ABSTRACT

A tool for fastening a wire-bearing terminal pin to terminal lug. A drive member is slidably mounted in a tube having a longitudinal opening in the tube wall at one end thereof. A terminal pin having a wire crimped thereto is pushed into the end of the tube until the tip of the terminal pin touches the tip of the drive member. As this occurs, the wire passes through the longitudinal opening and is deflected away from the tip of the terminal pin thus to clear the path of movement of the drive member, this being accomplished by a deflecting surface at the tip of the drive member. The end of the loaded tube is slipped over the companion terminal lug until the contact between the flat end of the tube and the mounting surface of the terminal lug aligns the longitudinal axis of the tube along the longitudinal axis of the terminal lug. This allows the end of the drive member to pushingly engage the tip of the terminal pin while the contact between the terminal pin and the tube wall prevents the application of a lateral force to either the terminal pin or the terminal lug. The longitudinal movement of the drive member forces the terminal pin substantially longitudinally into intimate electrical contact with the terminal lug. As the tool is removed, the terminal pin passes through the end of the tube and the wire passes through the longitudinal opening in the wall thereof.

6 Claims, 6 Drawing Figures
TOOL FOR STAKING A TERMINAL PIN TO A TERMINAL LUG

BACKGROUND OF THE INVENTION

The present invention relates to fastening tools and is directed more particularly to a tool for fastening a wire-bearing terminal pin to a companion terminal lug. Soldering and staking are two widely used methods for making electrical connections to the terminal lugs located on the back of a socket for a printed circuit card. As is well known, soldering involves the fastening of a wire to a terminal lug by means of a fusible metal. Staking, on the other hand, involves crimping a terminal pin to a wire followed by mechanically pressing the terminal pin into contact with a terminal lug.

Prior to the present invention, it has been the practice to utilize printed circuit card sockets having a first type of terminal lug where fastening is to be accomplished by soldering and to utilize printed circuit card sockets having a second, mechanically stronger type of terminal lug, where fastening is to be accomplished by staking. One reason for this practice has been the tendency of the first type of terminal lug to bend or break while a terminal pin is being staked thereto. This breakage occurs because the terminal lug, being mechanically weak, has little ability to resist the application of a force applied in any direction except along the longitudinal axis of the lug. Thus, because of the difficulty of utilizing staking with both types of terminal lugs, it has been felt necessary to stock two different types of printed circuit card sockets, one having solderable terminal lugs and another having stakeable terminal lugs.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the invention to provide improved means for staking a terminal pin to either a solderable terminal lug or a stakeable terminal lug.

Another object of the invention is to provide a staking tool so arranged that the force acting on a terminal lug during staking is applied substantially along the length of the terminal lug thereby preventing the bending or breaking thereof.

It is another object of the invention to provide a staking tool of the above characteristic which is easy to load with a wire-bearing terminal pin.

Still another object of the invention is to provide a staking tool which is easy to disengage from the terminal pin after staking.

Yet another object of the invention is to provide a staking tool having an end adapted to rest upon the terminal lug mounting to orient the longitudinal axis of the loaded staking tool along the longitudinal axis of the terminal lug.

It is still another object of the invention to provide a staking tool which applies the staking force to a terminal pin without damaging either the terminal pin or the wire crimped thereto.

Another object of the invention is to provide a staking tool having no exposed moving parts which might damage nearby terminal lugs or wires during staking.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation of a staking tool constructed in accordance with the invention.

FIG. 2 is a cross-sectional view taken on the line 2—2 of FIG. 1.

FIG. 3 is a fragmentary cross-sectional view from FIG. 2 showing the position of a terminal pin which is ready for staking.

FIG. 4 is a cross-sectional view taken along the line 4—4 of FIG. 1 showing the position of a terminal pin which is ready for staking.

FIGS. 5a and 5b show a terminal lug and a terminal pin which are of one type suitable for use with the staking tool of invention.

DESCRIPTION OF THE INVENTION

Referring to FIGS. 5a and 5b, there is shown a terminal pin 10 of a type suitable for fastening a wire 11 to a self-supporting but nonrigid terminal lug 12, the latter being fixed to a mounting structure 12a such as the back side of a printed circuit card socket. Terminal pin 10 is of a well-known type that includes a main body 10a from which are formed tabs 10b and 10c, tabs 10d and 10e and wipers 10f and 10g. Tabs 10b and 10c are provided to hold the insulation of wire 11 to terminal pin 10, tabs 10c and 10e are provided to hold a stripped end section of wire 10 in intimate electrical contact with terminal pin 10 and contact wipers 10d and 10f are provided to hold terminal lug 12 in low-impedance electrical contact with terminal pin 10 after staking. As is best seen in FIG. 4, wipers 10d and 10f curve inwardly upon main body 10a. This causes wipers 10d and 10f to exert a downward resilient force when a terminal lug such as 12 is forced between main body 10a and contact wipers 10d and 10f during staking. Thus, pressing pin 10 longitudinally against lug 12 assures a good electrical contact between wire 11 and terminal lug 12.

Referring to FIGS. 1 and 2, there is shown a staking tool including a hollow body or barrel 13 and a ram 14 arranged to slide longitudinally therewithin. This tool is adapted to longitudinally press a terminal pin, such as terminal pin 10, loaded therewithin, onto a terminal lug, such as terminal lug 12, when drive member 14 is advanced longitudinally to the left as shown in FIGS. 1, 2, and 3.

To the end that terminal pin 10 may be easily loaded into the staking tool, in a position suitable for the beginning of staking activity, as shown in FIGS. 3 and 4, a longitudinal section of the driving end of barrel 13 is cut away leaving an opening 19. Wire 11 may be passed laterally through this opening as terminal pin 10 is being loaded into the end of the staking tool to assume a position shown in FIG. 3. This slot allows the removal of the staking tool from the terminal pin after staking, the wire again being passed through opening 19.

In order that the staking tool may exert the desired longitudinal staking force on terminal pin 10 as distinguished from the wire 11, without damaging the insulation of the wire, the end of drive member 14 is reduced in cross section to provide a wire deflecting surface 16. This surface deflects the wire away from the end of terminal pin 10 to the position shown in FIG. 3 thereby allowing a metal-to-metal, driving contact between the tip 10e of terminal pin 10 and drive member 14 as shown in FIG. 3. A slot 17 is provided in drive member 14 to receive a key 18 which is fixed to barrel 13. Member 18, by riding in slot 17, prevents the rotation of drive member 14 with respect to hollow member 13.

As the flat end 13a of the loaded staking tool is slipped over terminal lug 12 and advanced until it rests on mounting structure 12a, it will be seen that the longitudinal axis of the terminal lug is parallel to the longitudinal axis of the staking tool and thus the terminal pin 10. Because the close fit of wipers 10d and 10f within hollow member 13 prevents terminal pin 10 from moving laterally, that is, in a direction which does not lie along the longitudinal axis of staking tool, it will be seen that the movement of the drive member 14 against the driving end of terminal pin 10 causes the latter to advance against terminal lug 12 in a direction along the longitudinal axis thereof. This causes lug 12 to enter between main body 10a and wipers 10d and 10f of terminal pin 10 to establish the desired electrical contact.

Because of the contact between the planar end 13a of barrel 13 and mounting 12a keeps the staking tool from moving angularly with respect to lug 12, and because pin 10 can move only longitudinally with respect to terminal lug 12 during staking, it will be seen that there is exerted no force which tends to bend lug 12 away from its normal perpendicularity with respect to mounting 12a. As a result, terminal pin 10 may be pressed against terminal lug 12 with a force sufficient to produce the desired good electrical contact despite the substantial inability of terminal lug 12 to resist the application of
forces in directions other than those perpendicular to its mounting surface. To the end that drive member 14 may be restored to its original position after the staking of terminal pin 10, there is provided a spring 20 which exerts a rightward force, as shown in FIG. 2, on drive member 14 by acting on a member 21 fixed thereto by a setscrew 22. The rightward travel of drive member 14 is stopped as member 18 comes into contact with the left end of slot 17. This assures the desired spacing between the end of barrel 13 and the wipers of the loaded terminal pin.

Because terminal pin 10 and drive member 14 move only within the boundaries of hollow member 13, it will be seen that the terminal lugs adjacent to terminal lug being connected are not interfered with during the staking operation. To the end that the orientation of pin 10 in barrel 13 may be observed and, if necessary, corrected before staking begins, there is provided a cutaway section 23 which serves as a window to expose and provide access to the rear portion of pin 10. This window does not interfere with the above-described movement of pin 10 because, as shown in FIG. 3, the forward portion of the window does not extend into the region where wipers 16a and 16b contact the inside of barrel 13. The sloping rear portion of window 23 provides clearance for the wire which is deflected upward by the tip of drive member 14.

In view of the foregoing it will be seen that a staking tool constructed in accordance with the invention is adapted to properly orient a terminal pin loaded therewithin with respect to a terminal lug and to drive the pin substantially longitudinally against the terminal lug until the desired electrical contact has been achieved, this being accomplished without exposing adjacent lugs or wires to abrasion from contact with a moving tool.

It will be understood that the embodiment shown herein is for explanatory purposes only and may be changed and modified without departing from the spirit and scope of the appended claims.

I claim:

1. In a device for staking a self-supporting terminal pin having resilient contact wipers to a self-supporting flexible terminal lug, in combination, a hollow member having an open end, the plane of the open end of said hollow member being substantially perpendicular to the longitudinal axis thereof, a drive member for driving a terminal pin along said longitudinal axis, said drive member having at its end a surface disposed angularly with respect to said longitudinal axis and having a rest position a predetermined distance from the open end of said hollow member, a longitudinal opening in said hollow member occupying at least the region between the open end of said hollow member and the rest position of the end of said drive member, said longitudinal opening having a width greater than the diameter of the largest wire to be staked.

2. In a device for staking a wire-bearing, self-supporting terminal pin having resilient contact wipers to a self-supporting, flexible terminal lug, in combination, a hollow rod having a longitudinal opening at one end thereof, a drive rod slidably mounted within said hollow rod, said drive rod having a reduced end whereby the wire fastened to the terminal pin may be deflected away from the tip of the terminal pin, through said longitudinal opening, to allow a driving contact between the tip of the self-supporting terminal pin and the driving end of said drive rod, means for maintaining the reduced end of said drive rod in wire deflecting relationship to said longitudinal opening, the plane of the end of said hollow rod having said longitudinal opening being substantially perpendicular to the longitudinal axis of said hollow rod.

3. In a device for staking a wire-bearing, self-supporting terminal pin having resilient contact wipers to a self-supporting, flexible terminal lug, in combination, a hollow member having a longitudinal opening at one end thereof, the plane of said one end being substantially perpendicular to the longitudinal axis of said hollow member, a drive member slidably mounted within said hollow member, said drive member having a reduced tip whereby the wire fastened to the terminal pin may be deflected away from the tip of the terminal pin, through said longitudinal opening, to allow a driving contact between the adjacent tip of the terminal pin and the driving end of said drive member when the wire-bearing terminal pin is loaded into said hollow member, means for maintaining said reduced tip in wire deflecting relationship to said longitudinal opening, a window in said hollow member, said window exposing a portion of said terminal pin when said terminal pin is loaded in said hollow member.

4. In a device for staking a self-supporting terminal pin having resilient contact wipers to a self-supporting, flexible terminal lug, in combination, a first member having an internal guide region passing longitudinally from end to end thereof, one end of said internal guide region having a shape suitable for axially receiving a terminal pin, said end lying in a plane which is substantially perpendicular to the longitudinal axis of said guide region, a section of said guide region at said end being exposed by a longitudinal opening in said first member, a second member, slidably mounted in said guide region, for longitudinally driving a terminal pin which is loaded in said one end of said guide region, said second member being provided with a deflecting surface near the end thereof, said deflecting surface being adapted to deflect a wire which is fastened to the terminal pin outwardly through said longitudinal opening and away from the tip of the terminal pin to thereby expose the adjacent tip of the terminal pin to the driving end of said second member.

5. In a device for staking a wire-bearing, self-supporting terminal pin having resilient contact wipers to a self-supporting, flexible terminal lug, in combination, a hollow member having a longitudinal opening in the wall at one end thereof, a drive member movably mounted within said hollow member, said drive member having a wire deflecting surface at the tip thereof whereby the wire fastened to the terminal pin may be deflected away from the tip of the terminal pin, through said longitudinal opening, to allow a driving contact between the adjacent tip of the terminal pin and the driving end of said drive member, means for maintaining said predetermined alignment between said deflecting surface and said opening, said hollow member being adapted to axially receive a terminal pin and to guide the longitudinal movement thereof when said drive member moves longitudinally within said hollow member.

In a device for staking a wire-bearing, self-supporting terminal pin having resilient contact wipers to a self-supporting flexible terminal lug, in combination, a hollow member having an internal guide region passing axially from end to end thereof, said guide region having a cross-sectional shape suitable for axially receiving a terminal pin, a longitudinal opening in the wall of said hollow member at one end thereof, said longitudinal opening having a width suitable for receiving a wire which is fastened to a terminal pin as the terminal pin is being loaded into said internal guide region, a drive member slidably mounted within said internal guide region, said drive member having a tip so shaped that said drive member can pushingly engage the adjacent tip of the loaded terminal pin without crushing the insulation of the wire fastened thereto, the contact between said internal guide region and the terminal pin providing lateral support to the terminal pin and, thereby, to the terminal lug, while the advance of said drive member applies a longitudinal staking force to the tip of the terminal pin.