

① Original Spec
26-7-95② Replacement Sheet
7-2-96③ Replacement Sheet
1-5-12-96

Discharging Device for Plate-Like Works

Detailed Description of the Invention

5 The present invention relates to a plate-like
work discharge device for use with a processing
apparatus for drilling holes through a plate-like work
such as a printed circuit board and, more
particularly, to such type of discharge device that is
adapted to sort and then discharge processed
10 plate-like work depending on whether or not they are
good or bad.

Prior Art

15 In such discharging device, the sorting of
processed works is carried out according to the
conventional practice. In accordance with the prior
art discharging device, after the works are
temporarily discharged into a work receiver, a
separator including carrier means such as a conveyor
and switching means for the carrier means is arranged
as a separate device so that good works are separated
20 from bad works and then, the good works are
accommodated in a good work stocker and the bad works
are accommodated in a bad work stocker. In other
words, in the prior art devices, it has been necessary
to arrange the good work stocker and the bad work
25 stocker on the same plane.

30 However, such a device requires a large floor
space for installation. In order to improve such
conventional device, the present applicant previously
filed an application of the invention as disclosed in
Japanese Unexamined Patent laid-open No.88-31966. This
invention concerns a device in which the work carrying
distance is differentiated depending upon whether
processed works are good or bad so that bad works are
so piled as to project from good works by a
35 predetermined length.

Problems to be Solved by the Invention

40 In the above described discharging device made by
the present applicant, bad works can be readily
separated from the good works by being drawn out.
However, since the good works and the bad works are
not received into separate stockers at the time of
discharging them, they are not completely separated
from each other.

Accordingly, an object of the present invention



is to provide a plate-like work discharging device capable of discharging good and bad works in a completely separated condition so that it is not necessary to provide a separator, a space-saving can
5 be achieved and the manufacturing cost is reduced.

Means for Solving the Problems

In order to achieve the above described object, in accordance with the present invention, there is provided a plate-like work discharging device
10 comprising: a pair of discharging rollers opposed vertically to each other and provided at one end of a work table for processing plate-like works such as printed circuit boards; a first stocker adjacent to the pair or discharging rollers, located at a position
15 lower than the surface of the work table and capable of piling the plate-like works thereon; a second stocker located at a position higher than the surface of the work table and capable of piling the plate-like works thereon, the second stocker located above the
20 first stocker; driving means for driving the pair of discharging rollers to come into contact, or separate from, each other and an elevating device for elevating or lowering the pair of discharging rollers between an elevation position above the second stocker and a
25 lowering position below the second stocker.

Embodiment

An embodiment of the present invention will now be described with reference to the accompanying drawings.

30 Fig. 4 shows the entire construction of a machining device to which the present invention is applied wherein printed circuit boards W (as plate-like works) to be machined are stocked in a storage box of storage means A. The printed circuit
35 boards W are sequentially attracted from the one that is located at the uppermost position by an air chuck b of carrier means B and carried to positioning means C. The printed circuit board W on a work table T is positioned and clamped at a prescribed reference
40 position by the positioning means C, and then carried to perforating means D under this positioned state. Then, the printed circuit board W is subjected to machining such as a perforating operation at prescribed positions. That is, an image of the printed
45 circuit board W on which a reference pattern is printed is picked up by a camera (not shown), so that the central position of the pattern is detected in accordance with an image processing and that position



is perforated. After that, the printed circuit board W is discharged by a discharging device E.

5 The present invention relates to this discharging device E which is provided at one end of the work table T. As shown in Figs. 1 and 2, a base plate 1 is fixed to a part lower than the surface of the work table T. On the base plate 1, a pair of guide shafts 2 and 2 are provided upright at an interval substantially equal to the width of the work table T. 10 To the guide shafts 2 and 2, are slidably fitted liner guides 3, 3 and 4, 4. A motor roller fixing plate 5 and a follower roller fixing plate 15 are respectively fixed to the linear guides 3 and 4.

15 Pairs of brackets 6, 6 and 16, 16 are respectively fixed to the motor roller fixing plate 5 and the following roller fixing plate 15. A pair of discharging rollers which are vertically opposed to each other are held by these brackets. A discharging roller provided on the lower side is a motor roller 71 as a roller of a driving side. A discharging roller 20 provided on the upper side is a follower roller 72. These discharging rollers are respectively rotatably held and prevented from axially dropping by holding means 8 and 18.

25 On the upper surfaces of both ends of the motor roller fixing plates there are provided driving means which drives the pair of discharging rollers 7 to come into contact with, or to separate from each other. The driving means are constituted of a pair of right and 30 left cylinders 9. The lower end surface of each of the cylinders 9 is fixed to the motor roller fixing plate 5. One end of a cylinder rod 9a is secured to the follower roller fixing plate 15 by a connecting member 10. The follower roller 72 is engaged with, or 35 disengaged from, the motor roller 71 by driving the cylinders 9.

A sensor 11 is attached to the edge of the motor roller fixing plate 5 opposite to the work table T to detect that the printed circuit board W is separated 40 from the motor roller 71.

An elevating device for elevating or lowering a pair of discharging rollers 7 is provided on the lower surface at the center of the base plate 1. This elevating device is constituted of a cylinder 19. The 45 upper end surface of the cylinder 19 is attached to the lower surface of the base plate 1. A cylinder rod 19a passes through the base plate 1 and protrudes on the upper surface thereof. The end of the cylinder rod



19a is fixed to the central portion of the lower surface motor roller fixing plate 5 through a connecting member 20. The motor roller fixing plate 5 can be elevated or lowered by driving the cylinder 19.

5 A pair of tubular stoppers 21 and 21 are fixed to the upper surface of the base plate 1 and guide shafts 22 fixed to the lower surface of the motor roller fixing plate 5 pass therethrough. When the motor roller fixing plate 5 is lowered the guide shafts 22 pass

10 through the stoppers 21 and the base plate 1 and protrude downward. As flanges 22a abut against the stoppers 21, the lowering of the motor roller fixing plate is stopped. The elevating device serves to elevate or lower the pair of discharging rollers

15 between an elevation position and a lowering position as will be described hereinbelow. The lowering position can be adjusted by the stoppers 21. To the motor roller fixing plate 5, a printed circuit board guide plate 23 is attached. This guide plate serves as

20 a guide for easily providing with the printed circuit board upon the motor roller 71.

As apparently illustrated in Fig. 4, a first stocker 22 for piling good printed circuit boards Wg and a second stocker 23 for piling bad printed circuit

25 boards Wng are provided adjacent to the discharging rollers 7 in such a manner that the second stocker 23 is positioned above the first stocker 22. The first stocker 22 is provided at a position lower than the surface of the work table. The second stocker 23 is

30 provided at a position higher than the surface of the work table. The good printed circuit boards Wg are discharged onto the first stocker 22. The bad printed circuit boards Wng are discharged onto the second stocker 23. The elevation position of the

35 above-mentioned pair of discharging rollers 7 is higher than the position of the second stocker 23. The lowering position thereof is lower than the position of the second stocker 23. When the bad printed circuit boards Wng are discharged at the elevation position,

40 they can be piled on the second stocker 23. When the good printed circuit boards Wg are discharged at the lowering position, they can be piled on the second stocker 22.

45 The operation of the plate-like work discharging device according to the present invention will be described hereinafter.

A printed circuit board subjected to a machining operation is carried to the discharging device E on the work table T. The discrimination as to whether the

50 printed circuit board is good or bad is carried out as



described before. Specifically, after the position of a pattern is generally detected by the perforating means D to perforate that position, the position of a hole is detected by image processing again. Then, the detected position of the hole is compared with the position of the pattern. As a result, whether the printed circuit board is good or bad is discriminated depending upon whether they coincide with each other or not. Therefore, data as to whether the printed circuit board is good or bad is supplied to the discharging device E.

Thus, in a stand-by state of the discharging device E illustrated in Fig. 3 (a), the discharging roller 7 are located at the lowering position. The motor roller 71 is located at the same level as the surface of the work table T. The following roller 72 is separated from the motor roller 71 in accordance with the driving of the cylinders 9. Under this state, when a good printed circuit board Wg is carried, the follower roller 72 is lowered in accordance with the driving of the cylinder 9 as illustrated in Fig. 3(b). Then, when the motor roller 71 is driven to rotate clockwise while the end of the good printed circuit board Wg is held between the motor roller 71 and the follower roller 72, the follower roller 72 rotate counterclockwise through the printed circuit board interlocking therewith, so that the good printed circuit board Wg is pushed rightward. As stated above, under the stand-by state of the discharging device E, the discharging roller 7 are located at the lowering position, and the good printed circuit board Wg is pushed under a condition in which the rollers remain at the lowering position as they are, upon discharging of the good printed circuit board Wg. Therefore, the good printed circuit board Wg is piled on the first stocker 22 as shown in Fig. 3(c).

When the superior printed circuit board Wg separated from the motor roller 71, a sensor is turned on and the cylinders 9 are driven so that the follower roller 72 is elevated to become separated from the motor roller 71 and the rotation of the motor roller 71 is stopped. Thus, the discharging device E returns to the stand-by state illustrated in Fig. 3(a).

Under this stand-by state, when a bad printed circuit board Wng is carried, as shown in Fig. 3(b), the following roller 72 is lowered in accordance with the driving of the cylinders 9 to hold the end of the bad printed circuit board Wng between the follower roller 72 and the motor roller 71. After that, as illustrated in Fig. 3(d), the cylinder 19 (Shown in



5 Figs. 1 and 2) is driven to elevate the discharging
device E to the elevation position. Thus, since the
discharging rollers 7 are located at a position higher
than the second stocker 23. When the motor roller 71
10 is driven to rotate clockwise, as mentioned above, the
follower roller 72 rotates counterclockwise through
the printed circuit board Wng interlocking therewith.
As a result, the bad printed circuit board Wng is
pushed rightward, so that the bad printed circuit
15 board Wng is piled on the second stocker 23.

When the bad printed circuit board Wng is
separated from the motor roller 71, the sensor 11 is
turned on as in the above-stated case. Then, the
cylinders 9 are driven to elevate the follower roller
15 72 and disengage it from the motor roller 71 and stop
the rotation of the motor roller 71. Further, the
cylinders 9 are driven to lower the discharging device
E and stop it at the lowering position where the motor
roller fixing plate 5 abuts against the stoppers 21.
20 In this manner, the discharging device E returns to
the stand-by state as shown in Fig. 3(a).

Consequently, the good printed circuit boards Wg
after subjected to a working operation are piled on
the first stocker 22 and the bad printed circuit
25 boards Wng are piled on the second stocker 23. Thus,
the good printed circuit boards can be completely
separated from the bad printed circuit boards.

Advantageous Effects of the Invention

30 As mentioned above, in accordance with the
discharging device of the present invention, since a
pair of discharging rollers themselves are elevated or
lowered by the elevating device, the height at which
good works are discharged can be different from that
at which bad works are discharged. Therefore, the good
35 and the bad works can be respectively sorted and piled
on the first stocker and the second stocker which is
positioned above the first stocker. Accordingly, the
good and bad work boards can be discharged in a
completely separated state. Additionally, it is not
40 necessary to provide a separator, the floor space for
installation can be significantly reduced and the
manufacturing cost can be reduced.

Brief Description of the Drawings

45 Fig. 1 is a front view showing an embodiment of the
present invention.

Fig. 2 is a right side view of Fig. 1.



THIS SHEET HAS BEEN
REPLACED

7

Fig. 3(a), Fig. 3(b), Fig. 3(c) and Fig. 3(d) are explanatory views for illustrating stepwise a discharging operation of a printed circuit board.

5 Fig. 4 is a front view of the entire body of a machining device.

Description of Reference Numerals

- E. discharging device
- T. work table
- W. printed circuit board (plate-like work)
- 10 Wg. good work (printed circuit board)
- Wng. bad work (printed circuit board)
- 7. discharging roller
- 9. driving means
- 19. elevating device
- 15 22. first stocker
- 23. second stocker

This Sheet Has Been Replaced



CLAIMS



Claim 1 :

A plate-like work discharging device comprising:

- 5 a pair of discharging rollers opposed vertically to each other and provided at one end of a work table for processing plate-like works such as printed circuit boards;
- 10 a first stocker adjacent to said pair of discharging rollers, located at a position lower than the surface of said work table and capable of piling said plate-like works thereon;
- 15 a second stocker located at a position higher than the surface of said work table and capable of piling said plate-like works thereon, said second stocker located above said first stocker;
- driving means for driving said pair of discharging rollers to come into contact with, or separate from, each other and
- 20 elevating means for elevating or lowering said pair of discharging rollers between an elevation position above said second stocker and a lowering position below said second stocker.

