# United States Patent [19]

**Serrano**

[11] **3,820,218**

[45] **June 28, 1974**


[54] **TERMINAL INSERTING APPARATUS**


[75] Inventor: **Pedro Serrano,** Barcelona, Spain

[73] Assignee: **AMP Incorporated,** Harrisburg, Pa.



[22] Filed: **Feb. 14, 1973**

[21] Appl. No.: **332,536**

[30] **Foreign Application Priority Data**

Feb. 29, 1972 Spain ..... 400262

[52] **U.S. Cl.** ..... **29/203 B**

[51] **Int. Cl.** ..... **H05k 13/04**

[58] **Field of Search** ..... 29/203 B, 203 D, 203 TS, 29/203 T, 203 P



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 3,293,735 | 12/1966 | Lovendusky | 29/203 B |
| 3,763,540 | 10/1973 | Long, Jr. | 29/203 B |



*Primary Examiner*—Thomas H. Eager

*Attorney, Agent, or Firm*—William J. Keating; Frederick W. Raring; Jay L. Seitchik



[57] **ABSTRACT**

Apparatus for inserting terminals into printed circuit boards comprises a reciprocable ram which actuates a shear block for shearing the leading terminal from a strip of terminals and which also actuates a punch for inserting the sheared terminal into a printed circuit board. The problem of transferring the sheared terminal to the punching station is solved by using a U-shaped member having two spaced arms extending from an intermediate straight portion. The shear block is slidable on the straight portion and a compression spring acting between one of the arms and the shear block biases the other arm towards the shear block to urge the leading terminal against the shear block which continues in the shear direction until the sheared terminal is aligned with the punch.


**3 Claims, 7 Drawing Figures**

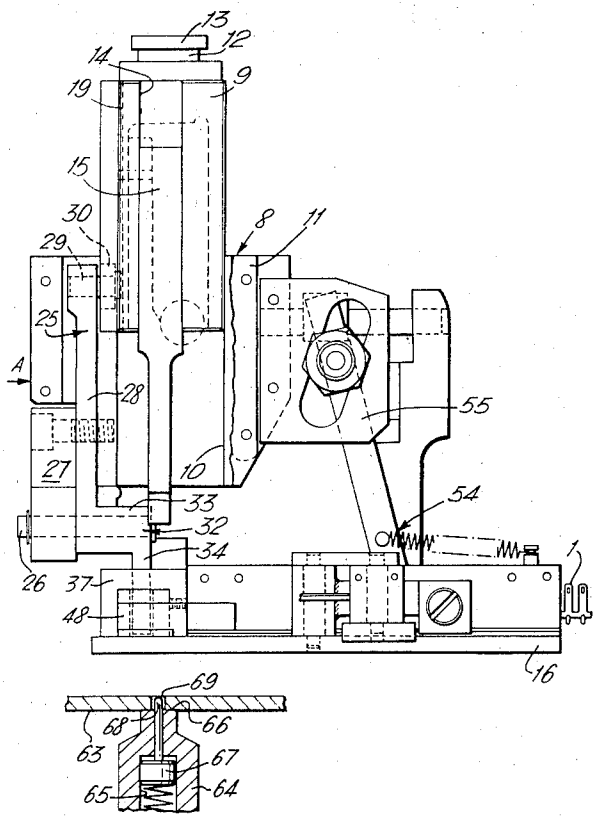


Fig. 1.

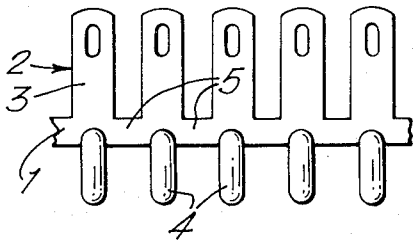

2
3
5
1
4

Fig. 2.


13
12
14
9
19
15
30
8
11
29
25
A
28
55
27
10
54
33
32
34
1
26
37
48
16
69
68
66
63
67
65
64

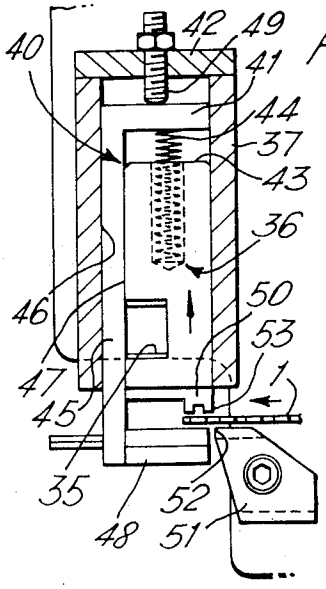



Fig. 5.

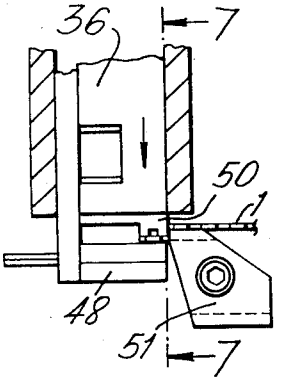



Fig. 6.

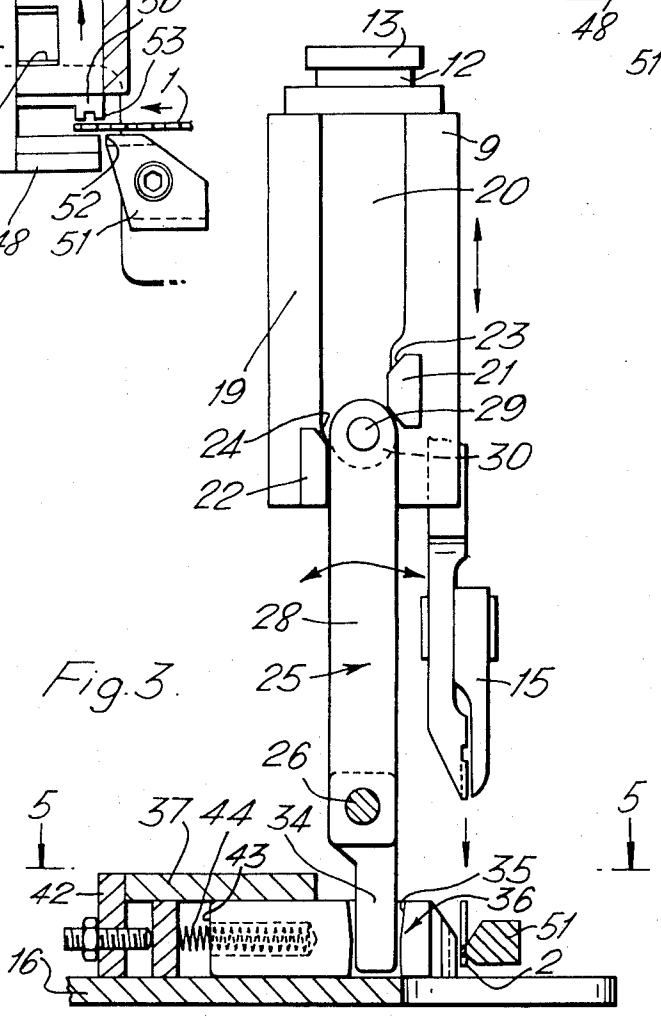



Fig. 3.

Fig. 4.

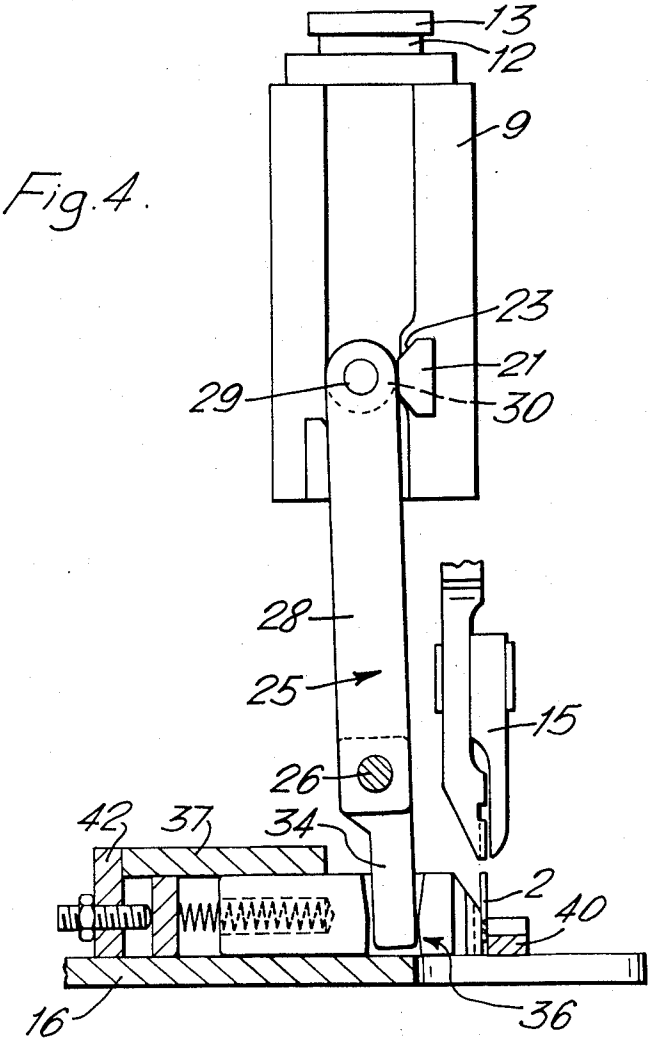
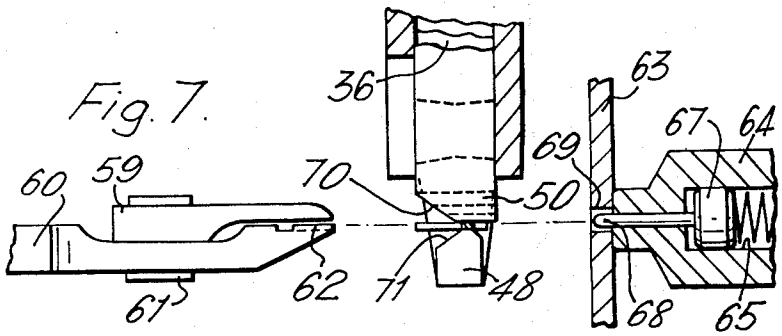

13
12
9
23
21
29
30
28
25
15
26
42
37
34
2
40
16
36

Fig. 7.


36
63
67
64
69
60
59
70
50
62
71
48
68
65

# TERMINAL INSERTING APPARATUS

This invention relates to apparatus for severing electrical terminals from a carrier strip carrying a plurality of electrical terminals in side-by-side relationship and securing the electrical terminals to a panel.

Such an apparatus is described and claimed in the specification of our Co-pending application Ser. No. 207,803, now U.S. Pat. No. 3,763,540; the present invention is a modification of or improvement in the earlier apparatus.

According to the present invention apparatus for severing electrical terminals from a carrier strip carrying a plurality of electrical terminals in side-by-side relationship and securing the electrical terminals to a panel comprises a mechanism for intermittently feeding the strip along a predetermined feed path to position successively leading terminals at a shear block movable along a shearing direction laterally of the feed path, a U-shaped member comprising a first arm serving as a terminal gripping member and a second arm joined to the first arm by a straight portion extending along the shearing direction of the shear block which is slidably positioned between the arms against the straight portion, the terminal gripping member having a terminal engaging end spaced from a terminal engaging end of the shear block and being resiliently biased relatively towards the shear block by a compression spring located between the second arm and the shear block for gripping the leading terminal, the shear block being cooperable with a shear blade to sever the leading terminal and position it in the path of an insertion punch having terminal gripping jaws and movable in a direction laterally of the direction of movement of the shear block.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is an enlarged view of part of a strip of tabs;

FIG. 2 is a front elevational view of a machine for inserting electrical tabs into a printed circuit board;

FIG. 3 is a view taken in the direction of the arrow A in FIG. 2 and showing diagrammatically the main moving parts of the machine immediately prior to a cycle of operation;

FIG. 4 is a view similar to FIG. 3 but with the machine having completed part of a cycle of operation;

FIG. 5 is a diagrammatic sectional view taken on lines 5—5 of FIG. 3;

FIG. 6 is a view similar to FIG. 5 but with the machine having completed part of a cycle of operation; and

FIG. 7 is a sectional view on line 7—7 of FIG. 6.

As shown in FIG. 1, a terminal strip 1 comprises tab terminals 2 each having a flat tab portion 3 and a post portion 4 which is slightly arcuate in cross-section. The terminals 2 are joined as a strip by means of integral metal slugs 5. The present invention is a machine for inserting the post portions 4 of severed terminals 2 into holes in a printed circuit board, the tab portions 3 projecting from the surface of the printed circuit board for engagement with a suitable receptacle.

Such a machine is indicated generally in FIG. 2 by the reference numeral 8. The machine 8 includes a ram 9 slidable in a recess 10 of a housing portion 11. The ram 9 is provided at its upper end with a post 12 having an enlarged head 13 which is adapted to engage in a complementary recess of a press ram forming part of a standard pneumatic bench press (not Shown). A slot 14 extending longitudinally of the ram 9 receives an upper end portion of an insertion punch 15 rigidly connected to the ram 9 by a screw (not shown), the lower end portion of the insertion punch 15 being spaced from a base plate 16 along which the terminal strip 1 is fed.

The left-hand surface 19, as seen in FIG. 2, of the ram 9 is provided with a shallow longitudinally extending groove 20 seen in FIGS. 3 and 4. Two projections 21 and 22 are provided on the surface 19, one on each side of the groove 20, to define respective cam surfaces 23 and 24.

A lever 25 is pivotally connected to a bracket 27 by means of a pin 26 extending perpendicularly with respect to the longitudinal axis of the ram. The bracket 27 is rigidly connected to the housing portion 11 by means of a bolt (not shown). An upper arm 28 of the lever 25 has a pin 29 extending parallel to the pin 26, the pin 29 rotatably mounting a roller 30 dimensioned to be received in the groove 20 in the surface 19 of the ram 9 and to engage the cam surfaces 23 and 24 on longitudinal movement of the ram 9. The lever 25 is shaped as an inverted L at its bottom end portion 32, one leg 33 of the L extending along the axis of the pin 26, as seen in FIG. 2, and the other leg 34 extending parallel to the projected axis of the upper arm 28. The free end of the leg 34 is received in a through lateral slot 35 provided in a shear ram or block 36 slidably mounted between the base plate 16 and a guide 37 for movement of the shear block 36 in a direction perpendicular to the plane of the paper in FIG. 2.

A generally U-shaped terminal holder 40, best seen in FIG. 5, is received in the guide 37. One arm 41 of the terminal holder 40 is positioned between an end plate 42 of the guide 37 and an end 43 of the shear block 36, the arm 41 being spaced from the end 43 by a compression spring 44 and from the end plate 42 by an adjustable stop 49. An elongate bight portion 45 of the terminal holder 40 is positioned between a surface 46 of the guide 37 and a surface 47 of the shear block 36 so that relative sliding movement between the terminal holder 40 and the shear block 36 is possible. A second arm 48 of the terminal holder 40 extends parallel to the first arm 41 and is spaced from an end 50 of the shear block 36 to define a space for reception of the leading terminal 2 of the strip 1. A shear blade 51 mounted on the base plate 16 has a shear edge 52 positioned to cooperate with an edge 53 of the shear block 36.

A feed mechanism generally referenced 54 is seen at the right-hand portion of FIG. 2. The feed mechanism 54 is conventional and will not be described in detail. It should be sufficient to note that it includes a feed finger (not shown) driven through a linkage 55 connected to a cam follower (not shown) driven by a cam surface (not shown) on the ram 9, the feed finger engaging and indexing the strip 1 in synchronism with movement of the shear block 36.

The insertion punch 15, most clearly shown in FIG. 7, comprises two fingers 59 and 60 rigidly connected together by a bolt 61. The finger 60 has an axial groove 62 accommodating an axially extending wire spring (not shown) anchored to the bolt 61.

The insertion machine 8 is mounted above a panel 63 supported in spaced relationship to the base plate 16 by an anvil 64 having an internal cavity 65 opening onto

the top surface 66 of the anvil and accommodating a plunger 67. The plunger 67 has a nose 68 and is spring biased upwardly so that the nose 68 protrudes out of the cavity 65 and into a hole 69 in the panel 63.

At the beginning of an operating cycle of the machine 8, its moving parts are positioned as shown in FIGS. 3 and 5. The ram 9 is in its fully retracted (upward) position and the shear block 36 is in a corresponding retracted (leftward as seen in FIG. 3) position so that the end 50 of the shear block 36 does not quite engage the leading terminal 2 of the strip 1, this terminal being received in the space between the end 50 and the arm 48 of the terminal holder 40.

The operator positions the panel 63 on the surface 66 of the anvil 64 and actuates the start switch of the bench press. The ram 9 is depressed from the position shown in FIG. 3 to that of FIG. 4. In the movement between these two positions, the cam surfaces 23 and 24 engage the roller 30 to pivot the lever 25 counterclockwise as seen in FIG. 3 to the position shown in FIG. 4. The shear block 36 is consequently moved to the right as viewed in FIG. 3 to the position shown in FIG. 4. As most clearly seen in FIG. 6, this causes the leading terminal 2 to be sheared from the strip 1 between the edge 53 of the shear block 36 and the edge 52 of the shear blade 51. The sheared terminal is held between the end 50 of the shear block 36 and the arm 48 of the terminal holder 40 by the force exerted by the compression spring 44, and is positioned directly over the hole 69 in the panel 63 and under the insertion punch 15. The sheared terminal is gripped in this way while the roller 30 engages the vertical portion of the cam surface 23 (see FIG. 4).

As the ram 9 descends the insertion punch 15 also descends and is arranged to receive in its groove 62 the tab portion 3 of the sheared terminal 2 while this terminal is gripped between the shear block 36 and the terminal holder 40. With reference to FIG. 7, it is to be seen that the end 50 of the shear block 36 and the arm 48 of the terminal holder 40 are chamfered at 70 and 71 to provide a mouth for reception of the insertion punch 15. Just as the insertion punch 15 grips the terminal 2, the roller 30 has reached the upper end of the vertical portion of the cam surface 23, so that on further downward movement of the ram 9 the lever 25 is rotated clockwise as viewed in FIG. 4 and the shear block is returned to its original position to free the sheared terminal 2 and move out of the path of the insertion punch 15. The insertion punch 15 on its continued downward travel engages the arm 48 of the terminal holder 40 and pushes the arm 48 against the bias of the compression spring 44 out of the path of the insertion punch. When the ram 9 is fully extended, the post portion 4 of the sheared terminal 2 has been inserted in the hole 69 in the panel 63, the nose 67 in the anvil 64 being depressed against its spring bias. The ram 9 is then fully retracted returning the parts to their original positions shown in FIG. 3 and leaving the sheared terminal 2 secured to the panel 63.

What is claimed is:

1. Apparatus for severing electrical terminals from a carrier strip carrying a plurality of electrical terminals in side-by-side relationship and securing the electrical terminals to a panel, the apparatus comprising a mechanism for intermittently feeding the strip along a predetermined feed path to position successively leading terminals at a shear block movable along a shearing direction laterally of the feed path, a U-shaped member comprising a first arm serving as a terminal gripping member and a second arm joined to the first arm by a straight portion extending along the shearing direction of the shear block which is slidably positioned between the arms against the straight portion, the terminal gripping member having a terminal engaging end spaced from a terminal engaging end of the shear block and being resiliently biased relatively towards the shear block by a compression spring located between the second arm and the shear block for gripping the leading terminal, the shear block being co-operable with a shear blade to sever the leading terminal and position it in the path of an insertion punch having terminal gripping jaws and movable in a direction laterally of the direction of movement of the shear block.

2. Apparatus according to claim 1, in which an adjustable stop member is located on the side of the second arm remote from the spring and engageable with the second arm to limit movement of the first arm towards the shear block.

3. Apparatus according to claim 1, in which the insertion punch is directly connected to a ram and the shear block has a slot receiving one arm of a lever pivotable about a fixed pin, the lever having another arm carrying a roller engageable with cam surfaces on the ram.

* * * * *