

METHOD FOR PUSHING AN OBJECT AND PUSH DEVICE

FIELD

5 The disclosure relates to a method for pushing an object and a push device, and more particularly to a method for pushing a carriage plate of a conveying equipment and a push device for pushing the carriage plate.

BACKGROUND

10 A conveying equipment for a chip fabrication process includes a conveyor, a push rod, a plurality of movable stages, a plurality of cuboid boxes and a plurality of carriage plates. Each of the carriage plates carries chips that are arranged in rows and columns. Each of
15 the boxes receives a plurality of the carriage plates that are spaced apart from each other in a top-bottom direction, and has two openings at two opposite ends thereof. Each of the movable stages is movable in the top-bottom direction, and permits at least one of the
20 boxes to be disposed thereon, such that one of the openings of the box corresponds in position to the conveyor, and the other one of the openings corresponds in position to the push rod. The push rod is operable to push and move the carriage plates received in the
25 box onto the conveyor one at a time.

 However, the push rod must have a considerable length to be able to move by a sufficient distance so as to

push the carriage plates out of the box. As such, the conveying equipment may occupy a relatively large space, and the layout of a production line including the conveying equipment in a factory may therefore be limited by the size of the conveying equipment. Moreover, when the push rod is restored to its original position, an end portion of the push rod may project outwardly. Not only may an operator be easily injured by the push rod, but the push rod may be easily fractured as well.

SUMMARY

Therefore, an object of the disclosure is to provide a method for pushing an object that can alleviate at least one of the drawbacks of the prior art.

According to one aspect of the disclosure, the method includes steps of: a) providing first and second slide seats that are able to be driven by at least one driving force to move relative to each other along a first straight line; b) providing a push member that is movable along a second straight line for pushing the object; and c) associating the push member with the first and second slide seats such that the push member and any one of the first and second slide seats are moved relative to each other along the second straight line by the relative movement between the first and second slide seats.

According to another aspect of the disclosure, the method includes steps of: a) providing a push member

that is movable along a first straight line for pushing the object; b) providing two driving forces that respectively act in two opposite directions along a second straight line that is perpendicular to the first straight line; and c) associating the push member with the driving forces such that the push member is able to be moved relative to the second straight line along the first straight line by the driving forces.

Another object of the disclosure is to provide a push device for pushing an object that can alleviate at least one of the drawbacks of the prior art.

According to the disclosure, the push device includes first and second slide seats and a push member. The first and second slide seats are able to move relative to each other along a first straight line. The push member is movable along a second straight line for pushing the object, and is associated with the first and second slide seats such that the push member and any one of the first and second slide seats are moved relative to each other along the second straight line by the relative movement between the first and second slide seats.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the disclosure will become apparent in the following detailed description of the embodiment with reference to the accompanying drawings, of which:

Figure 1 is a fragmentary perspective view

illustrating an embodiment of the push device according to the disclosure mounted to a conveying equipment;

Figure 2 is a perspective view illustrating the embodiment;

5 Figure 3 is a partly exploded perspective view illustrating the embodiment;

Figure 4 is a top view illustrating the embodiment pushing a carriage plate; and

10 Figure 5 is a top view illustrating the embodiment being spaced apart from the carriage plate.

DETAILED DESCRIPTION

Before the disclosure is described in greater detail, it should be noted that where considered appropriate, reference numerals or terminal portions of reference numerals have been repeated among the figures to indicate
15 corresponding or analogous elements, which may optionally have similar characteristics.

Referring to Figure 1, the embodiment of the push device 5 according to the disclosure is for use in a
20 conveying equipment 2. The conveying equipment 2 includes a fixing seat 21 that is fixedly mounted to one side 11 of a production machine 1, a first rail 22 that is fixedly mounted to the fixing seat 21 and that extends in a top-bottom direction (i.e., a Z-direction),
25 a slide seat 23 that is driven to move along the first rail 22, three horizontal racks 24 that are mounted to the slide seat 23 and that are spaced apart from each

other in the top-bottom direction, and a fixing member 25 that is fixedly mounted to the fixing seat 21 and that is spaced apart from the racks 24.

Each of the racks 24 permits a box frame 3 to be disposed thereon. Each box frame 3 receives a plurality of rectangular carriage plates 31, and has two openings 32 respectively at two opposite ends thereof in a Y-direction. The openings 32 of each box frame 3 respectively permit two opposite short edges of each corresponding carriage plate 31 to be accessible therethrough, and respectively correspond in position to the push device 5 and a conveyor 4. The conveyor 4 is movably mounted to a second rail 6 fixedly mounted to the production machine 1, and is movable in an X-direction that is perpendicular to the Y-direction. The conveyor 4 is able to convey the carriage plate 31 in the Y-direction.

Referring to Figures 1 and 2, the push device 5 includes a driving mechanism 51 and a linkage set 52, and is for pushing an object (i.e., the carriage plate 31).

The driving mechanism 51 includes a first mounting seat 516 that is configured as a rectangular plate and that is horizontally disposed, a slide rail 511 that is disposed on the first mounting seat 516 and that extends in the X-direction, first and second actuators 512, 513 that are respectively disposed at two opposite

longitudinal ends of the slide rail 511, and first and second slide seats 514, 515 each of which is slidably mounted to the slide rail 511. In one embodiment, each of the first and second actuators 512, 513 is configured as a pneumatic cylinder. The first actuator 512 is connected to the first slide seat 514 for moving the first slide seat 514 along the slide rail 511, and the second actuator 513 is connected to the second slide seat 515 for moving the second slide seat 515 along the slide rail 511. The first and second slide seats 514, 515 are configured to synchronously move toward or away from each other along the slide rail 511 (i.e., in the X-direction).

The linkage set 52 includes first and second scissor links 521, 522 that are respectively pivoted to the first and second slide seats 514, 515 and that are crossed at middle portions thereof, a first pivot member 523 that pivotally interconnects the middle portions of the first and second scissor links 521, 522, a first push link 524 that is pivoted to an end of the first scissor link 521 distal from the first slide seat 514 and that is parallel to the second scissor link 522, a second push link 525 that is pivoted to an end of the second scissor link 522 distal from the second slide seat 515 and that is parallel to the first scissor link 521, and a circular push member 526 that pivotally interconnects distal ends of the first and second push links 524, 525.

The first and second scissor links 521, 522 and the first pivot member 523 cooperatively serve as a scissor unit. The first and second push links 524, 525 and the push member 526 cooperatively serve as a push unit. It should
5 be noted that, in a modification, the linkage set 52 may includes a plurality of the scissor units that are connected in series, and the push unit is connected to a distal one of the scissor units.

In one embodiment, the length of each of the first
10 and second push links 524, 525 is half the length of each of the first and second scissor links 521, 522. An imaginary central line (L) passing through the center of the push member 526 and the center of the first pivot member 523 passes through a central point between the
15 first and second slide seats 514, 515 and extends in the Y-direction. The push member 526 of the linkage set 52 corresponds in position to a short edge of the corresponding carriage plate 31 that is accessible through the corresponding opening 32 of the
20 corresponding box frame 3. The first scissor link 521, the second scissor link 522, the first push links 524 and the second push link 525 cooperatively form a rhomboidal region that is located between the push member 526 and the first pivot member 523.

25 Referring to Figures 2 and 3, the push device 5 further includes a protection mechanism 53. The protection mechanism 53 includes a protection mounting seat 531

that is disposed below the first mounting seat 516 and that is configured as a rectangular plate. The protection mounting seat 531 is horizontally disposed on the fixing member 25. The long edges of the protection mounting seat 531 are perpendicular to the Y-direction. In a modification, the protection mechanism 53 may be omitted, and the first mounting seat 516 is directly mounted on the fixing member 25. The protection mounting seat 531 is provided on its top surface with two protection slide rails 532 that are parallel to each other and that extend in the Y-direction, two protection slide seats 533 that are respectively and slidably mounted on the protection slide rails 532, two spaced-apart stop members 534 that are located between the protection slide rails 532 and that are proximate to the linkage set 52, a protection connecting portion 535 that is located between the stop members 534 and that is proximate to the linkage set 52, and a sensor 536 that is located at one side of one of the protection slide rails 532 opposite to the other one of the protection slide rails 532. It should be noted that in modification, the number of the stop members 534 may be one or more than two.

The first mounting seat 516 of the push device 5 is provided on its bottom surface with two fixing portions 537 that respectively correspond in position to the protection slide seats 533 and that are respectively and fixedly connected to the protection slide seats 533,

a first connecting portion 538 that is located between the fixing portions 537 and that is distal from the linkage set 52, a resilient member 539 that has two opposite ends respectively connected to the protection
5 connecting portion 535 and the first connecting portion 538 and that is configured as an extension spring, and a sensing component 540 that correspond in position to the sensor 536. The resilient member 539 exerts a resilient force to resiliently bias the first mounting
10 seat 516 to abut against the stop members 534.

Referring to Figures 1, 4 and 5, when the push device 5 is in an idle state (see Figure 5), the push member 526 of the linkage set 52 is spaced apart from the carriage plate 31. When the first and second actuators 512, 513
15 exert two forces to respectively drive the first and second slide seats 514, 515 to move in two opposite directions along the slide rail 511, the push member 526 is driven to move along the imaginary central line (L) (i.e., in the Y-direction). The slide rail 511 and
20 the imaginary central line (L) may reside in the same plane, or may respectively reside in two planes that are parallel to each other.

For pushing a carriage plate 31 in a box frame 3, the first and second actuators 512, 513 respectively
25 drive the first and second slide seats 514, 515 to synchronously move toward each other, so that the first and second slide seats 514, 515 respectively rotate the

first and second scissor links 521, 522 to decrease an angle $\Theta 1$ formed between the first and second scissor links 521, 522, and that the first and second push links 524, 525 are rotated to decrease an angle $\Theta 2$ formed between the first and second push links 524, 525. As such, the linkage set 52 is lengthened in the Y-direction so that the push member 526 is moved along the imaginary central line (L) (i.e., in the Y-direction) through the openings 32 of the box frame 3 to push a corresponding short edge of the carriage plate 31 so as to move the carriage plate 31 out of the box frame 3 and onto the conveyor 4. In this embodiment, $\Theta 1$ is equal to $\Theta 2$.

Referring to Figures 1 and 5, after the carriage plate 31 is moved out of the box frame 3, the first and second actuators 512, 513 respectively drive the first and second slide seats 514, 515 to synchronously move away from each other, so that the first and second slide seats 514, 515 respectively rotate the first and second scissor links 521, 522 to increase the angle $\Theta 1$ formed between the first and second scissor links 521, 522, and that the first and second push links 524, 525 are rotated to increase the angle $\Theta 2$ formed between the first and second push links 524, 525. As such, the linkage set 52 is shortened in the Y-direction so that the push member 526 is moved out of the box frame 3 along the imaginary central line (L) (i.e., in the Y-direction).

Referring to Figures 1, 3 and 5, when the carriage

plate 31 is hindered so that the linkage set 52 cannot push and move the carriage plate 31 onto the conveyor 4, the first mounting seat 516 is moved away from the stop members 534 against the biasing action of the resilient member 539 during the stretching operation of the linkage set 52. The sensor 536 is configured to emit an alert signal for alerting an operator or shutting down the first and second actuators 512, 513 when the sensing component 540 moves to a predetermined position along with the movement of the first mounting seat 516 away from the stop members 534.

In the disclosure, the first actuator 512 drives the first slide seat 514 to move along the slide rail 511, the second actuator 513 drives the second slide seat 515 to move along the slide rail 511, and the first and second slide seats 514, 515 are configured to synchronously move toward each other or away from each other along a straight line (i.e., along the slide rail 511). As such, during the stretching or contracting operation of the linkage set 52, the push member 526 is not driven to move in the X-direction. Therefore, the linkage set 52 generates a force that has only Y-component for moving the carriage plate 31. In the case that the first and second slide seats 514, 515 are configured not to synchronously move toward each other or away from each other along the slide rail 511, the push member 526 would be driven to move in the X-direction

during the stretching or contracting operation of the linkage set 52. As a result, the linkage set 52 generates a force that has X-component and Y-component for moving the carriage plate 31.

5 In summary, the first and second actuators 512, 513 respectively drive the first and second slide seats 514, 515 to move toward or away from each other along the slide rail 511 (i.e., in the X-direction) for driving the stretching and contracting operation of the linkage
10 set 52, which in turn moves the push member 526 in the Y-direction. Since the first and second slide seats 514, 515 are moved in the X-direction and since the linkage set 52 is configured as a scissor mechanism so that the length of the linkage set 52 in the Y-direction is
15 adjustable, the linkage set 52 would not occupy additional space at one side thereof opposite to the conveyor 4 during the stretching and contracting operation of the linkage set 52. Therefore, the push device 5 according to the disclosure would occupy a
20 relatively small space during operation, and the operator is prevented from being injured by the linkage set 52.

 In the description above, for the purposes of explanation, numerous specific details have been set
25 forth in order to provide a thorough understanding of the embodiment. It will be apparent, however, to one skilled in the art, that one or more other embodiments

may be practiced without some of these specific details. It should also be appreciated that reference throughout this specification to "one embodiment," "an embodiment," an embodiment with an indication of an ordinal number and so forth means that a particular feature, structure, or characteristic may be included in the practice of the disclosure. It should be further appreciated that in the description, various features are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of various inventive aspects, and that one or more features or specific details from one embodiment may be practiced together with one or more features or specific details from another embodiment, where appropriate, in the practice of the disclosure.

While the disclosure has been described in connection with what is considered the exemplary embodiment, it is understood that this disclosure is not limited to the disclosed embodiment but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

CLAIMS:

1. A method for pushing an object comprising steps of:
 - a) providing first and second slide seats that are able to be driven by at least one driving force to move relative to each other along a first straight line;
 - b) providing a push member that is movable along a second straight line for pushing the object; and
 - c) associating the push member with the first and second slide seats such that the push member and any one of the first and second slide seats are moved relative to each other along the second straight line by the relative movement between the first and second slide seats.
2. The method as claimed in claim 1, wherein the push member is associated with the first and second slide seats by a plurality of links, the at least one driving force driving relative movement between the push member and any one of the first and second slide seats via the first and second slide seats and the links.
3. The method as claimed in claim 1, wherein the first straight line and the second straight line are configured to reside in the same plane.
4. The method as claimed in claim 1, wherein the first straight line and the second straight line are configured

to respectively reside in two planes that are parallel to each other.

5 5. The method as claimed in claim 1, wherein, when the push member is unable to move the object during the movement between the push member and any one of the first and second slide seats away from each other along the second straight line, the first and second slide seats move away from the object.

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6. A method for pushing an object comprising steps of:
a) providing a push member that is movable along a first straight line for pushing the object;
b) providing two driving forces that respectively
15 act in two opposite directions along a second straight line that is perpendicular to the first straight line; and
c) associating the push member with the driving forces such that the push member is able to be moved
20 relative to the second straight line along the first straight line by the driving forces.

7. The method as claimed in claim 6, wherein the push member is associated with the driving forces by a
25 plurality of links, the driving forces acting on the links for driving movement of the push member along the first straight line.

8. The method as claimed in claim 6, wherein the first straight line and the second straight line are configured to reside in the same plane.

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9. The method as claimed in claim 6, wherein the first straight line and the second straight line are configured to respectively reside in two planes that are parallel to each other.

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10. The method as claimed in claim 6, wherein when the push member is unable to move the object during the movement between the push member and the second straight line away from each other along the first straight line, the second straight line that serves as the line of action of the driving forces moves away from the object.

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11. A push device adapted for pushing an object comprising:

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first and second slide seats that are able to move relative to each other along a first straight line; and

a push member that is movable along a second straight line for pushing the object and that is associated with said first and second slide seats such that the push member and any one of said first and second slide seats are moved relative to each other along the second straight line by the relative movement between said first

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and second slide seats.

12. The push device as claimed in claim 11, further comprising a first scissor link that has an end pivoted to said first slide seat, a second scissor link that has an end pivoted to said second slide seat and that is crossed by said first scissor link, a first pivot member that pivotally interconnects middle portions of said first and second scissor links, a first push link that has an end pivoted to the other end of said first scissor link that is distal from said first slide seat, and a second push link that has an end pivoted to the other end of said second scissor link that is distal from said second slide seat, said push member pivotally interconnecting the other end of the first push link and the other end of the second push link.

13. The push device as claimed in claim 11, further comprising a first scissor link that has an end pivoted to said first slide seat, and a second scissor link that has an end pivoted to said second slide seat.

14. The push device as claimed in claim 13, further comprising a first push link that has an end pivoted to said push member, and a second push link that has an end pivoted to said push member, the relative movement between said first and second slide seats along the first

straight line driving relative movement between said push member and any one of said first and second slide seats along the second straight line via said first scissor link, said second scissor link, said first push link and said second push link.

15. The push device as claimed in claim 13, wherein said first scissor link and said second scissor link are crossed, said push device further comprising a first pivot member that pivotally interconnects the crossed portions of said first and second scissor links.

16. The push device as claimed in claim 11, further comprising a first mounting seat, a slide rail that is disposed on said first mounting seat and that extends in a direction perpendicular to the second straight line, first and second actuators that are respectively disposed at two opposite longitudinal ends of said slide rail, and first and second slide seats each of which is slidably mounted to said slide rail, said first actuator driving movement of said first slide seat along said slide rail, said second actuator driving movement of said second slide seat along said slide rail.

17. The push device as claimed in claim 16, further comprising a protection mounting seat, two protection slide rails that are disposed on a top surface of said

protection mounting seat, and two protection slide seats that are respectively and slidably mounted on said protection slide rails, said first mounting seat being is provided on its bottom surface with two fixing
5 portions that respectively correspond in position to said protection slide seats and that are respectively and fixedly connected to said protection slide seats.

18. The push device as claimed in claim 17, further
10 comprising at least one stop member that is disposed on said protection mounting seat and that is located at one side of said first mounting seat proximate to the object.

15 19. The push device as claimed in claim 18, further comprising a protection connecting portion that is disposed on said top surface of said protection mounting seat and that is proximate to said push member, a first connecting portion that is disposed on said first
20 mounting seat and that is distal from said push member, and a resilient member that has two opposite ends respectively connected to said protection connecting portion and said first connecting portion, said resilient member exerting a resilient force to
25 resiliently bias said first mounting seat to abut against said at least one stop member.

20. The push device as claimed in claim 18, further comprising a sensor that is disposed on said top surface of said protection mounting seat, a sensing component that is disposed on one side of said first mounting seat
5 that corresponds in position to said sensor.

21. The push device as claimed in claim 17, wherein said protection mounting seat is adapted to be mounted to a fixing member of a conveying equipment that is provided
10 with box frame for receiving the object.

22. A push device configured to execute the method for pushing an object as claimed in any one of claims 2 to 10.
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