US 20250259867A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2025/0259867 A1**

YAZAWA et al. (43) **Pub. Date: Aug. 14, 2025**

(54) **SUBSTRATE PROCESSING APPARATUS**

(71) Applicant: **EBARA CORPORATION**, Tokyo (JP)

(72) Inventors: **Akihiro YAZAWA**, Tokyo (JP); **Hirotaka OHASHI**, Tokyo (JP); **Yasuyuki MIYASAWA**, Tokyo (JP)

(21) Appl. No.: **18/704,865**

(22) PCT Filed: **Oct. 11, 2022**

(86) PCT No.: **PCT/JP2022/037848**

§ 371 (c)(1),
(2) Date: **Apr. 25, 2024**

(30) **Foreign Application Priority Data**

Nov. 10, 2021 (JP) 2021-183078

Publication Classification

(51) **Int. Cl.**
H01L 21/67 (2006.01)
H01L 21/677 (2006.01)

(52) **U.S. Cl.**
CPC .. ***H01L 21/67219*** (2013.01); ***H01L 21/67023*** (2013.01); ***H01L 21/67092*** (2013.01); ***H01L 21/67259*** (2013.01); ***H01L 21/67706*** (2013.01)

(57) **ABSTRACT**

The present invention relates to a substrate processing apparatus for processing a substrate. The substrate processing apparatus (**10**) at least one first processing module (**21***a*, **21***b*) configured to process a substrate W using a liquid; at least one second processing module (**31**) configured to process the substrate W that has been processed by the first processing module (**21***a*, **21***b*); a transfer robot (**22**) which is placed in a transfer area (**28**) for transferring the substrate W from the first processing module (**21***a*, **21***b*) to the second processing module (**31**); a pair of gutters (**53**, **54**) which are disposed above a floor (**51**) provided in the transfer area (**28**) and coupled to drain lines (**58**, **58**); and at least one inclined plate (**56**) which is hung over the pair of gutters (**53**, **54**). An upper surface of the inclined plate (**56**) extends from one of the pair of gutters (**53**, **54**) to the other at an angle with respect to a horizontal direction.

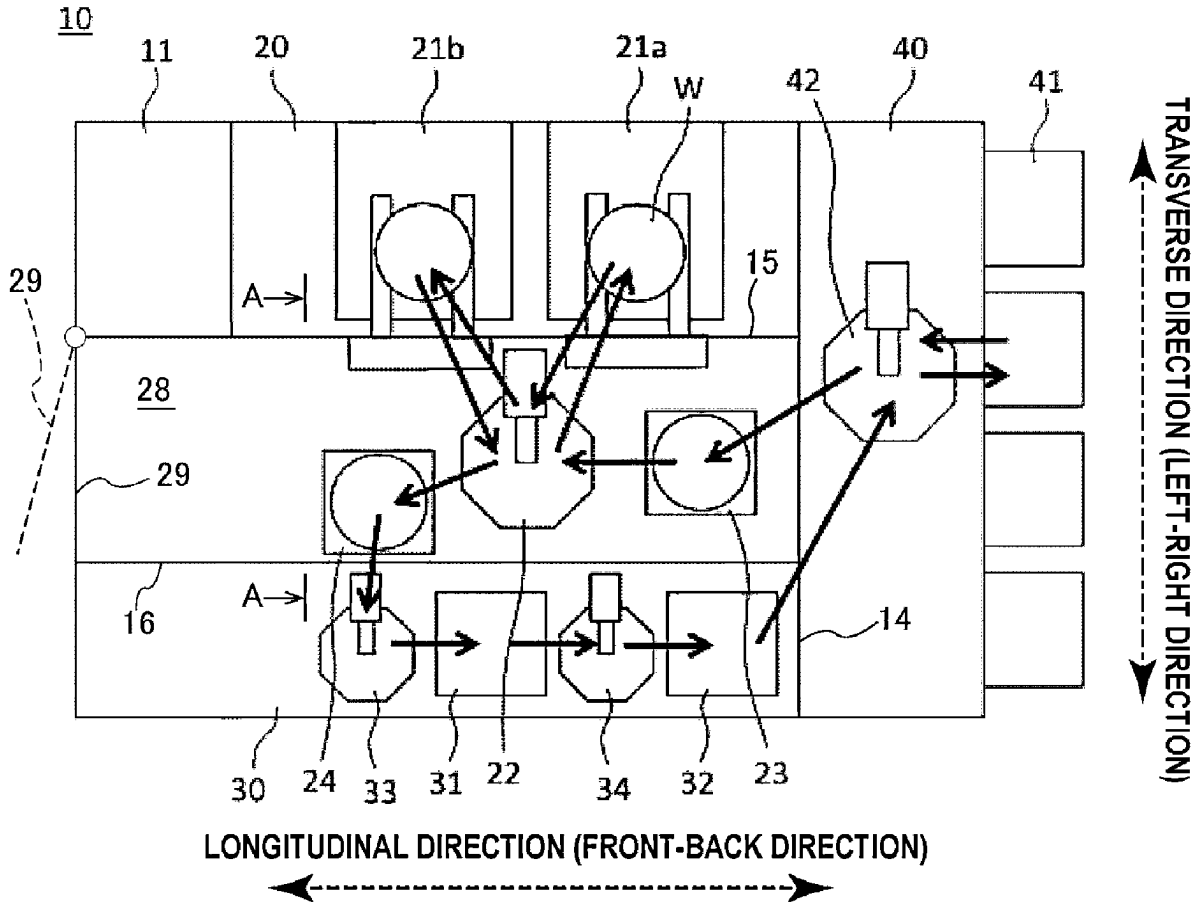


FIG. 1

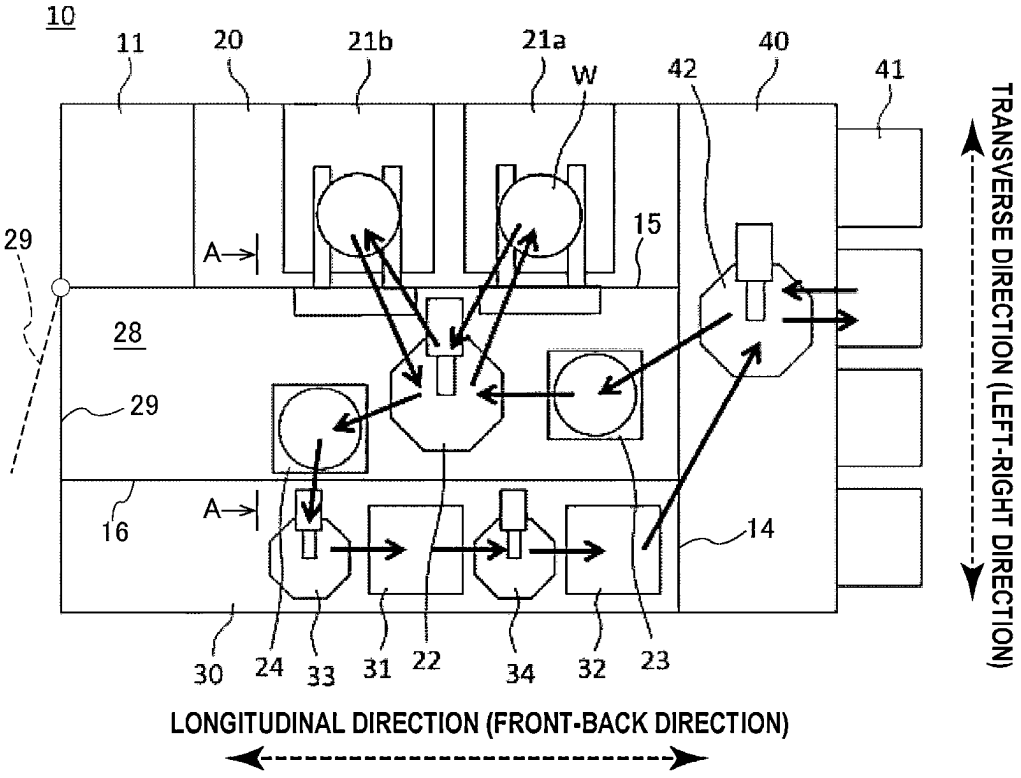

10
11
20
21b
21a
W
42
40
41
29
A
15
28
29
16
A
14
30
24
33
31
22
34
32
23
TRANSVERSE DIRECTION (LEFT-RIGHT DIRECTION)
LONGITUDINAL DIRECTION (FRONT-BACK DIRECTION)

FIG. 2

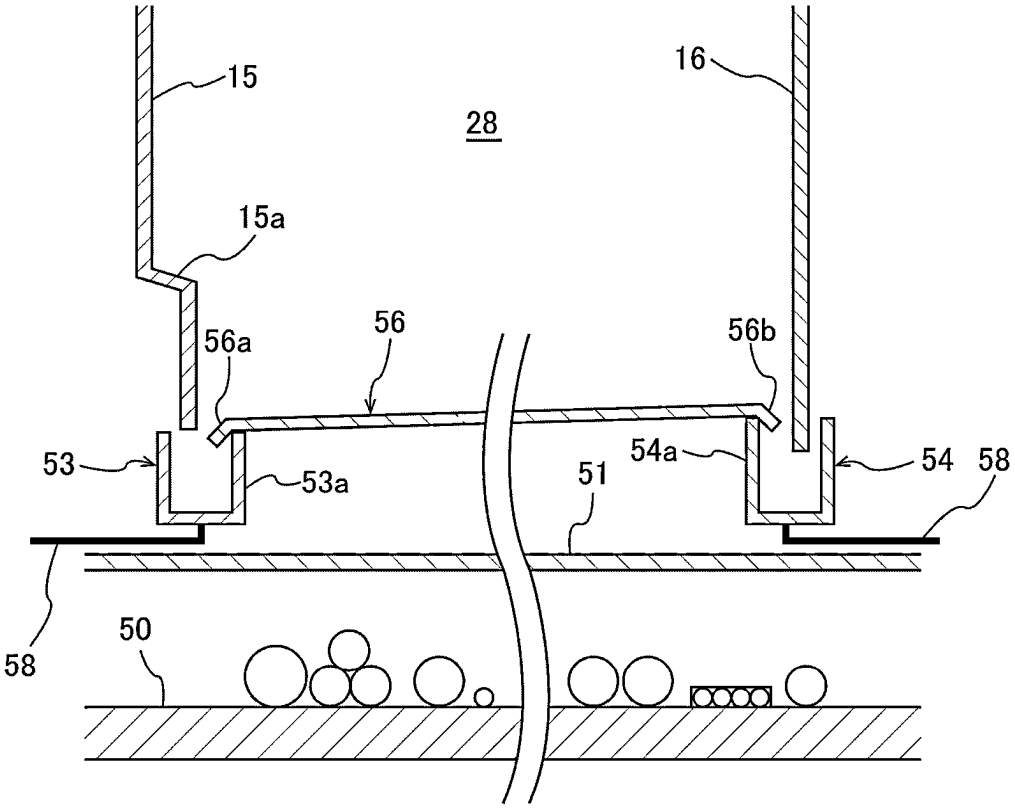


FIG. 3A

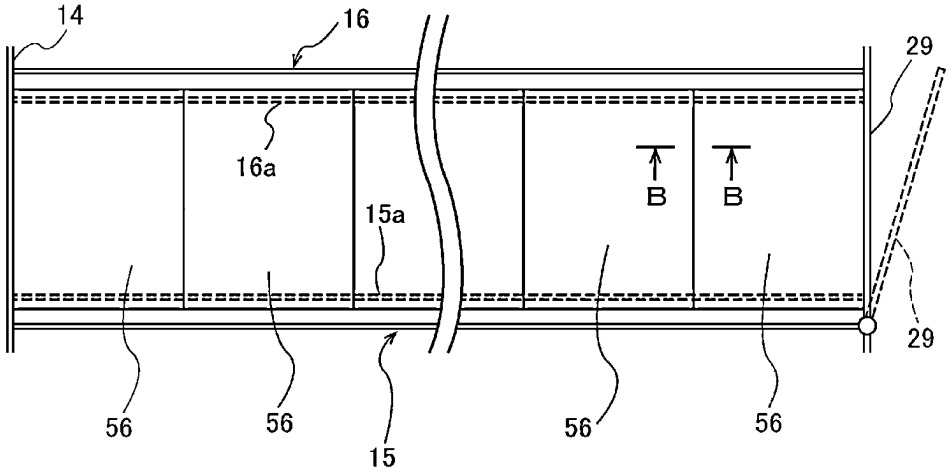


FIG. 3B

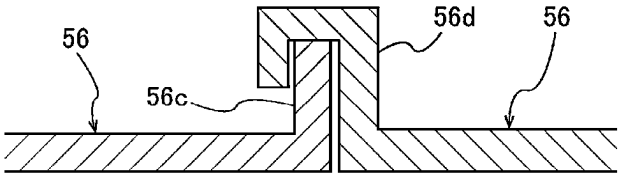


FIG. 4A

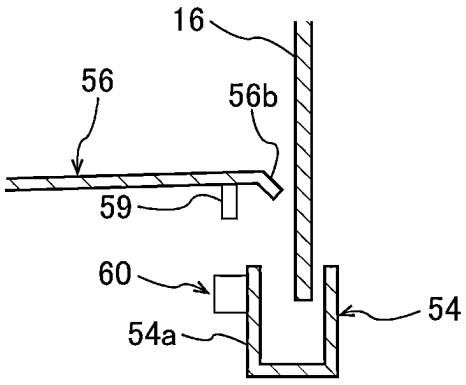


FIG. 4B

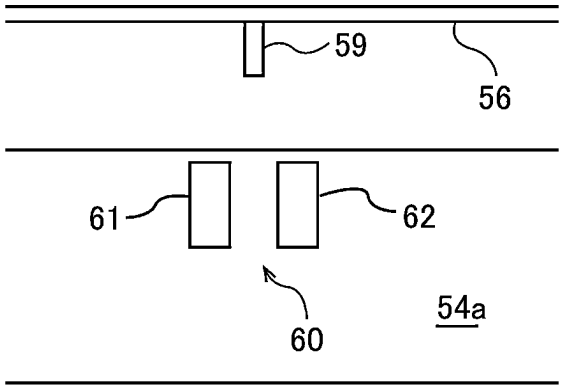


FIG. 4C

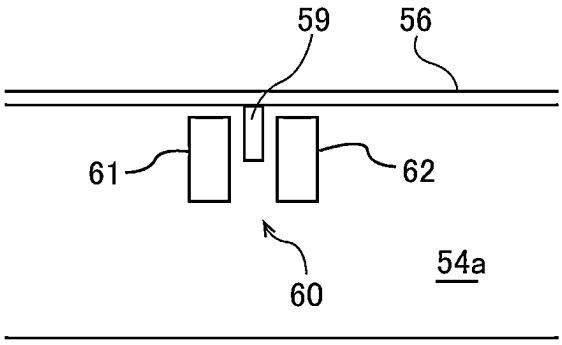


FIG. 5A

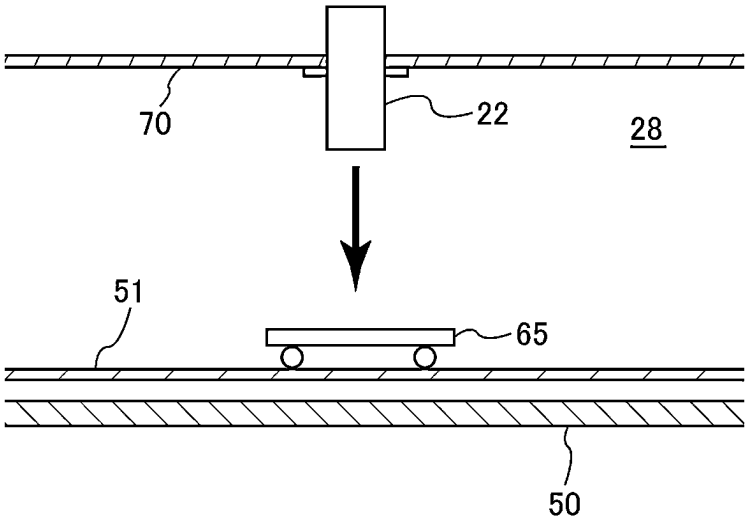
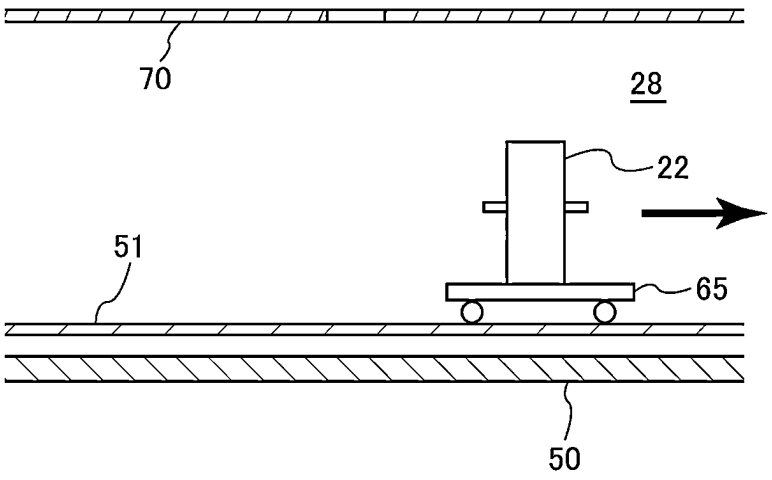


FIG. 5B



SUBSTRATE PROCESSING APPARATUS

TECHNICAL FIELD

[0001] The present invention relates to a substrate processing apparatus for processing a substrate, such as a wafer.

BACKGROUND ART

[0002] As one of substrate processing apparatuses for processing a substrate, such as a wafer, a polishing apparatus is widely known. A polishing apparatus generally includes a polishing module for polishing a substrate, a cleaning module for cleaning the polished substrate, and a drying module for drying the cleaned substrate. The polishing apparatus further has a transfer robot for transferring the substrate between each of the modules (see, patent document 1, for example).

[0003] When a substrate is processed in the polishing module, the substrate is made wet with liquid (e.g., polishing liquid and pure water). Accordingly, when the transfer robot transfers the polished substrate from the polishing module to the cleaning module, liquid adhered to the substrate falls down at a transfer area where the transfer robot is disposed. On the other hand, a floor is provided in the transfer area for workers who

[0004] perform adjustments and maintenances of equipment placed in the polishing apparatus, including the transfer robot described above. The workers can move on the floor to access the equipment to be adjusted and maintained. This floor is provided above a base of the polishing apparatus, and there are typically utilities, such as wires, signal cables, and pipes, disposed between the floor and the base. Therefore, in order to prevent liquid, which fall down from the substrate, from causing contamination or failure of the utilities mentioned above, there is a water-receiving pan above the floor, which is made of a plurality of panels.

CITATION LIST

Patent Literature

[0005] Patent document 1: Japanese laid-open patent publication No. 2018-190898

SUMMARY OF INVENTION

Technical Problem

[0006] A conventional water-receiving pan has a labyrinth structure provided between partitions, which separate each of the modules from the transfer area, and the panels in order to securely prevent liquid from reaching the floor and the utilities disposed below the floor.

[0007] On the other hand, when the workers enter the polishing apparatus for operations such as maintenance, the workers need to remove the water-receiving pan from the polishing apparatus to expose the floor. However, in order to remove the water-receiving pan, the labyrinth structure mentioned above requires to be disassembled, and this operation may be laborious. Further, after completing operations such as maintenance, the worker needs to reassemble the water-receiving pan including the labyrinth structure, and this reassembly operation may also be laborious. Time taken to remove and reassemble the water-receiving pan causes an increase in downtime for the polishing apparatus.

[0008] The issues mentioned above occur similarly in any type of substrate processing apparatuses that transfer the wetted substrate using transfer robot. For example, the same issues occur in substrate processing apparatus equipped with a plating apparatus, a grinding apparatus, a photoresist-film coating apparatus, an etching apparatus, and so on.

[0009] Therefore, it is an object of the present invention to provide a substrate processing apparatus having a liquid-proof structure capable of preventing liquid from intruding into a floor, and further capable of performing attach and detach operation easily.

Solution to Problem

[0010] In one embodiment, there is provided a substrate processing apparatus, comprising: at least one first processing module configured to process a substrate using a liquid: at least one second processing module configured to process the substrate that has been processed by the first processing module: a transfer robot which is placed in a transfer area for transferring the substrate from the first processing module to the second processing module: a pair of gutters which are disposed above a floor provided in the transfer area and coupled to drain lines; and at least one inclined plate which is hung over the pair of gutters, wherein an upper surface of the inclined plate extends from one of the pair of gutters to the other at an angle with respect to a horizontal direction.

[0011] In one embodiment, at least a lower end of a partition wall for dividing the first processing module from the transfer area is located above one of the pair of gutters.

[0012] In one embodiment, at least a lower end of a partition wall for dividing the second processing module from the transfer area is located above the other of the pair of gutters.

[0013] In one embodiment, the substrate processing apparatus further comprises: a sensor configured to detect whether or not the inclined plate is positioned correctly with respect to the pair of gutters.

[0014] In one embodiment, the inclined plate has a sensor dog attached to a lower surface thereof, and the sensor is a non-contact type detection-sensor or a contact type detection-sensor configured to detect the sensor dog.

[0015] In one embodiment, the at least one inclined plate comprises a plurality of inclined plates which are arranged along a longitudinal direction of the substrate processing apparatus, and the plurality of inclined plates are continuously arranged in the longitudinal direction of the substrate processing apparatus by overlapping front and rear ends of adjacent inclined plates in the longitudinal direction.

[0016] In one embodiment, the substrate processing apparatus further comprises: a door which is provided in a wall of the substrate processing apparatus and for access to the transfer area, wherein the transfer area extends from the door along a longitudinal direction of the substrate processing apparatus, and in a straight line.

Advantageous Effects of Invention

[0017] According to the present invention, since the inclined plate is hung over the pair of gutters, liquid falling down from the substrate flows along the inclined plate and flows into the gutters. As a result, liquid is prevented from reaching the floor. Further, simply lifting the inclined plate that is hung over the pair of gutters enables the floor to be

exposed, whereas simply placing the inclined plate on the pair of gutters enables the liquid-proof structure to be easily reassembled.

BRIEF DESCRIPTION OF DRAWINGS

[0018] FIG. **1** is a plan view showing a whole configuration of a substrate processing apparatus according to one embodiment;

[0019] FIG. **2** is a cross-sectional view schematically showing a lower portion of the substrate processing apparatus taken along line A-A in FIG. **1**:

[0020] FIG. **3**A is a top view showing a liquid-proof structure according to one embodiment:

[0021] FIG. **3**B is a cross-sectional view taken along line B-B in FIG. **3**A:

[0022] FIG. **4**A is a side view schematically showing an example of a sensor for detecting whether or not an inclined plate is correctly positioned with respect to a pair of gutters:

[0023] FIG. **4**B is a front view schematically showing the sensor shown in FIG. **4**A:

[0024] FIG. **4**C is a schematic view showing a state in which the sensor shown in FIG. **4**B is operating properly:

[0025] FIG. **5**A is a schematic view showing a state in which a cart for taking a second transfer robot out of the substrate processing apparatus has been carried into a transfer area; and

[0026] FIG. **5**B is a schematic view showing a state in which the second transfer robot is being taken out of the substrate processing apparatus using the cart shown in FIG. **5**A.

DESCRIPTION OF EMBODIMENTS

[0027] Embodiments according to the present invention will be described below with reference to the drawings.

[0028] Identical or corresponding components are denoted by identical reference numerals, and will not be described in duplication.

[0029] FIG. **1** is a plan view showing a whole configuration of a substrate processing apparatus according to one embodiment. Arrows in FIG. **1** indicate a direction in which a wafer W is transferred, the wafer being an example of a substrate.

[0030] As shown in FIG. **1**, the substrate processing apparatus **10** has a housing in a substantially rectangular-form, and an interior space of the housing is divided into a polishing section **20**, a cleaning section **30**, and a loading/unloading section **40** by partition walls **14**, **15**, and **16**. The polishing section **20**, the cleaning section **30**, and the loading/unloading section **40** are assembled independently of each other, and exhausted independently of each other. Further, a controller **11** is provided in the substrate processing apparatus **10**, which is configured to control operations of the polishing section **20**, the cleaning section **30**, and the loading/unloading section **40**.

[0031] As shown in FIG. **1**, the load/unload section **40** has a plurality (four in the illustrated example) of front loaders **41** arranged next to each other at the front of the load/unload section **40**, and a first transfer robot **42** that can move along an arrangement direction of the front loaders **41**.

[0032] A wafer cassette configured to store a large number of wafers W is placed on each of the front loaders **41**. Specifically, each of the front loaders **41** can receive thereon an open cassette, a SMIF (Standard Manufacturing Interface) pod, or a FOUP (Front Opening Unified Pod), for example. The SMIF and the FOUP are a hermetically sealed container, respectively, which houses a wafer cassette therein and is covered with a partition wall to provide an interior environment isolated from an external space.

[0033] The first transfer robot **42** can move along the arrangement direction of the front loaders **41** to access the wafer cassettes mounted on each front loader **41**. This first transfer robot **42** has two hands (not shown) on upper and lower sides. For example, the upper hand is used to return the wafer W to the wafer cassette, and the lower hand is used to transfer the wafer W before polishing, allowing the upper and lower hands to be used in different ways.

[0034] The polishing section **20** shown in FIG. **1** corresponds to an area where the polishing process of the wafer W is performed, and has at least one (two in the illustrated example) polishing module **21***a*, **21***b*, a first temporary stage **23** on which the wafer W before polishing is temporarily placed, a second temporary stage **24** on which the wafer W after polishing is temporarily placed, and a second transfer robot **22** configured to transfer the wafer W between the polishing modules **21***a*, **21***b*, the first temporary stage **23**, and the second temporary stage **24**.

[0035] In this embodiment, each of the polishing modules **21***a*, **21***b* is a polishing module configured to polish a peripheral portion (also referred to as a bevel portion) of the substrate by sliding a polishing tool into contact with the peripheral portion in the presence of a liquid, such as pure water and a chemical liquid. Each of the polishing modules **21***a*, **21***b* corresponds to a first processing module configured to process the wafer W (substrate) using liquid. In one embodiment, the polishing module as the first processing module may be a CMP module in which the substrate is pressed against a rotating polishing pad in the presence of a liquid, such as a slurry, to thereby polish a surface of the substrate, or may be a back-surface polishing module in which a polishing tool is slid into contact with a back surface of the substrate to thereby polish the back surface.

[0036] Hereinafter, the polishing module will be described as an example of the first processing module. However, the processing module is not limited to this example as long as liquid is used to process the substrate (e.g., processing liquid). For example, the first processing module may be other module, such as a plating module, a grinding module, a photoresist-film coating module, or an etching module.

[0037] The cleaning section **30** corresponds to an area where the wafer W after polishing is cleaned and further dried, and has a cleaning module **31**, a drying module **32**, a third transfer robot **33**, and a fourth transfer robot **34**. In this embodiment, the cleaning module **31** corresponds to a second processing module configured to process the wafer W that have been processed in the polishing module **21***a* or **21***b* serving as the first processing module.

[0038] The third transfer robot **33** is placed between the second temporary stage **24** of the polishing section **20** and the cleaning module **31**, and transfers the wafer W after polishing from the second temporary stage **24** to the cleaning module **31**. The fourth transfer robot **34** is placed between the cleaning module **31** and the drying module **32**, and transfers the wafer W after cleaning from the cleaning module **31** to the drying module **32**.

[0039] The cleaning module **31** may be a roll-type cleaning module which rotates and presses upper and lower roll-shaped sponges, which are vertically arranged, against

front and rear surfaces of the substrate to clean the front and rear surfaces of the substrate, or may be a pencil-type cleaning module which rotates and presses a hemispherical sponge against the substrate to clean the substrate. The drying module **32** can be, for example, a spin-dry type drying module which has a stage configured to rotate the substrate W chucked at high speed, and which enables the substrate W after cleaning to be dried by rotating the substrate W at high speed.

[0040] As shown in FIG. **1**, the partition wall **14** serves as a dividing wall that separates the polishing section **20** and the cleaning section **30** from the loading/unloading section **40**. Between the partition wall **15** for dividing the polishing section **20** and the partition wall **16** for dividing the cleaning section **30**, a transfer area **28** is formed, where the second transfer robot **22** is disposed. The wafer W that has been polished in the polishing modules **21***a* or **21***b* of the polishing section **20** is transferred through the transfer area **28** to the cleaning module **31** of the cleaning section **30**.

[0041] Next, an example of a substrate processing method in the substrate processing apparatus **10** having such configuration will be described.

[0042] As shown in FIG. **1**, at first, in the load/unload section **40**, the first transfer robot **42** removes the wafer W before polishing from the wafer cassette placed in the front loader **41**, and temporarily places the wafer W on the first temporary stage **23**.

[0043] The second transfer robot **22** clamps the wafer W before polishing on the first temporary stage **23** with the hand thereof, and then carries the wafer W into the first polishing module **21***a* (or the second polishing module **21***b*). The first polishing module **21***a* (or second polishing module **21***b*) then performs a polishing process on the carried-into wafer W.

[0044] Next, after the polishing process of the wafer W in the first polishing module **21***a* (or second polishing module **21***b*) is completed, the second transfer robot **22** removes the wafer W after polishing from the first polishing module **21***a* (or second polishing module **21***b*), and temporarily places the wafer W on the second temporary stage **24**.

[0045] After the wafer W after polishing is temporarily placed on the second temporary stage **24**, the third transfer robot **33** transfers the wafer W after polishing from the second temporary stage **24** to the cleaning module **31**, and then the cleaning module **31** performs the cleaning process of the wafer W. Next, the fourth transfer robot **34** transfers the wafer W after cleaning from the cleaning module **31** to the drying module **32**, and then the drying module **32** performs the drying process of the wafer W. Thereafter, the first transfer robot **42** of the load/unload section **40** removes the wafer W after drying from the drying module **32**, and stores the wafer W into the wafer cassette placed in the front loader **41**.

[0046] The wafer W polished in the polishing module **21***a* or **21***b* is transferred to the cleaning module **31** by use of the second transfer robot **22**. At this time, since the wafer W is wet with processing liquid (i.e., liquid) such as pure water, the liquid may fall down from the wafer W in the transfer area **28** where the second transfer robot **22** is disposed. Accordingly, a liquid-proof structure is provided in the lower portion of the transfer area **28** to catch the liquid that falls down from the wafer W. Hereinafter, the liquid-proof structure according to the present embodiment will be described.

[0047] In this specification, a direction of arrow indicated by a dotted line in FIG. **1** is referred to as a "longitudinal direction" or a "front-back direction," and a direction of arrow indicated by a single-dotted line in FIG. **1** is referred to as a "transverse direction" or a "left-right direction". The transverse direction is orthogonal to the longitudinal direction in the horizontal view.

[0048] FIG. **2** is a cross-sectional view schematically showing a lower portion of the substrate processing apparatus taken along line A-A in FIG. **1**. FIG. **2** corresponds to a cross-sectional view showing a liquid-proof structure provided in the lower portion of the transfer area **28**. As shown in FIG. **2**, the substrate processing apparatus **10** has a base **50** for supporting the substrate processing apparatus **10** in its entirety, and a floor **51** is disposed above the base **50** in the transfer area **28**. The floor **51** is provided for workers to enter the substrate processing apparatus **10**, and is, for example, supported on the base **50** or a frame of the substrate processing apparatus **10** by a plurality of support platforms (not shown). Between the base **50** and the floor **51**, utilities of the substrate processing apparatus **10**, such as wires, signal lines, and pipes, are arranged. The liquid-proof structure is provided to prevent liquid falling down from the wafer W from passing through the floor **51** and reaching the utilities.

[0049] The liquid-proof structure shown in FIG. **2** has a pair of gutters **53**, **54** provided above the floor **51** and adjacent to the partition walls **15**, **16** mentioned above, respectively, and at least one inclined plate **56** hung over the pair of gutters **53**, **54**. The inclined plate **56** is a plate having a substantially flat shape, and ends **56***a*, **56***b* of the inclined plate **56** in the left and right directions (see FIG. **1**) are bent downwards. When the inclined plate **56** is hung over the pair of gutters **53**, **54**, the ends **56***a*, **56***b* of the inclined plate **56** in the left-right direction are located within openings of the gutters **53**, **54**, respectively. In other words, the inclined plate **56** is placed on the pair of gutters **53**, **54** such that the ends **56***a*, **56***b* of the inclined plate **56** in the left-right direction are located within the openings of the gutters **53**, **54**.

[0050] The pair of gutters **53**, **54** are secured to the frame, which is not shown in the drawings, of the substrate processing apparatus **10**. Each of the gutters **53**, **54** has an upwardly opened and U-shaped cross-section, and the gutters **53**, **54** are coupled to drains **58**, **58**, respectively. The inclined plate **56** is hung over an inner wall **53***a* of the gutter **53** and an inner wall **54***a* of the gutter **54**.

[0051] One gutter **53** is provided below the partition wall **15**, and a lower end of the partition wall **15** is opposite to the opening of the gutter **53**. Similarly, the other gutter **54** is provided below the partition wall **16**, and a lower end of the partition wall **16** is opposite to the opening of the gutter **54**. As shown in FIG. **2**, the lower end of the partition wall **15** may be located above the gutter **53**, or the lower end of the partition wall **16** may extend into the interior space of the gutter **54**. Although not shown, the lower end of the partition wall **15** may extend into the interior space of the gutter **53**, and the lower end of the partition wall **16** may be located above the gutter **54**. In one embodiment, the lower end of the partition wall **15** may be coupled to an outer wall of the gutter **53**, or the partition wall **15** and the outer wall of the gutter **53** may be made integrally. Similarly, the lower end of the partition wall **16** may be coupled to an outer wall of the gutter **54**, or the partition wall **16** and the outer wall of the gutter **54** may be made integrally.

[0052] The lower end of the partition wall **15** shown in FIG. **2** is formed as a bent portion **15***a* which is directed toward the opening of the gutter **53**. The bent portion **15***a* serves as a guide portion for guiding liquid, which has flown down along the partition wall **15**, toward the gutter **53**. In this case, as long as the lower end of the bent portion **15***a* is opposite to the opening of the gutter **53**, no part of the partition wall **15** other than the bent portion **15***a* needs to be located above the gutter **53**. In this manner, the partition wall **15** may have the bent portion **15***a* formed in the lower end thereof, which guides liquid toward the opening of the gutter **53**. Similarly, the partition wall **16** may have a bent portion formed in the lower end thereof, which guides liquid toward the opening of the gutter **54**.

[0053] With this configuration, liquid that scatters from the wetted wafer W and adheres to the partition walls **15**, **16** when the wafer W is transferred by the second transfer robot **22**, flows along the partition walls **15**, **16** and into the gutters **53**, **54**.

[0054] The inclined plate **56**, which has a substantially flat shape and is hung over the pair of gutters **53**, **54**, is inclined at a constant angle with respect to a horizontal plane from one gutter **54** toward the other gutter **53**. In this embodiment, an upper end of the gutter **54** is higher than an upper end of the gutter **53** as viewed in a vertical direction, and thus when the inclined plate **56** is placed on the upper ends of the inner walls **53***a*, **54***a* of the gutters **53**, **54**, the inclined plate **56** is hung over the gutters **53**, **54** obliquely with respect to the horizontal direction. As a result, most of liquid falling down from the wafer W flows from the inclined plate **56** toward one gutter **53**, and is collected in the gutter **53**. The remaining (i.e., a part) of the liquid that falls from the wafer W is collected in the other gutter **54**. The liquid collected in the gutters **53** and **54** in this manner is discharged from the substrate processing apparatus **10** through the drains **58**, **58** coupled to the pair of gutters **53** and **54**. This liquid-proof structure prevents liquid falling down from the wafer W from reaching the floor **51**.

[0055] Further, when worker intends to enter the substrate processing apparatus **10**, only a simple operation of lifting the inclined plates **56** from the gutters **53**, **54** enables the worker to expose the floor **51**. As a result, the worker can expose the floor **51** in a short time, allowing easy entry into the substrate processing apparatus **10**. After a work has been completed, the inclined plates **56** can be hung over the gutters **53**, **54**, and thus the liquid-proof structure described above can be easily reassembled. Thus, downtime of the substrate processing apparatus **10** can be decreased.

[0056] FIG. **3**A is a top view showing the liquid-proof structure according to one embodiment, and FIG. **3**B is a cross-sectional view taken along line B-B in FIG. **3**A. FIG. **3**B represents a schematic view to illustrate a method of coupling adjacent inclined plates **56** to each other.

[0057] The liquid-proof structure shown in FIG. **3**A has a plurality of inclined plates **56**. The plurality of inclined plates **56** are continuously arranged in the longitudinal direction (see FIG. **1**) by overlapping a front end **56***c* and a rear end **56***d* in the adjacent inclined plates **56** in the longitudinal direction. As shown in FIG. **3**B, the inclined plate **56** has the rear end in which a protruding portion **56***c* extending upward is formed, and has the front end in which a covering portion **56***d* is formed so as to cover the protruding portion **56***c* from above. When the plurality of inclined plates **56** are arranged continuously in the longitudinal direction, the ends **56***a*, **56***b* of the inclined plates **56** in the left-right direction are placed on the inner walls **53***a*, **54***a* of the gutter **53**, **54**, respectively, and further the protruding portion **56***c* formed to the rear end of one of the adjacent inclined plates **56** is covered by the covering portion **56***d* formed to the front end of the other inclined plate **56**. This configuration prevents liquid falling down from the wafer W from reaching the floor **51** through a gap in the front-back direction formed between the adjacent inclined plates **56**.

[0058] Moreover, one of the inclined plates **56** can be easily lifted from the other inclined plate **56**, and thus the plurality of inclined plates **56** can be easily removed. When reassembling the plurality of inclined plates **56**, the covering portion **56***d* in one of the inclined plates **56** is simply placed over the protruding portion **56***c* in the other inclined plate **56** in accordance with the order of longitudinal arrangement. In this manner, the plurality of inclined plates **56** can be easily removed and reassembled, and thus downtime of the substrate processing apparatus can be decreased.

[0059] In this embodiment, the floor **51** can be exposed or covered by simple operations, such as hanging the inclined plates **56** over the pair of gutters **53**, **54**, or removing the inclined plates **56** from the pair of gutters **53**, **54**. On the other hand, if the inclined plates **56** are not positioned correctly with respect to the pair of gutters **53**, **54**, there is a risk that liquid falling down from the wafer W may reach the floor **51**. Therefore, the substrate processing apparatus **10** preferably has a sensor to detect whether or not the inclined plates **56** are correctly positioned with respect to the pair of gutters **53**, **54**.

[0060] FIG. **4**A is a side view schematically showing an example of a sensor for detecting whether or not the inclined plate is correctly positioned with respect to the pair of gutters: FIG. **4**B is a front view schematically showing the sensor shown in FIG. **4**A: and FIG. **4**C is a schematic view showing a state in which the sensor shown in FIG. **4**B is operating properly.

[0061] The sensor **60** shown in FIGS. **4**A and **4**B is an optical sensor having a light emitter **61** and a light receiver **62**. The sensor **60** is coupled to the controller **11** (see FIG. **1**) mentioned above, and is configured to transmit measurement results thereof to the controller **11**. In this embodiment, the light emitter **61** and the light receiver **62** are attached to an outer surface of the inner wall **54***a* of the gutter **54**, and the light receiver **62** is arranged in close proximity to the light emitter **61** so as to be able to receive light emitted from the light emitter **61**.

[0062] On the other hand, the inclined plate has a lower surface to which a sensor dog **59** is mounted. The sensor dog **59** is inserted into a gap formed between the light emitter **61** and the light receiver **62** when the inclined plate **56** is placed in the correct position with respect to the pair of gutters **53**, **54**. This action interrupts the light-receiving signal sent from the sensor **60** to the controller **11**. The controller **11** determines that the inclined plate **56** is positioned correctly with respect to the pair of gutters **53**, **54** when no light-receiving signal is sent from the sensor **60**. In this embodiment, the sensor dog **59** and the sensor **60** constitute a position detection mechanism for the inclined plate **56**.

[0063] Any type of the position detection mechanism can be used freely as long as the position detection mechanism can detect whether or not the inclined plate **56** is attached in the correct position with respect to the pair of gutters **53**, **54**. For example, the sensor **60** may be a non-contact type

detection-sensor, such as the optical sensor described above, as well as a contact type detection-sensor, such as a touch sensor capable of detecting a contact with the sensor dog **59**. Examples of the non-contact type sensors other than the optical sensor may include an ultrasonic sensor, which has a transmitter to emit ultrasonic waves and a receiver to receive the ultrasonic waves emitted from the transmitter, and a magnetic sensor.

[0064] As shown in FIGS. **1** and **3**A, the transfer area **28** is preferably formed along the longitudinal direction of the substrate processing apparatus **10**, and in a straight line as viewed in a plan. For example, the transfer area **28** extends in a straight line from an external surface of the substrate processing apparatus **10** to the partition wall **14**. In this case, the pair of gutters **53**, **54** can also be arranged in a straight line extending along the longitudinal direction of the substrate processing apparatus **10**, and the inclined plate **56** can also have a rectangular shape substantially.

[0065] Further, it is preferable to provide a door **29** in the wall (external wall) of the substrate processing apparatus **10** that allows access to the transfer area **28**. In this case, the workers can easily perform any work, such as maintenance of the substrate processing apparatus **10**, and furthermore components of the substrate processing apparatus **10**, such as the second transfer robot **22**, can be easily taken out of the substrate processing apparatus **10**.

[0066] FIG. **5**A is a schematic view showing a state in which a cart for taking the second transfer robot out of the substrate processing apparatus has been carried into the transfer area; and FIG. **5**B is a schematic view showing a state in which the second transfer robot is being taken out of the substrate processing apparatus using the cart shown in FIG. **5**A.

[0067] As shown in FIG. **5**A, in the substrate processing apparatus that has the door **29** mentioned above and that the transfer area **28** extends along the longitudinal direction of the substrate processing apparatus **10**, the door **29** is opened to easily carry the cart **65** into the transfer area **28** and move the cart **65** directly under the second transfer robot **22**. When carrying the cart **65** into the substrate processing apparatus **10**, it is necessary to remove the inclined plates **56** from the gutters **53** and **54** and carry the inclined plates **56** out of the substrate processing apparatus **10**. However, if the transfer area **28** is designed in a straight line, removal work of the inclined plates **56** and carrying them out of the transfer area **28** are very easy.

[0068] The second transfer robot **22** shown in FIG. **5**A is secured to a beam (or frame) **70** located near a ceiling of the substrate processing apparatus **10** using fasteners, such as bolts (not shown). In this embodiment, removal of the fasteners allows the second transfer robot **22** to be easily moved onto the cart **65** which has been moved directly under the second transfer robot **22**. Furthermore, since the transfer area **28** extends along the longitudinal direction of the substrate processing apparatus **10**, the second transfer robot **22** and the cart **65** can be carried out of the substrate processing apparatus without crashing against components of the substrate processing apparatus **10** (e.g., the partition walls **15**, **16**, and the gutter **53**, **54**).

[0069] In the embodiments described above, the substrate processing apparatus **10** has two polishing modules **21***a*, **21***b* as first processing module. However, the number of first processing module is not limited to this example. The substrate processing apparatus **10** only needs to have at least one first processing module. Similarly, the substrate processing apparatus **10** has one cleaning module **31** as the second processing module, but the number of second processing module is not limited to this example. The substrate processing apparatus **10** only needs to have at least one second processing module.

[0070] The previous description of embodiments is provided to enable a person skilled in the art to make and use the present invention. Moreover, various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles and specific examples defined herein may be applied to other embodiments.

[0071] Therefore, the present invention is not intended to be limited to the embodiments described herein but is to be accorded the widest scope as defined by limitation of the claims.

INDUSTRIAL APPLICABILITY

[0072] The present invention is applicable to a substrate processing apparatus for processing a substrate, such as a wafer.

REFERENCE SIGNS LIST

[0073] **10** substrate processing apparatus
[0074] **11** controller
[0075] **20** polishing section
[0076] **21**A first polishing module (first processing module)
[0077] **21**B second polishing module (first processing module)
[0078] **22** second transfer robot
[0079] **28** transfer area
[0080] **29** door
[0081] **30** cleaning section
[0082] **31** cleaning module (second processing module)
[0083] **32** drying module
[0084] **33** third transfer robot
[0085] **34** fourth transfer robot
[0086] **40** loading/unloading section
[0087] **41** front loader
[0088] **42** first transfer robot
[0089] **50** base
[0090] **51** floor
[0091] **53**,**54** gutter
[0092] **56** inclined plate
[0093] **58** drain
[0094] **59** sensor dog
[0095] **60** sensor

1. A substrate processing apparatus, comprising:
at least one first processing module configured to process a substrate using a liquid;
at least one second processing module configured to process the substrate that has been processed by the first processing module;
a transfer robot which is placed in a transfer area for transferring the substrate from the first processing module to the second processing module;
a pair of gutters which are disposed above a floor provided in the transfer area and coupled to drain lines; and
at least one inclined plate which is hung over the pair of gutters,

wherein an upper surface of the inclined plate extends from one of the pair of gutters to the other at an angle with respect to a horizontal direction.

2. The substrate processing apparatus according to claim **1**, wherein at least a lower end of a partition wall for dividing the first processing module from the transfer area is located above one of the pair of gutters.

3. The substrate processing apparatus according to claim **1**, wherein at least a lower end of a partition wall for dividing the second processing module from the transfer area is located above the other of the pair of gutters.

4. The substrate processing apparatus according to claim **1**, further comprising: a sensor configured to detect whether or not the inclined plate is positioned correctly with respect to the pair of gutters.

5. The substrate processing apparatus according to claim **4**, wherein the inclined plate has a sensor dog attached to a lower surface thereof, and

the sensor is a non-contact type detection-sensor or a contact type detection-sensor configured to detect the sensor dog.

6. The substrate processing apparatus according to claim **1**, wherein the at least one inclined plate comprises a plurality of inclined plates which are arranged along a longitudinal direction of the substrate processing apparatus, and

the plurality of inclined plates are continuously arranged in the longitudinal direction of the substrate processing apparatus by overlapping front and rear ends of adjacent inclined plates in the longitudinal direction.

7. The substrate processing apparatus according to claim **1**, further comprising: a door which is provided in a wall of the substrate processing apparatus and for access to the transfer area,

wherein the transfer area extends from the door along a longitudinal direction of the substrate processing apparatus, and in a straight line.

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