A tool is provided for facilitating removal and/or insertion of an electrical contact terminal of the type releasably lockable within a bore of an electrical connector body. A pair of elongated, hollow, half-cylindrical working members are mounted for movement between a closed position in which the members mate to form a uniform, open-ended, hollow, cylindrical working portion and an open position in which the working members are spread apart. In the open position the spaced working members are disposed for receiving a wire lead which may be connected to a contact terminal to be removed from, or inserted into, a bore in the connector body. In the closed position the hollow cylindrical working portion may be inserted into the bore without damaging the insulation surrounding the bore for releasing the contact terminal from its locked position therein. The working members are individually mounted on relatively rotatable hinge members having a pivotal axis radially spaced from the axis of said hollow cylindrical working portion, each of the hinge members being equipped with a pair of manually engageable wing grips or handles permitting selective manual movement of the working members between their open and closed positions.

18 Claims, 8 Drawing Figures
ELECTRICAL CONTACT TERMINAL HAND TOOL

BACKGROUND

This invention relates to tools for facilitating the removal and/or insertion of electrical contact terminals of the type which are releasably held within a bore of an electrical connector body. The hand tool is useful where one or more terminals must be removed and replaced or where it is simply desired to remove the terminal to perform an operation on or in connection with either the terminal or its lead wire. Such connectors are typically formed with a plurality of such bores for receiving a corresponding number of contact terminals, which may take the form of pins or sockets.

In connectors of this type the individual contact terminals may be inserted into the connector body after they have been suitably joined to a wire lead, such as by soldering or crimping, the bare end of the wire in a stem of the terminal.

The contact terminals may be releasably locked in the connector bores by spring biased retention fingers such that insertion and removal of the terminals may be effected as necessary. For example, it may be necessary during the life of the connector to repair the lead wires connected to the various contact terminals and for this purpose their release and removal from the connector body is desirable.

The connector and cooperating contact terminals typically have a configuration which requires insertion and removal of the terminals from the rear of the connector body. At the front of the connector the contacting portions of the terminals extend through minimum clearance openings to and for engaging their counterparts carried by a complementary connector. Many times the connector will be provided with protective insulating material adjacent the rear of the connector body and through which the contact terminals must be forcefully inserted and removed relative to the bores.

The utility of a tool means for facilitating this insertion and removal of the contacts has been recognized. For example, a plastic tool is disclosed in U.S. Pat. No. 3,110,093, directed to this purpose. As disclosed therein, a single slot resilient plastic tubular body is provided for insertion into a radial clearance surrounding a rear annular portion of the contact terminal. This operation releases retention fingers in the bore of the connector body and thereby provides for removal and/or insertion of the terminal.

While such a tool may be employed for non-critical applications, particularly where the rear of the connector body is relatively free of insulation or where the insulation is not easily damaged, it has been found that this type of prior art tool cannot be used for connectors and wiring which must meet rigorous insulation specifications. Such connectors may for example employ several layers of compressible insulating material at the rear of the connector body. Any gouging, cutting, galling, etc. of the insulation material during insertion and/or removal of the contact terminals through the opening which interconnects the bore and rear face of the connector cannot be tolerated.

Sometimes this insulation material is compressed, such as by a rear pressure plate on the connector, so as to flow or creep, filling in and closely surrounding the connector terminals and their associated lead wires. To repair the wiring or the connector, the removal and insertion of a contact terminal requires backing off the pressure plate and removal of the contact through this previously compressed insulating material. It will be appreciated that the insulating material must be somehow what displaced during such removal and that a sharp edge on the terminal removal tool may easily gall or cut the insulation permanently damaging the connector.

This has in fact been found to be true in the case of the plastic extraction and insertion tool of the type disclosed in U.S. Pat. No. 3,110,093. Because of the construction of this prior art tool, the split end never quite closes on itself and thereby leaves sharp edges which tend to damage the insulation in the above-mentioned type of connector. Moreover, the material from which these tools are made is by necessity a hard, inflexible, rigid plastic or the like having sufficient hardness to maintain the strength of the working end of the tool.

Such plastic material tends to chip during use thus forming sharp edges which further cut and injure the insulation.

Additionally, it is necessary to force the wire lead through the single longitudinal slit on the hard plastic body in order to insert the wire within the tubular sleeve. It has been found that this operation may scar or gall the insulation on the wire itself. This of course, cannot be tolerated any more than the damage to the connector insulation.

Where the thickness of the insulation at the rear of the connector body is substantial such that a relatively long tubular working portion for the tool is required in order to reach the connector bore, it is necessary to increase the rigidity of the reduced diameter tubular working end of this prior art tool to support the required elongation of its nose. Such increased rigidity makes it more difficult to spread the split end during insertion of the lead wire. Of course, it is possible to increase the natural or unbiased separation of the permanent slot so that the wire may be merely laid in place. However, this permanent slot or circumferential discontinuity at the entry end of the working portion as indicated above tends to cut the connector insulation. Moreover, such a permanently enlarged slot may result in failure to retain all or the retention fingers mounted within the connector bore due to alignment of one of the fingers with the slot. These fingers have a limited circumferential extent.

Another known type of contact terminal hand tool provides a pair of thin metal blades insertable from the rear into the connector bore for engaging and releasing the contact retention fingers. However, such devices have been found deficient in one or more respects. For example, the thin metal blades are awkward to manipulate and difficult to align with the retention fingers which provide the locking means within the connector bore. Also, the open edges of these blades, like the permanent slot in the plastic tubular tool disclosed in U.S. Pat. No. 3,110,093, tend to damage the connector insulation and lead wire insulation. Also, because this type of tool does not provide a closed tubular or annular working end, it is usable for removal but is not adapted for insertion of the contact terminal into place within the connector terminal bore.

SUMMARY

Accordingly, it is an object of the present embodiment of the invention to provide a contact extraction
and/or insertion hand tool which overcomes the above noted problems. A tool directed to this objective is provided by a pair of elongated hollow, half-cylindrical working members. These working members are hingedly joined for movement between a closed mated position in which the members define an open-ended hollow cylindrical working portion for cooperating with the connector bore and contact terminal, and an open position in which the members are spread apart for receiving a wire lead connected to the contact terminal. Manually operable means are provided for selectively moving the working members between their open and closed positions. A tool is thus provided in which the working portion thereof presents a tubular or hollow cylindrical portion which fully closes about the contact terminal and its lead wire. This closed end portion has a circumferentially uniform outside diameter without discontinuities caused for example by a permanent slot or the like. Thus there are no sharp cutting edges which might damage the insulation material of a connector body. Also, dependable release of the retention fingers within the connector terminal bore is achieved because of the uninterrupted circumferential working end.

DRAWINGS:

FIG. 1 is a perspective view of the contact terminal hand tool constructed according to one embodiment of the invention;
FIG. 2 is a fragmentary top plan view of the tool of FIG. 1 shown in its closed condition;
FIG. 3 is a cross-sectional view of the tool taken generally along the plane III—III of FIG. 2;
FIG. 4 is a fragmentary top plan view of the tool, similar to FIG. 2, although here showing the tool in its opened condition during which the split half tubular or hollow cylindrical members are disposed to receive the contact terminal lead wire;
FIG. 5 is a cross-sectional view of the tool taken generally along the plane V—V of FIG. 4;
FIG. 6 is an elevation view, partly in section, showing the split hollow cylindrical working portion of the tool of FIG. 1 immediately prior to insertion into a connector terminal bore for release of the contact terminal locked therein;
FIG. 7 is a view similar to FIG. 6 although here showing the split hollow cylindrical working portion of the tool grasping an annular body portion of the contact terminal during removal thereof from the connector bore following the unlocking of the retention fingers therein; and
FIG. 8 is a cross-sectional view taken generally along the plane VIII—VIII of FIG. 6 illustrating an axial end of the working portion of the tool in its closed condition.

DESCRIPTION

Referring now to FIG. 1, there is shown an exemplary embodiment of an electrical contact terminal hand tool 10 for facilitating removal and/or insertion of an electrical terminal in the bore of an electrical connector. As seen best in FIGS. 6 and 7, a terminal, indicated generally at 12, and in this instance constituting a pin or male terminal, is disposed within a bore indicated generally at 13 in the body 14 of a connector. The connector body 14 comprises one of two mating connectors each of which carries a plurality of contact terminals, one of which carries the male contact terminals 12, while the other carries the complementary female terminals (not shown). It will be understood that the tool of the present invention is equally useful for inserting and removing either female-socket terminals or male-pin terminals, such as pin 12.

The connector body 14, as in the exemplary illustration of FIGS. 6 and 7, may include several insulation layers, a plurality of which are indicated at 15 and which comprise the main and forward portion of the connector and a rearward layer or portion 16 which may be of a yieldable, deformable, rubber-like insulation material, such as neoprene or the like. It will be seen that the bore 13 has its widest portion in the main body 15 and extends rearwardly into the resilient layer 16. The bore 13 is connected to the rear face of the connector body by an opening 17 of a lesser diameter than the diameter of bore 13 and which may be substantially equal to the diameter of the lead wire to which the terminal is attached. The resilient layer 16 may be compressed against the main body 15 of the connector by a rear pressure plate 18 which is urged against the layer 16 forcing it to compress against the main body 15 by suitable fastening means (not shown).

The force exerted by the pressure plate 18 when fully drawn against the insulation layer 16 causes a portion of the insulation layer surrounding the opening 17 to deform and to circumferentially seal as shown at 19 around the wire lead 26, more specifically, around the insulation 21 of the bare wire 22 which together comprise the wire lead.

As seen best in FIGS. 6 and 7, the contact terminal 12 includes a pin portion 12a, a pin shank 12b, an enlarged diameter collar 12c, and a stem 12d in which the bare wire 22 is inserted and is either crimped or soldered or similarly secured to the terminal.

Extending forward from the bore 13 within the connector body is a reduced diameter portion indicated generally at 23 which provides a stop for limiting forward movement of the terminal within the bore 13. Disposed within the larger diameter portion of the bore 13 is releasable locking means which, in the exemplary embodiment, comprises a plurality of resilient fingers 24 which project radially inwardly from the walls of the bore 13 and which are sloped forwardly. When the fingers 24 are not spread, the effective diameter of the ends of the fingers is less than the outer diameter of the collar 12c of the terminal. It will therefore be seen that when the terminal is inserted into the connector body, the collar 12c will spread the ends of the fingers 24 radially away from the terminal until the collar passes the ends of the fingers which will then snap radially inwardly and rest behind the enlarged diameter collar preventing or limiting rearward movement of the terminal within the bore.

Having thus described the environment in which the terminal is positioned during use of the connector, it may now be pointed out how the tool 10 is used to insert and/or remove a terminal from the bore within the connector body. The tool 10, with reference to FIG. 1, generally comprises a working end portion indicated at 30, hinge means indicated at 30, and means 70 for manually operating or moving the hinge means 50 which in turn operates the working end portion 30. The working end portion 30 comprises a pair of elongated, hollow, half-cylindrical working members 31, 32. The entire tool, or at least the working portion 30, is prefer-
ably formed of hardened steel, preferably slightly resilient, and provided with a smooth finish so as to be easily slideable with respect to rubber or similar insulation material as in the body of an electrical connector. The working members 31, 32 when in the closed position, as shown in FIG. 8, define a working portion that comprises a tubular circumferentially continuous open-ended cylinder. The tip end 33 as seen best in FIG. 6, is rounded or smoothed so that there is no sharp edge which could possibly cut or gouge the insulation material when the working end portion of the tool is inserted through the opening 17 in the insulation material of layer 16 of the connector. At the opposite end of the working portion which is fixedly mounted to the hinge means, the tubular portion is open as at 34 and it will be noted from FIG. 1 that the axis of the tubular working portion defined by the working members 31, 32 is in a plane above the axis of the hinge means 50.

The hinge means 50, in the exemplary embodiment, comprises an elongated cylindrical sleeve 51, open at both ends and, as seen best in FIG. 2, attached at the forward end 52 to the working member 31. Within the sleeve 51 the hinge further includes a shaft 55 including a shaft extension member 56 that is mounted on the forward end of the shaft 55 within a notch 57 formed in the sleeve 51. As will be immediately apparent from FIGS. 4 and 5, the axis 58 of the hinge means is radially offset from the axis 35 of the tubular working portion 30. It will be apparent that when the hinge members 51, 55 are rotated relative to one another, the half-cylinder working members 31, 32, being on a radially displaced axis, will both rotate and translate so that when in the open position the members 31, 32 define a gap 36 which is nearly equal to the inner diameter of the tubular working portion which in turn is generally equal to the diameter of the insulation 21 of lead wire 20. The size of the gap 36 makes it extremely easy and convenient for the user of the tool to place the lead wire in position where it is held by the working end portion 30. It will also be appreciated that when the lead wire is in position, as seen best in FIGS. 6 and 7, the lead wire is displaced above the hinge means 50 and is therefore in a convenient position for manipulation by the user of the tool.

The means 70 for operating the tool comprises, in the exemplary embodiment, a pair of handles or wing grips 71, 72 which extend radially in one general direction, as seen in FIGS. 4 and 5, which is diametrically opposite to the radial direction in which the working members 31, 32 are disposed relative to the hinge members. Each of the handles 71, 72 may be integral with or otherwise fixedly mounted to one of the hinge means members, for example, grip 72 may be fixedly mounted to the sleeve 51 and grip 71 may be mounted to the shaft 55. For easy manipulation, it is desired that the working members 31, 32 be generally disposed in the closed condition or position and to effect such closure, there may be provided bias or spring means indicated generally at 73 in the form of a coil spring which separates the handles 71, 72 which in turn closes the working members 31, 32 to form the tubular working portion. Relative rotation of the hinge members 51, 55 is limited by the notch 57 in the sleeve 51 which engages the shaft extension 56 when the members 31, 32 are in the closed position. If desired, a stop limit in the other direction of rotation of the hinge members may be provided by stop means 74 comprising mating shoul-

Having now fully described the tool, attention is directed to FIG. 6 where the terminal 12 is in place in the bore 13 of a connector body 14 and it is desired to remove such terminal from the connector body. The lead wire 20 of the terminal 12 by opening the working members 31, 32 to the position as shown in FIG. 5 may be positioned so that when closed they will surround the lead wire 20 as shown in FIG. 6. It will be noted that the bore extension or opening 17 in the connector body is provided with a tapering portion adjacent the rear surface of the connector body so as to spread the soft resilient material surrounding opening 17 and the force is continued until the forward end portion of the working end portion is received over the stem 12d of the connector.

In the exemplary embodiment shown, the stem 12d of the connector 12 has a larger diameter than the insulation 21 of the lead wire 20. This relative difference in diameters is conventional and the tool of the present invention may be particularly adapted for use in connection with terminal/lead wire combinations as shown. It will be noted that the outside diameter of the working members 31, 32 is limited by the outside diameter of the bore 13 and more particularly by the metal ferrule or ring which supports the fingers 24 and is of substantially equal diameter to the inside diameter of bore 13. In any event, it would be undesirable to further increase the outside diameter of the working portion 30 of the tool since it is preferable to keep such outside diameter as small as possible so as to facilitate entry of the forward end portion 39 of the tool through the bore extension 17 which is necessary to deform the surrounding resilient material 16. Having established a desirable maximum external diameter, it should further be appreciated that the working members 31, 32 are greatly elongated relative to the diameter of the working portion. Accordingly, it is desired to keep the wall thickness of each of the working members 31, 32 as large as possible to provide the tool with adequate strength and rigidity such that it will not be easily deformed or broken during use such as if accidentally dropped or if it is maltreated by the user particularly where it is used for different purposes than that for which it was intended. Since it is desirable to maintain the wall thickness of the members 31, 32 as large as possible, the inside diameter of the working portion 30 will be limited by the external diameter of the insulation 21 on lead wire 20. However, it will be apparent that if the front end portion 39 of the tool has the same inside diameter as the remaining portion of the members 31, 32, the front end portion 39 will not completely close when the forward end is positioned over the larger diameter stem 12d of the terminal. If the remaining portions of the working members 31, 32 are then brought back into mating engaging relation, it will be appreciated that the end portion 39 will flare outwardly opening a slot or gap between the two members 31, 32 and making it considerably more difficult to insert a terminal into the connector body.

It has therefore been found desirable to provide an enlarged inside diameter portion 40 adjacent the front
end portion 39 of the working members 31, 32 so that
the front end portion of the tool will easily accommodating the enlarged diameter stem 12d of the terminal.
It has also been found desirable to provide the front end portion 39 of the tool with an outside diameter that
is substantially equal to the diameter of collar 12c of the terminal. It will be appreciated that with such relationship between the diameters of the tool and terminal, when the forward end portion 39 of the tool is slid over the stem 12d, the fingers 24 will be forced radially outwardly by the portion of the tool. As the terminal is withdrawn rearwardly, it will be apparent that the ends of the fingers 24 will be in sliding frictional engagement with the exterior surface of the front end portion 39 of the tool until the axial movement positions the collar beneath the fingers. In the transition of the fingers from bearing engagement with the outer end portion 39 of the tool and the collar 12c, it will be apparent that if the collar 12c is of a larger diameter than the working portion 30 of the tool, the fingers will not be sufficiently expanded and will impair if not prevent further withdrawal of the terminal from the bore. Thus, for purposes of withdrawing the terminal, it is desirable that the end portion 39 of the working portion 30 of the tool have an outside diameter at least equal to if not greater than the diameter of the collar 12c of the terminal. On the other hand, during insertion of a terminal, it is apparent that if the outer end portion 39 of the tool is greater than the diameter of the collar 12c, it will render movement of the terminal more difficult as it passes through the opening 17 in the resilient layer 16. It has thus been found that an exterior diameter for at least the forward or front end portion 39 of the working portion 30 of the tool which is substantially equal to the collar 12c of the terminal best facilitates manipulation and use of the tool. It will be appreciated that during insertion of a terminal into the connector body, the rounded tip 33 of the working portion 30 of the tool will bear against the rearward face of the collar 12c of the terminal and that when the terminal is fully positioned within the bore, the pin 12a may be held by a suitable tool while the tool is withdrawn through the rearward portion of the connector body.

From the preceding description, it will be seen that the hand tool of the present invention is particularly adapted for the easy and rapid removal and/or insertion of electrical contact terminals into a bore of a connector body where the bore includes releasable locking means such as radially inwardly directed spring arms for engagement with an enlarged diameter portion of a terminal. The tool is designed for easy use with one hand and the working members 31, 32 may be moved from the closed to the open position by a simple squeezing movement between the thumb and one or more of the fingers of the operator whereupon the lead wire of the terminal may be quickly positioned within the tubular structure forming the working portion of the tool without any danger of scarring, gouging, cutting, or otherwise damaging the wire insulation 21 as if the tool had to be forced through a narrow slot in a tube as in some prior art devices. Working members 31, 32 are maintained in the closed position during use through the provision of the spring means 73 further facilitating manipulation of the tool by the operator. The smooth, continuous exterior surface, particularly of the forward end portion 39 of the tool, together with the rounded tip 33 renders movement of the tool and the terminal through the resilient insulation layer 16 easy without any danger of gouging or cutting the insulation material surrounding the bore extension 17 which must tightly seal against the insulation 21 of the wire lead during use of the connector in order to prevent exposure of the terminals of the connector to a hostile environment. While many of the advantages of the tool have been brought forth in the above description of the structure and use of the device of the present invention, its continued use in the field will undoubtedly suggest further advantages over the prior art devices. Moreover, it will be apparent that various modifications and changes to the specific exemplary embodiment described may be made by those having ordinary skill in the art without departing from the scope of the invention. It is thus intended that the foregoing descriptive material and accompanying drawings shall be considered as illustrative and not limiting the scope of the invention.

I claim:

1. An electrical contact terminal hand tool for removing and inserting the terminal in a bore within an electrical connector body without damage to the connector body, the bore having a front end defining a stop for limiting forward movement of the terminal and releasable locking means within the bore for limiting rearward movement of the terminal, the body having a bore extension through an insulation layer between the rearward end of the bore and the rear face of the connector body, said tool comprising:

a pair of elongated hollow half-cylinder working members movable from a closed position defining an open ended hollow cylindrical working portion to an open position for receiving the terminal and a wire attached thereto;
hinge means comprising an elongated cylindrical sleeve and a shaft coaxially disposed within said sleeve, said hinge having a pivotal axis radially spaced from the axis of said cylindrical working portion, one of said half-cylinder working members fixedly mounted adjacent one end of said sleeve and the other of said working members fixedly mounted adjacent the end of the coaxial shaft; and
means for manually operating said hinge means so as to move said half-cylinder working members between closed and open positions.

2. The hand tool of claim 1 additionally including means for biasing said hinge means so that said half-cylindrical working members are in a closed position.

3. The hand tool of claim 2 wherein the forward edges of the tip of said half-cylindrical working members are rounded to prevent cutting or gouging of the insulation material when said working portion is passed through the connector body bore extension into the bore.

4. The hand tool of claim 3 for use in connection with a terminal having a collar intermediate its ends and a stem portion at the rearward end thereof from which the lead wire extends, the stem having a diameter greater than the diameter of the wire and the collar having a diameter greater than the diameter of the stem, said tool working members, when closed, having an inside diameter greater than the diameter of the wire lead and less than the diameter of the terminal collar so that the tip of the working members abuts against
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the collar when inserting a terminal into the connector.

5. The tool of claim 4 wherein the outside diameter of said half-cylinder working members, when closed, is less than the outside diameter of the terminal collar to facilitate removal of a terminal.

6. The tool of claim 5 wherein the outside diameter of said half-cylindrical working members, when closed, is substantially equal to the outside diameter of the terminal collar.

7. The tool of claim 1 wherein said means for manually operating said hinge means comprises a pair of radially extending handles connected to one of said hinge members for relative rotation of said hinge members to open and close said half-cylindrical working members.

8. The tool of claim 7 wherein said handles radially extend from said hinge means in one general direction and the axis of the hollow cylindrical working portion is radially spaced from the axis of said hinge means in a direction diametrically opposite to the direction at which said handles extend whereby when the tool is grasped in one hand by the handles with the hinge means above the handles a wire lead passing through the half cylinder members will be supported above the tool and the hand so as to facilitate manipulation of the tool.

9. An electrical contact hand tool for facilitating removal and/or insertion of an electrical contact terminal releasably lockable within a bore of an electrical connector body, comprising:

a pair of hollow half-cylindrical working members;
an elongated sleeve hinge member and an elongated shaft hinge member rotatable within said sleeve hinge member;
a pair of manually engageable handles mounted on said sleeve and shaft adjacent one of the ends thereof for selective relative rotation thereof; said working members mounted adjacent the opposite end of said shaft and sleeve for movement therewith between a closed position in which said half-cylindrical working members define an open ended hollow cylindrical working portion for insertion into the connector body bore and an open position in which said half-cylindrical working members are spread apart for receiving a lead wire attached to the terminal; and means continuously urging said half-cylindrical members toward said closed position.

10. The hand tool of claim 9 wherein the center line of said hollow cylindrical working portion defined by said working members when in a closed position is radially offset from the axis of said shaft and sleeve whereby the lead wire can extend through said hollow cylindrical working portion when the terminal is held at the free end of said working portion.

11. The hand tool of claim 10 wherein said hollow cylindrical working portion has a closed, continuous, smooth outer surface and a rounded front tip to permit the working portion to be easily moved into and out of the connector body.

12. A hand tool for facilitating removal and/or insertion of an electrical contact terminal which may be mounted within a bore of an electrical connector body and which comprises:
a pair of longitudinally extending hollow cylindrical working members;
hinge means comprising two hinge members on which are fixedly mounted said working members for relative movement of said working members between a closed position in which said working members define an open ended hollow cylindrical working portion in the forward end of which a contact terminal may be held for insertion into or removal from the bore of the connector, and an open position in which said working members are spread transversely apart for receiving a wire lead connected to the contact terminal; and manually operable means for selectively moving said working members between said closed and open positions.

13. The hand tool of claim 12 wherein the center line of said hollow cylindrical working portions defined by the closed working members is parallel to and radially offset relative to the thereof, axis of said hinge members so that rotation of said hinge members simultaneously rotates and translates the working members away from one another.

14. The hand tool of claim 13 additionally including biasing means in cooperative engagement with said manually operable means for normally biasing said working members into said closed position.

15. The hand tool of claim 13 wherein said hinge means comprises a pair of relatively rotatable elongated coaxial members on which are mounted said half-cylindrical working members at one end thereof.

16. The hand tool of claim 15 wherein each of said half-cylindrical members have an enlarged inside diameter portion adjacent the front ends thereof whereby the enlarged diameter portion accommodates a stem of the terminal when the terminal is held by said tool and the smaller diameter portion of the remainder of the half-cylindrical working members receives a smaller diameter lead wire connected to said terminal stem when the terminal is held by said tool during insertion or removal thereof.

17. An electrical contact terminal hand tool for removing and inserting the terminal in a bore within an electrical connector body without damage to the connector body, the bore having a front end defining a stop for limiting forward movement of the terminal and a releasable locking means within the bore for limiting rearward movement of the terminal, the body having a bore extension between the rearward end of the bore and the rear face of the connector body, the terminal having a pin, collar, and stem and attached to a lead wire, the terminal collar having a diameter greater than the diameter of the terminal stem and the terminal stem having a diameter greater than the diameter of the lead wire, the tool comprising:
a pair of elongated half-cylindrical working members having an outside diameter at least equal to the outside diameter of said terminal collar and an inside diameter at least slightly larger than the outside diameter of said lead wire; and means for moving said half-cylindrical working members between open and closed positions, said working members when in a closed position defining a hollow opened cylindrical working portion for holding the terminal at one end by clamping the end portions of said working members around the terminal stem with the lead wire disposed in the remaining portion of said hollow opened working portion.

18. The hand tool of claim 17 wherein said one end of said hollow open ended cylindrical working portion has an enlarged inside diameter substantially equal to the outside diameter of the terminal stem.