COMPACT APPARATUS AND METHOD FOR STORING AND LOADING SEMICONDUCTOR WAFER CARRIERS

Kompakte Vorrichtung und Methode zum Aufbewahren und Laden von Halbleiterscheibenträgern

Appareil compact et méthode de stockage et de chargement de supports de galettes semi-conductrices

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The present invention relates generally to semiconductor wafer fabrication systems, and to an improved method and apparatus for storing and loading semiconductor wafer carriers at a given semiconductor wafer fabrication tool. The present application is related to US-A-5,957,648.

The drive for reduced cost per unit wafer processed characterises the semiconductor industry. Thus the semiconductor industry continuously searches for ways to increase wafer output and/or reduce overall equipment costs (costs of ownership). Among the factors significantly affecting cost of ownership for a given piece of equipment are clean room costs, footprint and labor costs. It is well recognized that overall semiconductor wafer fabrication system (i.e., fabrication tool) productivity increases are achieved by ensuring a constant supply of wafers at each tool. Conventionally this has been accomplished by employing a local buffer supply (i.e., a supply of wafers at the tool). For example, the "MINI BUFFER" marketed by Jenoptik/Infab is a vertical buffer which is positioned near a fabrication tool's load lock chambers. The MINI BUFFER comprises a series of vertically arranged shelves and one or more load ports for access by the tool's loader robot, and/or for access by factory transport agents (i.e., the mechanism that transfers wafer carriers from the factory to the buffer apparatus' factory load port). Conventionally one MINI BUFFER is positioned near each load lock, a distance from the load lock sufficient to accommodate the axis of rotation of a front loader robot. The loader robot may then access either MINI BUFFER to obtain a wafer carrier for loading to the front load lock. Although such methods maintain a constant local buffer supply of wafer carriers, they occupy a considerable amount of floor space thus increasing the system's cost of ownership. The fact that fabrication tools are frequently maintained in a clean room environment further exacerbates the increased cost associated with the system's larger footprint.

In addition, most prior art systems do not allow simultaneous access by the tool loader and the factory transport agent, and thereby complicate factory transport scheduling.

US-A-5,957,648 discloses a Factory Automation Apparatus and Method for Handling, Moving and Storing Semiconductor Wafer Carriers, which provides an apparatus which advantageously allows for independent operation of the factory transport agent and the fabrication tool's loader mechanism, and provides for local interconnection of fabrication tools in a reduced footprint configuration. However, a continuous need exists for an apparatus and method which provides even further footprint reduction.

EP-A-0675523 discloses a method of providing local area buffer of wafers for loading to a fabrication tool comprising receiving a wafer at the fabrication tool, elevating a wafer carrier to a height greater than the height of the fabrication tool, placing the wafer above the fabrication tool, and lowering the wafer carrier to the tool load port of the fabrication tool.

This invention provides an apparatus for buffering wafer carriers to be loaded to a fabrication tool comprising a first load port for receiving wafer carriers; a first vertical transfer mechanism for wafer carriers, operatively coupling said first load port; at least one storage location for wafer carriers operatively coupling said first vertical transfer mechanism; and a first wafer exchange port for transferring a plurality of wafers from wafer carriers to the fabrication tool; wherein the first vertical transfer mechanism is for lifting wafer carriers to a height greater than that of the fabrication tool; the at least one storage location is located above the fabrication tool; in that the apparatus further comprises a second vertical transfer mechanism for wafer carriers operatively coupling said at least one storage location for lowering the wafer carrier for loading into the fabrication tool; and in that the first wafer exchange port operatively couples the second vertical transfer mechanism.

The present invention provides a compact method and apparatus for buffering wafer carriers to be loaded to a fabrication tool (i.e. a load buffer) which eliminates the need for the front loader robot required of prior art systems and provides overhead storage locations, therefore greatly reducing footprint as compared to prior art systems. The load buffer features 1) two physically separate load ports; a load port for transferring wafer carriers between the factory and the load buffer apparatus, and a wafer exchange port for transferring either the entire wafer carrier, or one or more wafers at a time between the load buffer apparatus and the fabrication tool and 2) overhead storage locations. Preferably the load buffer will have two pairs of physically separated load ports comprising a first load port and a first wafer exchange port, and a second load port and a second wafer exchange port respectively. In a further aspect the load buffer includes top opening load locks to receive wafers for loading into the fabrication tool. Each load lock includes a loader mechanisms for transferring wafers or cassettes of wafers between the wafer exchange port and the load lock chamber. The physical separation of the load port and the wafer exchange port allows for independent loading of both the load buffer apparatus and the fabrication tool. The independent loading of the load buffer apparatus and the fabrication tool allows a factory transport agent to operate independent of the operation of the fabrication tool's loader mechanism, making factory-wide automation more flexible and efficient.

The overhead storage locations are above the fabrication tool (as used herein a first feature described as "above" a second feature shall mean the first and second feature have at least partially overlapping footprints). Preferably the overhead storage locations are...
such that elevation of the first lid causes the second lid
anism which engages a second lid (the lid of a pod type
by reference. In one aspect the top opening load lock
ther comprises a top opening load lock such as that dis-
[0011]
nderably completely above the respective port.
fourth positions are substantially above, and most pref-
respectively. Preferably the first, second, third and
second wafer exchange port from a third and fourth
ond load port respectively; and the second robot is con-
from a first and second position above the first and sec-
as to access the first load port and the second load port
that the x-axis component can travel along the length of
x-axis component being movably coupled to the y-axis component such that the x-axis component can travel along the length of the y-axis component. The first robot is configured so as to access the first load port and the second load port from a first and second position above the first and second load port respectively; and the second robot is configured so as to access the first wafer exchange port and the second wafer exchange port from a third and fourth position above the first and second wafer exchange port respectively. Preferably the first, second, third and fourth positions are substantially above, and most preferably completely above the respective port.
[0011] In another aspect, the inventive load buffer further comprises a top opening load lock such as that disclosed in US-A-539105 entitled “Micro-Environmental Load Lock” the entirety of which is hereby incorporated by reference. In one aspect the top opening load lock has a first lid comprising a wafer carrier engaging mechan-
ism which engages a second lid (the lid of a pod type wafer carrier positioned on the first wafer exchange port) such that elevation of the first lid causes the second lid to elevate, opening the wafer carrier positioned on the first wafer exchange port. In a further aspect the wafer exchange port is positioned above the fabrication tool's transfer chamber and wafers are extracted therefrom and transferred to a position within the open first load lock by a loader first loader mechanism such as the wa-
[0012] Other objects, features and advantages of the present invention will become more fully apparent from the following detailed description of the preferred embodiments, the appended claims and the accompanying drawings.
[0013] The invention will now be illustrated with reference to the drawings, in which:
FIG. 1 is a side view of an inventive load buffer;
FIG. 2 is a front elevational view of the load buffer of FIG. 1 which shows a preferred arrangement of four storage locations 25a, 25b, 25c, and 25d;
FIG. 3 is a top plan view of the load buffer of FIG. 2 which shows a preferred footprint thereof;
FIGs. 4A-4F are side elevational views of the load buffer of FIG. 2, which are useful in explaining a first aspect of wafer carrier transport therethrough; and
FIGs. 5A-5C are side elevational views of the load buffer of FIG. 2, which are useful in explaining a second aspect of wafer carrier transport there through.
[0014] FIG. 1 is a side view of an inventive load buffer 11. The load buffer 11 comprises a first and second vertical transfer mechanism comprised of a first robot 13 and a second robot 15, respectively. The first robot 13 comprises a first y-axis component 17 and a first x-axis component 19 movably coupled to the first y-axis component 17 such that the first x-axis component 19 may travel along the length of the first y-axis component 17. Similarly, the second robot 15 comprises a second y-axis component 21 and a second x-axis component 23 movably coupled to the second y-axis component 21 such that the second x-axis component 23 may travel along the length of the second y-axis component 21. Operatively coupled between the first robot 13 and the second robot 15 are one or more storage locations 25a, 25b. The first robot 13 is configured such that when the first x-axis component 19 is at the lower portion of the first y-axis component 17 it may access a first load port 27 (preferably a SEMI E 15 type load port) and such that when the first x-axis component 19 is at the upper portion of the first y-axis component 17 it may access a first overhead load port (not shown) which provides access to a first overhead wafer carrier transport system such as a monorail, referenced generally by the numeral 29a of FIG. 1. The second robot 15 is configured such that when the second x-axis component 23 is at the lower portion of the second y-axis component 21 it may access a first wafer exchange port 31 and, optionally, such that when the second x-axis component 23 is at the upper portion of the second y-axis component 23 it may

The invention comprises a top opening load lock such as that disclosed in US-A-539105 entitled “Micro-Environmental Load Lock” the entirety of which is hereby incorporated by reference. In one aspect the top opening load lock has a first lid comprising a wafer carrier engaging mechanism which engages a second lid (the lid of a pod type wafer carrier positioned on the first wafer exchange port) such that elevation of the first lid causes the second lid to elevate, opening the wafer carrier positioned on the first wafer exchange port. In a further aspect the wafer exchange port is positioned above the fabrication tool's transfer chamber and wafers are extracted therefrom and transferred to a position within the open first load lock by a loader first loader mechanism such as the wafer extraction platform disclosed in EP-A-0848412. Other objects, features and advantages of the present invention will become more fully apparent from the following detailed description of the preferred embodiments, the appended claims and the accompanying drawings. The invention will now be illustrated with reference to the drawings, in which:

FIG. 1 is a side view of an inventive load buffer; FIG. 2 is a front elevational view of the load buffer of FIG. 1 which shows a preferred arrangement of four storage locations 25a, 25b, 25c, and 25d; FIG. 3 is a top plan view of the load buffer of FIG. 2 which shows a preferred footprint thereof; FIGs. 4A-4F are side elevational views of the load buffer of FIG. 2, which are useful in explaining a first aspect of wafer carrier transport therethrough; and FIGs. 5A-5C are side elevational views of the load buffer of FIG. 2, which are useful in explaining a second aspect of wafer carrier transport there through.
access an optional second overhead load port which provides access to a second overhead wafer carrier transport system such as a monorail, referenced generally by the numeral 20 in FIG. 1. Both the first x-axis component 19 and the second x-axis component 23 are configured so as to reach any of the storage locations 25a, 25b, 25c, and 25d. In a preferred embodiment, each load port, each overhead load port and each wafer exchange port may simply comprise a predetermined location.

[0015] The first wafer exchange port 31 is preferably located substantially or completely above a fabrication tool 33 having at least a transfer chamber 32, a process chamber 34 and a first load lock 35. Most preferably the first wafer exchange port 31 is located above the transfer chamber 32 of the fabrication tool 33. The first wafer exchange port 31 is operatively coupled to the first load lock 35 via a first loader mechanism referenced generally by the numeral 37 of FIG. 1. The first loader mechanism 37 comprises a wafer cassette platform such as that described in EP-A-0848412 that extends outside the open load lock 35 to extract wafers from a cassette located on the first wafer exchange port 31. The first load lock 35 has a first lid 39 and a lift-lower mechanism 41. In the present invention the first loader mechanism 37 is positioned on lift-lower mechanism 41. When the first lid 39 and the lift-lower mechanism 41 are in their elevated positions, as shown in FIG. 1, the first loader mechanism 37 extends horizontally, extracts one or more wafers from a first wafer carrier 43 (or, alternatively, can transfer the entire wafer carrier) located on the first wafer exchange port 31 and retracts carrying the extracted wafers (or the entire cassette) into position on the lift-lower mechanism 41. The lift-lower mechanism 41 then lowers the wafers (or the cassette) as the first lid 39 lowers.

[0016] Further, in a preferred embodiment the first lid 39 has a wafer carrier-engaging mechanism referenced generally by the numeral 45 of FIG. 1 which will engage a second lid 47 of a first wafer carrier 43 located on the first wafer exchange port 31 causing the second lid 47 to elevate as the first lid 39 elevates. Thus, as shown in FIG. 1, the first wafer carrier 43 is open and ready for the first loader mechanism 37 to extract wafers for loading to the first load lock 35.

[0017] FIG. 2 is a front elevational view of the load buffer 11 of FIG. 1 which shows a preferred arrangement of four storage locations 25a, 25b, 25c, and 25d, above the first load lock 35 and a second load lock 49. As shown in FIG. 2, the first load lock 35 is open with the first lid 39 elevated and the first wafer carrier 43 loaded on the lift-lower mechanism 41 for subsequent lowering into the first load lock 35. A second wafer carrier 51, a third wafer carrier 53, a fourth wafer carrier 55 and a fifth wafer carrier 57 are in storage on the storage locations 25a, 25b, 25c and 25d, respectively.

[0018] FIG. 3 is a top plan view of the load buffer 11 of FIGs. 1 and 2 which shows a preferred footprint of the load buffer 11, and which shows in pertinent part, a preferred footprint of the local area semiconductor wafer fabrication system. The four primary horizontal positions of the first x-axis component 19 and of the second x-axis component 23 are represented as 19a, 19b, 19c, and 19d, and 23a, 23b, 23c, and 23d respectively. However, it is understood that the first x-axis component 19 and the second x-axis component 23 each occupy only one of these positions at a given time. (The primary vertical positions of the first x-axis component 19 and of the second x-axis component 23 are shown sequentially in FIGs. 4A-4F and FIGs. 5A-5C.) As shown, the first load port 27 and a second load port 59 are advantageously positioned directly adjacent the first load lock 35 and the second load lock 49 of the fabrication tool 33, resulting in the overall footprint of the local area semiconductor wafer fabrication system being considerably smaller than that of prior art systems which require sufficient space for a front loader robot. Such advantageous positioning of the first load port 27 and the second load port 59 is possible because wafer carriers entering the load buffer 11 via the first load port 27 or the second load port 59 are extracted from the top of the first load port 27 and the second load port 59, respectively, rather than from the sides thereof. Similarly, because the first load port 27 and the second load port 59 are loaded and unloaded from above, they may be positioned in close proximity to each other, unlike side loaded prior art systems whose load ports must be positioned a sufficient distance from each other to accommodate the loader robot’s axis of rotation.

[0019] Further, as shown by FIG. 3, storage locations 25a and 25c are positioned above the first load lock 35 and the second load lock 49, respectively, and the first wafer exchange port 31 and a second wafer exchange port 61 are positioned above the transfer chamber 32 of the fabrication tool 33. The location of the plurality of storage locations 25a-25d, the first wafer exchange port 31 and the second wafer exchange port 61 above the fabrication tool allows the footprint of the inventive local area semiconductor wafer fabrication system to be significantly smaller than that of prior art systems. The smaller footprint provided by the present invention reduces the systems cost of ownership which in turn reduces the cost of each unit produced.

[0020] FIGs. 4A-4F are side elevational views of the load buffer 11, which are useful in explaining a first aspect of wafer carrier transport through the load buffer 11. The components of the load buffer 11 are described above with reference to FIG. 1 and are therefore not repeated here. Further, in the preferred embodiment, the entire load buffer apparatus 11 is maintained under a vacuum hood. However, it is understood that if the load buffer 11 were not under vacuum, the steps of opening a pod type wafer carrier and loading the wafers to the load lock would be performed within an enclosed vacuum chamber that would surround each wafer exchange port and the open load lock associated therewith.

[0021] As shown in FIG. 4A the first wafer carrier 43
is in storage at the storage location 25a. In operation, a second wafer carrier 51 is placed on the first load port 27 by, for example, an operator, automatic guided vehicle (AGV) or rail-guided vehicle (RGV), and the first x-axis component 19 of the first robot 13 lowers to pick up the second wafer carrier 51, as shown in FIG. 4A. The second robot 15 operates independently of the first robot 13, and may therefore be in any required position at a given time.

[0022] Next, as shown in FIG. 4B, the first x-axis component 19 lifts the second wafer carrier 51 and pivots to deposit the second wafer carrier 51 on the storage location 25b, as represented by arrow 63.

[0023] Thereafter, as shown in the example of FIG. 4C, the first x-axis component 19 may pivot and lower to pick up the third wafer carrier 53 from the first load port 27, as the second x-axis component 23 of the second robot 15 picks up the first wafer carrier 43 from the storage location 25a, pivots, lowers and deposits the first wafer carrier 43 at the first wafer exchange port 31, as represented by the arrow 65.

[0024] As shown in FIG. 4D the first lid 39 of the first load lock 35 elevates, and the wafer carrier-engaging mechanism 45, which engages the second lid 47, of the first wafer carrier 43, causes the second lid 47 to elevate. Thus, the first wafer carrier 43 is open and any number of wafers or the entire cassette 43a (i.e., the contents of the open pod type first wafer carrier 43) may be transferred from the first wafer exchange port 31 to the open first load lock 35. As described with reference to FIG. 1, the first loader mechanism 37 may be a conventional apparatus, or, preferably, is as described in EP-A-0 848 412. The apparatus described in this application comprises a slotted assembly which extends to position the slots beneath the wafers to be extracted. The assembly then elevates, lifting the wafers, and retracts. The assembly can be modified such that the number of slots correspond to the number of wafers to be extracted, or can be modified to extend to a position beneath the entire cassette, thus transporting the entire cassette when the assembly retracts.

[0025] FIG. 4E shows the wafer cassette 43a (extracted from the open first wafer carrier 43) positioned on the lift-lower mechanism 41 for subsequent lowering into the first load lock 35.

[0026] FIG. 4F shows the wafer cassette 43a positioned within the first load lock 35, and the first lid 39 of the first load lock 35 in the closed position. Thereafter wafers may be extracted from the first load lock 35 and processed within the fabrication tool 33. The empty first wafer carrier 43 can be closed and moved to one of the storage locations 25a-25d or can remain positioned on the first wafer exchange port 31 until wafers have been processed and returned to the first wafer carrier 43.

[0027] The first robot 13 and the second robot 15 may continue to operate independent of the loading of the first wafer carrier 43 from the first wafer exchange port 31 to the first load lock 35. Although not shown in FIGs. 4E and 4F, the first robot 13 may continue transferring wafers carriers between the first load port 27 and/or the overhead load port (e.g., a predetermined location along the monorail 29) and the plurality of storage locations 25a-25d; and the second robot 15 is able to pick up wafer carriers as required from the plurality of storage locations 25a-25d, and deposit them at either the first wafer exchange port 31 or the second wafer exchange port 61, provided the particular wafer exchange port is vacant.

[0028] The configuration of the load buffer 11 advantageously enables independent operation of the first robot 13 and the second robot 15, and enables independent loading and unloading of each pair of load ports (e.g., the first load port and the first wafer exchange port) and the overhead load ports. Thus, it is understood that the specific operation of the load buffer 11 described with reference to FIGs. 4A-4F is merely exemplary.

[0029] FIGs. 5A-5C are side elevational views of the load buffer of FIG. 2, which are useful in explaining a second aspect of wafer carrier transport therethrough. As shown in FIG. 5A the first x-axis component 19 of the first robot 13 pivots to pickup the first wafer carrier 43 from the monorail 29. Thereafter as shown in FIG. 5B, the first x-axis component 19 lowers and pivots about the first y-axis component 17 to deposit the first wafer carrier 43 on the storage location 25b, as represented by arrow 67. Then, as shown in FIG. 5C, the second x-axis component 23 of the second robot 15 picks up the first wafer carrier 43 from the storage location 25b and pivots about the second y-axis component 21 and lowers to deposit the first wafer carrier 43 on the first wafer exchange port 31, as represented by arrow 69. Thereafter the first wafer carrier 43 is opened and lowered into the first load lock 35 as previously described with reference to FIGs. 4D-4F. While only the first wafer carrier 43 is shown traveling through the load buffer 11, it is understood that when the first x-axis component 19 and the second x-axis component 23 are not transporting the first wafer carrier 43, they may be picking up, transporting, or depositing other wafer carriers at any location within load buffer 11, as previously described. In sum, the operation of the first robot 13 and the second robot 15 may be synchronous at certain times, and also may operate asynchronously at other times. Therefore it is understood that the specific operation of the load buffer 11 described with reference to FIGs. 5A-5C is merely exemplary.

[0030] After processing is complete and the wafers have been returned to the load lock 35, the lid of load lock 35 elevates, the lift lower mechanism 41 lifts the wafers to the elevation of the first wafer exchange port 31, and the first loader mechanism 37 returns the wafers to the cassette 43 positioned on the wafer exchange port 31. As the first lid 39 of load lock 35 lowers, lift/lower mechanism 41 lowers, and the second lid 47 of the wafer carrier 43 lowers, sealing around the cassette 43a. Thereafter the second robot 15 transfers the wafer car-
An apparatus for buffering wafer carriers (51, 53, 55, 57) to be loaded to a fabrication tool (33) comprising:

1. A first load port (27) for receiving wafer carriers (51, 53, 55, 57);
2. A vertical transfer mechanism (13) for wafer carriers, operatively coupling said first load port (27);
3. At least one storage location (25a, 25b, 25c, 25d) for wafer carriers operatively coupling said first vertical transfer mechanism; and
4. A first wafer exchange port (31) for transferring a plurality of wafers from wafer carriers (51, 53, 55, 57) to the fabrication tool (33);

characterised in that:

the first vertical transfer mechanism (13) is for lifting wafer carriers (51, 53, 55, 57) to a height greater than that of the fabrication tool (33); the at least one storage location (25a, 25b, 25c, 25d) is located above the fabrication tool (33); and in that the apparatus further comprises a second vertical transfer mechanism (15) for wafer carriers operatively coupling said at least one storage location (25a, 25b, 25c, 25d), for lowering the wafer carrier for loading into the fabrication tool (33); and in that the first wafer exchange port (31) operatively couples the second vertical transfer mechanism (15).

Claims

1. An apparatus for buffering wafer carriers (51, 53, 55, 57) to be loaded to a fabrication tool (33) comprising:

2. In operation, at any given time wafer carriers may be traveling both forward and backward through the load buffer 11. Thus, a robot may transfer a wafer carrier to the storage shelves or to the overhead load ports, and then immediately pick up a second wafer carrier for transfer to one of the load ports or to the wafer exchange ports.

3. The foregoing description discloses only the preferred embodiment of the invention, modification of the above disclosed apparatus and method which fall within the scope of the invention will be readily apparent to those of ordinary skill in the art. For instance, although only four storage locations 25a, 25b, 25c and 25d are shown, additional storage locations could be provided.

4. Accordingly, while the present invention has been disclosed in connection with the preferred embodiment thereof, it should be understood that other embodiments may fall within the spirit and scope of the invention, ad defined by the following claims.
x-axis component (23) and a second y-axis component (21).

7. An apparatus as claimed in claim 6, characterised in that the first x-axis component (19) is moveably coupled to the first y-axis component (17) and is configured so as to be able to access the first load port (27).

8. An apparatus as claimed in claim 7, characterised in that the first vertical transfer mechanism is configured so as to access the first load port (27) from a position above the first load port (27).

9. An apparatus as claimed in claim 7, characterised in that the first vertical transfer mechanism (13) is configured so as to access an overhead factory automation system (29).

10. An apparatus as claimed in claim 6, characterised in that the second x-axis component (13) is moveably coupled to the second y-axis component (21) and is configured so as to access the first wafer exchange port (31).

11. An apparatus as claimed in claim 10, characterised in that the second vertical transfer mechanism (15) is configured so as to access the first wafer exchange port (31) from a position above the first wafer exchange port (31).

12. A method of providing a local area buffer of wafers to a fabrication tool (33), comprising:

receiving a wafer carrier at the fabrication tool (33) from an overhead wafer carrier transport system; and
lowering the wafer carrier to a tool load port (27) of the fabrication tool (33);

characterised in that:

the method further comprises:

using a first vertical transfer mechanism for lifting wafer carriers to said at least one storage location which is located at a height greater than that of the fabrication tool;
lowering wafer carriers from the storage location using a second vertical transfer mechanism for loading the carriers into a fabrication tool; and
transferring wafers from the wafer carriers following lowering from the storage location to the fabrication tool using said first wafer exchange port.

13. A method as claimed in claim 12, characterised in that the step of receiving the wafer carrier at the fabrication tool (33) comprises receiving the wafer carrier from an overhead wafer carrier transport system (29) at an overhead factory load port.

14. A method as claimed in claim 12, characterised in that the step of placing the wafer carrier above the fabrication tool (33) further comprises storing the wafer carrier above the fabrication tool (33).

15. A method as claimed in claim 12, characterised in that the step of storing the at least one wafer carrier above the fabrication tool (33) comprises the steps of transferring the wafer carrier to a storage shelf (25).

16. A method as claimed in claim 15, characterised in that the step of storing the wafer carrier above the fabrication tool (33) comprises the step of transferring the wafer carrier from a first load port (27) to the storage shelf (29) via a first robot (13), and transferring the wafer carrier from the storage shelf (25) to a second load port (59) via a second robot (15).

17. A method as claimed in any one of claims 12 to 16, further comprising:

transferring at least one wafer stored in said wafer carrier from the tool load port (27) to a load lock (35) of the fabrication tool (33);
transferring the at least one wafer from the load lock (35) to a processing chamber (34) within the fabrication tool (33); and
processing the at least one wafer within the processing chamber (34) to produce a semiconductor wafer.
tungsvorrichtung (33))

dadurch gekennzeichnet,

- dass der erste vertikale Überführungsmechanismus (13) für ein Anheben von Waferträgern (51, 53, 55, 57) auf eine Höhe vorgesehen ist, die größer ist als die der Verarbeitungsvorrichtung (33),
- dass die wenigstens eine Lagerstelle (25a, 25b, 25c, 25d) sich über der Verarbeitungsvorrichtung (33) befindet,
- dass die Vorrichtung weiterhin einen zweiten vertikalen Überführungsmechanismus (15) für Waferträger aufweist, der die wenigstens eine Lagerstelle (25a, 25b, 25c, 25d) zum Absenken des Waferträgers für ein Laden in die Verarbeitungsvorrichtung (33) funktionsmäßig anbindet, und
- dass die erste Waferaustauschstelle (31) den zweiten vertikalen Überführungsmechanismus (15) funktionsmäßig anbindet.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet,

- dass der erste vertikale Überführungsmechanismus (13) zum Anheben und Absenken eines Waferträgers (43) zwischen der ersten Ladestelle (27) und einer Höhe vorgesehen ist, die größer ist als die der Verarbeitungsvorrichtung (33), und
- dass der zweite vertikale Überführungsmechanismus (15) für ein Anheben und Absenken eines Waferträgers (43) zwischen der ersten Waferaustauschstelle (31) und einer Höhe vorgesehen ist, die größer ist als die der Verarbeitungsvorrichtung (33).

3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass die erste Ladestelle (27) für die Aufnahme von Waferträgern aus einer Fabrik vorgesehen ist.

4. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass die erste Waferaustauschstelle (31) für die Aufnahme von in die Verarbeitungsvorrichtung (33) zu ladende Wafer vorgesehen ist.

5. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass der erste vertikale Überführungsmechanismus (13) mit einem Überkopf-Waferträger-Transportsystem (29) verbunden ist.

6. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass der erste vertikale Überführungsmechanismus (13) eine erste x-Achsen-Komponente (23) und eine zweite y-Achsen-Komponente (21) aufweist.

7. Vorrichtung nach Anspruch 6, dadurch gekennzeichnet, dass die erste x-Achsen-Komponente (19) beweglich mit der ersten y-Achsen-Komponente (17) verbunden und so gestaltet ist, dass ihr ein Zugang zu der ersten Ladestelle (27) möglich ist.


10. Vorrichtung nach Anspruch 6, dadurch gekennzeichnet, dass die zweite x-Achsen-Komponente (13) bewegbar der zweiten y-Achsen-Komponente (21) gekoppelt und für den Zugang zu der ersten Waferaustauschstelle (31) gestaltet ist.


12. Verfahren zur Bereitstellung eines Lokalbereichspuffers von Wafern für eine Verarbeitungsvorrichtung (33), bei welchem

- ein Waferträger an der Verarbeitungsvorrichtung (33) aus einem Überkopf-Waferträger-Transportsystem aufgenommen wird, und
- der Waferträger zu einer Vorrichtungs-Ladestelle (27) der Verarbeitungsvorrichtung (33) abgesenkt wird,

dadurch gekennzeichnet,

- dass ein erster vertikaler Überführungsmechanismus zum Anheben von Waferträgern zu wenigstens einer Lagerstelle verwendet wird, die sich auf einer Höhe befindet, die größer ist als die der Verarbeitungsvorrichtung,
- dass die Waferträger von der Lagerstelle unter Verwendung eines zweiten vertikalen Überführungsmechanismus zum Laden der Träger in die Verarbeitungsvorrichtung abgesenkt wer-
den und
dass Wafer von den Wafeträgern nach dem Absenken aus der Lagerstelle zu der Verarbei-
tungsvorrichtung unter Verwendung der ersten Waferaustauschstelle überführt werden.

13. Verfahren nach Anspruch 12, dadurch gekenn-
zeichnet, dass der Schritt des Aufnahmens des Wafeträgers an der Verarbeitungsvorrichtung (33) die Aufnahme des Wafeträgers von einem Über-
kopf-Wafeträger-Transportsystem (29) an einer Überkopf-Fabrik-Ladestelle aufweist.

14. Verfahren nach Anspruch 12, dadurch gekenn-
zeichnet, dass der Schritt des Anordnens des Wafeträgers über der Verarbeitungsvorrichtung (33) weiterhin das Lagern des Wafeträgers über der Verarbeitungsvorrichtung (33) aufweist.

15. Verfahren nach Anspruch 12, dadurch gekenn-
zeichnet, dass der Schritt des Lagens des wenigstens einen Wafeträgers über der Verarbeitungs-
vorrichtung (33) den Schritt aufweist, den Wafeträger zu einem Lagerfach (25) zu überführen.

16. Verfahren nach Anspruch 15, dadurch gekenn-
zeichnet, dass der Schritt des Lagens des Wafeträgers über der Verarbeitungsvorrichtung (33) den Schritt aufweist, den Wafeträger von einer ersten Ladestelle (27) zu dem Speicherfach (29) über ei-

17. Verfahren nach einem der Ansprüche 12 bis 16, bei welchem weiterhin
- wenigstens ein in dem Wafeträger gelagerter Wafer von der Vorrichtungs-Ladestelle (27) zu einer Ladeschleuse (35) der Verarbeitungs-
vorrichtung (33) überführt wird,
- der wenigstens eine Wafer aus der Lade-
schleuse (35) in eine Behandlungskammer (34) in der Verarbeitungsvorrichtung (33) über-
führt wird,
- dad wenigstens eine Wafer in der Behand-
lungskammer (35) zur Erzeugung eines Halb-
leiterwafers behandelt wird.

Revendications

1. Appareil pour former un stock tampon de supports (51, 53, 55, 57) de tranches devant être chargés sur un outil de fabrication (33) comportant :

un premier orifice (27) de chargement destiné à recevoir des supports de tranches (51, 53, 55, 57) ;
un premier mécanisme de transfert vertical (13) pour des supports de tranches, accolé fonctionnellement audit premier orifice de charge-
ment (27) ;
au moins un emplacement de stockage (25a, 25b, 25c, 25d) pour des supports de tranches s’accouplant fonctionnellement audit premier mécanisme de transfert vertical ; et un premier orifice (31) d’échange de tranches pour le transfert de plusieurs tranches depuis des supports de tranches (51, 53, 55, 57) à l’outil de fabrication (33) ;

2. Appareil selon la revendication 1, caractérisé en ce que le premier mécanisme de transfert vertical (13) est destiné à élever des supports de tranches (51, 53, 55, 57) à une hauteur supérieure à celle de l’outil de fabrication (33) ;
le, au moins un, emplacement de stockage (25a, 25b, 25c, 25d) est situé au-dessus de l’outil de fabrication (33) ;
et en ce que l’appareil comporte en outre un second mécanisme de transfert vertical (15) pour des supports de tranches, s’accouplant fonctionnellement audit, au moins un, emplace-
cement de stockage (25a, 25b, 25c, 25d) pour faire descendre le support de tranches pour un chargement dans l’outil de fabrication (33) ; et et en ce que le premier orifice (31) d’échange de tranches est accolé fonctionnellement au second mécanisme de transfert vertical (15).

3. Appareil selon la revendication 1, caractérisé en ce que le premier orifice de chargement (27) est destiné à recevoir des supports de tranches proven-
ant d’une usine.

4. Appareil selon la revendication 1, caractérisé en ce que le premier orifice (31) d’échange de tranches est destiné à recevoir des supports de tranches devant être chargées sur l’outil de fabrication (33).

5. Appareil selon la revendication 1, caractérisé en ce que le premier mécanisme de transfert vertical
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6. Appareil selon la revendication 1, **caractérisé en ce que** le premier mécanisme de transfert vertical (13) comporte un premier constituant (19) d'axe x et un premier constituant (17) d'axe y, et dans lequel le second mécanisme de transfert vertical (15) comporte un second constituant (23) d'axe x et un second constituant (21) d'axe y.

7. Appareil selon la revendication 6, **caractérisé en ce que** le premier constituant (19) d'axe x est accouplé de façon mobile au premier constituant (17) d'axe y et est configuré de façon à pouvoir accéder au premier orifice (27) de chargement.

8. Appareil selon la revendication 7, **caractérisé en ce que** le premier mécanisme de transfert vertical est configuré de façon à accéder au premier orifice (27) de chargement à partir d'une position située au-dessus du premier orifice (27) de chargement.

9. Appareil selon la revendication 7, **caractérisé en ce que** le premier mécanisme de transfert vertical (13) est configuré de façon à accéder à un système aérien (29) d'automatisation d'usine.

10. Appareil selon la revendication 6, **caractérisé en ce que** le second constituant (13) d'axe x est accouplé de façon mobile au second constituant (21) d'axe y et est configuré de façon à accéder au premier orifice (31) d'échange de tranches.

11. Appareil selon la revendication 10, **caractérisé en ce que** le second mécanisme de transfert vertical (15) est configuré de façon à accéder au premier orifice (31) d'échange de tranches à partir d'une position située au-dessus du premier orifice (31) d'échange de tranches.

12. Procédé de production d'un stock tampon local de tranches pour un outil de fabrication (33), comprenant :

la réception d'un support de tranches à l'outil de fabrication (33) depuis un système aérien de transport de supports de tranches ; et l'abaissement du support de tranches jusqu'à un orifice (27) de chargement d'outils de l'outil (33) de fabrication ;

**caractérisé en ce que** :

le procédé comprend en outre :

l'utilisation d'un premier mécanisme de transfert vertical destiné à élever des sup-

ports de tranches jusqu'au-dit, au moins un, emplacement de stockage qui est situé à une hauteur supérieure à celle de l'outil de fabrication ; l'abaissement de supports de tranches depuis l'emplacement de stockage en utilisant un second mécanisme de transfert vertical pour charger les supports dans un outil de fabrication ; et le transfert de tranches depuis les supports de tranches à la suite de l'abaissement à partir de l'emplacement de stockage jusqu'à l'outil de fabrication en utilisant ledit premier orifice d'échange de tranches.

13. Procédé selon la revendication 12, **caractérisé en ce que** l'étape de réception du support de tranches à l'outil de fabrication (33) comprend la réception du support de tranches depuis un système aérien (29) de transport de supports de tranches à un orifice aérien de chargement en usine.

14. Procédé selon la revendication 12, **caractérisé en ce que** l'étape de mise en place du support de tranches au-dessus de l'outil de fabrication (33) comprend outre le stockage du support de tranches au-dessus de l'outil de fabrication (33).

15. Procédé selon la revendication 12, **caractérisé en ce que** l'étape de stockage d'au moins un support de tranches au-dessus de l'outil de fabrication (33) comprend les étapes de transfert du support de tranches à un rayon de stockage (25).

16. Procédé selon la revendication 15, **caractérisé en ce que** l'étape de stockage du support de tranches au-dessus de l'outil de fabrication (33) comprend l'étape de transfert du support de tranches à un premier orifice de chargement (27) au rayon de stockage (29) par l'intermédiaire d'un premier robot (13), et de transfert du support de tranches au rayon de stockage (25) à un second orifice de chargement (59) par l'intermédiaire d'un second robot (15).

17. Procédé selon l'une quelconque des revendications 12 à 16, comprenant en outre :

le transfert d'au moins une tranche stockée dans ledit support de tranches depuis l'orifice (27) de chargement de l'outil jusqu'à un sas (35) de chargement de l'outil de fabrication (33) ;

le transfert de la, au moins une, tranche depuis le sas (35) de chargement jusqu'à une chambre de traitement (34) à l'intérieur de l'outil de fabrication (33) ; et le traitement de la, au moins une, tranche dans la chambre de traitement (34) pour produire
une tranche de semiconducteurs.