. It will be obvious that various modifications of angle **24** both within and without a coplanar relation to head member **20** may be made to suit specific available angles of access for tool operation.

As may be seen in FIG. **7** wherein the tool of FIG. **2** is shown in bottom view elongate handle **21** may comprise a shaft **25** secured to head member **20** by opposed clamping portions **26** formed integrally therewith. Clamping portions **26** may be rigidly fastened to shaft **25** by any suitable means such as spot welding whereby the head member **20** is rigidly connected to the elongate handle **21**.

One of many situations in which the tool of my invention has particular application is illustrated in FIG. **8** wherein a plurality of male electrical terminals **11** are shown extending outwardly in closely spaced arrangement from a supporting casing wall **12**. As may be seen in FIG. **8**, the tool embodiment of FIG. **2** is particularly well adapted to permit the selective installation of female terminals **10** onto male terminals **11** so arranged without interfering with surrounding terminals.

As was previously mentioned the tool of my invention is particularly adapted for use in connection with the installation of female electrical terminals onto male terminals wherein it is desirable to provide a tool which will limit the deformation of the female terminal during installation without interfering which such electrical conductors as may be connected to the female terminal.

From the foregoing description it should now be apparent that the present invention, being simple in configuration, compact in form, and having a head member which partially encompasses the female terminal and an elongate handle disposed at an angle thereto, provides such a tool which engages the installation of wire-carrying female electrical terminals onto male terminals with proper electrical connection therebetween.

As will be evident from the foregoing description, certain aspects of the invention are not limited to the particular details of the construction of the examples illustrated, and it is contemplated that other modifications, applications or variations will occur to those skilled in the art. It is therefore intended to cover such modifications, applications and variations as do not depart from the true spirit and scope of the invention.

I claim:

**1.** A tool adapted to releasably engage and carry a female electrical terminal comprising a shank having a wide portion and a narrow portion, the wide portion being adapted to engage a male electrical terminal, and the narrow portion being adapted for connection to at least one electrical conductor, the tool comprising:

a head member;

opposed sidewall portions formed integral with said head member and being adapted to at least partially encompass the wide portion so as to limit the deformation of the wide portion as the female electrical terminal is installed over a male electrical terminal;

at least one stop portion formed integral with said head member and adapted to engage the end of the wide portion adjacent its juncture with the narrow portion to limit the relative movement of the female electrical terminal and said head member; and

an elongate handle secured to said head member and disposed at an angle thereto, said angle being adapted to minimize interference by said handle with the electrical conductor connected to the female electrical terminal.

**2.** The invention of claim **1** wherein said at least one stop portion comprises a pair of opposed stop portions formed adjacent said opposed sidewall portions.

**3.** A tool adapted to releasably engage and carry a female electrical terminal comprising a shank having opposed resilient gripping portions formed adjacent one end of the shank and integral therewith, the gripping portions being adapted to engage a male electrical terminal, the shank being adapted adjacent its other end for connection to at least one electrical conductor, the tool comprising:

a head member;

opposed sidewall portions formed integral with said head member and being adapted to at least partially encompass the resilient gripping portions so as to limit the deformation thereof as the female electrical terminal is installed over a male electrical terminal;

at least one stop portion formed integral with said head member and adapted to engage the resilient gripping portions to limit the relative movement of the female electrical terminal and said head member; and

an elongate handle secured to said head member and disposed at an angle thereto, said angle being adapted to minimize interference by said handle with the electrical conductor connected to the female electrical terminal.

**4.** The invention of claim **3** wherein said at least one stop portion comprises a pair of opposed stop portions formal adjacent said opposed sidewall portions.

**5.** The invention of claim **3** wherein said angle is at least 30°.