Aug. 11, 1970 G. J. FILIA 3,523,351

LOCATOR AND HOLDER IN A CRIMPING TOOL FOR AN ELECTRICAL CONNECTOR

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Fig 1

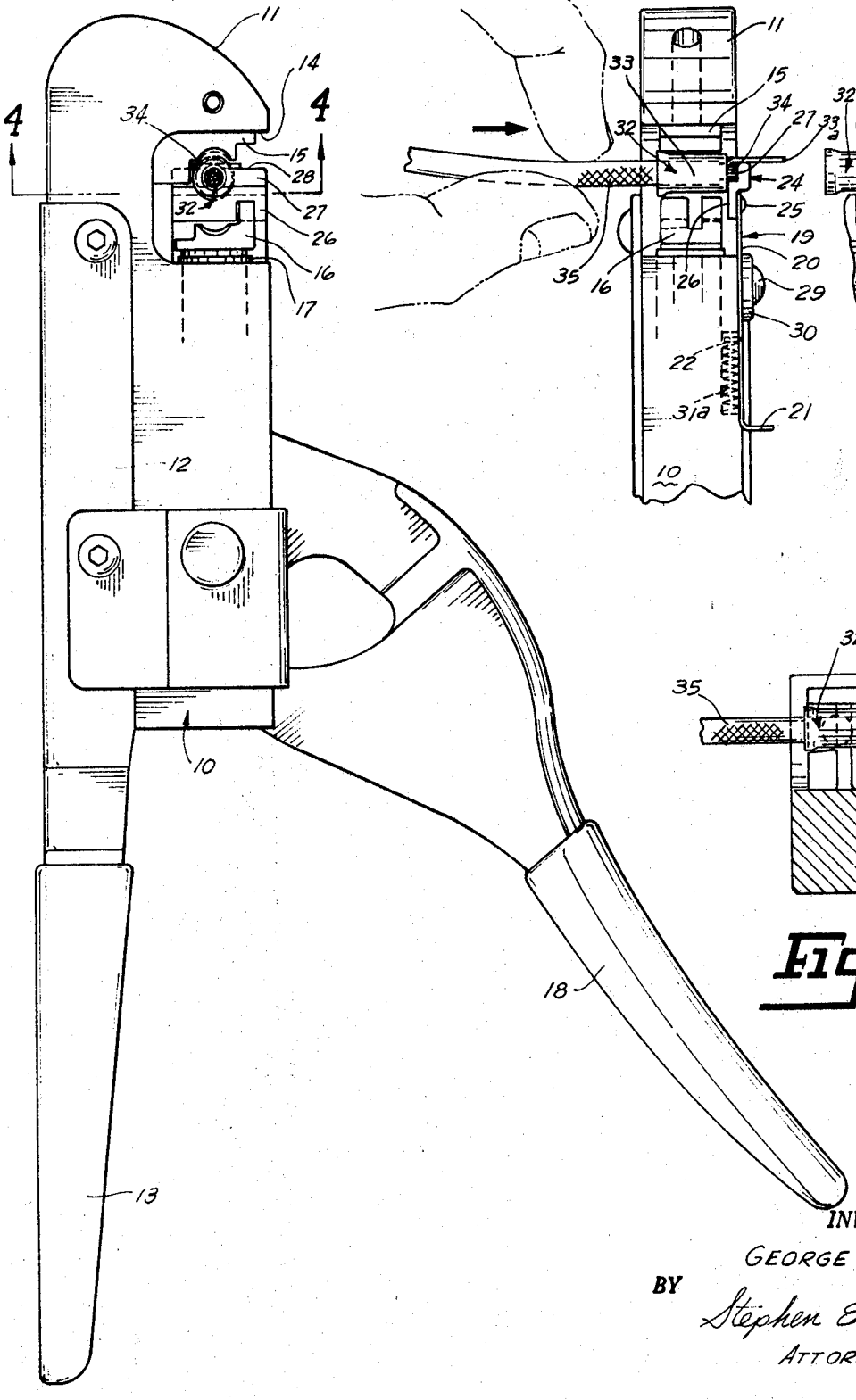

Fig 3

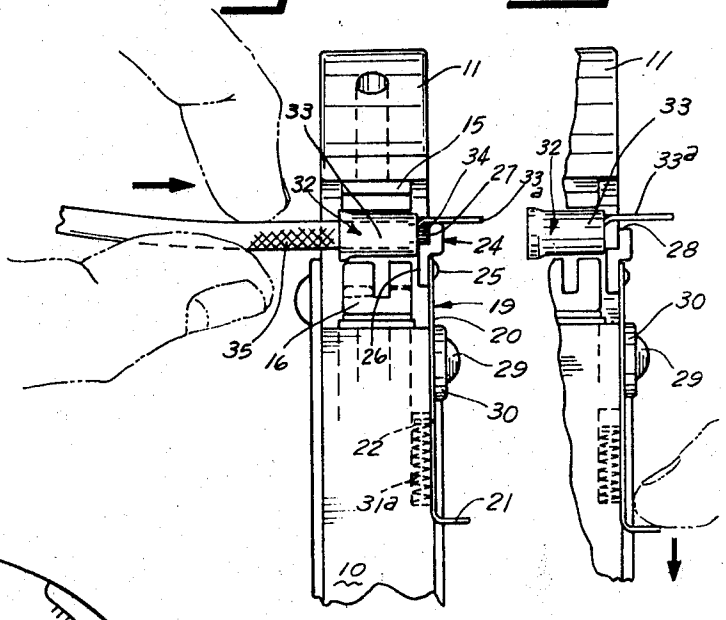

Fig 2

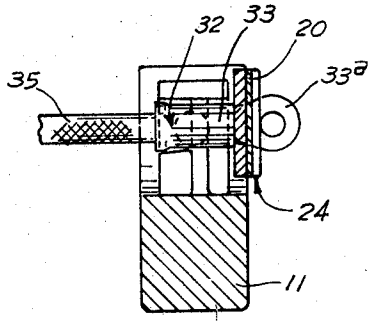

Fig 4

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Fig 5

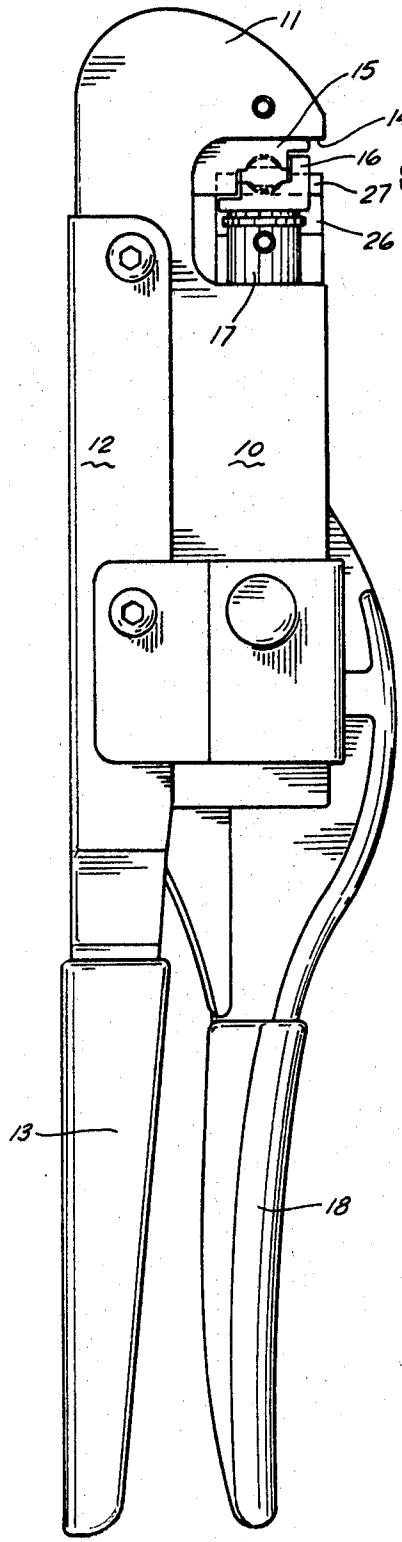
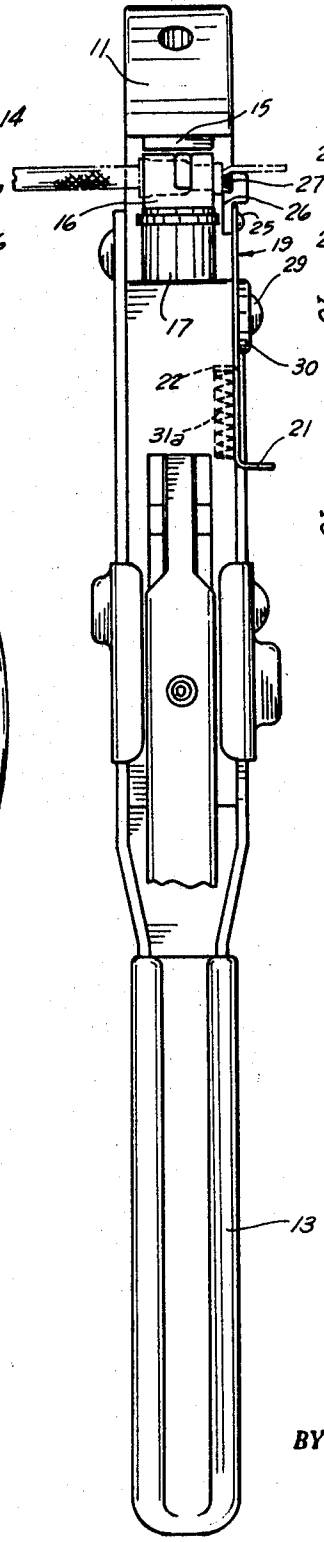


Fig 6



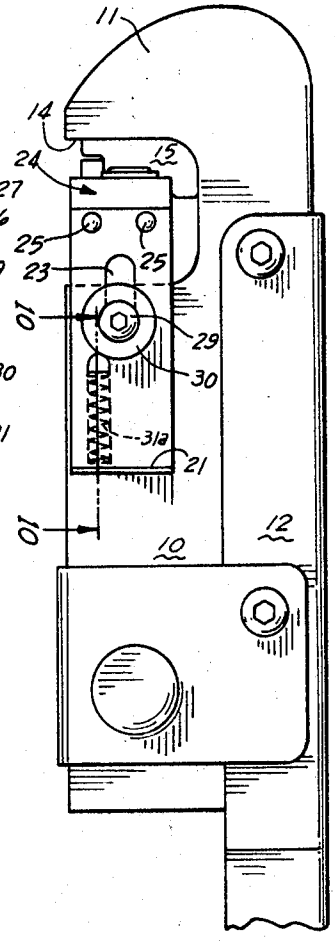


Fig 7

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FIG.6a.

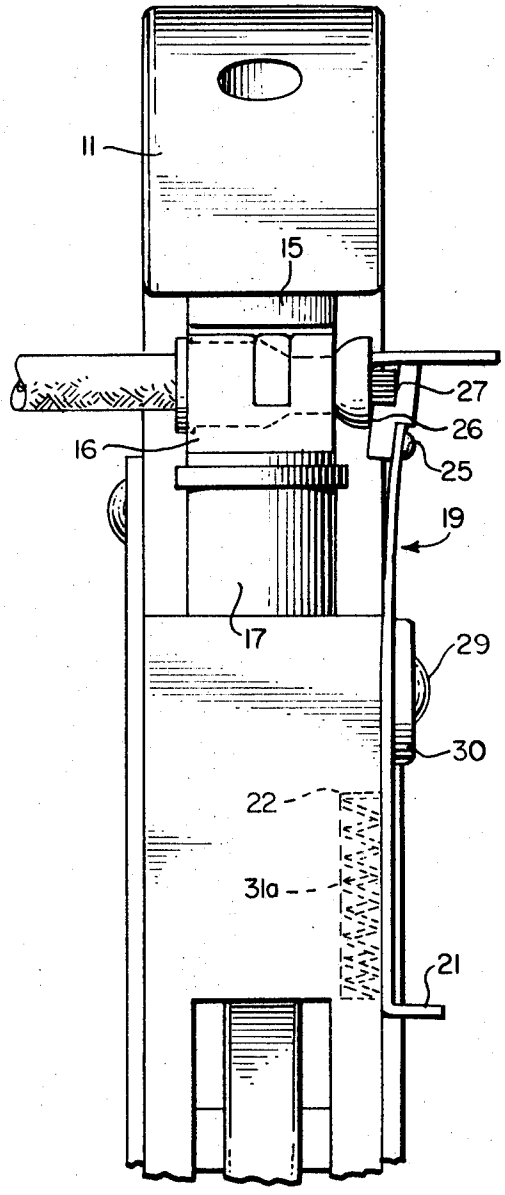
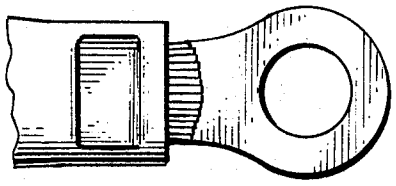


FIG.6b.



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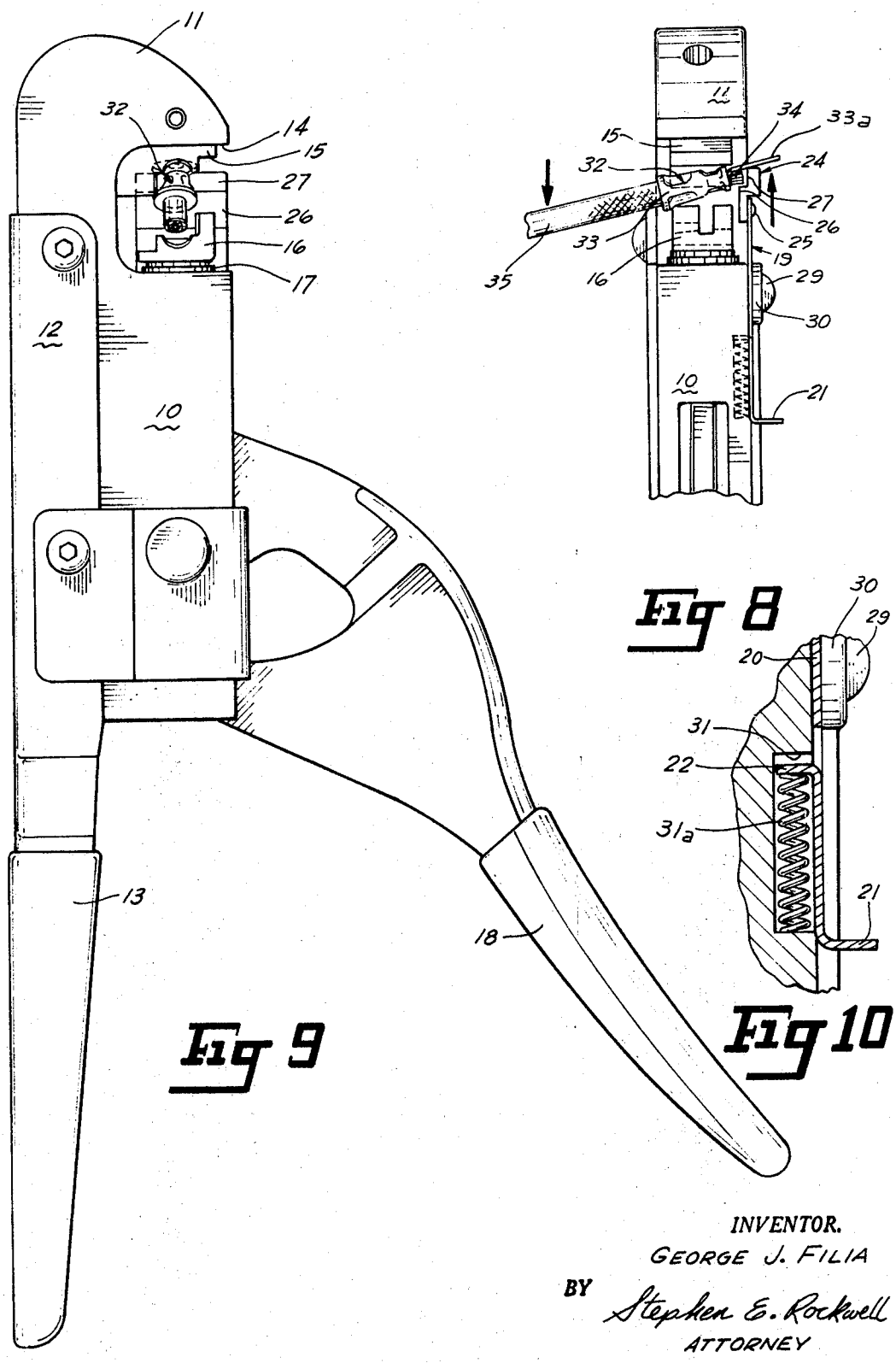

Fig 9

Fig 8

Fig 10

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3,523,351

LOCATOR AND HOLDER IN A CRIMPING TOOL FOR AN ELECTRICAL CONNECTOR

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Int. Cl. B25b 25/00; H01r 5/10; B21d 9/08
U.S. Cl. 29—203 8 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to a work locator and holder in a crimping tool for an electrical connector, which tool is of the hand type having cooperating fixed and movable crimping dies. The locator and holder for the electrical connector is mounted on the tool body for sliding movement toward and away from the fixed die and is spring biased to the former position. This slide serves to engage and axially position with reference to the dies a connector or terminal of the ferrule type to be crimped about a wire. It also angularly positions the connector with reference to the dies and serves as a wire stop.

This invention relates to a locator and holder for an electrical terminal or connector for crimping of the latter about a wire by a hand tool with which the locator and holder is associated and supported. Such crimping tools commonly comprise a body supporting in fixed relation thereto a crimping die and providing as a part thereof a handle member. The aforementioned body also supports for sliding movement a second die cooperating with the first-mentioned die and movable toward and away from the latter by relative swinging movement of a second handle member to the first handle member, the second handle member having a pivotal relationship to the body and operative means of connection to the second die. These tools are often employed for crimping a terminal or connector, of the ferrule type having a protruding tongue portion, about an insulated or uninsulated wire conductor.

Heretofore in the use of such tools considerable difficulty has been encountered in forming by a crimping operation a strong electrical and mechanical connection between the terminal and the wire owing to improper positioning and/or holding of the terminal by an operator with reference to the crimping dies prior to a crimping operation. The barrel portion of such a connector, which may be open ended, must be properly positioned and held with reference to the dies axially thereof. It is also necessary in many such tools to angularly orientate the terminal so that the protruding tongue thereof has a particular angular relationship with reference to the dies before a crimping operation.

The terminal should be placed intermediate the open dies in a manner such that the portion of the barrel from which the tongue protrudes is backed by the fixed die so as to give it solid support, and it is desirable to hold the terminal in these axial and angular positions prior to a crimping operation. It is also desirable to provide, in the locator and holder, means to stop a wire inserted into the open-ended terminal so that the wire will be extended sufficiently into the terminal but not too far, to assure best electrical results in the crimped product.

Known work locators for such tools have in the past been subject to a variety of shortcomings when employed for crimping terminals of the type described above. For example, such locators have failed to effectively inhibit the improper positioning by an operator of such a terminal between jaws of a crimping tool. In at least some instances it has been found that in the use of such locators it has been somewhat difficult for the operator to position the terminal in the jaws for a crimping operation. Some tools equipped with locators have lacked simple, effective means to axially and angularly orientate a terminal with reference to the crimping dies and axially orientate a wire in the terminal, and at least some have lacked effective means to hold a terminal in proper position prior to a crimping operation. Moreover, at least some devices of the prior art, such as described above, have inadequately provided for elongation of such a terminal upon compression thereof during a crimping operation.

One object of the invention is to provide a terminal or connector locator which inhibits improper positioning by an operator of a terminal such as described between the jaws of a crimping tool.

Another object is to provide a locator which axially orientates such a terminal and tends to also angularly orientate it.

Another object is to provide a locator such as described which very effectively holds the terminal in proper position for a crimping operation.

Still another object is to provide a locator and holder such as described above which is of simplified construction and dependable in operation, which also serves as a wire stop and which readily permits elongation of the barrel portion of such terminal for crimping of the latter between the dies of the tool.

Further objects of the invention will be apparent from the following detailed description of one form of the terminal locator and holder.

In the drawings:

FIG. 1 is a side elevational view illustrating a hand tool equipped with a locator and holder for an electrical connector, embodying the invention;

FIG. 2 is a fragmentary plan view of the head portion of the tool illustrating a terminal and the locator and holder therefor in one position thereof;

FIG. 3 is a similar view showing the locator and holder in another position thereof and showing a wire inserted in the terminal;

FIG. 4 is a sectional view taken on line 4—4 of FIG. 1;

FIG. 5 is a side elevational view of the tool of FIG. 1 illustrating the parts thereof with the handles of the tool in closed condition, as upon the completion of a crimping operation, the work being omitted;

FIG. 6 is a top plan view of the tool in the last-mentioned condition;

FIG. 6*a* is a fragmentary enlarged view, similar to FIG. 6, illustrating exaggeratedly the deflection of a head portion and a resilient portion of the locator on crimping of a terminal,

FIG. 6*b* is a fragmentary view illustrating a crimped terminal or connector;

FIG. 7 is a fragmentary side elevational view of the tool in the last-mentioned condition illustrating the side thereof remote from that shown in FIG. 5;)

FIG. 8 is a fragmentary top plan view of the crimping tool illustrating the dies thereof in open position subsequent to a crimping operation, and further illustrating the removal of the crimped connector therefrom;

FIG. 9 is a side elevational view of the tool similar to FIG. 1, illustrating the same in the last-mentioned condition; and

FIG. 10 is an enlarged sectional view taken on line 10—10 of FIG. 7.

In the drawings the elongated body of the tool, indicated generally at **10**, is provided with a crimping head portion **11**. The body is provided with an element **12** extending from the end thereof remote from the head **11** to provide a handle member **13**. The element **12**, while

shown as secured to the body by fastening means, may be considered for present purposes as an integral part of the body **10** as it may be so formed.

The head **11** is illustrated as provided with a transverse recess **14** in which crimping dies **15** and **16** are located. Die **15** is fixed to the head **11** by any suitable means, and die **16** is fixed to one end of a ram **17** slidably supported in the body for movement toward and away from the die **15** for cooperation of these dies with one another. When the die **16** is retracted in the body by the ram, opening of the dies is effected, and when it is moved in the opposite direction the dies are closed to effect a crimping operation.

The tool is provided with a handle member **18** in pivotal relation to the body **10** and has operative means of connection to the ram **17** to effect opening and closing of the dies. A further description of the details of the above-mentioned parts of the tool and their cooperation with one another is unnecessary to an understanding of the of the present invention as the above-described tool may be similar to that illustrated and described in U.S. Pat. No. 3,322,008, issued May 30, 1967.

The terminal or connector locator and holder of the invention is indicated generally at **19**. It comprises an elongated relatively thin steel body **20** capable of flexing in a manner to be described hereinafter. It lies generally in a plane lengthwise of the tool body **10** along one side thereof. One end portion of the body **20** is laterally and outwardly bent (FIG. 3) with reference to the tool body **10** to provide an abutment or operating member **21** for finger control, as will be explained hereinafter.

Intermediate of its ends it has a lug **22** struck therefrom laterally and inwardly with reference to the body **10**. A longitudinal slot **23** (FIG. 7) is formed in the body **20** intermediate the other end thereof and the lug **22**.

The last-mentioned end of the body **20** has thereon the head **24** of the locator and holder, which head in the illustrated form of the invention is formed as a separate piece. It may be cast from a suitable metal to provide the stepped configuration shown in FIGS. 2 and 6 of the drawings, for example. The head **24**, which may be secured to the body **20** of the locating and holding device by fasteners indicated at **25**, has in opposing relation to the transverse opening **14** in the head **11** of the tool planar stepped surfaces **26** and **27** parallel to one another, the surface **26** being disposed laterally inwardly with reference to the tool body **10** from the surface **27**. The distal end of the head **24** of the locator and holder is provided with a surface **28** of planar form disposed at right angles to the adjoining surface **27**.

The aforementioned body **20** of the locator and holder is supported in part for longitudinal sliding movement by a bolt **29** having a head preferably provided with a hexagonal socket for reception of a suitable wrench. The bolt extends through the slot **23** in the body and is threaded into a tapped hole in the body **10** of the tool. A washer **30** is interposed between the head of the bolt and the body **20** of the locator and holder to provide support for the body **20** while permitting free sliding movement with reference thereto.

The body **20** of the locator and holder is also supported in part and is guided by the aforementioned lug **22** thereof which extends into a longitudinal groove **31** (FIG. 10) in the body **10**. This groove, while permitting sliding movement of the lug **22** in a lengthwise direction, guides with the bolt **29** the movement of the body **20** so that angular movement of the body about the axis of the bolt is effectively inhibited. Interposed between one end of the groove **31** and the lug **22** is a compression spring **31a** acting to urge the body or slide **20** in a direction toward the head **11** of the tool or, in other words, toward the fixed die **15** thereof. The bolt **29** may be effective to limit this sliding movement. It will be noted that in the position of the locator and holder shown in FIG. 3 the head surface **26** lies in a plane parallel to but spaced somewhat from the plane in which the adjacent end of the die **15** is located.

An electrical terminal or connector of one type adapted to be crimped in the tool is indicated generally at **32**, as best shown in FIG. 2. It comprises a ferrulelike part **33** serving as an electrical conductor which may have an outer covering of insulating material and which has extending from one end thereof a tongue **33a** adapted to be secured to another conductor such as a binding post. It will be noted that the tongue **33a** projects from one side wall portion of the ferrule or barrellike part **33** of the electrical connector. For crimping purposes the last-named portion of the terminal should be strongly backed by the fixed die **15** which has sometimes been referred to in the trade as a mold.

As previously mentioned, the terminal locator and holder may be employed to crimp a terminal on either an insulated or uninsulated wire. In the use of the tool illustrated in the drawings, the wire conductor **34** (FIG. 3) is provided with an insulating cover **35** which for a crimped connection of the conductor with the terminal is stripped back a distance from the end of the conductor wire. The die configuration and arrangement in the tool is such that when these dies are closed for a crimping operation, the insulated barrel of the terminal is crimped to the wire insulation to form a physical connection therewith and the barrel **33** is crimped to form a strong physical and electrical connection with the conductor **34**.

In the operation of the tool, the dies **15** and **16** are moved from their closed positions to their open positions to receive a wire terminal by relative movement of the handles **13** and **18** of the tool from the positions of FIG. 5 to the positions of FIG. 1. A terminal may then be inserted in the tool in the manner best shown in FIG. 2. When the terminal is properly inserted in the tool the handles **13** and **18** of the tool may be moved a distance toward their closed positions of FIG. 5 from their positions of FIG. 1 so that the terminal is lightly gripped by the dies. The tool may be equipped with a motion-compelling device as shown and described in the aforementioned U.S. Pat. 3,322,008 to prevent opening of the dies thereafter until the dies have been moved, through movement of the tool handles, to their closed postions. As shown in FIG. 2, the terminal locator and holder is partially retracted for insertion of the terminal **32** in the tool by exerting finger pressure as indicated on the lug **21** of the body **20**. It may be retracted a distance only sufficient to clear the tongue **33a** of the connector as it is inserted in the tool. It may then be released.

In released position, the surface **26** of the terminal locator and holder provides an abutment acting as a stop engageable by the barrel **33** of the terminal at the end thereof corresponding to the tongue **33a**, as shown in FIG. 3. This axially orientates the terminal. Also when the terminal locator and holder is released, the end surface **28** thereof engages the tongue **33a** of the terminal in a manner to press the terminal firmly against the die or mold **15** with the tongue in the vertical position shown in FIG. 3, so that the portion of the terminal barrel from which the tongue protrudes is angularly aligned with the mold **15** and next thereto. This is very important to effect correct crimping of the terminal. The surface **26** of the locator engaged with the barrel of the terminal facilities this action of the locator on the tongue **33a** for the last-mentioned purpose.

The terminal is angularly oriented by the engagement of the end surface **28** of the locator with the tongue **33a**. If the terminal is inserted in a tool, as is often the case, with the tongue **33a** not in the true vertical position shown in FIG. 2 but cocked either toward the mold **15** or the die **16**, the action of the locator head **24** is such that the terminal is moved angularly so that the tongue **33a** is straightened up to the position of FIG. 2. If the operator attempts to insert the terminal in the tool with the tongue **33a** of the terminal nearest the die

16 instead of its proper position shown in FIG. 2, the spring-biased terminal locator and holder acting on the tongue 33a of the terminal cocks the terminal in such a manner as to indicate to the operator that the terminal is improperly positioned in the tool.

After the terminal is positioned and held in the tool as aforesaid, the aforementioned wire is inserted in the terminal as shown in FIG. 3. The surface 27 of the head of the terminal locator and holder acts as a stop for the wire conductor 34, as shown in FIG. 3. The location of the work with reference to the die or mold 15 is also shown to advantage in FIG. 4.

When the parts are assembled as aforesaid, the handles 13 and 18 of the tool may be swung from their open positions of FIG. 1 to the closed positions of FIG. 5 to effect closing of the crimping dies 15 and 16 on the work, performing a crimping operation. During this operation the barrel of the terminal may be somewhat elongated and, owing to the flexibility of the body 19 of the terminal locator and holder, the terminal-abutting head 24 of the locator is moved slightly to the right as viewed in FIG. 6, permitting this elongation

The closed condition of the dies on the work is illustrated in FIG. 6. After the work has been crimped, as shown in the last-mentioned view, the dies may be opened for the removal of the work upon the return movement of the handles of the tool to their open positions illustrated in FIG. 9. Upon retraction of the die 16 on the plunger 17, the spring-biased locator bearing on the tongue of the connector or terminal, as shown in FIG. 8, in the direction of the arrow tends to strip the work from the die 16 while manual pressure on the wire in the opposite direction shown by the arrow may conveniently strip the work from the die 15. In this manner the work may be easily removed from the dies and from the tool. Removal of the work from the tool does not require the locator to be manually retracted by finger pressure on the lug 21. The work may be freed merely by grasping the wire and pulling it with the work out of the tool. It is to be noted that the work locator and holder may be employed on suitable tools for crimping terminals other than the type illustrated and described above. For example, as viewed broadly, the terminal shown and described is of the type having a barrel and an axial projection therefrom and the work locator and holder may coact with such a terminal so as to bear against the last-mentioned projection and align the barrel of the terminal.

It will thus be seen that the terminal locator and holder attains the stated objects. It is very efficient and reliable in operation. Obviously the spring associated with the locator and holder may be selected to exert the desired degree of pressure on the work when the locator and holder is in the released condition thereof. In at least many instances the spring pressure may be relatively light to facilitate retraction of the work locator and holder.

While only one form of the locator and holder in a crimping tool for an electrical connector has been illustrated and described, it will be apparent to those versed in the art that the invention may take other forms and is susceptible of various changes in details without departing from the principles of the invention and the scope of the appended claims.

What I claim is:

1. In combination with a hand tool for crimping to a wire a terminal having a barrel portion and an axial projection therefrom, which tool has an elongated die-supporting body having a first side which is a wire-receiving side and a second side, a first die fixed to said body and a second die movably supported for cooperation with the first die, a terminal locator and holder comprising a slide mounted externally on said body for movement past the second die in a direction toward the transverse plane in which at least a portion of the working face of the first die is located, a spring interposed between the body and the slide urging the latter in the last-mentioned direction, means by which the slide may be retracted by manipulation thereof for insertion of a terminal intermediate the dies, the slide having at one end a head provided with a projecting end portion for engagement with said axial projection of the terminal to align and hold the latter with reference to the first die, and also having a portion engageable with the corresponding end of the barrel to axially orientate the terminal inserted in the tool, and the slide having a resilient portion supporting the head permitting said head and said resilient portion to be deflected transversely of the longitudinal axis of the tool body in a direction away from said second side during a crimping operation on elongation of the terminal barrel as it is crimped.

2. The combination of claim 1 wherein said resilient portion of the slide is formed by a relatively thin strip of steel extending lengthwise of the body of the tool and constituting the body of the slide.

3. The combination of claim 1 wherein said means for retracting the slide comprises a manually operable member fixed thereto at the end thereof remote from said head.

4. The combination of claim 2 wherein said slide has sliding engagement with an external surface of the tool body and wherein the slide is provided with a longitudinal slot through which a headed fastener extends into the tool body to support and permit said movement of the slide.

5. The combination of claim 4 wherein the body at a location remote from said head is provided with a laterally outwardly extending manipulating member constituting said means for retracting the slide.

6. The combination of claim 5 wherein the body of the slide is provided with a laterally inwardly extending lug, the lug extending into means defining a groove in the body coacting with the lug to guide said movement of the slide and inhibit angular dislocation of the slide about an axis transverse thereof.

7. The combination of claim 6 wherein said spring is of the compression type and is interposed between one end of the means defining said groove in the body and said lug.

8. The combination of claim 7 wherein the axial projection of the terminal comprises a platelike tongue and wherein said head of the locator and holder is a separate part wider than the striplike body and secured to one end of the latter, the head having an axially offset planar surface engageable with the corresponding end of the terminal barrel to axially align the terminal, and having a second planar surface laterally offset outwardly with respect to the first-mentioned surface thereof providing a wire stop, and wherein the distal end of the head provides a planar surface transverse to the first and second planar surfaces thereof, engageable with the platelike tongue of the terminal to angularly orientate the terminal.

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WAYNE A. MORSE, JR., Primary Examiner

U.S. Cl. X.R.

29—282; 72—410, 465; 81—420; 269—96