SUBSTRATE PROCESSING APPARATUS AND TRANSFER METHOD

TECHNICAL FIELD

[0001] The present disclosure relates to a substrate processing apparatus and a transfer method.

BACKGROUND

[0002] Patent Document 1 discloses a substrate processing apparatus that takes out a plurality of substrates from a carrier which accommodates the plurality of substrates to be transferred, and performs substrate processing on the taken-out substrates. In the substrate processing apparatus disclosed in Patent Document 1, the carrier is transferred with respect to a load port through which the carrier is loaded or unloaded, by an overhead hoist transport which moves along a track formed in a ceiling of a clean room where the substrate processing apparatus is installed.

[Prior Art Document]

[Patent Document]

[0003] Patent Document 1: Japanese Laid-Open Patent Publication No. 2014-116464

SUMMARY

[0004] A technology according to the present disclosure improves an efficiency of transferring a cassette to a substrate processing apparatus.

[0005] According to an embodiment of the present disclosure, a substrate processing apparatus that performs processing on a substrate which is accommodated in a cassette and is to be transferred, includes: at least one transfer block configured to transfer the substrate in an interior of the at least one transfer block; at least one substrate processing module configured to perform the processing on the substrate; and a cassette transfer mechanism configured to transfer the cassette between a delivery position set on an outer surface of the substrate processing apparatus and a loading/unloading position at which the cassette is loaded into and unloaded from an interior of the substrate processing apparatus. The cassette transfer mechanism includes a stage on which

example, 25 sheets of substrates per lot) semiconductor substrates (hereinafter, simply referred to as "substrates") is transferred to a substrate processing apparatus by an overhead hoist transport (OHT) which moves along a rail arranged on a ceiling surface of a clean room, as exemplified in Patent Document 1.

[0009] However, in the case of using the overhead hoist transport, an arrangement position of a load port of the substrate processing apparatus is limited within a movable range of the overhead hoist transport, that is, directly below the rail. This reduces a degree of freedom in the arrangement of the substrate processing apparatus. Further, even when unloading the cassette from the substrate processing apparatus, it is necessary to wait for the arrival of the overhead hoist transport in order to transfer the cassette. This may cause a degradation in throughput.

[0010] A technology according to the present disclosure has been made in view of the above matters and improves a transfer efficiency of the cassette with respect to the substrate processing apparatus. Hereinafter, the substrate processing apparatus and a cassette transfer method carried out by the substrate processing apparatus according to the present embodiment will be described with reference to the drawings. In addition, in this specification and the accompanying drawings, constituent elements having substantially the same functional configuration will be denoted by the same reference numerals, and redundant descriptions thereof will be omitted.

<Substrate Processing Apparatus>

[0011] First, a configuration of the substrate processing apparatus according to the present embodiment will be described. FIGS. 1 and 2 are a plan view and a perspective view illustrating an outline of a configuration of a substrate processing apparatus 1 according to the present embodiment, respectively. In addition, a wafer is an example of a substrate.

[0012] The substrate processing apparatus 1 has a configuration in which an atmospheric section 10 and a depressurization section 11 are integrally connected to each other via a load lock module 20. The atmospheric section 10 includes an atmospheric module that processes and/or transfers a substrate W in an atmospheric atmosphere. The depressurization section 11 includes

descends to a height position of the loading/unloading block 31.

[0038] Subsequently, after the first vertical transfer unit 67a descends, the horizontal transfer unit 63 with the cassette C1 placed thereon moves to the second horizontal-plane motor 61b (Operation S6 in FIG. 5). At this time, the supply of the current to the coils 62 of the second horizontal-plane motor 61b may be performed in advance prior to the delivery of the cassette C1 to the second horizontal-plane motor 61b, or may be performed simultaneously with the delivery of the cassette C1 to the second horizontal-plane motor 61b. The cassette C1 (the horizontal transfer unit 63) delivered to the second horizontal-plane motor 61b magnetically levitates and moves along the second horizontal-plane motor 61b when the current is supplied to the coils 62, and is placed on the load port 32 as a transfer destination (Operation S7 in FIG. 5). Thereafter, the substrate transfer port 33 of the atmospheric transfer block 30 is open, and the unprocessed substrates W in the cassette C1 are loaded into the substrate processing apparatus 1 by the substrate transfer mechanism (not illustrated). The unprocessed substrates W are subjected to various processes in the substrate processing modules 50.

[0039] In addition, in the case in which the cassette C is transferred from the placement portion 68 of the first vertical transfer unit 67a to the load port 32, for example, when the load port 32 as a transfer destination is at the center of the loading/unloading block 31 in the X-axis direction, interference may occur between the cassette C and another cassette C placed on another load port 32. This may make it difficult to appropriately transfer the cassette C1 to the corresponding load port 32.

[0040] In view of the foregoing, as illustrated in FIG. 6, a retreat position for another cassette C2 may be provided in the loading/unloading block 31. As illustrated in FIG. 6, the retreat position for another cassette C2 may be provided on a side facing the substrate transfer port 33 with reference to the load port 32 (that is, a side of the load port 32 in the negative Y-axis direction). Alternatively, as illustrated in FIG. 7, the retreat position for another cassette C2 may be provided above the load port 32 (that is, on a side of the load port 32in a positive Z-axis direction). In this case, for example, a lifting mechanism 70 may be further provided to move another cassette C2 upward and downward by magnetic levitation. In addition, FIGS. 6 and 7 are merely illustrative

cassette transfer mechanism 60 is not limited to this example as long as the cassette transfer mechanism 60 can transfer the cassette C to the load port of the substrate processing apparatus 1 independently of the overhead transfer mechanism 100.

Specifically, instead of the magnetic levitation, a moving mechanism including wheels, a power supply such as a battery, a drive source, a steering mechanism and the like may be used to transfer the cassette C. A base serving as a stage may be provided above the wheels and the cassette C may be placed on the base. Even in the case in which the cassette C is transferred using the wheels instead of the magnetic levitation, it is not necessary to arrange the load port 32 at least directly below the rail R of the overhead transfer mechanism 100. This makes it possible to improve a degree of freedom in installation of the substrate processing apparatus 1 and enhance a layout efficiency of the substrate processing apparatus 1 inside the clean room.

[0062] In addition, in the above embodiments, the substrate W has been described to be loaded or unloaded between the cassette C placed on the load port 32 and the interior of the substrate processing apparatus 1 via the substrate transfer port 33. However, the method of loading the substrate W into the substrate processing apparatus 1 is not limited thereto.

[0063] FIG. 11 is a perspective view schematically illustrating an outline of a configuration of a substrate processing apparatus 200 provided with a lifting mechanism 210 for loading the cassette C (the substrates W) into the substrate processing apparatus 200. In addition, in the substrate processing apparatus 200, constituent elements having substantially the same functional configuration as those of the substrate processing apparatus 1 described above will be denoted by the same reference numerals, and detailed descriptions thereof will be omitted.

[0064] The substrate processing apparatus 200 according to another embodiment includes the lifting mechanism 210, a vacuum transfer block 40, a substrate processing module 50, and a cassette transfer mechanism 60. The cassette transfer mechanism 60 transfers the cassette C at least on the upper surface of the vacuum transfer block 40 by the aforementioned method.

[0065] The lifting mechanism 210 places the cassette C which is delivered from the cassette transfer mechanism 60, in an interior of the lifting mechanism 210, and transfers (lifts) the substrates W between the exterior of the substrate processing apparatus 200 kept in an