

May 1, 1956

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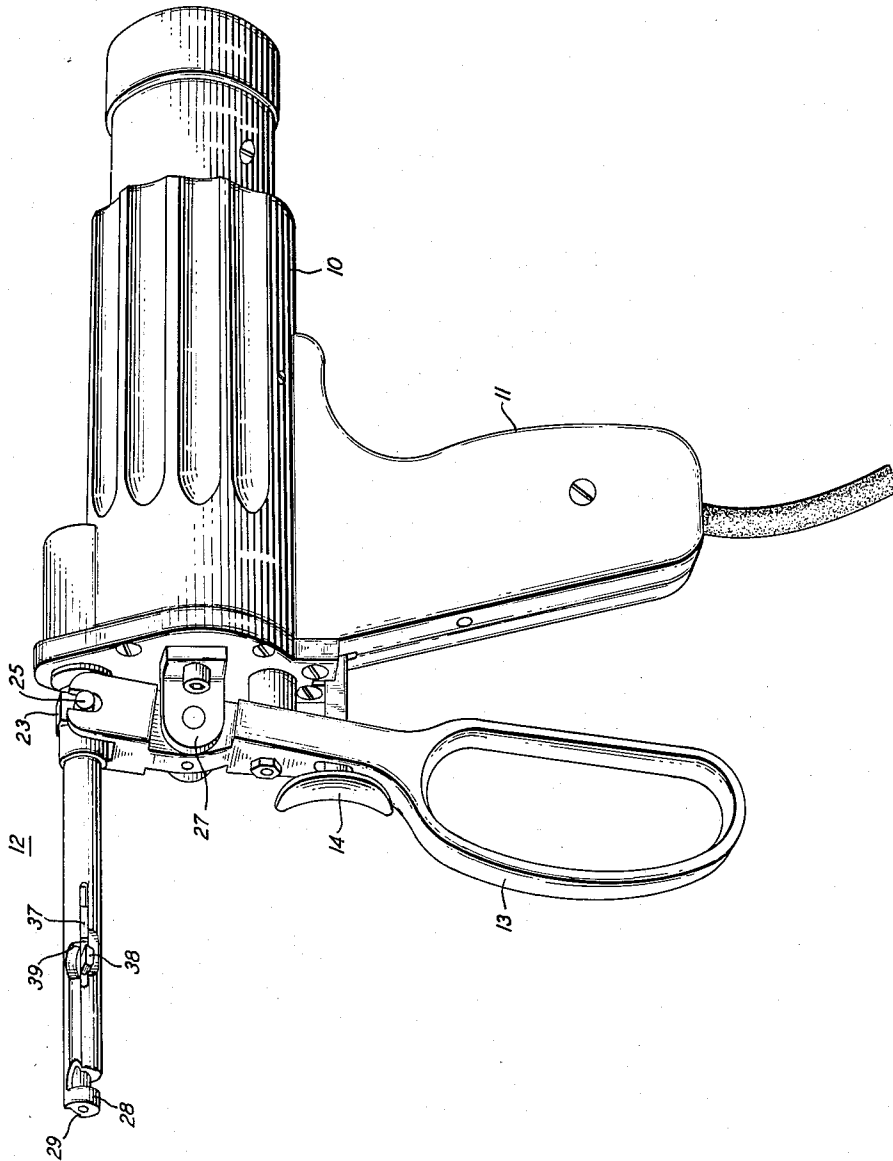
2,743,502

WIRE CONNECTING TOOL

Filed June 30, 1951

4 Sheets-Sheet 1

FIG. 1



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FIG. 8

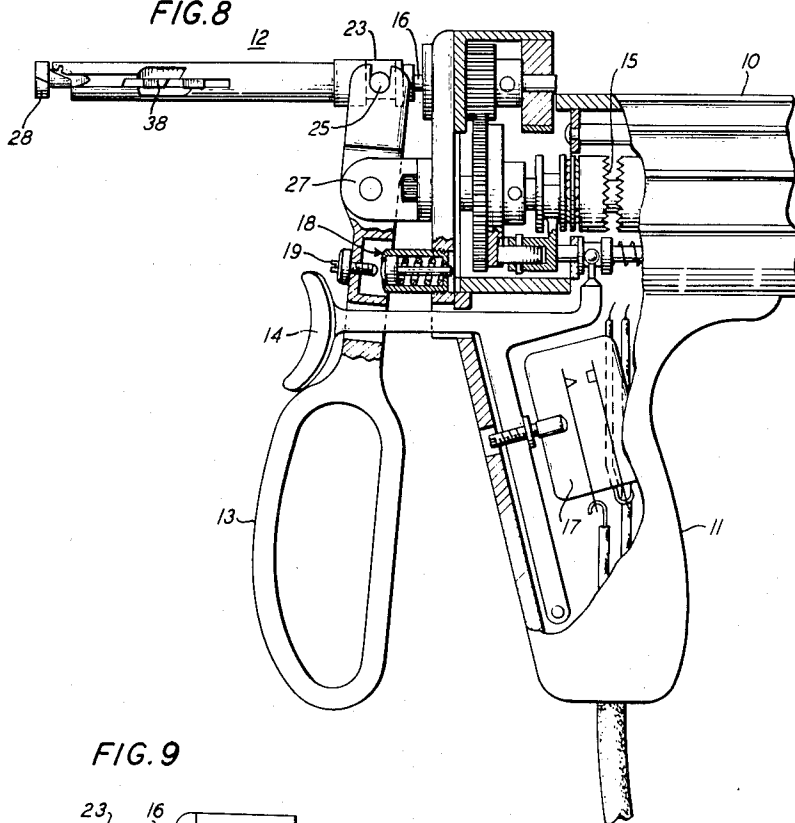
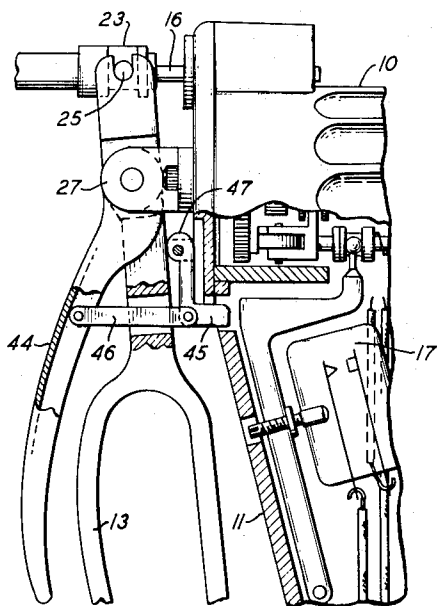


FIG. 9



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FIG. 10

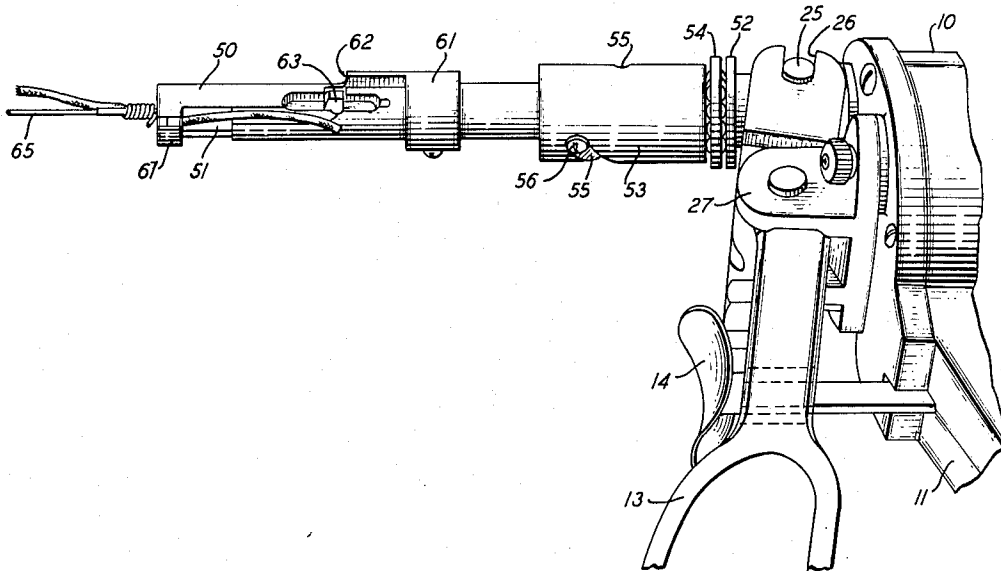


FIG. 11

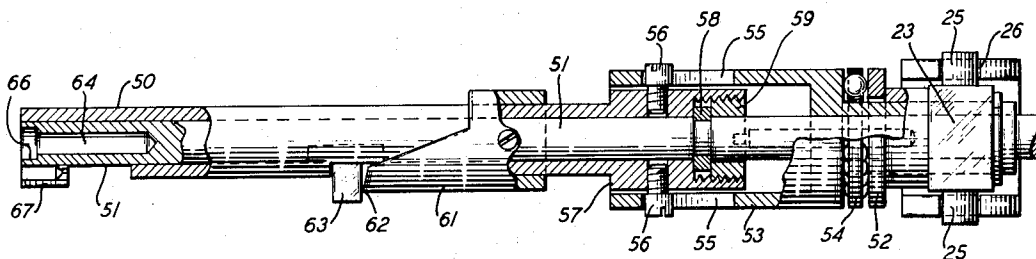


FIG. 12

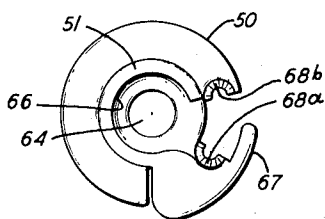


FIG. 13

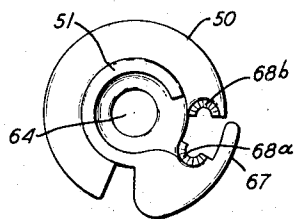
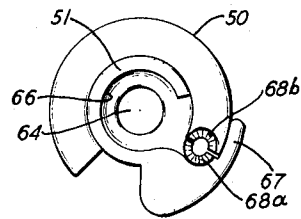


FIG. 14



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2,743,502

WIRE CONNECTING TOOL

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Application June 30, 1951, Serial No. 234,643

6 Claims. (Cl. 29—33)

This invention relates to tools for making wire connections and more particularly to hand tools for connecting wire to an electrical terminal, to another wire or to a like conductor.

Methods at present used for securing a wire to a terminal, for example on a terminal board, are laborious, time consuming, require a plurality of tools, and involve a multiplicity of operations. For example, in making one type of connection, the wire is drawn from a storage spool and cut to length with a wire cutter; insulation is then removed from a suitable portion with another tool; and the stripped end of the wire is wrapped upon and soldered to the selected terminal.

Devices such as those disclosed in the application of H. A. Miloche, Serial No. 752,895, filed June 6, 1947, now Patent 2,655,953, issued October 20, 1953, and the application of Hickman-Mallina-Reck, Serial No. 753,066, filed June 6, 1947, now Patent 2,585,010 issued February 12, 1952, have been proposed for wrapping a wire about a terminal in such a manner as to afford a solderless connection. Such devices, however, do not eliminate the separate and distinct steps of cutting the wire to length and stripping the insulation from the end, since these devices require that the noted operations be performed first.

A wire connecting tool which cuts, strips and wraps a connection is disclosed in the application of H. A. Miloche, Serial No. 234,641, filed June 30, 1951, now Patent 2,682,063, issued June 29, 1954. The tool of the present invention is of this type.

One object of this invention is the improvement of tools for making wire connections, particularly to terminals.

Another object of this invention is to enable the performance of the three steps of cutting, stripping and wrapping a wire into a connection in one substantially continuous operation.

Various embodiments of this invention include a wiring tool having a wiring head comprising a shaft and a sleeve member on said shaft and adapted for motion relative thereto. A cutting member is mounted on the shaft and cooperates with a portion of the sleeve member to cut a properly inserted wire as the sleeve is moved relative to the shaft. Other cooperating elements mounted respectively on the shaft and sleeve serve to mutilate the insulation of the wire so that it may be skinned or stripped. At the end of the wiring head and adjacent the mutilating means is a wrapping head or guide for directing the wire as it is wrapped. When an aperture at the end of the shaft is seated over a terminal, simultaneous rotation of the shaft and sleeve by means of a suitable driving mechanism pulls the cut wire through the insulation mutilating means, stripping the insulation therefrom, and winds or wraps it upon the terminal.

In one embodiment of this invention, the cutting of the wire and the mutilating of its insulation result from axial movement between the sleeve and shaft; and in an-

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other embodiment these operations are performed by relative rotation of these two members.

In a further embodiment of this invention, the mutilating means are located sufficiently far back from the wrapping head or guide to leave an unstripped portion of the wire in the wrapping head, which portion is first wrapped on the terminal followed by the stripped wire.

In accordance with one feature of this invention, a single tool includes means for cutting a wire to length, means for stripping the insulation from a desired portion of the wire, and means for wrapping the wire on a terminal or on another wire or conductor.

In accordance with another feature of this invention, the cutting, stripping and wrapping means are so mounted and correlated that the cutting and the mutilation of the insulation occur substantially simultaneously and are followed immediately, if desired, by simultaneous wrapping and stripping of the wire.

The above-noted and other objects and features of this invention will be understood more clearly and fully from the following detailed description of illustrative embodiments thereof taken in connection with the accompanying drawing, in which:

Fig. 1 is a perspective view of a wiring tool illustrative of one embodiment of this invention;

Fig. 2 is an exploded view of operating means, and of the cutting, stripping and wrapping elements which comprise the wiring head of the tool shown in Fig. 1;

Fig. 3 is a perspective view of the wiring head shown in Fig. 2 in an open position, ready to receive a wire;

Fig. 4 is a perspective view of the wiring head of Fig. 2 with a wire positioned therein;

Fig. 5 is a perspective view showing the wiring head seated on a terminal and actuated so that the wire is cut to length and the insulation mutilated.

Fig. 6 is a perspective view of the wiring head showing the wire with the insulation stripped therefrom, wrapped about a terminal;

Fig. 7 is a perspective view similar to Fig. 6 but with a different wrapping head that provides for wrapping a portion of insulated wire on a terminal;

Fig. 8 is an elevational view of the device shown in Fig. 1 with parts broken away to show internal mechanisms;

Fig. 9 is an elevational view similar to Fig. 8 but showing another operating means;

Fig. 10 is a perspective view of a tool similar in many respects to that of Fig. 1 but having a different wiring head; parts of the operating mechanism being broken away;

Fig. 11 is an elevational view of the wiring head of the tool of Fig. 10 with parts broken away to show internal details; and

Figs. 12, 13 and 14 are end views of the operating head of Figs. 10 and 11, respectively in open, intermediate, and closed or operating positions.

Referring to Figs. 1 and 8 of the drawings, the wiring tool illustrated comprises a housing 10 with a handle 11 and having mounted thereon a wiring head 12, an operating lever or handle 13, and a motive means controlling trigger or button 14. Within the housing is a motor, not shown, a clutch 15 with suitable clutch operating means, gearing for making connection to a shaft 16 and indexing means for stopping the shaft at a desired home position. A similar motor, clutch, gearing and indexing assembly in disclosed and fully described in the application of F. Reck, Serial No. 15,834, filed March 19, 1948, now Patent 2,649,121, issued August 18, 1953. Within the handle 11 is a switch 17 which is operated in an obvious manner from the motive control means or trigger 14. The spring and plunger assembly 18 mounted on

the housing 10, cooperates with the adjustable screw 19 on the lever 13 in a manner and for a purpose to be later described.

Referring also to Fig. 2 along with Figs. 1 and 8, the shaft 16 has a sliding fit within a sleeve 20. The sleeve 20 is provided with an enlarged portion 21 and a reduced portion 22. A cross-head 23 fits over the sleeve 20 against the shoulder of the enlarged portion 21 and is held in place by a washer 24 fitting over and secured to the reduced portion 22 of the sleeve 20. The pins 25 of cross-head 23 cooperate with notches 26 of lever 13 to impart longitudinal motion to the sleeve 20. The lever 13 is pivoted on the bracket 27 which is suitably secured to the housing 10.

The shaft 16 is provided with an enlarged portion 28 which is notched at 29 to cooperate with end portion 30 of the sleeve 20 to act as a wire wrapping head or guide. The head 28 is also provided with an axial orifice 31 for fitting over a terminal, or a wire, or other conductor on which the wrapped connection is to be made. The face 32 of the notch 29 in the head 28 cooperates with the beveled portion 33 of sleeve 20 to form a wire crushing or mutilating means. The mating faces of 32 and 33 may be longitudinally grooved. A key element 34 is secured in the slot 35 of shaft 16 through the slot 36 of the sleeve 20 after the shaft and sleeve are assembled. The key 34 may be held in the slot 35 by means of wedges, a force fit or other suitable means. A lug 37 on the key 34 cooperates with the slot 36 on the sleeve 20 to prevent relative rotation of the shaft 16 and the sleeve 20. A shearing member 38 on the key 34 cooperates with a shoulder 39 on the sleeve 20 to provide a wire cutter.

With the lever 13 in the position shown in Figs. 1 and 8, the wiring head 12 is in the condition shown in Figs. 3 and 4. Fig. 3 shows the head ready to receive a wire and Fig. 4 shows the head with a wire 40 inserted therein ready for cutting and mutilation of the insulation. When the lever 13 is pulled back toward the handle 11, the sleeve 20 slides longitudinally on the shaft 16 to shear the wire between the member 38 and the shoulder 39, and at the same time to crush the insulation between the face 32 of the notch 29 and the beveled portion 33 of the sleeve 20. This condition is shown in Fig. 5 wherein the insertion of a terminal 41 into the tool is also shown. Inward pressure on the button 14 operates to mesh the clutch 15 and close the switch 17 to operate the motor to drive the shaft 16. Simultaneous rotation of the shaft 16 and sleeve 20 wraps the stripped portion of the wire 40 on the terminal 41 stripping it out of the insulation 42 which is retained in the crushing or mutilating means. Although only a short section of wire 40 is illustrated, it will be obvious that the length of this wire will in practice be sufficient to reach to another terminal, either relatively close to terminal 41 or at a distance via wire guides, ducts, etc. If an initial connection is being made, the wire 40 may come from a storage spool. The stripping 42 will drop free when the tool is prepared for the next wiring operation.

Good practice dictates that the lever 13 be moved slightly away from the handle 11 before button 14 is pressed in order that there will not be too great pressure on the crushing jaws, which may result in breaking of the wire during the stripping operation. The spring and plunger assembly 18 against which the lever 13 is operated aids the operator in attaining a slight "easing-off" which is just sufficient for the purpose. By adjusting the screw 19 in its mounting on the lever 13, so that there is a gap between the point of 19 and the plunger head of assembly 18, when the lever 13 is in a fully outward position, the biasing effect of 18 may be made just sufficient to provide the required "easing-off" of lever 13. Thus the crushing jaws are slightly relaxed, retaining their grip on the insulation, but relieving the pressure on the wire so that it may be freely pulled out of the insulation without breaking the wire.

The "easing-off" operation may also be accomplished, if desired, by using a mechanism such as shown in Fig. 9. In this embodiment, a lever 44 is pivoted with the lever 13 on the bracket 27 and operates a secondary lever 45 pivoted on the housing, by way of a link 46. The secondary lever 45 is provided with a cam surface 47 which cooperates with a surface of the lever 13 to move this lever the slight necessary distance away from the handle 11 to attain the "easing-off," when lever 44 is pressed to operate the motor and clutch.

If it is desired to include a portion of insulated wire in the wrapping on a terminal such as 41, this may be done by means disclosed in Fig. 7. Here the wrapping head or guide 43 which corresponds to the wrapping head 28 of Figs. 1 to 6, inclusive, is made deeper, that is greater in longitudinal length, than 28, so that the portion of insulation mutilated is further from the point of wrapping. Thus a small portion of insulation included in the head 48 is first wrapped on the terminal followed by the uninsulated wire.

In the operation of a device of this type the wiring tool is most conveniently held in the right hand and the wire manipulated with the left hand. In a typical operation the wire is inserted in the tool and the operating lever depressed sufficiently to retain the wire therein but not enough to either cut the wire or to crush the insulation. The axial orifice on the end of the shaft is then applied to a terminal, and the wire is properly dressed with the left hand. The operating lever is then fully depressed to cut the wire to length and to mutilate the insulation. Now operation of the motor control button or trigger rotates the shaft and sleeve simultaneously to wrap the wire on the terminal and to strip the insulation therefrom as it is drawn through the stripping means. As has been previously noted if the tool is equipped with the crushing type of insulation mutilating means a slight easing of the pressure on the operating lever is desirable before wrapping in order that the wire will not be broken.

In Figs. 10 to 14, inclusive, are shown several views of a modified wiring tool in which the sleeve 50 and the shaft 51 of the wiring head operate by relative rotation rather than by relative longitudinal movement. The parts which are the same as those of the device of Figs. 1 to 6, inclusive are designated by the same reference characters.

The cross-head 23, which is moved axially by the lever 13 as in the other modifications, imparts axial movement to the camming member 53 through the ring 52 and the bearing 54. The member 53 is splined to shaft 51 limiting it to axial motion relative thereto. Spiral slots 55 in the member 53 bear on screws 56 which are threaded into a head 57 on the sleeve 50. The sleeve 50 is prevented from axial movement with respect to the shaft 51 by means of a spring washer 58 which is retained in a peripheral groove in shaft 57 by a retaining member 59 threaded into the head 57. Thus axial movement of the camming member 53 imparts rotational movement to the sleeve 50. Since the camming member 53 is prevented from rotational movement with respect to the shaft 51, the sleeve 50 is also rotated with respect to the shaft 51. A cutter sleeve 61, secured to the main sleeve 50 by a screw or other suitable means, is provided with a cutting edge 62 which cooperates with a mating edge of a cutter member 63 secured to the shaft 51. The cutter member 63 may be secured in a groove in the shaft 51 by any suitable means such as by wedges or a force fit.

The outer end of shaft 51 is provided with an orifice 64 for receiving a wiring terminal such as 65. The outer end of the orifice 64 is counterbored at 66 for a purpose to be described. The outer ends of sleeve 50 and of shaft 51 are provided with cooperative means for guiding the wire during wrapping and for cutting or mutilating and stripping the insulation. As may be seen in Figs. 12, 13 and 14 the end of the shaft 51 is slotted adjacent the counterbore 66 and is provided with a hook or projec-

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tion 67, and with a half 68a of a cutting and stripping die 68. The sleeve 50 which is notched to cooperate with the projection 67 on shaft 51 carries the other half 68b of the cutting and stripping die 68. Thus a wire being drawn from the die 68 passes into the counterbored portion 66 of shaft 51 which aids in guiding the wire during wrapping around a terminal inserted in the axial orifice 64.

In the operation of this device, a wire is placed in the wiring head between the mating portions 68a and 68b of the die 68 and the cutters 62, 63, and the handle 13 operated for a sufficient distance to bring the projection 67 to the position shown in Fig. 13. The tool may then be moved around to a proper position and applied to a terminal such as 65, allowing the wire to slide freely in the tool. The lever 13 is then operated to a fully depressed position which closes the die halves 68a and 68b around the wire, their position being that shown in Fig. 14. This die is so proportioned that the cutting means 68 will cut through the insulation without damaging the wire. The button or trigger 14 is then pressed to operate the clutch and the motor, turning the sleeve 50 and the shaft 51 simultaneously to wrap the wire on the terminal 65, stripping it as it is drawn out of the head. As the end of the wrap is approached the final portion of the wire is drawn into the counterbore 66 which is dimensioned so that it aids in closely wrapping the wire end on the terminal. Since this cutting type of wire mutilating means does not put any appreciable pressure on the wire itself, it is not necessary to "ease off" on the handle 13 during the wrapping and stripping operations.

Although this type of wiring tool is particularly adapted for cutting and stripping a wire as well as wrapping it on a terminal, it may obviously be used with a wire which is already stripped and cut to length, since the cutting and insulation mutilating means will in such a case be inoperative. Moreover, although this tool is particularly adapted for wrapping a wire on a suitable terminal in such a manner that no soldering is required, it may also be used for wrapping wires which are to be soldered.

Although the foregoing description has dealt primarily with the wrapping of a wire on a terminal, this type of tool may also be used for connecting two wires together. Ordinarily in this case one wire will be somewhat larger than the other with the larger wire serving as the "terminal" and the smaller wire as the wrapped element.

What is claimed is:

1. A wiring tool for cutting and stripping an insulated wire, and for wrapping a portion thereof on a terminal, that comprises a shaft, and a sleeve mounted thereon for relative movement with respect thereto, said shaft having on one end a notched projection, one notch face thereof comprising part of a wrapping head, a portion of said face comprising the shaft part of an insulation mutilating means, and an edged projection spaced from said end comprising part of a wire cutting means; and the sleeve having on the corresponding end a shoulder opposite said notch face and defining therewith a wrapping head, a portion of the sleeve adjacent the shoulder, opposite said shaft part of the mutilating means and defining therewith insulating, mutilating and stripping means, and a shouldered slot spaced from said sleeve end, opposite the edged projection and defining therewith the wire cutting means; means for imparting relative movement to said shaft and sleeve to allow the insertion of an insulated wire in said device and also for imparting different relative movement to said shaft and sleeve for simultaneously cutting the wire, mutilating the insulation preparatory to stripping, and securing the wire in the winding head, a motor, and means for connecting said motor to rotate said shaft and sleeve for simultaneously stripping the wire and wrapping a portion thereof on a terminal.

2. A wiring tool for cutting and stripping a wire, and

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for wrapping a portion thereof on a terminal, that comprises a shaft, and a sleeve mounted thereon for longitudinal movement with respect thereto, said shaft having on one end a notched projection, one notch face thereof comprising part of a wrapping head, a portion of said face comprising the shaft part of an insulation mutilating means, and an edged projection spaced from said end comprising part of a wire cutting means; and the sleeve having on the corresponding end a shoulder opposite said notch face and defining therewith a wrapping head, a portion of the sleeve adjacent the shoulder, opposite said shaft part of the mutilating means and defining therewith insulating, mutilating and stripping means, and a shouldered slot spaced from said sleeve end, opposite the edged projection and defining therewith the wire cutting means; means for imparting relative longitudinal movement to said shaft and sleeve to allow the insertion of an insulated wire in said tool and also for imparting different relative longitudinal movement to said shaft and sleeve for simultaneously cutting the wire, mutilating the insulation preparatory to stripping, and securing the wire in the winding head, a motor, and means for connecting said motor to rotate said shaft and sleeve for simultaneously stripping the wire and wrapping a portion thereof on a terminal.

3. A wiring tool for cutting and stripping a wire, and for wrapping a portion thereof on a terminal, that comprises a shaft, and a sleeve mounted thereon for rotational movement with respect thereto, said shaft having at one end a hooked, lateral projection comprising part of a wrapping head, a first portion of an insulation cutting die adjacent said lateral projection comprising part of a stripping means, and an edged projection spaced from said end comprising part of a cutting means; and the sleeve having on the corresponding end a shoulder opposite said lateral projection and defining therewith the wrapping head, a second portion of an insulation cutting die adjacent said shoulder, opposite said first portion of an insulation cutting die, and defining therewith the stripping means, and a shouldered slot spaced from said sleeve end, opposite the edged projection, and defining therewith the cutting means; means for imparting relative rotative movement to said shaft and sleeve to allow the insertion of an insulated wire in said device and also for imparting different relative rotative movement to said shaft and sleeve for simultaneously cutting the wire, mutilating the insulation preparatory to stripping, and securing the wire in the winding head, a motor, and means for connecting said motor to rotate said shaft and sleeve for simultaneously stripping the wire and wrapping a portion thereof on a terminal.

4. A wiring tool which cuts, strips, and wraps a stripped portion of an insulated wire on a terminal that comprises a shaft and a sleeve mounted for relative movement with respect thereto, a blade mounted on said shaft and protruding through an aperture in the sleeve and cooperating with a sharp edge of the aperture to serve as a wire cutter, crushing jaws for mutilating the insulation of a wire comprising mating elements mounted respectively adjacent one end of said shaft and of said sleeve, an axial aperture in the end of the shaft for fitting over a terminal, and means for rotating said shaft and sleeve to pull a cut wire through the crushing jaws, to strip it and to wrap it upon a terminal.

5. A wiring tool for cutting and stripping an insulated wire and for wrapping a portion thereof on a terminal that comprises a housing, a shaft mounted on said housing and a sleeve mounted on said shaft for relative longitudinal movement with respect thereto, said shaft having on one end a notched projection, one notch face thereof comprising part of a wrapping head, a portion of said face comprising the shaft part of an insulation mutilating means, and an edged projection spaced from said end comprising part of a wire cutting means; and the sleeve

having on the corresponding end a shoulder opposite said notch face and defining therewith a wrapping head, a portion of the sleeve adjacent the shoulder, opposite said shaft part of the mutilating means and defining therewith insulating, mutilating and stripping means, and a shouldered slot spaced from said sleeve end, opposite the edged projection and defining therewith the wire cutting means; means for imparting relative longitudinal movement to said shaft and sleeve comprising a lever pivoted on said housing and means securing one end of said lever to said sleeve whereby the wire may be cut and a portion of the insulation simultaneously mutilated preparatory to stripping, biasing means on the housing for cooperation with said lever, a motor, means for activating said motor, and means for connecting said motor to rotate said shaft and sleeve for simultaneously stripping the wire and wrapping a portion thereof on a terminal, said activating means cooperating with said

biasing means for moving said lever sufficiently to relieve the pressure on said insulation crushing means during wrapping and stripping.

6. A device as claimed in claim 5 in which the biasing means comprises a camming element operated by said activating means.

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