LOAD PORT AND ADAPTOR

Inventors: Hiroshi Itou, Tokyo (JP); Takehiko Yoshimura, Tokyo (JP); Masaru Seki, Tokyo (JP); Makoto Maejima, Tokyo (JP)

Appl. No.: 11/667,339
PCT Filed: Nov. 9, 2004
PCT No.: PCT/JP2004/016560
§ 371 (c) (1), (2), (4) Date: May 7, 2007

Publication Classification

Int. Cl. A47B 37/00 (2006.01)

U.S. Cl. .................................................. 108/42

ABSTRACT

A load port, which can selectively place wafer carriers differing in size on a table and can map wafers differing in size stored in the wafer carriers, and an adaptor, which can indirectly attach a wafer carrier on the table, are provided. A load port (100) includes a movable table (110) movable provided on the table (101), a module (161) for determining a carrier, and a module (162) for mapping a wafer. A wafer carrier (200) storing wafers (200A) is indirectly seated on the movable table via an adaptor (10), or a wafer carrier (300) storing wafers (300A) is directly seated on the movable table. The module (161) detects which of the wafer carriers is seated on the movable table and outputs a detection signal in response to the wafer carriers. The module (162) conducts mapping for the wafers, receiving the detection signal sent from the module (161).
FIG. 9

START

S101
DETECT A SIGNAL A1

S102
DETECT A SIGNAL A2?

S103
READ A SIGNAL B1

S104
READ A SIGNAL B2

S105
READ A SIGNAL C1

S106
TRANSMIT A SIGNAL D1

S107
TRANSMIT A SIGNAL E1

END
LOAD PORT AND ADAPTOR

TECHNICAL FIELD

[0001] This invention relates to a load port that is attached to a substrate treatment apparatus, to which various types of substrates such as a silicon wafer (hereinafter referred to as “wafer”) are transferred. A container for wafers (hereinafter referred to as “wafer carrier”) storing wafers so as to be spaced a predetermined distance is seated on the load port. This invention also relates to an adapter that is attached to the wafer carrier.

BACKGROUND ART

[0002] Conventionally, this type of load port has been used in a process, a so-called front-end process, in which imprinting of a circuit pattern on a wafer and the like are typically carried out.

[0003] Patent document 1 discloses a load port, which has a fine adjustment mechanism that provides a fine adjustment for positioning pins for a carrier door, and a position retaining mechanism that retains a position of the carrier door engaged by the positioning pins. The load port couples and uncouples the carrier door in an opening of a wafer carrier with a high level of cleanliness while it engages the carrier door with a load port door in an opening of a wafer treatment apparatus such that peripheral areas of both openings tightly mate with each other so as to maintain a high level of cleanliness.

[0004] The load port disclosed in patent document 1 is intended to be applied to a front-end process which requires a high level of cleanliness. However, it is not considered to be applicable to a load port of a so-called backend process, in which processes including the fabrication of chips, bonding and molding such as resin molding are carried out for wafers having undergone a front-end process.

[0005] Since factories for a backend process are not required to maintain as high a level of cleanliness as those for a front-end process, an FOSB (Front Opening Shipping Box) with a carrier door removed in advance and an open cassette without a carrier door are sometimes used at the factories for a backend process. This means that a load port used for a backend process does not require a mechanism, as disclosed in patent document 1, which couples and uncouples a carrier door, which is engaged with a load port door by the mechanism.

[0006] It is noted that a load port is not compatible with both an FOSB and an open cassette. Since a wafer treatment apparatus applied to both an FOSB and an open cassette is required to have both a load port for the FOSB and a load port for the open cassette, there have been drawbacks such as an increase in cost and a reduction in working space.

[0007] It is anticipated that an open cassette for 200 mm wafers may be replaced with that for 300 mm wafers at the request of a customer. In this case, even if a wafer treatment apparatus has an SMIF (Standard Mechanical Interface) compatible with an open cassette for 200 mm wafer, it is necessary to replace the SMIF with a load port compatible with 300 mm wafers.

[0008] In addition, it has been very difficult to use one common machine to carry out detection and mapping for both 300 mm wafers stored in an FOSB and 200 mm wafers stored in an open cassette. The reason for this is attributed not only to differences in the size and thickness of wafers, but also to a difference in a pitch of slots for supporting wafers between the FOSB and the open cassette, which are adapted to the SEMI standard (10 mm for the FOSB and 6.35 mm for the open cassette, for example).

[0009] It has been known that when a film formed on a wafer is a nitride or an oxide, it is difficult to detect the wafer by a reflective sensor.

[0010] For this reason, a transmission sensor has typically been used for mapping a 300 mm wafer. However, it is necessary for the transmission sensor to detect an end portion of a wafer, which makes it difficult for one common mechanism to detect wafers having different sizes.


DISCLOSURE OF THE INVENTION

[0012] This invention provides a load port that is able not only to provide a table on which wafer carriers differing in size from each other are selectively seated, but also to carry out mapping for wafers differing in size from each other stored in the wafer carriers seated on the table, and an adapter by which a wafer carrier is indirectly seated on the table.

[0013] In a first aspect of the invention, a load port is provided, which is provided in front of a door opening of a wafer treatment apparatus and on which a carrier is seated. The load port opens and closes a load port door in the door opening. The carrier stores wafers at predetermined intervals therein. The load port includes a table and a detecting device. The detecting device identifies which of first and second carriers is seated on the table. The first carrier, which stores first wafers, is seated directly on the table. The second carrier, which differs in size from the first carrier and stores second wafers differing in size from the first wafers, is seated on the table via an adapter.

[0014] In a second aspect of the present invention, the load port according to the first aspect further includes a mapping device. The detecting device outputs a detection signal in response to one of first and second carriers which is seated on the table. The mapping device conducts mapping for one of a first wafer and a second wafer, receiving the detection signal.

[0015] In a third aspect of the present invention, the load port according to the second aspect is provided, in which the mapping device changes initial values for conducting the mapping, receiving the detection signal.

[0016] In a fourth aspect of the invention, the load port according to the third aspect is provided, in which the initial values include: a distance between the first wafers, and a distance between one of lowermost and uppermost holders for a first wafer in the first carrier and the table; and a distance between the second wafers, and a distance between one of lowermost and uppermost holders for a second wafer in the second carrier and the table.

[0017] In a fifth aspect of the invention, the load port according to the fourth aspect is provided, in which the mapping device includes a mapping sensor that detects one of a first wafer and a second wafer while the mapping sensor moves in one direction selected from moving in a direction from the lowermost holder to the uppermost holder, and moving in a direction from the uppermost holder to the lowermost holder.

[0018] In a sixth aspect of the invention, the load port according to the fifth aspect is provided, in which when one carrier selected from the first carrier and the second carrier is seated on the table, the table moves towards the load port door such that an end portion of a first wafer stored in the first
carrier and an end portion of a second wafer stored in the second carrier substantially coincide with each other. The mapping device includes a slip-out sensor that is attached to the load port door so as to detect a first wafer and a second wafer slipping out of the holders towards the load port door. When the end portion lies inside a sensing area of the slip-out sensor after the table has finished moving towards the load port door, the mapping device terminates the mapping.

In a seventh aspect of the invention, the load port according to the sixth aspect is provided, in which when the end portion lies outside the sensing area of the slip-out sensor after the table has finished moving towards the load port door, the mapping device starts the mapping.

In an eighth aspect of the present invention, the load port according to the first aspect is provided, in which the adapter includes a shifting member, and the detecting device includes: a first sensor for detecting an amount of displacement with a bottom surface of the first carrier when the first carrier is seated on the table, and detecting an amount of displacement with a bottom surface of the adapter when the adapter is seated on the table; and a second sensor that is provided on a bottom surface of the adapter so as to detect an amount of displacement with the shifting member moving towards the table, when the second carrier is seated on the table via the adapter.

In a ninth aspect of the invention, the load port according to the eighth aspect is provided, in which the adapter includes a thrust member on an upper surface thereof, and the thrust member is depressed by a protrusion provided on a bottom surface of the second carrier. When the protrusion depresses the thrust member, the shifting member moves towards the table.

In a tenth aspect of the invention, an adapter for a load port system is provided, which has a table on which a first carrier and a second carrier differing in size from each other are selectively seated. The first carrier storing first wafers is directly seated on the table. The second carrier storing second wafers differing in size from the first wafers is indirectly seated on the table. The load port system has a detecting device that outputs a detection signal indicating that the second carrier has been seated on the table. The adapter that is provided between the second carrier and the table includes: a thrust member that is provided on an upper surface of the adapter and depressed by a protrusion provided on a bottom surface of the second carrier; and a shifting member that is provided on a bottom surface of the adapter. When the second carrier is indirectly seated on the table and the protrusion depresses the thrust member, the shifting member moves towards the table, and the detecting device outputs the detection signal.

Since the load port of this invention provides the table which allows selective mounting of the first carrier and the second carrier, the first carrier storing first wafers is directly seated on the table, while the second carrier storing second wafers is indirectly seated on the table. The load port of this invention brings a reduction in costs and space saving.

In addition, the load port outputs a signal indicating which of the first carrier and the second carrier is seated on the table. Identifying a type of carrier, the load port carries out mapping for one of the first wafer and the second wafer. In this way, the load port is able to carry out mapping with a common mechanism for wafers differing in size from each other.

**BRIEF DESCRIPTION OF THE DRAWINGS**

**FIG. 1** is a perspective view illustrating a load port and an adapter according to an embodiment of this invention;

**FIG. 2** is a perspective view illustrating the load port, a table, a wafer carrier seated on the table via an adapter, and the other wafer carrier directly seated on the table;

**FIG. 3** is an enlarged view illustrating the inside of the table of the load port and the adapter shown in FIG. 1;

**FIG. 4** is a sectional view taken along line A-A in FIG. 3;

**FIG. 5A** is a plan view, FIG. 5B a side view, and FIG. 5C a front view, each showing the adapter according to the embodiment of this invention;

**FIG. 6** is a bottom view showing the adapter according to the embodiment of this invention;

**FIG. 7A** is a plan view and FIG. 7B a side view, each showing a geometrical relationship between wafer carriers differing in size from each other seated on the load port, a transmission sensor and a mapping sensor, according to the embodiment of this invention;

**FIG. 8** is a block diagram showing the load port according to the embodiment of this invention; and

**FIG. 9** is a flow chart showing the operation of the load port according to the embodiment of this invention.

**PREFERRED MODE FOR CARRYING OUT THE INVENTION**

This invention provides a load port not only having a table on which wafer carriers differing in size from each other is selectively seated, but also carrying out mapping for wafers that differ in size from each other and are stored in the wafer carriers seated on the table. The load port includes the table on which a first carrier is directly seated and a second carrier is indirectly seated, and a mapping device which carries out mapping for one of a first wafer and a second wafer receiving a detection signal indicative of one of the first carrier and the second carrier.

An embodiment of this invention is now described in detail with reference to the drawings.

**FIG. 1** is a perspective view illustrating a load port and an adapter according to the embodiment of this invention.

**FIG. 2** is a perspective view illustrating the load port, a table, a wafer carrier seated on the table via the adapter, and the other wafer carrier directly seated on the table.

As shown in FIG. 1 and FIG. 2, a load port 100 includes a wall 130 having a door opening 131 in which it is possible for a load port door 140 to be opened and closed. The load port 100 is installed on a wall of a wafer treatment apparatus (not shown), which conducts a backend process for wafers (processes including fabrication of chips, bonding, and molding such as resin molding for wafers having undergone a front-end process).

The load port 100 includes a table 101, a support stand 102 for supporting the load port 100, a movable table 110 movably installed on the table 101, a driving device 120 (see FIG. 3) which is provided inside the table 101 so as to drive the movable table 110, and a mechanism 150 for opening and closing the load port door 140. The load port 100 provides the movable table 110, on which a carrier 200 having a carrier opening 202, or a carrier 300 having a carrier opening 302 is seated. In addition, the load port 100 closes and opens the load port door 140 in the door opening 131.

The movable table 110 is a table on which the wafer carrier 200 or 300 transferred by an automatic transfer apparatus (not shown) is selectively seated. The wafer carrier 200 is indirectly seated via an adapter 10, and the wafer carrier 300 is directly seated on the movable table 110.
The load port door has transmission sensors \(14a\) and \(14b\) adjacent to its upper and lower ends. The transmission sensors \(14a\) and \(14b\) are used in mapping to be described later, one of them serving as a light emitting member and the other one serving as a light receiving member.

On its upper surface the movable table \(110\) has kinematic pins \(11a\) to \(11c\) that are used in positioning the adapter \(10\) and the wafer carrier \(300\).

As shown in FIG. 2 and FIG. 7, the wafer carrier \(200\) is a so-called open cassette storing wafers with a dimension of 200 mm at predetermined intervals (approximately 6.35 mm). The wafer carrier \(200\) includes a carrier shell \(201\) and slots \(2000\) for supporting wafers \(200A\).

On an upper portion of the carrier shell \(201\) is provided a robot flange \(203\) which is grasped by an automatic transfer device. On a bottom surface \(210\) of the carrier shell \(201\) are provided convex members (not shown) for depressing thrust members \(24-1\) and \(24-2\) which are provided on an upper surface of the adapter \(10\).

As shown in FIG. 2 and FIG. 7, the wafer carrier \(300\) is a so-called FOSB storing wafers with a dimension of 300 mm at predetermined intervals (approximately 10 mm). The wafer carrier \(300\) includes a carrier shell \(301\) and slots \(3000\) for supporting the wafers \(300A\).

On an upper portion of the carrier shell \(301\) is provided a robot flange \(303\). On a bottom surface \(310\) of the carrier shell \(301\) are formed V-shaped grooves (not shown) for engaging with the kinematic pins \(11a\) to \(11c\).

FIG. 3 is an enlarged view illustrating the inside of the table of the load port and the adapter shown in FIG. 1.

As shown in FIG. 3, the driving device \(120\), which is provided inside the table \(101\), includes a sliding member \(123\), first sensors \(121a\) to \(121d\) and second sensors \(122a\) to \(122b\). The sliding member \(123\) allows the movable table \(110\) to move towards the load port \(140\). The first sensors \(121a\) to \(121d\) and the second sensors \(122a\) to \(122b\), which are provided around the sliding member \(123\), move together with the sliding member \(123\).

The sliding member \(123\) has a protruding member which penetrates a hole formed in the movable table \(110\). The protruding member is able to descend while it is horizontally moving. As shown in FIG. 1 and FIG. 2, when the movable table \(110\) is seated on an upper portion of the driving device \(120\), this protruding member comes to abut an upper surface of the movable table \(110\) so as to secure the movable table \(110\) to the driving device \(120\).

The first sensors \(121a\) to \(121d\) are contact-type sensors each having a first protrusion, which penetrates a hole formed in the movable table \(110\). When the wafer carrier \(300\) is seated on the movable table \(110\), the first sensors \(121a\) to \(121d\) measure displacements of first protrusions due to the bottom surface \(310\) of the wafer carrier \(300\). In addition, when the adapter \(10\) is seated on the movable table \(110\), the first sensors \(121a\) to \(121d\) measure the displacements of the first protrusions due to a bottom surface of the adapter \(10\).

The second sensors \(122a\) to \(122b\) are contact-type sensors each having a second protrusion, which penetrates a hole formed in the movable table \(110\). When the wafer carrier \(200\) is seated on the movable table \(110\) via the adapter \(10\), the second sensors \(122a\) to \(122b\) measure displacements of shifting members \(22-1\) and \(22-2\) (see FIG. 4), which are provided on the bottom surface of the adapter \(10\) and move towards the movable table \(110\).
The bottom surface 210 of the wafer carrier 200 is engaged with the claw members 14a and 14b of the bridge plate 14 and the engagement holes 13a and 13b of the engagement plate 13, so that the wafer carrier 200 is securely seated on the adapter 10.

Moreover, when the adapter 10 is seated on the movable table 110 while the wafer carrier 200 is mounted onto the adapter 10, not only are the V-shape grooves 17a to 17c engaged with the kinematic pins 11a to 11c, but also the groove 15 of the cutout 16 is engaged with a conical and convex portion of the sliding member 123. In this way, the wafer carrier 200 is securely seated on the movable table 110 via the adapter 10.

Since the shifting member 22-1 moves towards the movable table 110 when the wafer carrier 200 is seated on the movable table 110 via the adapter 10, the shifting member 22-1 comes into contact with the second protrusion of the second sensor 122a at a contact point 22A.

When the shifting member 22-1 of the adapter 10 comes into contact with the second sensor 122a, a module 161 for determining a carrier (see FIG. 8) detects the wafer carrier 200 indirectly seated on the movable table 110 (to be described in detail later).

A description is given of the wafer carrier 200 or the wafer carrier 300 on the movable table 110 of the load port 100 with reference to FIG. 7 and FIG. 8.

FIG. 7A is a plan view and FIG. 7B a side view, each showing a geometrical relationship between wafer carriers having different sizes seated on the load port, a transmission sensor and a mapping sensor, according to the embodiment of this invention. In FIG. 7, the wafer carrier 200 and the wafer carrier 300 are overlapped in a manner that their end portions towards the load port door 140 lie in a same position in order to demonstrate a geometrical relationship between the wafer 200, the transmission sensors 141a and 141b, and mapping sensors 152a and 152b; and a geometrical relationship between the wafer 300, the transmission sensors 141a and 141b, and mapping sensors 152a and 152b.

FIG. 8 is a block diagram showing the load port according to the embodiment of this invention.

As shown in FIG. 8, the load port 100 includes a controller 160, a module 161 for determining a carrier, a module 162 for mapping a wafer, first sensors 121a to 121d, second sensors 122a to 122b, transmission sensors 141a to 141b, a module 163 for determining initial values, mapping sensors 152a to 152b and a mechanism 150 for opening and closing a load port door. These items are electrically connected with one another through the controller 160.

The module 161 detects which of the wafer carriers 200 and 300 is seated on the movable table 110, outputting a detection signal to the module 162 as a result of the detection.

The module 162 carries out mapping for the wafers 200A and the wafers 300A, receiving the detection signal outputted by the module 161. Mapping is meant to represent a process to determine if a wafer 200A (or 300A) is present in a particular slot 200B (or 300B), generating information on the presence of the wafer 200A (or 300A) and its position in the wafer carrier 200 (or 300). A wafer transfer robot of the wafer treatment apparatus controls its movement based on the mapping results.

The module 163 changes initial values applied to mapping, based on the detection signal received. The initial values include a distance between wafers 200A (or 300A), and a distance between one of an uppermost slot 200B (or 300B) and a lowest slot 300B (or 300B) supporting a wafer 200A (or 300A) (see FIG. 7B) and the movable table 110.

As shown in FIG. 7B, the mapping sensors 152a and 152b are rotatably attached to a support axis 151 which is disposed along an upper end portion of the mechanism 150 for opening and closing a load port door. When starting detection of a wafer 200A (or 300A), the mapping sensors 152a and 152b rotate in a counterclockwise direction, and detects the wafer 200A (or 300A) through moving from an uppermost slot 200B (or 300B) to a lowermost slot 200B (or 300B).

In addition, the mapping sensor 152a and 152b are provided between an inner wall of the carrier opening 202 (or 302) and the transmission sensors 141a to 141b, as shown in FIG. 7A, so as to detect the wafer 200A (or 300A) without interfering with other portions, when the wafer carrier 200 (or 300) is seated on the movable table 110. Moreover, end portions of the mapping sensors 152a and 152b are inserted so as to reach the end portion of the wafer 200A (or 300A).

As shown in FIG. 7, the movable table 110 is able to move towards the load port door 140. The movable table 110 is able to set each end portion of a wafer 200A and a wafer 300A towards the load port door 140 so as to lie substantially in a same position when the wafer carrier 200 or the wafer carrier 300 is seated on the movable table 110.

When the movable table 110 has moved towards the load port door 140 and an end portion of a wafer 200A (or 300A) lies outside a detection area of the transmission sensors 141a and 141b, the module 162 controls the mapping sensors 152a and 152b to start detection for the wafer 200A (or 300A).

A description is given of an operation of the load port 100, which detects which of the wafer carriers 200 and 300 is seated on the movable table 110 so as to conduct mapping for a wafer 200A or 300A, with reference to FIG. 8 and FIG. 9. The description focuses on the module 161 and the module 162.

FIG. 9 is a flow chart showing the operation of the load port according to the embodiment of the invention.

When the wafer carrier 300 or the adapter 10 is seated on the movable table 110, the module 161 for determining a carrier receives detection signals A1 outputted from the first sensors 121a to 121d (S101). These detection signals A1 are outputted when the first protrusions of the first sensors 121a to 121d come into contact with the bottom surface 310 of the carrier 300 or the bottom surface of the adapter 10.

The module 161 determines whether or not the second sensors 122a and 122b have outputted detection signals A2 (S102). When the wafer carrier 200 is seated on the movable table 110 via the adapter 10, the second sensors 122a and 122b send the detection signals A2 to the module 161. More specifically, when the second protrusions of the second sensors 122a and 122b come into contact with the contact point 22A of the shifting member 22-1 and the contact point 22B of the shifting member 22-2, the second sensors 122a and 122b output the detection signals A2, respectively.

When the second sensors 122a and 122b output the detection signals A2 (S102 YES), the module 161 identifies that the wafer carrier 200 is seated on the movable table 110.
via the adapter 10, outputting a signal indicative of the identification to the module 162 for mapping a wafer.

[0083] The module 162 reads out a signal B1 from the module 163 for determining initial values so as to carry out mapping for wafers 200A stored in the slots 300B of the second carrier 200 (S103). The signal B1 includes information about a pitch (6.35 mm, for example) between the wafers 200A, a distance between the movable table 110 and an uppermost slot 200B, for which the mapping sensors 152a and 152b start finding a wafer 200A. In this connection, it may be alternatively possible to include the number of slots 200B in the signal B1, which allows the module 162 to calculate a position to finish finding a wafer 200A.

[0084] On the other hand, when the second sensors 122a and 122b do not output detection signals A2 (S102, NO), the module 161 identifies that a wafer carrier 300 is seated on the movable table 110, sending a signal indicative of the identification to the module 162. It is noted that when only the adapter 10 is seated on the movable table 110, the module 161 also receives the detection signals A1. However, because the adapter 10 is always handled with the wafer carrier 200 seated on it, it is reasonable for the module 161 to identify the wafer carrier 300 seated on the movable table 110 as described above.

[0085] The module 162 reads out a signal B2 from the module 163 for determining initial values so as to carry out mapping for wafers 300A stored in the slots 300B of the wafer carrier 300 (S104). The signal B2 includes information about a pitch (10 mm, for example) between the wafers 300A, and a distance between the movable table 110 and an uppermost slot 300B, for which the mapping sensors 152a and 152b start finding a wafer 300A. In this connection, it may be alternatively possible to include the number of slots 300B in the signal B2, which allows the module 162 to calculate a position to finish finding a wafer 300A.

[0086] After reading a signal C1 outputted by the transmission sensors 141a and 141b (S105), the module 162 sends a signal D1 to the mapping sensors 152a and 152b so as to start finding a wafer 200A or 300A (S106).

[0087] The signal C1 includes information about which wafers 200A or wafers 300A lie in an appropriate position for mapping. More specifically, the appropriate position coincides with where all end portions of the wafers 200A or the wafers 300A towards the load port door 140 lie outside a sensing area of the transmission sensors 141a and 141b, when the movable table 110 has moved towards the load port door 140.

[0088] If a wafer 200A (or 300A) slips out of a slot 200B (or 300B) due to a vibration resulting from the movement of the movable table 110, an end portion of the wafer 200A (or 300A) comes to lie inside the sensing area of the transmission sensors 141a and 141b.

[0089] At this moment the transmission sensors 141a and 141b output a signal indicative of the dislocation of the wafer 200A (or 300A), and the module 162 prohibits the mapping sensors 152a and 152b from starting to find the wafer 200A (or 300A) so as to cancel mapping.

[0090] In this case, the movable table 110 moves apart from the load port door 140, returning to the original position. It may be possible for the module 162 to output a signal carrying an instruction to cause an audio module (not shown) to produce warning sound or a display to display a warning message so as to alert an operator to the dislocation of the wafer 200A (or 300A). Moreover, it may be possible for the module 162 to send this signal to a wafer treatment apparatus and the like.

[0091] After the operator and the like set the wafer 200A (or 300A) correctly in the slot 200B (or 300B), the module 162 for mapping a wafer resumes reading a signal C1 and outputting a signal D1 so as to allow the mapping sensors 152a and 152b to start finding the wafer 200A (or 300A).

[0092] Subsequently, the controller 160 outputs a signal E1 to the mechanism 150 for opening and closing a load port door (S107). When the controller 160 outputs the signal E1, the mechanism 150 opens the load port door 140 in the door opening 131. In this way, the carrier opening 202 (or 302) of the wafer carrier 200 (or 300) and a processing space inside the wafer treatment apparatus come to spatially communicate with each other.

[0093] The wafer transfer robot transfers the wafer 200A (or 300A) into the processing space to be subjected to processes of the backend process.

[0094] Since not only can a wafer carrier 300 be directly seated on the movable table 110, but a wafer carrier 200 can also be indirectly seated on the movable table 110 via the adapter 10, the load port 100 provides the movable table 110 on which one of the wafer carriers 200 and 300 differing in size from each other can be selectively seated.

[0095] In this way, a wafer treatment apparatus is able to handle wafer carriers having different sizes so long as the load port 100 is disposed in front of the apparatus, which leads to a reduction in costs and space saving.

[0096] The load port 100 detects which of a wafer carrier 200 and a wafer carrier 300 is seated on the movable table 110. Accordingly, the load port 100 is able to selectively carry out mapping for a wafer 200A and a wafer 300A having different sizes so long as the module 163 for determining initial values selects a corresponding initial value, when one of the wafer carrier 200 and the wafer carrier 300 having different sizes is seated on the movable table 110.

[0097] The adapter 10, which is provided between a wafer carrier 200 and the movable table 110, has the shifting members 22-1 and 22-2 that move towards the movable table 110, causing the second sensors 122a and 122b to output detection signals A2. In this way, the adapter 10 allows the load port 100 to identify that the wafer carrier 200 is indirectly seated on the movable table 110.

(Exemplary Modifications)

[0098] It can be appreciated from the foregoing description that the present invention is not limited to the particularly illustrated embodiment discussed above and may be carried out in various modified forms.

[0099] (1) In the embodiment described above, the load port 100 has the movable table 110 on which a wafer carrier 200 or a wafer carrier 300 is selectively seated. This invention is not limited to the wafer carriers 200 and 300. It may be alternatively possible to select positions associated with the first sensors 121a to 121d, the second sensors 122a and 122b, and the thrust members 24-1 and 24-2 so as to be compatible with a carrier in accordance with the SEMI standard.

[0100] (2) In the embodiment described above, when the first sensors 121a to 121d output detection signals A1, but the second sensor 122a or 122b does not output a detection signal A2, the module 161 for determining a carrier identifies in steps S101 and S102 that a wafer carrier 300 is seated on the movable table 110. It is alternatively possible to introduce a timer and the like. When a signal A2 is not outputted after a
predetermined elapsed time counted by the timer, which is triggered to start counting by a signal A1, the module 161 identifies that the wafer carrier 300 is seated on the movable table 110.

[0101] (3) In the embodiment described above, the first sensors 121a to 121d and the second sensors 122a and 122b are contact-type sensors. This invention is not limited to this type of sensor. It may be possible to adopt noncontact-type sensors so long as they detect displacements relative to the bottom surface of the wafer carrier 300, the bottom surface of the adapter 10, and the shifting members 24-1 and 24-2.

[0102] (4) In the embodiment described above, the mapping sensors 152a and 152b start finding a wafer 200A (or 300A) at an uppermost slot 2003 (or 3003). This invention is not limited to this method. It may be alternatively possible to introduce a distance between a lowermost slot 2003 (or 3003) and the movable table 110 and the number of slots 2003 (or 3003) into a signal B1 and a signal B2, respectively, to lower the support axis 151 in advance so that the mapping sensors 152a and 152b start finding a wafer 200A (or 300A) at a lowermost slot 2003 (or 3003).

[0103] (5) In the embodiment described above, the descriptions are given of the load port 100, which is used in a backend process. This invention is not limited to this type of application. It may be alternatively possible to apply the load port 100 to a front-end process so long as it is used in a clean room with a high level of cleanliness. A detailed description is given below of the alternatives.

[0104] A typical load port is intended for use at factories principally carrying out treatment for wafers having a dimension of 300 mm. In addition, a factory for 300 mm wafers locally maintains a high level of cleanliness for a clean room, in which overall cleanliness is relatively low.

[0105] Of the factories for 300 mm wafers, a factory of a front-end process for 300 mm wafers carries out treatment for 300 mm wafers with a wafer carrier having a carrier door. In contrast, a factory of a backend process for 300 mm wafers, which does not require as a high level of cleanliness as one for a front-end process, sometimes carries out treatment for not only 300 mm wafers but also 200 mm wafers with a wafer carrier 300 and a wafer carrier 200, with each having an open face.

[0106] Therefore, it is possible to versatilely use the load port 100 at the factory of a backend process for 300 mm wafers.

[0107] On the other hand, since factories of 200 mm wafers maintain a high level of cleanliness in their clean rooms, it sometimes occurs that a factory for 200 mm wafers uses a wafer carrier 200 having an open face, irrespective of whether the factory is intended for a front-end process or a backend process. In this way, the load port 100 can be used not only at a factory of a back-end process for 200 mm wafers, but also at a factory of a front-end process for 200 mm wafers.

[0108] In addition, since a factory for 300 mm wafers such as a miniFab, which provides a small production line for experiments, maintains a high level of cleanliness in its clean room, it is able to use wafer carriers 200 and 300 each having an open face. In this way, this type of factory is able to use the load port 100 for a front-end process.

[0109] Furthermore, it is possible to use the load port 100 for a front-end process at a laboratory having a clean room with a high level of cleanliness in addition to the factories described above.

1. (canceled)

2. A load port, which is provided in front of a door opening of a wafer treatment apparatus and on which a carrier is seated, opening and closing a load port door in the door opening, the carrier storing wafers at predetermined intervals therein, the load port comprising:

- a detecting device for identifying which of first and second carriers is seated on the table, the first carrier, storing first wafers, being seated directly on the table, and the second carrier, differing in size from the first carrier, storing second wafers differing in size from the first wafers, being seated on the table via an adaptor; and
- a mapping device,

wherein the detecting device outputs a detection signal in response to one of the first and second carriers which is seated on the table, and the mapping device conducts mapping for one of a first wafer and a second wafer, receiving the detection signal.

3. A load port according to claim 2, wherein the mapping device changes initial values for conducting the mapping, receiving the detection signal.

4. A load port according to claim 3, wherein the initial values comprise:

- a distance between the first wafers, and a distance between one of lowermost and uppermost holders for a first wafer in the first carrier and the table; and
- a distance between the second wafers, and a distance between one of lowermost and uppermost holders for a second wafer in the second carrier and the table.

5. A load port according to claim 4, wherein the mapping device includes a mapping sensor for detecting one of a first wafer and a second wafer, while moving in one direction selected from moving in a direction from the lowermost holder to the uppermost holder and moving in a direction from the uppermost holder to the lowermost holder.

6. A load port according to claim 5, wherein

- when one carrier selected from the first carrier and the second carrier is seated on the table, the table moves towards the load port door such that an end portion of a first wafer stored in the first carrier and an end portion of a second wafer stored in the second carrier substantially coincide with each other;
- the mapping device includes a slip-out sensor that is attached to the load port door so as to detect a first wafer and a second wafer slipping out of the holders towards the load port door, and when the end portion lies inside a sensing area of the slip-out sensor after the table has finished moving towards the load port door, the mapping device terminates the mapping.

7. A load port according to claim 6, wherein

- when the end portion lies outside the sensing area of the slip-out sensor after the table has finished moving towards the load port door, the mapping device starts the mapping.

8. A load port according to claim 1, wherein

- the adaptor includes a shifting member, and
- the detecting device includes:

- a first sensor for detecting an amount of displacement with a bottom surface of the first carrier when the first carrier is seated on the table, and detecting an amount of displ-
placement with a bottom surface of the adaptor when the adaptor is seated on the table; and
a second sensor that is provided on a bottom surface of the adaptor so as to detect an amount of displacement with the shifting member moving towards the table, when the second carrier is seated on the table via the adaptor.

9. A load port according to claim 8, wherein
the adaptor includes a thrust member on an upper surface thereof, depressed by a protrusion provided on a bottom surface of the second carrier, and
when the protrusion depresses the thrust member, the shifting member moves towards the table.

10. An adaptor for a load port system, the load port system having a table on which a first carrier and a second carrier differing in size from each other are selectively seated, the first carrier, which stores first wafers, being directly seated on the table, the second carrier, which stores second wafers differing in size from the first wafers, being indirectly seated on the table, the load port system having a detecting device that outputs a detection signal indicating that the second carrier has been seated on the table, the adaptor that is provided between the second carrier and the table comprising:
a thrust member that is provided on an upper surface of the adaptor and depressed by a protrusion provided on a bottom surface of the second carrier; and
a shifting member that is provided on a bottom surface of the adaptor, wherein
when the second carrier is indirectly seated on the table and the protrusion depresses the thrust member, the shifting member moves towards the table, and the detecting device outputs the detection signal.

* * * * *