

- [54] **CRIMPING TOOL FOR SOLDERLESS ELECTRICAL CONNECTORS**
- [72] Inventor: **Richard J. Wunder**, Richboro, Pa.
- [73] Assignee: **Thomas & Betts Corporation**, Princeton, N.J.
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3,314,135	4/1967	Smith.....	29/203
2,992,576	7/1961	Evans et al.....	72/410
2,774,268	12/1956	Kagan.....	72/410
1,321,208	11/1919	Hinnershitz.....	72/410
511,991	1/1894	Biggs, Sr.....	72/410

Primary Examiner—Charles W. Lanham
Assistant Examiner—Michael J. Keenan
Attorney—David Teschner

- [52] **U.S. Cl.**.....72/410, 29/203 H, 81/418
- [51] **Int. Cl.** B21d 9/08
- [58] **Field of Search** 72/409, 410; 29/243.56, 282, 29/628, 629, 630, 212 R, 212 D, 203 H, 203 HC, 203 HM; 81/418

[56] **References Cited**

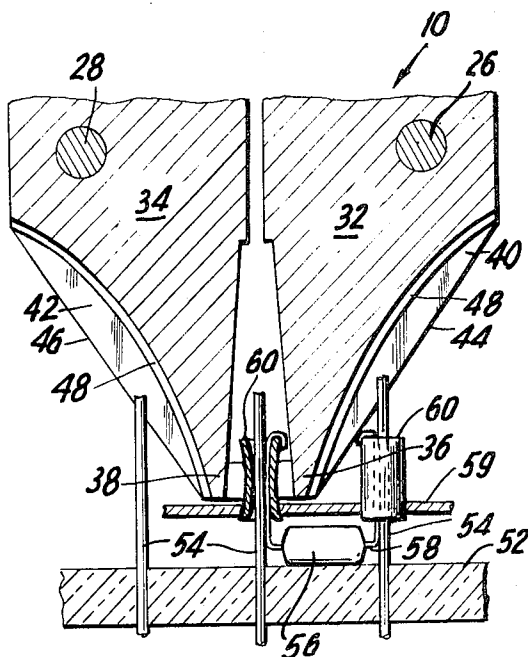
UNITED STATES PATENTS

1,753,080	4/1930	Zwilling, et al.....	81/418
1,225,180	5/1917	Schaub.....	72/410

[57] **ABSTRACT**

A hand type crimping tool for use with connectors to be applied to small, closely spaced terminals posts is provided with channels along the backsides of the nose portion of the tool to provide clearance for adjacent terminal posts during a crimp operation, and further includes upstanding, integral web sections defining the channel sidewalls which carry crimping loads applied at the nib section of the tool.

2 Claims, 4 Drawing Figures



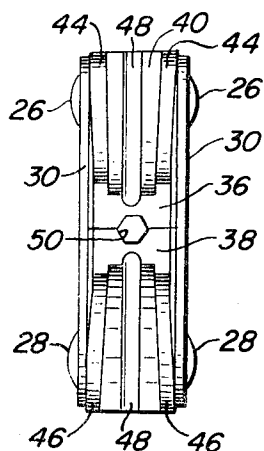


FIG. 4

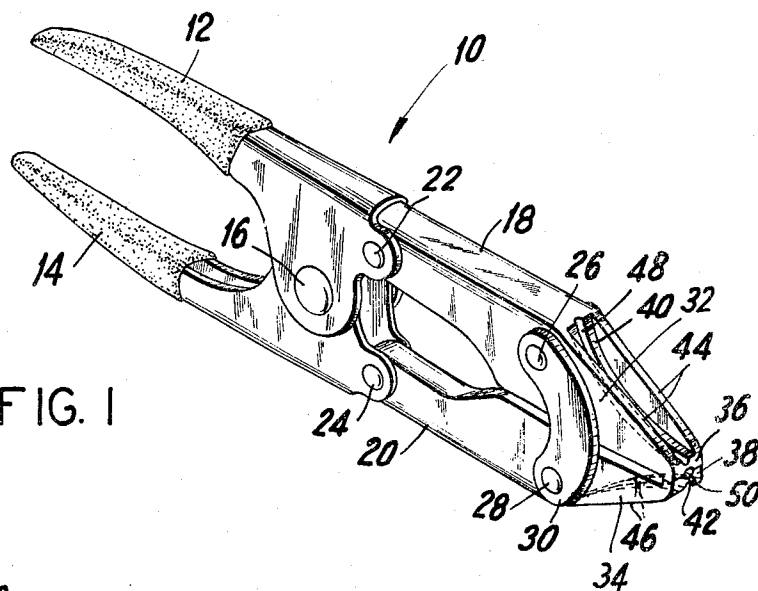


FIG. 1

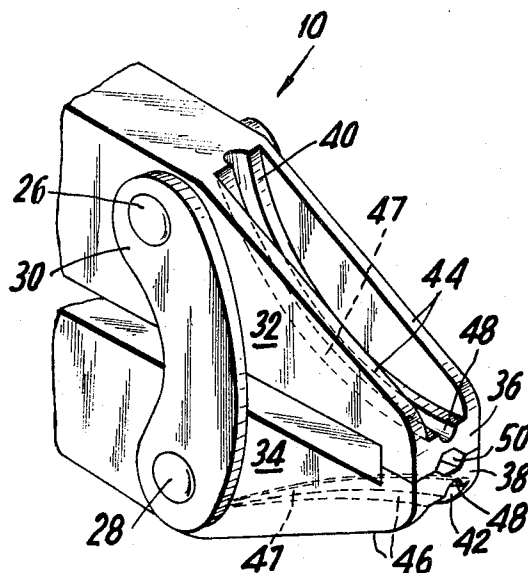


FIG. 2

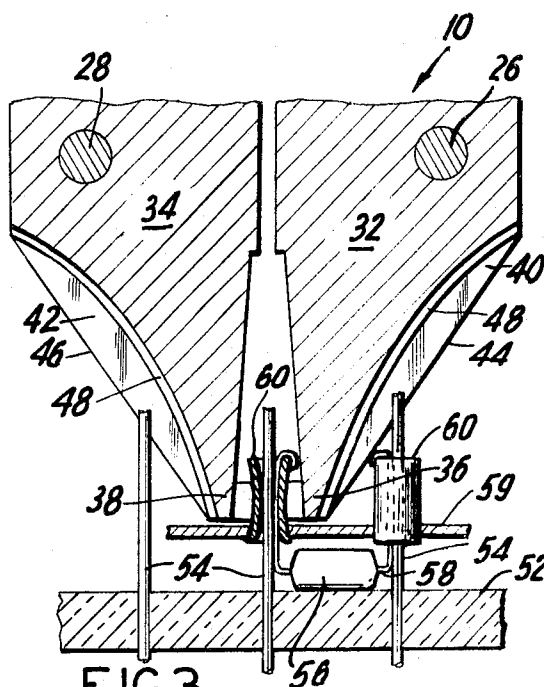


FIG. 3

INVENTOR.
RICHARD J. WUNDER

BY

Thomas M. Marshall
ATTORNEY

CRIMPING TOOL FOR SOLDERLESS ELECTRICAL CONNECTORS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a hand held crimping tool for use in applying solderless electrical connectors to terminal posts.

2. Description of the Prior Art

Recent developments in electronics technology have resulted in the increasing use of circuit boards having components and integrated circuit packs mounted thereon, these being secured mechanically and conductively to upstanding terminal posts provided on the circuit boards. This securing is achieved through the use of, for example, solderless connectors which are crimped to bind leads and terminal posts together. With the advent of miniaturization in this field, with terminal posts on the order of 0.025 inch square and spaced on 0.100 inch centers, for example, it was found that crimping tool designs of the prior art were either totally incapable of use because of their inability to fit between the posts without damaging same, or, if they were sufficiently small at their working end to fit between the posts, they did not possess sufficient rigidity to perform a satisfactory crimp, particularly with harder connector materials. In short, prior art crimping tools of the plier type simply have not been designed to function under extremely close tolerance conditions and with sufficient rigidity to perform a crimp at a relatively high force level.

SUMMARY OF THE INVENTION

This invention embodies a plier type crimping tool specifically designed for close tolerance operation at its working or nose end, while still possessing a high level of rigidity in the nib area. This is accomplished by providing channels extending along the back portions of the plier nibs, the channels having upstanding, integral outer web sections defining the channel sidewalls for transmitting the working force to the nibs for crimping a lead to a terminal post, while permitting clearance for adjacent terminal posts by enabling them to extend into the channel areas during a crimping operation. Thus, the channels provide the close tolerance feature of the subject tool, while the outer web sections provide the rigidity needed for relatively high force level crimping operations. A preferred embodiment of the present invention is described in full below, in conjunction with the accompanying drawings. The novel features are set forth with particularity in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the crimping tool embodying this invention;

FIG. 2 is an enlarged perspective view of the nib end of the crimping tool shown in FIG. 1;

FIG. 3 is an elevational and partial cutaway view of the tool of this invention performing a crimping operation in a typical environment; and

FIG. 4 is a front view of the tool of this invention illustrating the tapered nose portions which form the forward extremities of the tool jaw members.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the drawings, the crimping tool 10 of this invention is a plier type tool intended for hand use in performing crimping operations for securing connectors on closely spaced terminal posts; this function will be more clearly described below in connection with the discussion of FIG. 3. Crimping tool 10 includes handle lever portions 12 and 14 pivotally fulcrumed at pin 16 towards their forward ends and pivotally attached to the jaws 18 and 20 of the tool 10 through hinge pins 22 and 24. The jaw members 18 and 20 in turn are pivotally fulcrumed at pins 26 and 28 which are held in fixed, spaced relationship by links 30 which are provided on opposite sides of the jaw members 18 and 20. The structure described thus far is generally conventional, and it is obvious that, with this arrangement of levers, fulcrums and hinge pins, manipulation of handles 12 and 14 produces opening and closing motion of the forward or nose ends of the jaw members 18 and 20 with a force magnification the degree of which depends on the leverage designed into the tool by variation of the lever lengths and selection of pivot point locations.

The nose end of pliers 10 is seen best in FIG. 2 and comprises opposed, tapered nose portions 32 and 34 which form the forward extremities of jaw members 18 and 20. The nose portions 32 and 34 include female crimping die halves 36 and 38 respectively, which form the nibs of the tool 10. A clearance gap is provided between the nose halves 32 and 34 behind the nibs 36 and 38. The nose portions 32 and 34 are preferably tapered both in their plane of motion (up and down) as well as across their transverse dimension (side to side) towards the nib end, as illustrated in FIGS. 1 and 2.

The nose portions 32 and 34 are further provided with channels 40 and 42 extending along the respective backsides thereof. Upstanding, integral web sections 44 and 46 extend along opposite sides of the nose portions 32 and 34, respectively, the web sections 44 and 46 defining the sidewalls of channels 40 and 42. The bottom surfaces 47 of each channel 40, 42 may be grooved as at 48 for all or a portion of the channel length for reasons which will be discussed below. The channels 40, 42 are also shown as having arcuate bottom surface 47 for ease in manufacturing, and to produce a nose portion between webs 44, 46 that reduces its cross section as the nibs 36, 38 are approached. However, it should be clear that any suitable bottom surface configuration which would provide a structurally sound nose section of the crimping tool would be satisfactory. Also, the web sections 44 and 46 are shown tapering down from the full width of the nose sections 32-34 at the rear portions thereof to narrow widths adjacent the nibs 36 and 38. Obviously, various other configurations of web cross sections could be envisioned as the full equivalents of the webs 44, 46 illustrated, these coming within the scope of the invention as claimed below. A female die cavity 50 formed by cutouts in the mating faces of the nibs 36, 38 is shown hexagonal in configuration in this instance, since this form is desirable for use in crimping connectors on small, square terminal posts which are used in certain circuit board applications. However, it should be understood that the invention

contemplates that the crimping die could be of any desired configuration capable of fitting within the nib cross sectional area. Moreover, it should be clearly understood that the basic plier unit of handles, pivots and jaws may be of any desired form which will produce a closing action of the nibs, the illustrated plier unit being exemplary of a type that could be used with the novel channel-backed nose portions of the present crimping tool.

FIG. 3 shows a typical application of the crimping tool shown in FIG. 1. In FIG. 3, member 52 is a circuit board having multiple upstanding terminal posts 54 between a pair of which can be mounted an integrated circuit pack 56 having leads 58 extending from opposite sides thereof, and upwardly along a pair of terminal posts 54. Connector elements 60, which are generally tubular prior to crimping, each encompass a terminal post 54 and a lead wire 58. A non-conductive retainer sheet 59 is shown supporting the connectors 60, and forms a part of the circuit board assembly. The nibs 36 and 38 of crimping tool 10 are shown completing a crimp operation on a connector 60. It will be evident that clearance gap 40 allows a portion of the crimped connector to bow outwardly above the crimping die section of the nibs 36 and 38 and generally provides relief clearance for the nibs.

In the environment in which it is contemplated this tool will be used, as illustrated in FIG. 3, the size of terminal posts 54 are in the order of 0.025 inches, and the spacing between the posts may be as little as 0.100 inches. Obviously the closeness of the posts requires a tool for crimping the connectors that can fit between the terminals without damaging them while still having a nose cross sectional configuration that enables the transmittal of relatively large crimping forces to the nib sections. These objectives are met by the present invention by means of the channel back nose portions 32 and 34 and the upstanding, integral web portions 44, 46. As seen in FIG. 3, during operation, the nose sections 32, 34 of tool 10 can be readily inserted between a pair of closely spaced terminal posts 54 to perform a crimp on connector 60, with the adjacent terminal post or posts extending into the channel regions 40, 42 of the tool 10. The grooves 48 may be provided to supply even more clearance for extremely close clearance conditions; that is, grooves 48 can be proportioned to either or both the size of the die cavity 50 and the size of ter-

minal posts 54 so that the posts adjacent the one being crimped can extend into the grooves 48 along a portion of their lengths or at least at their tips. As indicated above, grooves 48 can extend the full length of channels 40, 42 or only part way therealong, or may be omitted if extreme clearance requirements are not necessary. It should be noted that the motion of jaws 32 and 34 at the nib end is very small, with force magnification being relatively high to further minimize clearance requirements. The webs 44 and 46 transmit the majority of the compressive crimping forces to the nibs 36, 38 and provide a rigid nose section of tool 10 under high stress conditions, considering the generally reduced cross sectional area of the nose end of tool 10.

What is claimed is:

1. In a plier type crimping tool, including handles, lever members and pivot pins for causing compressive forces to be applied between the nibs of the tool upon actuation of the handles, the improvement comprising: nose portions for said tool having nib portions therebetween for performing the crimping operations;

channels extending along the backsides of said nose portions for at least a portion of their length opposite the nib portions; and

upstanding web sections defining at least a portion of the sidewalls of said channels and being longitudinally co-extensive therewith, said nose portions, including said web portions, being of reduced cross-sectional area in a symmetrical, tapered manner both in the plane of motion of the nose portions, and in a plane transverse thereto as the nib portions are approached, said upstanding web sections and said nib portions being integral with said nose portions, and said nib portions further including female crimping die sections on their mating faces to form a die cavity therebetween when the nibs abut each other, with the bottoms of said channels being grooved at least in the areas opposite the nibs, the grooves corresponding in width generally to the female die sections of the nibs.

2. The crimping tool of claim 1 wherein the said channels have bottoms that are arcuate so that the cross sectional areas of material forming the nose portions between the upstanding web sections decrease as the nib portions thereof are approached.

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