APPARATUS AND METHOD FOR RECOVERY OF A SYSTEM FOR DISC-SHAPED OBJECTS

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ABSTRACT

An apparatus for recovery in the system for processing disc-shaped objects is disclosed. The system is provided with an OHT that places and/or removes at least one FOUP containing disc-shaped objects onto and/or off of a loadport. A light barrier arrangement is attached in front of a region of the loadport, which is designed for placing and/or removing a FOUP by means of the OHT. An input device is provided through which the OHT resumes the process of placing and/or removing the FOUP when this is stopped by an interruption of the light barrier arrangement.
E48 load sequence between the OHT and the loadport has begun

Light barrier is interrupted before placing the FOUP

Loadport stops OHT by means of ES signal

"Light barrier" alarm on the visual display screen and signal tower

Eliminate interruption of the light barrier, if still ongoing

Elimination of interruption?

YES

Automatic recovery

RESET OHT manually

Manual reset confirmed on a visual display screen

Reset "light barrier" alarm

E48 load sequence restarted

NO

Automatic recovery

SELECT automatic recovery on the visual display screen

Reset "light barrier" alarm

ES signal permits resumption of E84

E84 load sequence concluded

NO

Reset OHT manually

Manual reset confirmed on a visual display screen

Reset "light barrier" alarm

E84 load sequence restarted

YES

Fig. 4
E48 unload sequence between the OHT and the loadport has begun

Light barrier is interrupted before placing the FOUP

Loadport stops CHT by means of ES signal

"Light barrier" alarm on the visual display screen and signal tower

Eliminate interruption of the light barrier, if still ongoing

Interruption eliminated?

Automatic recovery

YES

Reset CHT manually

Reset "light barrier" alarm

ES signal permits resumption of E84

NO

Select automatic recovery on the visual display screen

Manual reset confirmed on a visual display screen

Reset "light barrier" alarm

E84 unload sequence restarted

E84 unload sequence concluded

NO

Service technician required

Fig. 5
APPARATUS AND METHOD FOR RECOVERY OF A SYSTEM FOR DISC-SHAPED OBJECTS

RELATED APPLICATIONS

[0001] This application claims priority to German patent application number DE 10 2004 062 594.8, filed Dec. 24, 2004, which is incorporated herein by reference in its entirety.

FIELD OF INVENTION

[0002] The invention relates to an apparatus for recovery in a system for processing disc-shaped objects. In particular, the invention relates to an apparatus for recovery in a system for processing disc-shaped objects with an OHT provided to the system that places and/or removes at least one FOUP with disc-shaped objects on and/or from a loadport.

[0003] Furthermore, the invention relates to a method for recovery in a system for processing disc-shaped objects.

BACKGROUND OF THE INVENTION

[0004] In semiconductor manufacturing, wafers or disc-shaped substrates, respectively, are sequentially processed in a multiplicity of processing steps during the production process. The disc-shaped substrates are transported to the systems in containers, the FOUPs. The various processing steps are then carried out in the systems. The FOUPs are delivered or transported by an OHT to the system's loadport.

[0005] US patent application 2003/0053989 A1 discloses how the individual FOUPs are transported to a loadport by means of an OHT. However, this patent application does not disclose a device that monitors whether objects or the like are present in the transport path of the FOUP from the OHT to the base plate of the loadport.

[0006] US patent application 2002/0155641 A1 discloses an apparatus for positioning a loadport in a processing machine. The apparatus has a base plate in which at least two vertical bore holes are implemented that interact with the corresponding pins in the processing machine. A positioning block is provided for positioning in which at least one horizontal borehole is provided. The position of the loadport is determined via the borehole by means of a light source and a detector.

SUMMARY OF THE INVENTION

[0007] The object underlying the invention is to create an apparatus that enables quick and inexpensive continuation of operation in case of a malfunction in placing and/or removing a FOUP on and/or from a loadport.

[0008] This object is solved by an apparatus for recovery in a system for processing disc-shaped objects, whereby an OHT that places and/or removes at least one FOUP containing disc-shaped objects on and/or off from a loadport is provided to the system; in that a light barrier arrangement is attached in front of an area of the loadport, which is implemented for placing and/or removing a FOUP by means of the OHT, and in that an input device is provided by which the OHT can be reset when the placing and/or removing has been stopped by an interruption of the light barrier arrangement.

[0009] A further object of the invention is to make available a method by which quick and inexpensive continuation of operation with the apparatus is possible when a malfunction in placing and/or removing a FOUP on and/or from a loadport occurs.

[0010] This object is solved by a method with the following characteristics:

[0011] interruption of the light barrier arrangement during placing or removing a FOUP on and/or from a loadport;

[0012] monitoring whether interruption of the light barrier arrangement is ongoing; and

[0013] recovery and continuation of placing of the FOUP or removing of the FOUP on and/or from the loadport.

[0014] It is particularly advantageous when an OHT is provided with which at least one FOUP with disc-shaped objects may be placed and/or removed on and/or from a loadport, for recovery in the system for processing disc-shaped objects. The system is provided with a light barrier arrangement, whereby an input device is provided by means of which the interruption of the process of placing and/or removing a FOUP by the OHT can be reset when the interruption in placing and/or removing is caused by an interruption in the light barrier arrangement.

[0015] The light barrier arrangement comprises a linear arrangement of several individual light barriers, whereby each is comprised of a light source and a receiver. A first and a second side wall are attached above the loadport. The input opening for the system is implemented between the first and the second side wall. The light barrier arrangement is attached to an end of the first and the second wall that is facing away from the system.

[0016] The input device is a visual display screen that is connected to a control unit for the system and the OHT. The visual display screen can be implemented as a touchscreen. The system is connected to a signal tower that comprises several signal lights.

[0017] The method for recovery in the system for processing disc-shaped objects is equally advantageous. Here, the interruption in the light barrier arrangement during placing or removing a FOUP on and/or from a load transport is first registered, and the loading/unloading process immediately interrupted. Then monitoring begins to determine whether the interruption of the light barrier arrangement is ongoing. Finally, recovery is undertaken and placing the FOUP or removing the FOUP on and/or from the loadport is resumed.

[0018] Further advantageous developments of the invention may be inferred from the subclaims.

[0019] The above and other features of the invention including various novel details of construction and combinations of parts, and other advantages, will now be more particularly described with reference to the accompanying drawings and pointed out in the claims. It will be understood that the particular method and device embodying the invention are shown by way of illustration and not as a limitation of the invention. The principles and features of this invention may be employed in various and numerous embodiments without departing from the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] In the accompanying drawings, reference characters refer to the same parts throughout the different views.
The drawings are not necessarily to scale; emphasis has instead been placed upon illustrating the principles of the invention. Of the drawings:

[0021] The subject of the invention is schematically represented in the diagram, and is described below based on the figures. They show:

[0022] FIG. 1 a schematic view of a system that processes disc-shaped semiconductor substrates, whereby the disc-shaped semiconductor substrates are delivered in a FOUP via an OHT (overhead hoist transportation) to a loadport of the system;

[0023] FIG. 2 a perspective view of a loadport connected to a system for processing disc-shaped substrates;

[0024] FIG. 3 a perspective view of a loadport connected with the light barrier arrangement according to the invention;

[0025] FIG. 4 a schematic representation of a block diagram of the method according to the invention for placing a FOUP; and

[0026] FIG. 5 a schematic representation of a block diagram of the method according to the invention for removing a FOUP.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0027] FIG. 1 is a schematic view of a system 100 that processes disc-shaped semiconductor substrates. The disc-shaped semiconductor substrates are delivered to a loadport 20 of the system 100 in a FOUP 101 via an OHT 102 (overhead hoists transportation). The loadport 20 comprises a base plate 21 onto which the FOUP 101 may be placed so that the disc-shaped substrates may be processed by the system 100. The system 100 is further provided with a signal tower 105 that may comprise several light sources 104 of varying color. The lights 104 give the operator an indication of potential errors. Furthermore, the system 100 is provided with a visual display screen by means of which the operator may make inputs. The visual display screen makes available to the operator several input fields 107 for the purpose. Thus, for example, the operator may initiate automatic recovery via at least one of the input fields 107. Similarly, the operator may confirm a manual reset of the system 100 via the visual display screen.

[0028] FIG. 2 is a perspective view of a loadport 20 that is connected to a system 100 for processing disc-shaped substrates. The loadport 20 is connected with the system 100 and forms an interface between the system 100 for processing the disc-shaped substrates and that for inputting disc-shaped substrates in the system 100. The loadport 20 has a base plate 21 onto which a FOUP 101 can be placed. The base plate 21 itself bears a connection plate 22 that is implemented in accordance with the SEMI E15 standard and interlocks with a bottom side (not represented) of the FOUP 101. By interlocking, the FOUP 101 is securely seated on the loadport 20. In addition to the aforesaid interlocking, coupling elements (not represented) between the FOUP 101 and a loadport 20 grip each other to achieve a secure seat. A FOUP 101 filled with disc-shaped objects can therefore not be accidentally knocked off of the loadport 20, so that an additional level of security to protect the disc-shaped objects is built in. In addition, several lights 23 are provided at the loadport 20, which indicate the correct positioning of the FOUP 101 on the loadport 20. Similarly, the lights 23 indicate whether the FOUP 101 has been placed on the loadport or whether the present FOUP may be removed.

[0029] FIG. 3 is a perspective view of a loadport 20 with the operating element 30 according to the invention. The operating element 30 makes it possible for a FOUP 101 to be placed onto the loadport without initializing the lock device, by means of which the FOUP 101 is prevented from being removed before the disc-shaped objects contained in the FOUP 101 have been processed by the system 100. Once the operator has placed a FOUP 101 on the loadport and presses or activates the operating element 30, the disc-shaped objects contained in the FOUP 101 are processed. If the operator parks a FOUP 101 on the loadport 20 without activating the operating element 30, the FOUP 101 is secured and fixed on the loadport 20 and can be removed and placed again as desired. A light barrier arrangement 24 is provided in a suitable manner at the loadport 20, with which events or objects that should not be present in the load path of the FOUP 101 by means of the OHT 102 may be detected or registered. An event may, for example, include the operator’s interrupting the light barrier arrangement 24 with his elbow. The light barrier arrangement 24 is a linear arrangement of several individual light barriers, whereby each comprises a light source and a receiver. For the spatial arrangement of the light barrier arrangement 24 a first and a second wall 26 and 27 are attached above the loadport 20, and between which an input opening 28 for the system is provided. The light barrier or the light barrier arrangement 24 are each provided as a linear arrangement at the end of the first and the second wall 26 and 27 that faces away from the system.

[0030] FIG. 4 is a schematic representation of a block diagram of the method according to the invention for placing a FOUP 20. The ES4 load sequence 40 between the OHT 102 and the loadport 20 has begun. During the process of placing the FOUP 101 via the OHT 102 there is an interruption 41 of the light barrier, which interrupts the process of placing the FOUP 101. An alarm is given 43 on the visual display screen and/or signal tower. The interruption of the light barrier is eliminated 44 by the operator, if it is still ongoing. The system conducts a status inquiry 45 to determine whether the interruption has been eliminated or not. If the result of the status inquiry 45 is that the interruption has not been eliminated, a service technician will have to be brought in. If the result of the status inquiry 45 is that the interruption was eliminated, a further status inquiry 46 is made to determine whether the system should undertake an automatic recovery. If the result of the status inquiry 46 is that no automatic recovery should be undertaken, there then follows an action 471, by which the OHT is manually reset. A confirmation 472 that a manual reset has taken place appears on the visual display screen. The alarm 473 of the light barrier is reset, and the ES4 load sequence is resumed 474.

[0031] If the result of the status inquiry 46 is that an automatic recovery should be undertaken, this is then done by the operator’s selection 481 of automatic recovery. After the selection 481, the light barrier is reset 482. Subsequently, an ES signal is given that permits resumption 483 of the ES4
load sequence. Finally, the E84 load sequence is concluded 484. This means that placing of the FOUP 101 on the loadport has been concluded.

[0032] FIG. 5 is a schematic representation of a block diagram of the method according to the invention for removing a FOUP 101. The E84 on load sequence 50 between the OHT 102 and the loadport 20 has begun. During the process of removing of the FOUP 101 via the OHT 102 there is an interruption 51 of the light barrier, and the process of removing the FOUP 101 is therefore interrupted. An ES signal is then given 52 so that the loadport 20 stops the OHT 102. An alarm is then registered 53 on the visual display screen and/or a signal tower. The interruption of the light barrier is eliminated 54 by the operator, if it still exists. The system conducts a status inquiry 55 to determine whether the interruption has been eliminated or not. If the result of the status inquiry 45 is that the interruption has not been eliminated, a service technician will have to be brought in. If the result of the status inquiry 55 is that the interruption was eliminated, a further status inquiry 56 is initiated to determine whether the system should undertake an automatic recovery. If the result of the status inquiry 56 is that no automatic recovery should be undertaken, there then follows an action 571, by which the OHT is manually reset. A confirmation 572 that a manual reset has taken place appears on the visual display screen. The alarm 573 of the light barrier is reset, and the E84 unload sequence is resumed 574.

[0033] If the result of the status inquiry 56 is that an automatic recovery should be undertaken, this is then done by the operator’s selecting 581 automatic recovery. After the selection 581, the light barrier is reset 582. Subsequently, an ES signal is given that permits resumption 583 of the E84 unload sequence. Finally, the E84 unload sequence is concluded 584. This means that removing the FOUP 101 from the loadport has been completed.

[0034] While this invention has been particularly shown and described with references to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the scope of the invention encompassed by the appended claims.

What is claimed is:

1. Apparatus for recovery in a system for processing disc-shaped objects, whereby an OHT is provided for the system, which places and/or removes a FOUP with disc-shaped objects on and/or from a loadport, wherein a light barrier arrangement is attached in front of a region of the loadport that is implemented for placing and/or removing a FOUP by the OHT, and wherein an input device is provided by which the OHT can be reset when the placing and/or removing is stopped by interruption of the light barrier arrangement.

2. Apparatus according to claim 1, wherein the light barrier arrangement comprises a linear arrangement of several individual light barriers, whereby each comprises a light source and a receiver.

3. Apparatus according to claim 2, wherein a first and a second wall are attached above the loadport, between which the input opening for the system is implemented, and wherein the linear arrangement of a light barrier is provided at the end of the first and the second wall that faces away from the system.

4. Apparatus according to claim 1, wherein the input device is a visual display screen that is connected to the system and the OHT by a control mechanism.

5. Apparatus according to claim 4, wherein the visual display screen is a touchscreen.

6. Apparatus according to claim 1, wherein the system is connected with a signal tower that comprises several lights.

7. Apparatus according to claim 1, wherein the disc-shaped object is a wafer, or a wafer on a glass substrate, or a mask for lithography, or a flat-panel display.

8. Method for recovery in a system for processing disc-shaped objects, characterized by the following steps:

   interruption of the light barrier arrangement during placing or removing a FOUP on and/or from a loadport;

   monitoring whether interruption of the light barrier arrangement is ongoing; and

   recovery and continuation of placing of the FOUP or removing of the FOUP on and/or from the loadport.

9. Method according to claim 8, wherein automatic recovery is selected by the operator from the visual display screen.

10. Method according to claim 9, wherein the alarm caused by the light barrier is reset as a result of automatic recovery; wherein an ES signal is given to resume the process; and wherein the E84 load/unload sequence is concluded.

11. Method according to claim 8, wherein manual recovery is selected by the operator, whereby the OHT is manually reset and a manual reset is confirmed on the visual display screen.

12. Method according to claim 11, wherein the alarm caused by the light barrier is reset, and wherein the E84 load/unload sequence is restarted.

13. Method according to claim 8, wherein a service technician must be called if the interruption of the light barrier arrangement cannot be eliminated.

14. Method according to claim 8, wherein the disc-shaped object is a wafer, or a wafer on a glass substrate, or a mask for lithography, or a flat-panel display.

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