June 29, 1971 W. S. SEDLACEK 3,588,932

INSERTION TOOL FOR CLIP TYPE TERMINAL

Filed Aug. 22, 1969

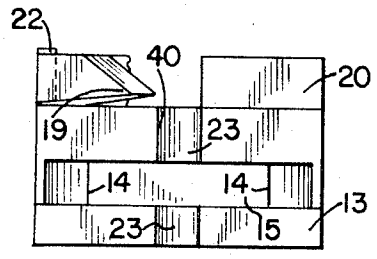


FIG. 5

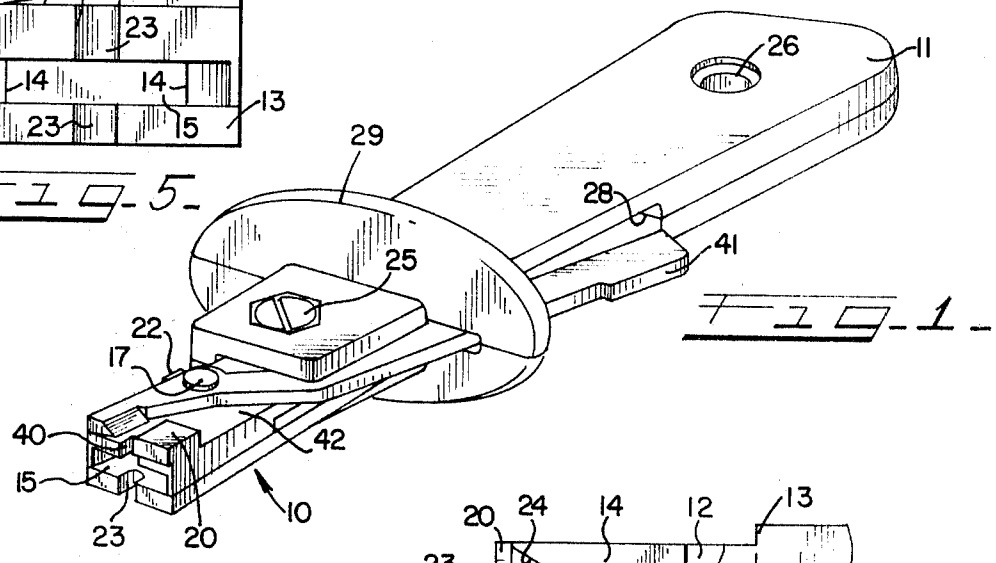


FIG. 1

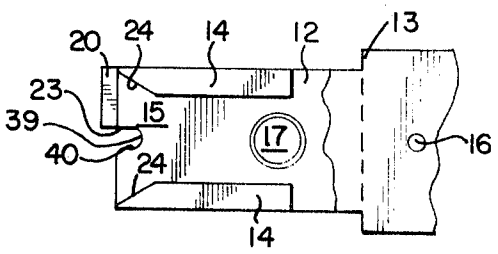


FIG. 4

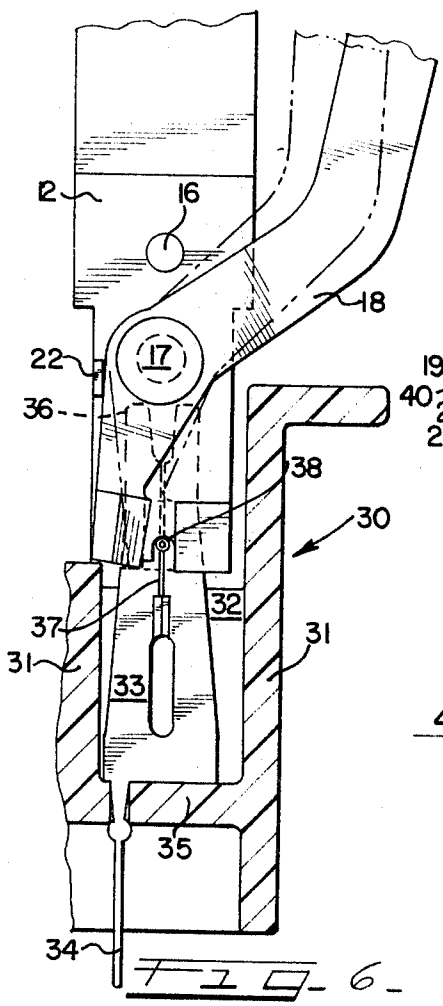


FIG. 6

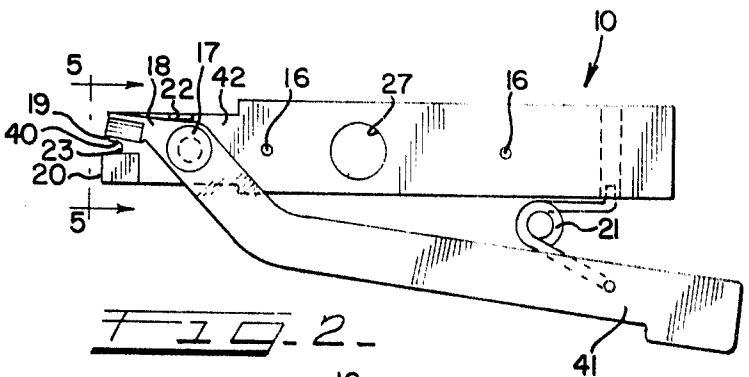


FIG. 2

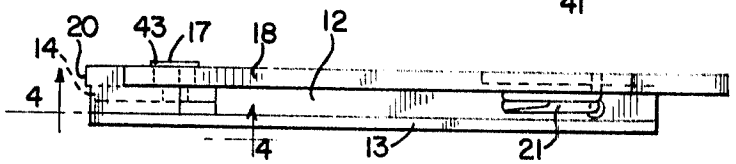


FIG. 3

INVENTOR

WILLIAM S. SEDLACEK

BY Dalied, Baker, York & Jones ATT'YS.

United States Patent Office 3,588,932 Patented June 29, 1971

3,588,932

INSERTION TOOL FOR CLIP TYPE TERMINAL

William S. Sedlacek, Chicago, Ill., assignor to Reliable Electric Company, Franklin Park, Ill.

Filed Aug. 22, 1969, Ser. No. 852,408
Int. Cl. B25f 1/00
U.S. Cl. 7—14.1 7 Claims

ABSTRACT OF THE DISCLOSURE

A tool for inserting wire into the slot of a clip type terminal has a cut-off blade pivotally mounted on a side surface of the elongate tool member. The end surface of the tool has a recess for receiving the upper end of the terminal. Notches at the front edges of the tool serve to locate the wire across the recess during operation. The edge of the chisel-type cutting blade is longitudinally disposed and moves across a notch and cooperates with an anvil projecting from said surface so that the free end of the wire located in the notches can be severed at the end of the insertion operation.

This invention relates to an insertion tool for a clip type terminal.

A clip type terminal is a flat piece of metal having integrally formed resilient arms providing a conductor receiving slot. An insulated wire is forced into the slot which is of a width considerably less than the diameter of the conductor, that is of the copper. The process of inserting the conductor into this slot results in a penetration of the insulation so that electrical contact is obtained between the slot edges and the conductor.

The nature of these clip terminals is such that considerable force is required to insert a wire into its slot, with the result that a special tool has been provided having end surfaces which engage the insulated wire at a point immediately adjacent the side surfaces of the clip, so that the wire can be forced into the slot, thus spreading the arms.

At the same time the space between the end surfaces is in the form of a recess having a controlled width in order to limit the extent of arm flexure so that it will not exceed the elastic limit of the clip material.

An example of a clip type terminal and an insertion tool therefor is shown in my copending application, Ser. No. 807,336, filed Mar. 14, 1969.

The clip type terminals are often mounted on a connector block. It is desirable to cut off the free end of the conductor at a point close to the clip for reasons of neatness. To this end, the insertion tool of said copending application includes a transverse blade projecting beyond the end surfaces.

The disadvantage of this arrangement in which the cutting edge of the blade is disposed transversely across the width of the tool is that it is not suitable for operation in close quarters. For instance, in high density connector blocks where the clips are closely spaced from each other, the distance between adjacent clips may be as small as ⅛ of an inch. Thus the manipulation of the tool incident to insertion of a wire may nick the conductor, or abrade the insulation of the wire leading to an adjacent clip.

Furthermore, in order to effect proper insertion, the free end of the wire should either be held by the fingers, or else should be sufficiently long that the end will be bent upwardly along the side of the tool so that the adjacent portion will be held firmly against its end surface. With small gauge wires, the transverse blade will sometimes sever the wire during the insertion step with

the result that there is no upward bend to hold the severed end of the wire closely against its adjacent end surface. Then, further downward movement of the tool will cause the wire to be pulled through the slot.

According to my invention, I provide a cutting edge which is disposed longitudinally of the tool and which is so shielded that it will not damage either an adjacent wire or the wire being inserted.

Furthermore, this earlier arrangement requires either a sharp tug on the wire for effecting severance, or else requires a connector block which presents a flat surface against which the transverse blade can be forced to effect severance. In either situation, there is the distinct possibility that the blade will pull the wire in such a manner that the wire axis will not be perpendicular to the surfaces of the clip terminal, but will extend through the slot in a sloping direction. This will result in improper seating of the wire in the slot.

The clip is of appreciable thickness and the slot width tapers. Threfore, the gripping force of the clip on the wire will not be uniformly distributed along the thickness dimension of the slot edges, and the contact area between the two will be greater at one slot edge than the other. This improper seating increases the probability of high resistance electrical contact, or of eventual contact failure, a higher than normal probability being referred to as "poor integrity" of contact.

According to my invention, I provide an insertion tool which cuts the free end of the wire at a point closely adjacent to the clip surface, but which nevertheless maintains the wire axis perpendicular to the side surfaces of the clip so that there will be proper seating of the wire in the slot. Furthermore, the cut off point is so close to the clip surface, about .06 inch, that it will not interfere with the wire to the adjacent clip.

Other objects, features and advantages will become apparent as the description proceeds.

In the drawings:

FIG. 1 is a perspective view of the insertion tool assembled with the handle;

FIG. 2 is a plan view of the tool assembly alone;

FIG. 3 is a side elevation of FIG. 2;

FIG. 4 is a fragmentary enlarged bottom view taken along line 4—4 of FIG. 2;

FIG. 5 is an enlarged front view taken along line 5—5 of FIG. 2; and

FIG. 6 is a view similar to FIG. 2 but showing the manner in which the tool is used.

In FIG. 1 the reference numeral **10** indicates the tool assembly, and **11** the handle. The tool assembly comprises a body portion **12** and a backing plate **13**. These are spaced from each other by lands **14** on the body portion **12** to provide a recess **15**. Rearwardly of the recess **15**, the thickness of the body portion includes the thickness of the lands, so that the body portion and backing plate may be secured to each other by rivets **16**.

A blade **18** overlies the upper surface **42** of the body portion **12** and includes a longitudinally extending cutting edge **19**. The blade **18** is pivotally mounted on the surface **42** by a shoulder pin **17** which takes into the body portion **12**. The head **43** of the pin is preferably countersunk into the blade so that it projects above the upper surface of the lever to a minimum extent, in this case, .005 inch. A rearward extension of the blade **18** constitutes an operating arm **41**. Extending from the upper surface of the body portion **12** is an anvil **20** which may be formed integrally with the body portion **12** or may be a separate block of a somewhat softer metal which is welded thereto. A spring **21** biases the blade **18** away from the anvil **20**, but pressure on the operating arm **41** moves the blade **18** into engagement with the anvil **20**.

A stop **22** extending from the upper surface **42** of the body portion **12** limits the open position of the blade **18**.

The front edges of the body portion **12** and backing plate **13** are provided with aligned notches **23**. The front surfaces of the lands **14** are chamfered at **24** as shown in FIG. 4.

The tool assembly **10** is received within the handle **11**, the latter being a two piece plastic device which is secured to the tool assembly by a suitable screw **25**. A countersunk rivet **26** may secure the handle halves to each other at the rear. Openings **27** extend through the body portion **12** and backing plate **13** to accommodate the screw **25**. The handle **11** has a recess **28** to accommodate the operating arm **41** when depressed, and also has a flange **29** for manipulative purposes.

The insertion tool is used in inserting a wire **38** into a clip type terminal **33** which is mounted in a connecting block **30**. Although there are a number of types of connecting blocks, only one type is shown in FIG. 6 for the purpose of illustration. Here the connecting block **30** has side walls **31** and transverse partitions **32** which provide a separate compartment for each clip **33**. A tail portion **34** of the terminal extends through an opening in the bottom wall **35** of the connector block so that a lead or a plug-in connector can be electrically connected to the tail portion **34**.

As described more fully in the aforesaid copending application 807,336, the clip type terminal **33** has a notch **36** at its upper end which communicates with a slot **37** which divides the terminal into two arms. An insulated wire **38** initially laid in the terminal notch **36** is forced by the insertion tool **10** downwardly into the slot **37** where electrical contact is made with the metal of the clip type terminal.

The preferred operation of the present invention is to loop the wire through the notches **23**, with the free end located on the blade side of the tool. The flange **29** provides a backing against which the fingers may press both the circuit portion and the free end portion of the wire **38** so that the wire portion which spans the recess **15** is reasonably taut. Then the tool **10** is placed over the terminal **33**, the latter extending into the recess **15**, so that downward movement of the tool causes the wire first to enter the terminal notch **36**, and then the slot **37**. The base of each notch **23** provides a forwardly facing surface **39** which engages the surface of the insulated wire **38** at a point immediately adjacent to the side surfaces of the clip. Thus the considerable force required to spread the arms can be transmitted to the wire **38** so that it can be forced into the slot **37**.

The connector block is preferably designed so as to limit the downward movement of the tool, as shown in FIG. 6, or the bottom of the recess may act as a limit stop.

At this point, the wire is properly seated in the slot **37**, and electric contact made either in the manner pointed out in the aforesaid copending application, or in some other manner, depending on the type of clip (see Patent No. 3,112,147, for example).

Then the operating arm **41** is depressed, which causes the free end portion of the wire to be cut off, leaving a short stub which projects from the terminal surface only about .06 inch. The severed end of the wire is then removed from the connector block.

During the insertion step the side edge **40** of the notch **23** shields the wire **38** from the cutting edge **19** so that there is no danger of damaging the conductor **38** at this time. As shown in FIG. 1, the blade **18** in its normal position is retracted beyond the edge **40** of the notch **23**.

Since the upper surface of the anvil **20** extends beyond the cutting edge **19**, the anvil also serves as a shield to protect the wire to the adjacent clip from contact with the cutting edge **19**. It will also be noted in FIGS. 2 and 4 that the anvil **20** extends forwardly of the front surface of the body portion **12** which also provides a shielding action.

As shown in FIG. 5, the cutting edge **19** is offset away from the surface **42**. This assures that the cutting action will be against the anvil **20**.

The backing plate **13**, the body portion **12**, and the blade **18** are perferably made of stainless steel stock having thicknesses of .040, .080, and .050 inch respectively, giving an overall thickness of substantially .170 inch.

Although the downward movement of the tool is limited by engagement of the tool with a portion of the connecting block **30**, as shown in FIG. 6, it is also possible to dimension the recess **15** so that it is less deep. Then the top of the terminal will engage the inner end of the recess to limit the downward movement of the tool beyond the desired degree of insertion.

Although only a preferred embodiment of my invention is shown and described herein, it will be understood that modifications and changes may be made in the construction shown without departing from the spirit of my invention.

I claim:

1. An insertion tool for clip type terminals comprising an elongate member having a recess in its front end surface, aligned notches formed in said front end surface on either side of said recess, a blade having a cutting edge longitudinally disposed on the top surface of said elongate member, means for pivotally mounting said blade for movement between a normal position in which said cutting edge clears said notches into a cutting position in which it ovelies said notches, means biasing said blade into said normal position, said blade including an operating arm for moving same into said displaced cutting position whereby a wire disposed transversely of a clip type terminal received within said recess and extending through said aligned notches may be severed by the movement of said operating arm.

2. An insertion tool as claimed in claim **1** in which said top surface has an anvil member projecting therefrom at a point adjacent said notch and oppositely disposed from said cutting edge whereby the severance of said wire is effected by the cooperation of said cutting edge with a surface of said anvil, the top surface of said anvil projecting beyond said cutting edge so that said anvil provides a shielding means for said cutting edge when in normal position.

3. An insertion tool as claimed in claim **2** in which said cutting edge includes two sloping surfaces providing an apex which is offset away from said top surface of said elongate element so that said cutting edge will engage said anvil surface at a point intermediate its edges.

4. An insertion tool as claimed in claim **2** in which said anvil also projects beyond the front end surface of said elongate member.

5. An insertion tool as claimed in claim **1** which includes handle means, said elongate member being mounted within said handle means and projecting from one end thereof, and a flange at the front end of said handle to facilitate engagement by the fingers of a wire which is to be inserted into said clip terminal.

6. An insertion tool as claimed in claim **5** in which said operating arm extends rearwardly of said flange, said handle having a recess to accommodate said operating arm, a portion of said operating arm projecting laterally from said recess.

7. An insertion tool for clip type terminals comprising an elongate member having a recess in its front end surface, aligned notches formed in said front end surface on either side of said recess, a blade having a cutting edge member longitudinally disposed on a surface of said elongate member, means for pivotally mounting said blade for movement between a normal position in which it clears said notches into a cutting position in which it overlies said notches, whereby a wire disposed transversely of a slotted clip type terminal received within said recess and

extending through said aligned notches may be severed by the movement of said blade, said notches providing spaced forwardly facing surface portions for applying pressure to said wire at points immediately adjacent to the side surfaces of said clip type terminal received within said recess to force said wire into the slot of said clip type terminal, and one of said notches providing a side edge which shields said wire from said cutting edge during the insertion operation when said blade is in normal position, and means biasing said blade into said normal position.

References Cited

UNITED STATES PATENTS

984,678	2/1911	Kiesel	30—233
3,259,981	7/1966	Raymond	30—289
3,168,750	2/1965	Gattiker	7—14.1

ROBERT C. RIORDON, Primary Examiner

J. C. PETERS, Assistant Examiner

U.S. Cl. X.R.

29—203