

[54] ELECTRICAL WIRE INSERTING TOOL

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30/367, 81/52, 81/35

[51] Int. Cl. H01r 43/00

[58] Field of Search 29/203 H, 275, 203 HM;
30/277 X, 367; 81/52.35

[56] References Cited

UNITED STATES PATENTS

2,907,241 10/1959 Lazar 81/52.35

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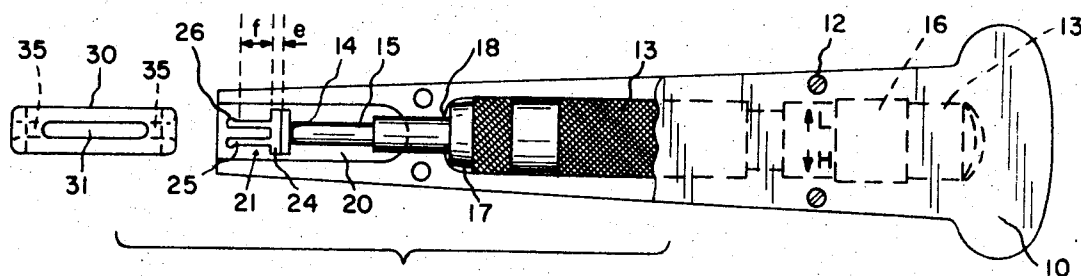
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[57]

ABSTRACT

A tool for inserting an electrical wire into a clip type terminal is described. The tool features a removable working blade which is also reversible to provide a cutting edge to remove excess wire. Cutting is effected by applying a controlled impulse to the blade via a bifurcated blade holding adaptor from an automatic impulse generator arranged in an elongated housing.

8 Claims, 6 Drawing Figures



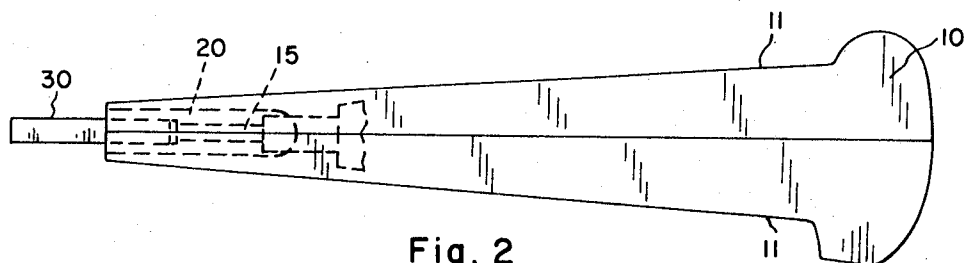


Fig. 2

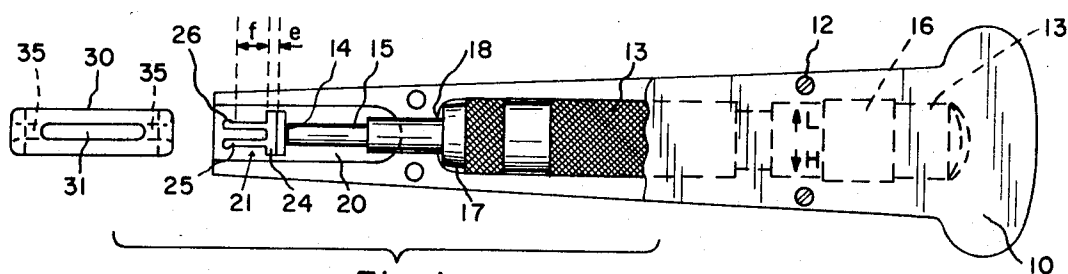


Fig. 1

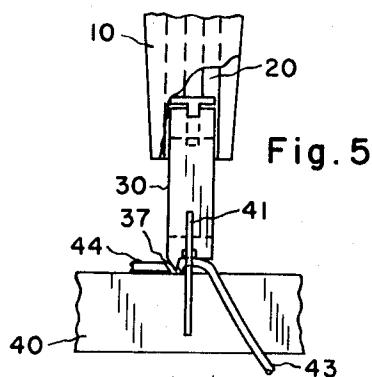


Fig. 5

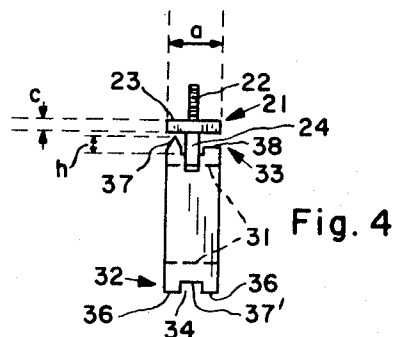


Fig. 4

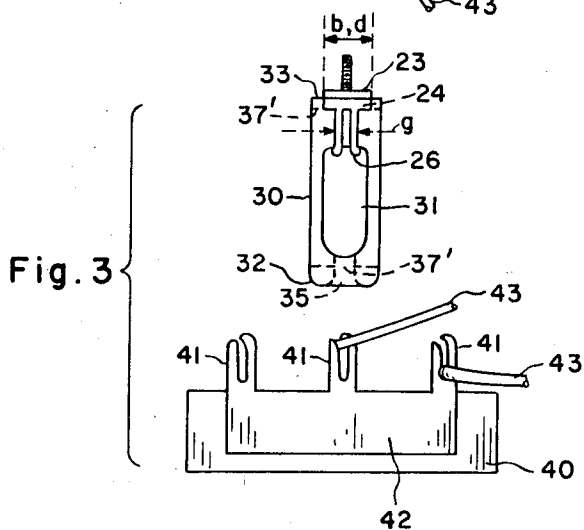


Fig. 3

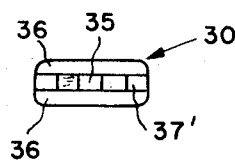


Fig. 6

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ELECTRICAL WIRE INSERTING TOOL

This invention relates to an insertion and wire clipping tool for inserting wire into the slot of a clip type terminal of an electrical terminal block or connector.

Known electrical terminal blocks of the type commonly used in telephone systems comprise an insulating support from which protrudes a plurality of wire receiving terminals aligned in parallel rows and columns by means of which various wires can be electrically interconnected. One such terminal of the solderless type is known as a clip-type terminal, and comprises a bifurcated ended strip of spring metal forming tines with inside metal edges generally spaced apart down to where the tines join. The wire, which is usually insulated with plastic, is placed over the opening in the terminal split end, and then an insertion tool with a recess adapted to receive the terminal end is pushed thereon, driving the wire down between the tines causing its engaged interior edges to break away or strip the insulation as they are forced apart, resulting in the spring metal tines tightly locking onto the bare wire and making a solid electrical connection therewith. Usually several terminals in a row project from a common base embedded in the block and thus interconnect all wires inserted into the terminals of that row.

In one form of known insertion tool, the working end is reversible. One side has flat edges and is designed for inserting the wire. The other side has one protruding cutting edge and one flat edge. With the latter side, after the wire has been pressed down, the operator uses his other hand to strike the back end of the tool. This impact causes the cutting edge to press the wire against the block surface severing or clipping the inserted wire from the remaining wire. This tool construction exhibits a number of disadvantages as follows:

- a. two hands are required to operate the tool,
- b. continued impact of the hand on the tool back is uncomfortable and fatiguing,
- c. the resulting impact to the tool is not always uniform and difficulties may arise; thus, if insufficient force is applied, the wire is not severed; if too much force is applied, the resulting mechanical shock to the terminal block may cause damage,
- d. the conventional tool generally contains a skirt to protect the holding hand of the user, and the skirt blocks a satisfactory view of the terminal.

The chief object of the invention is an improved insertion tool for clip type terminals which eliminates the aforementioned disadvantages.

These and other objects of the invention as will appear hereinafter are achieved with a tool construction comprising a housing containing an automatic impulse applying mechanism removably connected by means of a bifurcated adaptor to a working part comprising a reversible one-piece blade having opposed slotted ends each with an interior recess extending from the slot bottom to an opening in the blade center. The recess is adapted to receive both the split terminal end and also the bifurcated end of the adaptor but without touching the working edge. One of the slotted ends has a protruding knife edge for wire clipping. With the inventive construction, the operator merely presses the tool onto the terminal until there is transmitted to the blade an impulse of uniform force and of sufficient intensity, as preset by the operator, to sever the wire. This operation requires only one hand, no banging of

the tool is necessary, and no skirt portion blocking a view of the terminal is present.

One exemplary embodiment of the invention will now be described in greater detail with reference to the accompanying drawing wherein:

FIG. 1 is a plan view of one form of insertion tool in accordance with the invention with part of the housing broken away to show interior details and with the blade separated;

FIG. 2 is a side view of the tool of FIG. 1 but with the blade in place;

FIG. 3 is an enlarged front view of just the blade and adaptor in position to insert a wire in a terminal, the remainder of the tool being omitted for clarity;

FIG. 4 is a side view of the blade and adaptor shown in FIG. 3;

FIG. 5 is a side view of the blade end of the tool showing a wire being severed;

FIG. 6 is an end view of the blade shown in FIG. 3.

Referring now to the drawing, FIG. 1 is a plan view of one form of the tool of the invention with the working blade separated therefrom, while FIG. 2 is a side view with the blade attached. The tool shown comprises a generally tapered, elongated housing 10, for example of molded plastic, having top and bottom flat surfaces 11. The housing is formed as two molded halves held together by suitable removable fasteners 12. The housing interior is hollow and shaped to receive and hold an elongated automatic impulse tool 13 of a type generally known in the art. Such tools, as is well known, generally comprise an exterior projecting plunger rod 15 whose interior end (not shown) is adapted to be struck by a cam-actuated, spring-loaded ram (not shown) when the rod 15 is urged a preset distance inward (to the right in FIG. 1). Such tools are also generally provided with a rotatable barrel 16 for adjusting the spring tension and thus the impulse intensity. The interior construction whereby the impulse is generated is not part of my invention and thus is not shown. Any conventional device can generally be employed. U.S. Pat. Nos. 2,866,266; 2,907,241; and 3,029,512 show various impulse generating constructions adaptable for use in my invention. In the tool of my invention, the exposed end 14 of the rod 15 has a threaded hole, and the impulse tool 13 has a shoulder depicted at 17 for bearing against a wall 18 in the plastic housing 10 to secure the impulse tool within the housing. The plunger rod 15 in operation reciprocates horizontally in the position shown in FIGS. 1 and 2 within a guideway 20 of generally rectangular configuration.

Also located within the guideway 20 is a blade-holding adaptor 21, comprising a threaded shank 22 threadably engaging the threaded hole in the exposed end 14 of the plunger rod 15. The adaptor 21 further comprises an enlarged shoulder 23 of width *a*, length *b*, and height *c*, from which a flattened shank 24 of width *d*, the same length *b* as shoulder 23, and height *e* depends. Projecting from the shank 24 are a pair of spring metal tines 25 having outwardly extending lobe ends 26. The height of the tines 25 from the lobe ends 26 to the shank 24 is designated *f*, and the length across the tines is designated *g*.

The working blade which engages the adaptor 21 is designated 30. It comprises a one-piece body of tool steel and of generally rectangular cross-section having a generally oval opening 31 in its side and opposed ends

32, 33, each of which comprises a center slot 34 of approximately width d , slightly larger than that of the shank 24 enabling the slot to receive the shank 24 until its bottom edge engages the slot bottom 37'. A recess 35 having a flared opening at the slot bottom extends from the latter through the wall separating the slot from the blade opening 31 and into the opening 31. The length of the recess 35 is approximately g , the same as the length across the tines 25. The depth of the recess 35 is approximately f , the same as the height of the tines 25. One end 32 of the blade 30 has opposed side walls defining its slot 34, which side walls terminate in flat edges 36. This end is used for wire insertion. The opposed end 33 has one slot side wall terminating also in a flat edge 38, similar to that at end 32, but the opposite side wall is slightly longer terminating in a sharp cutting edge 37. The height h of the cutting edge wall 37 is slightly less than the height e of the shank 24, and thus, the three other slot side walls 36, 38 are also shorter than the height e of the shank 24. Thus, with the shank 24 seated in either slot 34, the edges 36, 37, 38 are spaced from the shoulder 23.

To mount the blade 30 on the tool, it is inserted into the open end of the guideway 20 and pressed onto the adaptor 21, during which process the tines 25 are forced inward as they enter the recess 35 but when the lobe ends 26 pass through the recess into the opening 31 they snap outward (FIG. 3) locking the blade to the adaptor. At this position, the shank 24 bottom is fully seated in the slot 34, but the blade edges 36, 37 remain clear of the shoulder 23 in order to prevent dulling of those edges. The blade 30 is removed by simply pulling it off the adaptor tines 25, whose spring action permits this operation.

While mounted on the adaptor, the blade 30 reciprocates with the adaptor and rod 15 within the rectangular guideway 20 which prevents rotation of the blade 30.

FIG. 3 shows part of a typical terminal block, comprising an insulating support 40 in which are embedded rows of clip terminals 41. As shown, each row comprises three terminals 41 with a common base 42. Each terminal is usually arrayed in a column with the corresponding terminal of the other rows. The terminals each comprise a bifurcated or split end. In the right hand terminal is shown a wire 43 which when pressed down to the bottom of the terminal as shown forces the terminal apart breaking through the wire insulation and locking the bare wire to the terminal making a solid electrical connection. Wire insert is effected with the blade end 32 having the flat edges 36. As shown in FIG. 3 for the center terminal, the wire 43 is placed in the terminal end, and then the tool with the blade 30 positioned as shown (the tool handle 12 is omitted for clarity) is pressed onto the terminal 41. The terminal 41 passes through the recess 35 while the edges 36 push the wire down to the terminal bottom. The dimensions of the recess 35 are chosen to receive the terminal 41. When the tool is removed, the terminal retains the wire.

To sever excess wire from one side, the blade 30 is reversed so that the opposite end 33 with the cutting edge 37 is exposed. This is illustrated in FIG. 5, which is now a side view of the same terminal 41 shown in FIG. 3. Now, when the blade is pressed down, the flat edge 38 and sharp edge 37 force the wire 43 down, but when the wire reaches the terminal bottom, then the

cutting edge 37 presses it against the block surface. Now, as the operator continues to press the tool down, the blade 30, now unable to move forward remains fixed, but the housing 10 continues forward toward the block, which means that the rod 15 moves into the impulse tool 13. After a preset distance has been effected, the interior ram is actuated imparting a blow of uniform intensity, controlled by the position of barrel 16, to the rod 15, and in turn to the blade 30. This impulse 10 severs the wire end as shown at 44.

As will be observed from the following description, only one hand of the user is necessary to sever the wire with the tool of the invention. Also, severance occurs with an impact of controlled uniform intensity chosen to cut the wire without causing damage to the terminal block. Moreover, the tool is of generally narrow configuration with flat sides offering a good view of the terminal while the wire is being inserted, and lacks the shirt in the known tool which hindered clear vision of the terminal.

The tool of the invention is readily assembled with the adaptor simply screwed into the rod end, the generally flat guideway for the blade preventing rotation thereof. The blade is easily engaged and disengaged from the adaptor due to its tines configuration and the spring action of the tines, yet the working edges of the blade remain clear of adaptor surfaces preventing dulling of the edges. Moreover, the blade may be made shorter than the blade of the conventional tool, and several slots therein used for blade reversal are eliminated simplifying the blade construction.

While the tool of the invention has been described in connection with the insertion of wires in terminal blocks, it is also useful for inserting wires into terminals attached to other structures, such as printed circuit boards and connectors. Also while the invention has been described in connection with a working blade designed to sever the wire when impacted against the block surface, the impulse generator 13 may also be used with blades of differing construction which also operate to insert a wire in a terminal and clip the wire at the end of the insertion stroke. For instance, blades which operate by a camming action which drives the cutting edge sideways to clip the wire end when the wire reaches the terminal bottom or by a scissors or other cutting action whereby the wire is placed between a cutting edge and a supporting edge, modified or constructed to be mounted to the impulsing tool 13, are also usable in my invention. Thus, while the principles of the invention have now been made clear in an illustrative embodiment, there will be immediately obvious to those skilled in the art many modifications in structure, arrangement, proportions, the elements, materials, and components, used in the practice of the invention, and otherwise, which are particularly adapted for specific environments and operating requirements, without departing from those principles, which the claims are intended to embrace within the limits only of the true spirit of the invention.

What is claimed is:

1. A tool for inserting a wire into the slot of a clip-type terminal, comprising an elongated housing, an elongated impulse generating device within said housing and having a projecting plunger rod which is impacted when moved inward a preset distance, a working blade having opposed ends and a generally rectangular cross-section, at least one of said opposed ends

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having a slot and a recess extending into the blade from the slot bottom and dimensioned to receive the terminal end, and means for securing the blade at the other of its ends to the end of the projecting plunger rod in such manner that the blade one end projects from the housing, said housing containing a generally rectangular guideway for receiving the blade and preventing rotation thereof.

2. A tool as set forth in claim 1 wherein an adaptor member is secured to the plunger rod end and comprises means for removably locking same to the blade other end.

3. A tool as set forth in claim 2 wherein the adaptor comprises a flattened shank portion adapted to seat in the blade end recess, said shank portion having a height such that the blade edges remain clear of the adaptor.

4. A tool as set forth in claim 3 wherein the adaptor comprises projecting tines of spring metal for engaging the blade end recess, said tines having outwardly en-

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larged lobe ends for engaging blade walls at the bottom of the recess.

5. A tool as set forth in claim 1 wherein in the housing is of generally tapered configuration from a wide end remote from the blade to a narrow end at the blade providing an unobstructed view of the terminal.

6. A tool as set forth in claim 1 wherein the blade other end also has a slot and a recess extending from the slot bottom into the blade interior, both recesses terminating in a common hole in the blade side.

7. A tool as set forth in claim 6 wherein at said one end the blade walls defining the slot have flat edges, and at said other end the blade walls defining the slot have one flat edge and one slightly longer cutting edge.

8. A tool as set forth in claim 1 wherein the housing contains an interior wall portion separating the guideway from another cavity therein housing the remainder of the impulse generating device.

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