United States Patent [19]

Epstein

[11] **3,733,627**

[45] **May 22, 1973**

[54] ELECTRICIAN'S COMBINATION TOOL

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[22] Filed: **May 20, 1971**

[21] Appl. No.: **145,345**

[52] **U.S. Cl.**.....**7/5.4,** 81/9.5 R, 30/90.1, 140/102.5

[51] **Int. Cl.**.....**H02g 1/12**

[58] **Field of Search**.....7/5.4, 3, 4, 5.1, 7/14.1, 5.6; 81/9.5 R; 30/90.1; 140/102.5, 104, 106, 121

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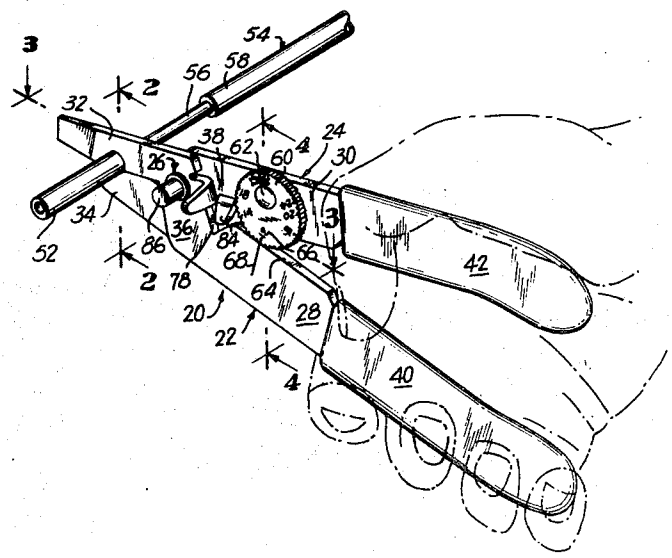
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Attorney—Armand E. Lackenbach and Elliot A. Lackenbach

[57] **ABSTRACT**

Combination tool of particular utility to electricians or other craftsmen, handymen, mechanics or the like, for performing any of a plurality of operations involved in terminating electrical wires including cutting of wires, stripping of insulation therefrom, crimping solderless terminals, forming screw connection loops and turning screws.

10 Claims, 11 Drawing Figures



PATENTED MAY 22 1973

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SHEET 1 OF 2

FIG. 1

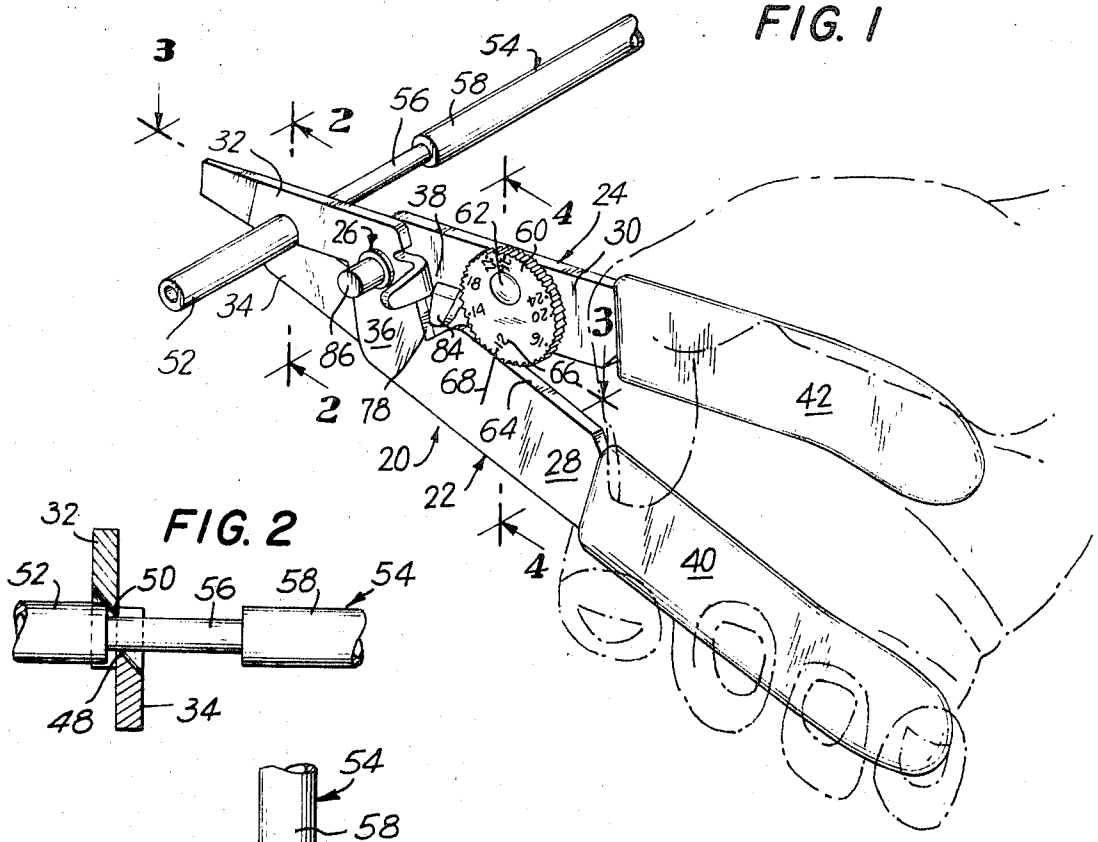


FIG. 2

FIG. 3

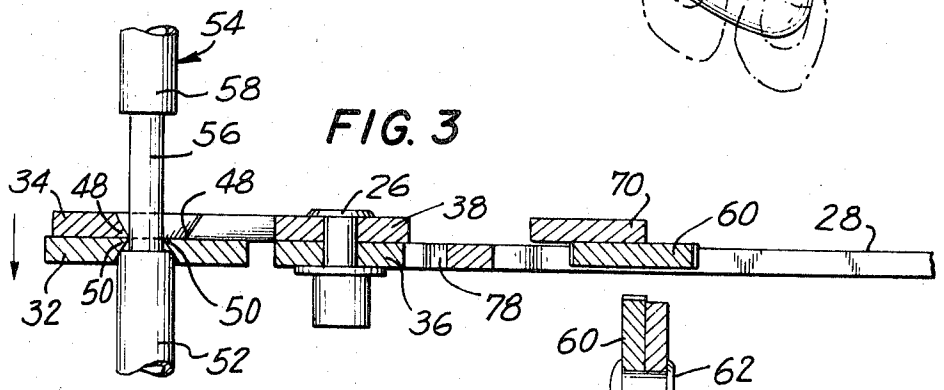


FIG. 4

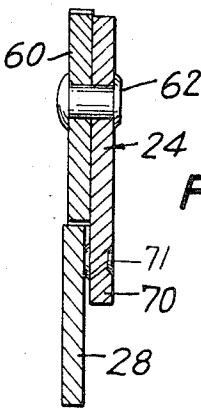
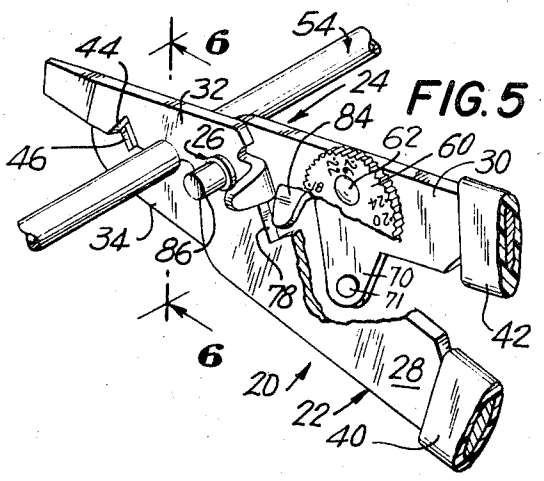


FIG. 5



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FIG. 6

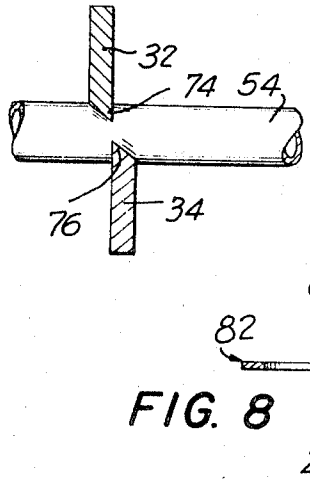


FIG. 8

FIG. 7

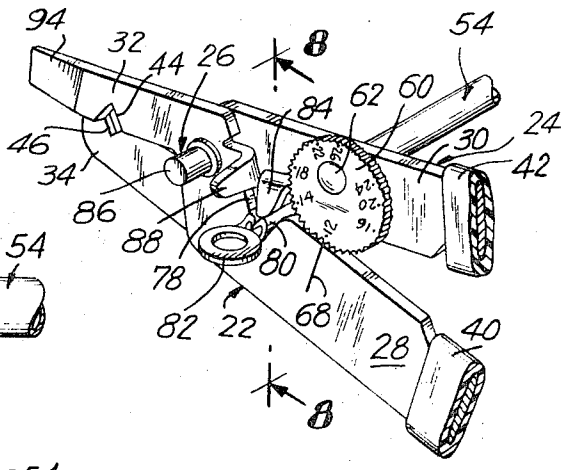


FIG. 9

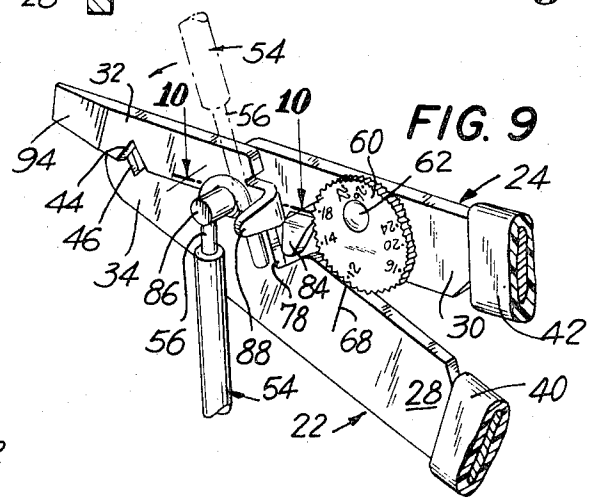


FIG. 11

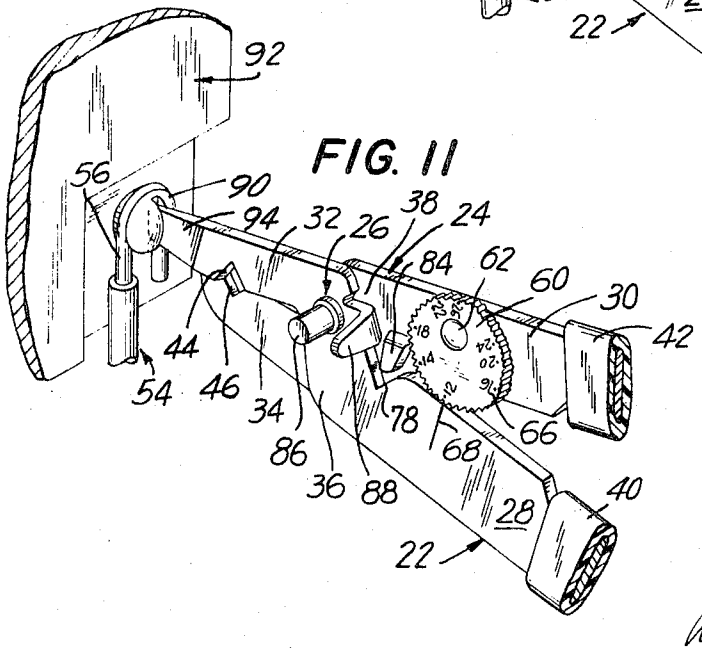
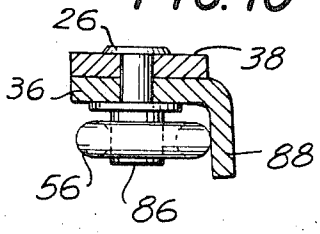


FIG. 10



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ELECTRICIAN'S COMBINATION TOOL

This invention relates generally to multiple purpose tools and, more particularly, to a multiple purpose tool of particular utility for terminating electrical wires.

It is a primary object of the present invention to provide a single multiple utility tool particularly for the use of electricians, handymen, mechanics, craftsmen and the like, capable of performing substantially any desired function relative to the termination of wiring.

Another primary object of the present invention, in addition to the foregoing object, is the provision of such a tool adapted to enable the user to prepare the wire for termination and to terminate it without requiring any other tools.

Another primary object of the present invention, in addition to each of the foregoing objects, is the provision of such tools adapted for terminating wires both by screw connection and solderless terminals.

Yet still another primary object of the present invention, in addition to each of the foregoing objects, is the provision of such a tool which is capable of cutting wire, stripping insulation therefrom, crimping solderless terminals thereon, forming screw connection loops and loosening or tightening screws.

Another and still further primary object of the present invention, in addition to each of the foregoing objects, is the provision of such tools wherein the wire stripping means and the crimping means are calibrated and may be set to properly strip or crimp any given size of wire.

Yet still another primary object of the present invention, in addition to each of the foregoing objects, is the provision of such a tool in a generally plier-like configuration having one jaw thereof extended to form a screwdriver blade.

Yet another and still further primary object of the present invention, in addition to each of the foregoing objects, is the provision of such a tool which is economic to manufacture and durable, efficient and convenient in use.

The invention resides in the combination, construction, arrangement and disposition of the various component parts and elements incorporated in an improved electrician's tool constructed in accordance with the principles of this invention. The present invention will be better understood and objects and important features other than those specifically enumerated above will become apparent when consideration is given to the following details and description, which when taken in conjunction with the annexed drawing describes, discloses, illustrates and shows a preferred embodiment or modification of the present invention and what is presently considered and believed to be the best mode of practicing the principles thereof. Other embodiments or modifications may be suggested to those having the benefit of the teachings herein, and such other embodiments or modifications are intended to be reserved especially as they fall within the scope and spirit of the subjoined claims.

IN THE DRAWING

FIG. 1 is a perspective illustration showing how the tool may be used for stripping insulation from electrical wire;

FIG. 2 is an elevational cross-sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional plan view taken along line 3—3 of FIG. 1;

FIG. 4 is an elevational cross-sectional view taken alone line 4—4 of FIG. 1;

FIG. 5 is a partial view similar to FIG. 1 illustrating how the tool may be utilized as a wire cutter;

FIG. 6 is an elevational cross-sectional view taken along line 6—6 of FIG. 5;

FIG. 7 is a partial perspective illustration similar to FIG. 5 illustrating how the tool may be used as a wire crimper or a terminal crimper;

FIG. 8 is an elevational cross-sectional view taken along line 8—8 of FIG. 7;

FIG. 9 is a perspective illustration similar to FIG. 7 showing how the tool may be used to form screw connection loops;

FIG. 10 is a cross-sectional plane view taken along line 10—10 of FIG. 9; and

FIG. 11 is a perspective illustration similar to FIG. 9 showing how the tool may be used as a screwdriver.

With reference now to the drawing, there is shown and illustrated a combination electrician's tool constructed in accordance with the principles of the present invention and designated generally by the reference character 20 which may comprise a pair of lever-like members. The tool 20 comprises a pair of lever members 22 and 24 which may be of generally flat configuration and crossed at an intermediate region. Securing means, such as a rivet 26 may be provided at the location of crossing to enable the two levers 22 and 24 to pivot relative one another so that the tool 20 presents a generally plier-like configuration.

Each of the levers 22 and 24 may comprise a handle portion 28 and 30, respectively; a jaw portion 32 and 34, respectively; and an intermediate portion 36 and 38, respectively. Each of the handle portions 28 and 30 may extend generally obliquely from the corresponding intermediate portion 36 and 38 and be offset therefrom in opposite directions. Similarly, the jaw portions 32 and 34 may extend generally obliquely from the respective intermediate portion 36 and 38 and be offset therefrom in opposite directions and opposite their respective handle portions. Each of the handle portions 28 and 30 may be provided with an insulating covering 40 and 42, respectively, enabling the tool 20 to be more safely utilized in connection with live wires and, additionally, providing cushioning for the user's hands. Such insulating coverings 40 and 42 may, for example, comprise a vinyl or other plastic of appropriate density and rigidity.

Accordingly, when the handle portions 28 and 30 are squeezed together, the jaw portions 32 and 34 will similarly be moved towards each other. Because of the difference in the length of the lever arms of the handles and jaws, a substantially increased force will be developed at the jaws. The angular orientation of the handles and jaws may be selected so that when the handles are fully closed, the jaws 32 and 34 partially overlap.

Each of the jaws 32 and 34 may be provided with opposed generally V-shaped stripping notches 44 and 46, respectively, on the adjacent inner edges of the jaws. Hence, as the handles 28 and 30 are moved towards each other so that the jaws 32 and 34 commence overlapping, the cooperating notches 44 and 46 create a generally square or quadrilateral aperture whose size is dependent upon the degree of overlap of the jaws 32 and 34 and, indirectly, from the distance separating the

distance or angle separating the handle portions **28** and **30.** Each of the notches **44** and **46** may have the sides thereof bevelled so as to define cutting edges **48** and **50,** respectively. Hence, to strip insulation **52** from an electric wire **54** having a metallic core **56** and a covering of insulation **58,** the handles **28** and **30** may be opened sufficiently to enable the wire **54** to be inserted between the jaws **32** and **34** in alignment between the stripping notches **44** and **46** and the handles **40** and **42** squeezed sufficiently for the cutting edges **48** and **50** to pass through the insulative covering **58** of the wire **54** but stop short of severing the core **56.** Then, a slight rotation of the tool **20** about the wire **54** will sever the length of insulation **52** to be removed and then, sliding movement of the tool **20** along the core **56** may be effective to strip the length of insulation **52** therefrom leaving a short length of exposed metallic core or conductor **56** for termination and attachment into an electric circuit.

In order to limit the degree of closure of the handles **40** and **42** and, accordingly, of the jaws **32** and **34** so that an appropriate sized aperture will be formed by the stripping notches **44** and **46** without regard to the "feel" or strength of grip of the mechanic utilizing the tool, adjustable stop means such as an edge cam **60** of generally circular configuration eccentrically mounted, as by means of a river **62** may be provided carried by one of the handles, such as the handle portion **30** for engagement with the adjacent edge **64** of the other handle portion **28.** The edge of the cam **60** may be knurled, as shown, so as to decrease the likelihood of the cam moving during the engagement thereof with the edge **64.** Appropriate indicia such as wire size gauge numbers **66** may be provided on the face of the cam disk **60** for disposition in alignment with a guide mark or line **68** to indicate the size of the aperture that will be formed by the stripping grooves or notches **44** and **46** and, hence, the size of the wire to be stripped. Hence, if as shown, the indicia indicating **12** gauge wire is disposed in general alignment with the line **68,** then the electrician or mechanic utilizing the tool knows that if he merely closes the handles **28** and **30** as far as possible, he will be able to readily strip the insulation from a **12** gauge wire without cutting or nicking the wire core **56.**

The disk **60** may be of substantially the same thickness as the levers **22** and **24** so that, when disposed on the handle portion **30** the disk will be in alignment with the opposite handle portion **28.** A tensioning spur **70** extends outwardly of the handle portion **30** and may be provided with a dimple raised towards the handle portion **28** to bend and tension the handle portions laterally away from each other so that the jaws **32** and **34** will be tensioned towards each other to increase the shearing action at the cutting edges **74** and **76.**

Referring now more particularly to FIGS. **1–6** the portions of the adjacent edges of the jaws **32** and **34** between the stripping notches **44** and **46** and the intermediate portions of the levers **36** and **38** may be bevelled in opposite directions so as to define cooperating shear cutting edges **74** and **76** so that the electric wire **54** disposed therebetween may be cut as desired by squeezing the handle portions **28** and **30** together.

Once an electrical wire has been cut to the desired length and stripped so as to be prepared for termination, several terminating devices are conventionally used. In commercial, industrial and residential wiring, however, the vast majority of terminations are made either by methods that require no tools, such as by the use of wire nuts or automatic spring terminals or by the use of terminating devices which require essentially simple tools and, more particularly, by solderless or crimp-type connectors or terminals or by the use of a screw-type terminal. The screw-type terminals are again of two major types, those wherein the wire is inserted into a channel beneath a screw and the screw tightened so that the front of the screw bears against the wire or by means of terminals wherein the prepared wire end is formed into a loop which is disposed beneath the head of the screw surrounding the threaded shank. The present tool is particularly constructed, adapted and arranged to enable either or any of the types of termination to be readily and easily made with equal facility.

With particular reference to FIGS. **7** and **8,** one of the handle portions, such as the handle portion **28** may be provided with a generally V-shaped crimping groove extending inwardly of the edge **64** for receiving and automatically centering therewith the sleeve portion of a solderless or crimp-type connector or terminal of substantially any size or diameter such as a ring terminal **82.** The other handle, such as the handle portion **30,** may be provided with a crimping prong **84** bent so as to extend into the crimping groove **78** to engage the sleeve portion **80** of the terminal **82** and, upon squeezing together of the handle portions **28** and **30** crimp the sleeve portion **80** of the terminal **82** onto the exposed conductor **56** of the wire **54.**

The crimping groove **78** and crimping point **84** should be disposed a radial distance from the pivot rivet **26** relative the radial length of the handle portions **28** and **30** such that the tool may be opened sufficiently to enable the terminal sleeve portion **80** to be easily inserted therein without requiring that the handle portions **28** and **30** be separated so far as to be not easily grasped by a workman's hand and, at the same time, spaced so that sufficient force may be applied to the crimping point **84** to provide a proper crimp without necessitating that the workman apply an uncomfortable amount of squeeze to the handle portions **28** and **30.**

While a proper crimp may sometimes be accomplished by a skilled workman who knows from long experience just how hard to squeeze a crimping tool, for maximum reliability it is preferable that a mechanical stop be provided so that even an unskilled workman need merely squeeze the tool sufficiently to engage the mechanical stop and he will then be assured that a proper crimp has been made. Since the extent of closure or movement of the crimping point **84** into the crimping groove **78** for a proper crimp varies dependent upon the wire size being crimped, said stop is preferably adjustable. In the present tool, the adjustable eccentric cam stop **60** may, if the dimensions of the crimping groove **78** and crimping point **84** and radial distance thereof from the pivot **26** are appropriately selected relative the stripping grooves **44** and **46,** be utilized so that a single setting of the adjustable stop **60** will provide a proper separation of the crimping groove **78** and crimping point **84** simultaneously to provide an appropriate size aperture between the stripping grooves **44** and **46.** In other words, if the relationships between the stop disk **60,** crimping groove **78,** crimping point **84** and wire stripping grooves **44** and **46** are ap-

propriately selected then an electrician who is working with a specific size of wire, such as, for example, size 12 wire, by setting the stop disk 60 so that the numeral 12 is opposite and aligned with the index line 68, then he may strip 12 gauge wire and crimp terminals thereon without requiring any adjustment. Similarly, if working with any other gauge of wire, a similar single adjustment suffices. For example, it has been found that if the center of the stripping grooves 44 and 46 is located approximately 0.72 inches from the pivot point, then the center of the crimping groove 78 should be located approximately 0.47 inches from the pivot point to maintain this relationship.

As heretofore pointed out, many electrical wires in commercial, residential and industrial lighting and power installations are terminated by forming a loop in the stripped end of the wire and inserting the formed loop under the head of a machine screw and subsequently tightening the screw to form the electrical connection. With particular reference now to FIGS. 9–11, the electrician's tool of the present invention is also particularly adapted to aid and assist in forming such terminations. The pivot rivet 26 of the termination tool 20 may be extended to provide an enlarged, elongated generally cylindrical post portion 86 around which the stripped wire end 56 may be bent or formed to define a loop. To cooperate with the loop-forming post 86, one of the levers, such as the lever 24 may be provided with a loop-forming tang 88 bent upwardly in spaced apart relationship to the post 86 so that if the end portion of the stripped wire end 56 is inserted therebetween, as shown in phantom in FIG. 9 and the wire 54 bent downwardly around the post 86 to the position shown in solid lines in FIG. 9, an appropriate loop will be automatically formed in the stripped wire end portion 56. Then, the loop so formed may be inserted behind the head of the connection screw, such as the screw 90 forming the terminal of an electrical device 92, as shown in FIG. 11 and the screw 90 tightened. To enable the tool 20 to be utilized to tighten the screw 90, as well as any other electrical screw or mounting screw as may be required by an electrician utilizing the tool, one of the jaws, such as the jaw 32 may be extended and formed to define a screwdriver blade portion 94 extending forwardly of the tool 20 generally opposite the handle portions 28 and 30.

Hence, the combination tool of the present invention enables an electrician or other craftsman to form all of the various operations ordinarily required to terminate electrical wiring, including cutting, stripping of insulation, crimping of solderless terminals or connectors, forming a screw connection loop and tightening and loosening screw terminals and/or component mounting screws all with facility and convenience.

While the invention has been described, disclosed, illustrated and shown in terms of embodiments or modifications which it has assumed in practice, the scope of the invention should not be deemed to be limited by the precise embodiment or modification herein described, disclosed, illustrated or shown, such other embodiments or modifications as may be suggested to those having the benefit of the teachings herein being intended to be reserved especially as they fall within the scope and breadth of the claims here appended.

What is claimed is:

1. Combination tool for enabling performance of a number of different operations involved in terminating electrical wiring comprising a pair of crossed essentially flat levers stacked one above the other, means securing said levers at the location of crossing for pivotal movement thereabout and adjustable stop means for limiting the closure of said levers towards each other, each of said levers comprising an elongated handle portion entending generally outwardly of said securing means in a first direction and a jaw portion extending generally outwardly of said securing means generally oppositely thereof, said jaw portions defining therebetween a wire stripper comprising a pair of oppositely facing generally V-shaped cutting edges formed on opposed adjacent edges of said jaws for cutting insulation and enabling a stripping of such cut insulation from wire end portions when said handle portions are squeezed together and said handle portions defining a terminal crimper therebetween comprising a generally V-shaped groove extending inwardly of an edge of one of said handle portions adjacent the other of said handle portions and a cooperating crimping point extending outwardly of said other handle portion offset above the plane thereof substantially in the plane of the other handle portion for projecting into said V-shaped groove and crimping solderless terminals disposed therein upon squeezing of said handle portions, said wire stripper and said crimping means being proportioned and positioned relative said securing means so that a single setting of said adjustable stop properly sets both said stripper and said crimper for a selected wire size.

2. Tool for enabling performance of operations involved in terminating electrical wiring comprising, in combination, a pair of crossed essentially flat levers stacked one above the other and provided with a plurality of cooperating working portions for preparing and terminating electrical wires upon pivotal movement therebetween and means securing said levers at the location of crossing for pivotal movement thereabout, said securing means comprises a post extending through said crossed levers having a generally cylindrical head portion extending generally perpendicularly upwardly of said levers, the upper one of said levers comprising a tang extending generally upwardly generally parallel said post and spaced apart a short distance therefrom to define therewith a wire former so that a wire having the end portions inserted therebetween may be wrapped about said post to form a loop.

3. Tool defined in claim 1 wherein said adjustable stop comprises a generally circular cam rotatably and eccentrically mounted on one of said handle portions for engagement by the adjacent edge of the other of said handle portions.

4. Tool defined in claim 1 wherein said jaws further comprise wire cutting edges for shearing wire disposed therebetween during squeezing of said handle portions.

5. Tool defined in claim 4 wherein at least one of said jaws is extended generally forwardly and shaped to define a screwdriver blade tip.

6. Tool defined in claim 5 wherein said securing means comprises a generally cylindrical head portion extending generally perpendicularly upwardly of said levers, the upper one of said levers comprising a tang extending generally upwardly generally parallel said post and spaced apart a short distance therefrom to define therewith a wire former so that a wire having the end portions inserted therebetween may be rapidly and

easily wrapped around said post to form a screw connection loop.

7. Tool defined in claim **6** wherein said securing means comprises a neck portion extending through said crossed levers and peened over on the other side so as to rivet said levers together.

8. Tool defined in claim **1** wherein at least one of said jaws is extended generally forwardly and shaped to define a screwdriver blade tip.

9. Tool defined in claim **2** wherein said securing means further comprises a neck portion extending through said crossed levers and peened over on the other side so as to rivet said levers together.

10. Tool defined in claim **4** further comprising means for urging said jaws laterally together to increase the shearing action thereof, said means for urging comprising, in turn, a tensioning spur extending outwardly of one of said handles generally parallel the other and subjacent thereto provided with a dimple raised toward said other handle to bend said handles apart and thereby tension said jaws.

* * * * *

Dedication

3,733,627.—*Harry Epstein*, Seaford, N.Y. ELECTRICIAN'S COMBINATION TOOL. Patent dated May 22, 1973. Dedication filed Feb. 12, 1976, by the assignee, *Kastar, Inc.*

Hereby dedicates said patent to the Public.

[*Official Gazette March 30, 1976.*]