

A POSITIONING AND CLAMPING DEVICE OF A BOARD

DETAILED DESCRIPTION OF THE INVENTION

[Industrial Field of Utilization]

The present invention relates to a device for positioning a board before processing
5 such as perforating at a predetermined location and clamping it in a normal attitude.

[Prior Art]

In a conventional perforating device of a printed circuit board, unprocessed circuit
boards are stocked in a stock box of a stock means, adsorbed by a chuck of a carrier
means in due order from a board at the topmost location and are transferred to a
10 positioning means. The position of the printed circuit board fed by the positioning means
is not accurate and is rather at an approximate location. Therefore, after accurately
positioning the board by the positioning means in conformity with a predetermined
standard location, the board is transferred to a perforating means while being in the
positioned state and predetermined portions of the printed circuit board are perforated by
15 drills of a perforating means.

The present invention relates to an improvement in a means for positioning a
printed circuit board at a proper location. In a first example of a conventional positioning
means, two pivotally fixed rollers opposing a first side of a square circuit board are
provided, one pivotally fixed roller opposing a second side orthogonal the first side is
20 provided and pivotal movable rollers which push the board to make it contact the
respective fixed rollers are provided for pushing the printed circuit board in X and Y
directions to thereby position it at a standard location (Japanese Patent Laid-open No.
85285/1982).

In a second conventional example, fixing side positioning members which contiguous two sides of a printed circuit board can respectively contact are provided in a vertically movable fashion. In order to bring the two sides of the printed circuit board into contact with the respective fixing side positioning members, a transverse direction positioning device and a longitudinal direction positioning device are installed at locations proximate to the remaining other two sides of the printed circuit board, rollers are respectively provided to both of the transverse and longitudinal direction positioning devices. Further, when the printed circuit board is fed on a table, the board is moved with the casters of the longitudinal and transverse direction positioning devices being guided by guide grooves, the printed circuit board is moved in a direction of a positioning member on the fixing side and the two sides of the board are brought into contact with the fixing side positioning member thereby positioning the printed circuit board at a reference location (Japanese Patent Laid-open No. 31959/1988).

[Problems that the Invention is to Solve]

However, both in the first and the second conventional examples, fixing side or moving side positioning means (pins or rollers) are installed at an outer periphery of the four sides of the transverse square printed and par circuit board. Therefore, a space for installation is enlarged which deteriorates a space efficiency. Particularly the location of the positioning means on the moving side must be moved to be adjusted in conformity with various sizes of the printed circuit board which further deteriorates the space efficiency. Further, cutting chips are scattered in perforating operation, and if there are guide grooves as in the second conventional example, the chips are piled up in the guide grooves causing to lower the accuracy of positioning. Further, it is necessary to retract the positioning means such that it does not create a hindrance in feeding the board and normally the

positioning means has a structure in which pins and the like are escaped to a lower portion of the table. That is, pins and the like are provided at the lower portion of the table such that they protrude above the table in the positioning operation. Therefore, it is naturally necessary to provide guide grooves having an elongated hole shape to make them movable.

5 It is an object of the present invention to provide a positioning and clamping device of a board having an improved space efficiency.

[Means of Solving the Problems]

According to an aspect of the present invention, there is provided a positioning and clamping device of a board including a plurality of clamping means disposed along a side
10 of the board for clamping an edge portion of the board and a dragging means of the board disposed between the plurality of clamping means for dragging the board wherein the clamping means is provided with a positioning member, the dragging means comprises a board clamping portion and a reciprocating means for reciprocating the board clamping portion and the board clamping portion pivotally clamps the board.

15 [Examples]

An explanation will be given of embodiments of the present invention in reference to drawings as follows.

As shown in Figure 5, unprocessed printed circuit boards W are stocked in a stock box of a stock means A, adsorbed by a suction chuck b of a carrier means B in due order
20 from the topmost board and are fed to a positioning and clamping device (clamper) C. The board is positioned at a predetermined standard location by the positioning and clamping means C and is transferred to a perforating means D while being clamped. Predetermined portions of the printed circuit board are perforated by drills of the perforating means D and thereafter discharged to the outside by discharge rollers R.

In the structure of the positioning and clamping means C according to the present invention, a plurality of clamping means for clamping an edge portion of a printed circuit board are arranged along a side of a printed circuit board and a dragging means of the printed circuit board is arranged between the clamping means. An explanation will be
 5 given of respective specific structures of the clamping means and the dragging means.

As shown Figure 1, in the positioning and clamping means C a plurality (two in this embodiment) of clamping means 1a and 1b are installed along a side wl of the printed circuit board W and a dragging means 2 is installed between the plurality of the clamping means. Both the clamping means and the dragging means are provided on a mounting base
 10 3. The mounting base is mounted on an XY table device 4 (refer to Figure 2) which are movable in X and Y directions although a detailed explanation will not be given thereto. The clamping means 1a designates a left claw while the clamping means 1b designates a right claw. However, both have the same structure and explanation will summarizingly given thereto as a clamping means 1.

15 As shown in Figure 1 through Figure 3, in the clamping means 1 a lower claw 6 is fixed and an upper claw 7 overlaps the lower claw and the printed circuit board is pinched between the both claws. A mounting plate 5 which is slidable in the front and back (left and right) directions along linear guides 5a is mounted on the upper face of the mounting base 3 and a lower claw mounting member 6a to which the lower claw 6 is
 20 fixed, is fixed on the lower face of a front end portion (left end portion) of the mounting plate. An upper claw mounting member 7a to which the upper claw 7 is fixed is pivotably connected to the lower claw mounting member 6a via a connecting pin 8. Positioning pins 6b which are positioning members are protruded from the lower claw 6 and a position of an end face of a side of the print circuit board is regulated by the positioning means.

A back end portion 7b of the upper claw mounting member 7a is connected to the mounting plate 5 via a linked mechanism L. The upper claw 7 is opened and closed with respect to the lower claw 6 by converting a linear motion of a rod 11a of a cylinder 11 into a pivotal motion of the upper claw mounting member 7a via a connecting member 12 that is fixed to the linked mechanism L. That is, the connecting member 12 is reciprocated by the action of the cylinder 11. Then, arms 9 and 10 are pivoted via a connecting pin and the upper claw mounting member 7a are pivoted in correspondence therewith. The cylinder 11 is mounted on a mounting plate 13 fixed to the mounting plate 5 in a slightly pivotal fashion in the up and down direction.

10 The standard location of the printed circuit board W regulated by the positioning pins 6b provided at the lower claw 6 is adjusted by reciprocating a cylinder rod 14a of a cylinder 14 fixed to the mounting base 3. That is, the movement of the front end portion of the cylinder rod 14a is transferred to the support plate 5 via a shock absorber 15 fixed to a connecting plate 16 that is fixed to the mounting plate 5. A total of the clamping
15 means is moved by the forward and backward movements of the support plate 5 and the locations of the positioning pins 6b are adjusted to proper locations by moving them forwardly and backwardly.

As shown in Figure 3 a device for detecting whether the printed circuit board is clamped or not is provided between the upper claw 7 and the lower claw 6. In this
20 detecting device, a groove 6c is provided at the central portion of the lower claw 6 and a detecting lever 17 disposed in the groove is pivotably supported by a connecting pin 17c. A front end portion 17a of the detecting lever 17 is disposed a little backward from the front end of the lower claw 6 and a back end portion 17b is bent upwardly and is protruded from an opening 7c provided on the upper claw mounting member 7a. An

access sensor 18 is fixed at the back of the back end portion 17b and the back end portion is urged backwardly by a spring 19. Therefore, the back end portion 17b is proximate to the access sensor 18 when the printed circuit board is not present thereby detecting the absence of the printed circuit board.

5 Next, an explanation will be given of a dragging means 2. As shown in Figure 4, the dragging means 2 comprises a board clamping portion 20 comprising a fixed lower claw (one claw portion) 21 and an upper claw (other claw portion) 22 which is attachable to and detachable from the lower claw and an open-close cylinder 23 as a means of driving to open and close the claw portions 21 and 22. Further, a reciprocating cylinder 26 is
10 installed as a means of reciprocating the board clamping portion 20.

The lower claw 21 is provided on the lower face of the open-close cylinder 23 via a lower claw mounting member 21a, the upper claw 22 is fixed to an upper claw mounting member 22a and the upper claw mounting member is fixed to an upper claw guide member 22b connected to a cylinder rod 23a of the open-close cylinder 23. The board
15 clamping portion 20 has a structure of pivotally pinching the printed circuit board, and the lower claw 21 and the upper claw 22 are provided with mutually opposing rotating disks 24a and 24b that are rotatable by bearings 25a and 25b.

The reciprocating cylinder 26 is supported by a support plate portion 27a of a base 27 fixed to the mounting base 3. A linear slide table 28 is reciprocally provided on the
20 base 27. A slider 30 dragged backwardly by a spring 29 the back end of which is hooked to the support plate portion 27a is fixed to the slide table. The retracted location of the slider 30 corresponds to the retracted location of the board clamping portion 20 which must be adjusted such that it is retractable backward from the positioning pins 6b of the clamping means 1a and 1b. The retracted location is determined by making the back end

of an adjusting screw 31 contact the front end of the cylinder rod 26a of the reciprocating cylinder 26. The open-close cylinder 23 of the board clamping portion 20 is fixed to the front end of the slider 30. The slider 30, the spring 29 and the like are covered with a cover 32.

5 An explanation will be given of the operation of this embodiment. The unprocessed print circuit board W which has been adsorbed by the suction chuck b of the carrier means B shown in Figure 5 and fed to the positioning and clamping means C, is at first dragged by the dragging means 2 as shown in Figure 6(a) in a simplified manner. That is, the upper claw 22 of the board clamping portion 20 is made rise by extending the cylinder rod 10 23a of the open-close cylinder 23 and at the same time the cylinder rod 26a of the reciprocating cylinder 26 is moved forwardly by which the slide table 28 and the slider 30 are moved forwardly against the spring 29 to a location at which the printed circuit board W can be pinched. Then the upper claw 22 is lowered by retracting the cylinder rod 23a and the edge portion of the side w1 of the printed circuit board W is pinched between 15 the lower claw 21 and the upper claw 22.

The printed circuit board W is brought into contact with the rotating plates 24a and 24b and the printed circuit board W is clamped pivotally at an arbitrary angle. When the printed circuit board W is in a slanted state as shown in Figure 6(a) and the cylinder rod 26a of the reciprocating cylinder 26 is retracted while clamping the board, the slide table 20 28 and the slider 30 are retracted by the spring force of the spring 29 and the printed circuit board W is dragged.

On the other hand, in the clamping means 1a and 1b, when the cylinders 11 are driven and their cylinder rods 11a are retracted, an angel made by the arms 9 and 10 is decreased by the linked mechanisms L. Therefore, the upper claw mounting members 7a

are pivoted in the clockwise direction with the connecting pins 8 as the center of pivoting and therefore, the upper claws 7 are at a location shown by chain lines of Figure 2 that is detached from the lower claws 6. At this instance the printed circuit board W does not reach the detecting arms 17 and therefore, the back end portions 17b thereof are

5 proximate to the access sensors 18 by the action of the springs 19 and the absence of the printed circuit board W is detected by the sensors 18.

Under this state the printed circuit board W is dragged by the dragging means 2 as mentioned above and the end face of the side w1 of the printed circuit board W is brought into contact with the positioning pin 6b of the clamping means 1a. When the

10 dragging continues under this state by the further action of the spring force, the printed circuit board W is rotated by the presence of the rotating plates 24a and 24b into the state of Figure 6(b) in which the board is also brought into contact with the positioning pin 6b of the clamping means 1b.

The printed circuit board W is mounted on the front end portions 17a of the

15 detecting arms 17 of the both clamping means 1a and 1b and the detecting levers 17 are pivoted in the anticlockwise direction centering on the connecting pins 17c against the spring force of the springs 19 by the load of the board. In this way, the arrival of the printed circuit board W at the predetermined location is detected and at this moment the cylinders 11 are driven. Further, when the cylinder rods 11a are moved forwardly, the

20 angle made by the links 9 and 10 are increased. Therefore, the upper claw mounting members 7a are pivoted in the anticlockwise direction with the connecting pins 8 as the center of pivoting by which the printed circuit board W is firmly clamped between the upper claws 7 and the lower claws 6.

Finally, when the upper claw 22 is made rise by driving the open-close cylinder

23 of the driving means 2 by which the clamping of the printed circuit board W is released and the cylinder rod 26a is retracted, the slider 30 is retracted to the predetermined retracted location by the action of the spring 29 thereby detaching from the printed circuit board W into a state shown in Figure 6(c). In this way, the board W is conformed to the
 5 standard location in Y direction by the positioning pins 6b.

Next, positioning in X direction is performed. A detecting means such as a reflex type optical sensor 3 is arranged in the midst of transferring route of the printed circuit board W to the processing means D by the clamping means 1a and 1b . As shown in Figure 6(c), when the end face of a side of the printed circuit board W reaches the
 10 location of the sensor 33, an output is caused in the sensor 33. The location of detecting this output is determined as the standard location. Therefore, the board W can accurately be transferred to a predetermined processing position by moving the clamping means 1a and 1b by a transfer distance from the standard location as the start point to the predetermined processing means D.

15 [Effect of the Invention]

As stated above, according to the present invention, a plurality of clamping means for clamping an edge portion of a board is arranged along a side of the board and a dragging means of the printed circuit board is arranged between the plurality of clamping means. Therefore, members for positioning and clamping are arranged at portions along
 20 one side of the printed circuit board and portions along the other sides are open by which the space can effectively utilized. Further, it is not necessary to provide guide grooves as in the conventional example and therefore, there is no concern of lowering the positioning accuracy caused by scattering cutting chips in perforating operation.

[BRIEF EXPLANATION OF THE DRAWINGS]

[Figure 1]

Figure 1 is a plane view of an embodiment of the present invention.

[Figure 2]

5 Figure 2 is a front view of a clamping means.

[Figure 3]

Figure 3 is a magnified sectional view of a front end portion of the clamping means.

[Figure 4]

10 Figure 4 is a front view of a dragging means.

[Figure 5]

Figure 5 is a front view showing a total of a processing device adopting the above embodiment .

[Figure 6]

15 Figures 6(a), 6(b) and 6(c) are explanatory views for explaining respective steps of the operation of positioning and clamping.

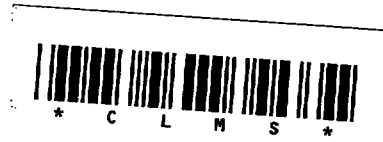
[Explanation of the Reference Numerals]

- | | |
|----------|--|
| 1 a, 1 b | : clamping means |
| 2 | : dragging means |
| 20 6b | : positioning means (positioning pin) |
| 20 | : board clamping portion |
| 23 | : open-close driving means (open-close cylinder) |
| 26 | : reciprocating means (reciprocating cylinder) |
| W | : board |
| 25 w1 | : side of board |

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Claims :-



Claim 1

A positioning and clamping device of a board comprising:

a plurality of clamping means disposed along a side of the board for clamping an

5. edge portion of the board;

a dragging means of the board disposed between the plurality of clamping means
for dragging the board; and

wherein the clamping means is provided with a positioning member, the dragging
means comprises a board clamping portion and a reciprocating means for reciprocating the
10 board clamping portion and the board clamping portion pivotally clamps the board.

Claim 2

The positioning and clamping device of a board according to Claim 1, wherein the
plurality of clamping means are transferable while clamping the board.

Claim 3

15 The positioning and clamping device of a board according to Claim 1 or Claim 2,
wherein the board clamping portion comprises a couple of claw portions respectively
provided with rotatable members at mutually opposed locations thereof and an open-close
driving means for opening and closing the couple of claw portions.

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