

DESCRIPTION

APPARATUS FOR SUPPLYING GAS FOR WAFER CONTAINER

TECHNICAL FIELD

[0001] The present invention relates to an apparatus for supplying a gas for a wafer container, and more particularly, to an apparatus for supplying a gas for a wafer container, which injects a purge gas into a wafer container accommodating and transferring a wafer.

BACKGROUND ART

[0002] In general, a semiconductor device is manufactured through a plurality of wafer processes. The wafer processes include: a deposition process for forming a film on a wafer; a chemical-mechanical polishing process for flattening the film; a photolithography process for forming a photo-resist pattern on the film; an etching process for forming the film into a pattern having electrical characteristics by using the photo-resist pattern; an ion-implantation process for implanting specific ions into a predetermined area of the wafer; a cleaning process for removing impurities on the wafer; and an inspection process for inspecting a surface of the wafer on which the film or the pattern is formed. Also, a heat-treatment process for the wafer is included.

[0003] The semiconductor device is manufactured by selectively and repeatedly performing processes, on the wafer, including the deposition process, the polishing process, the photolithography process, the etching process, the ion implantation process, the cleaning process, the inspection process, and the heat-treatment process, and the wafer is transferred to a specific position required in each process in order to be formed into the

semiconductor device.

[0004] In the process of manufacturing the semiconductor, the wafer to be processed, as a high precision object, requires much attention during being stored or transferred not to be polluted or damaged by external impurities or impact. In particular, in the process of storing or transferring while processes are being processed, a surface of the wafer is necessarily prevented from being polluted by impurities such as dust, moisture, and all sorts of organic matters. Accordingly, when the wafer is stored or transferred, the wafer is necessary to be accommodated in a separated wafer container to protect the wafer from external impact or impurities.

[0005] To this end, a wafer container such as a front opening unified pod (FOUP) accommodating a plurality of wafers in a predetermined unit is widely used. The wafers in the FOUP are transferred to a wafer processing device by a transfer robot of a wafer transfer device.

[0006] Here, although air introduced when the wafer is inserted into or withdrawn from the wafer container is filtered, air that is not filtered is partially remained in the sealed FOUP, and such air includes molecular contaminants such as oxygen, moisture, and ozone.

[0007] Accordingly, a chemical reaction is generated on the surface of the wafer accommodated in the wafer container by a process fume gas generated while the wafer undergoes processes to serve as a cause for reducing productivity of the semiconductor wafer.

[0008] In order to reduce activation of the chemical reaction cause by pollutants or internal moisture of the wafer accommodated in the wafer container, the wafer container accommodating the wafer is seated on a gas supply device of the wafer container for a predetermined time, and a purge gas is supplied into the wafer container to adjust the

pollutants or the internal moisture.

[0009] A typical gas supply device supplies a purge gas into a wafer container such that a nozzle descends by a weight of the wafer container when the wafer container is seated, and stops to supply the purge gas such that the nozzle ascends again by removing the weight applied to the nozzle when the wafer container is separated.

[0010] Here, Korean Patent Publication No. 10-2016-0128806, which is a related art for lifting a nozzle again, discloses a gas supply device that includes a stage part and a gas entrance part and has an elastically supporting piece installed in the gas entrance part to apply an elastically supporting force to the nozzle in a vertical direction,

[0011] Korean Patent Registration No. 10-1655437 discloses a purge nozzle that prevents leakage and damage by maintaining a predetermined compression while a nozzle moves downwards by an elastic force as many as a compression in which FOUP compresses the nozzle by inserting a spring into a holder.

[0012] Korean Patent Registration No. 10-1703854 discloses a solenoid separation-type N₂ purge nozzle that prevents leakage in such a manner that, as a solenoid is coupled to operate a purge nozzle in an integrated manner, when FOUP is seated on a load port module (LPM), a nozzle of LPM moves downwards through the solenoid, and when FOUP is seated on LPM, the nozzle moves upward again through elasticity of a spring, so that the nozzle closely contacts FOUP.

[0013] As described above, in the related arts, the spring is provided between the housing and the nozzle, and the nozzle is lifted by using the elastic force of the spring. For another related art, as a nozzle is connected to a hydraulic or pneumatic cylinder, the nozzle ascends according to ascending and descending of the cylinder.

[0014] However, since the ascending driving force provided by the spring or the

cylinder is restricted, although the wafer container is separated by a load generated at the beginning of driving, the ascending driving force may not be sufficiently supplied to the nozzle, and thus nozzle may not fully ascend.

[0015] When the nozzle does not fully ascend, the purge gas is wasted because the purge gas is supplied even in a state in which the wafer container is not seated, and the productivity of the wafer processing process is reduced because the gas supply apparatus is not smoothly driven. When the wafer container is seated in a state in which the nozzle does not fully ascend, an air-tight force between the wafer container and the nozzle is reduced, and thus the purge gas is leaked.

DISCLOSURE OF THE INVENTION

TECHNICAL PROBLEM

[0016] The present invention provides an apparatus for supplying a gas for a wafer container, which may prevent a purge gas from being wasted such that a nozzle smoothly ascends when the wafer container is separated from an upper portion of the nozzle.

[0017] The present invention also provides an apparatus for supplying a gas for a wafer container, which may enhance productivity of a wafer processing process by smoothly driving ascending and descending of a nozzle.

TECHNICAL SOLUTION

[0018] In accordance with an embodiment of the present invention, an apparatus for supplying a gas for a wafer container, which injects a purge gas into a wafer container accommodating and transferring a wafer, the apparatus includes: a stage part on which the wafer container is seated; a gas entrance part disposed in correspondence to a position of

each of a gas inlet and a gas outlet, which are defined in the wafer container, and including a housing coupled to the stage part and a nozzle inserted into the housing to ascend and descend in the housing and in which a flow path, through which a purge gas flows, is defined; a first driving part ascending and descending while connected to the nozzle and providing an ascending driving force for lifting the nozzle; and a second driving part elastically supporting the first driving part to provide an elastic force in a direction in which the first driving part ascends.

[0019] Desirably, the first driving part may include: a cylinder fixed to a lower portion of the stage part; a piston ascending and descending in the cylinder; a connecting part connecting the piston to the nozzle so that the piston and the nozzle ascend and descend at the same time; and a fluid entrance part allowing a fluid to be introduced to and discharged from an inner space between the cylinder and the piston in order to lift the piston by an inner pressure of the cylinder.

[0020] Desirably, the second driving part may include: a fixing member fixed to the lower portion of the stage part; a moving member inserted into the fixing member in a slidable manner and transmitting an elastic force so that the piston ascends; and an elastic member installed in the fixing member and elastically supporting the moving member to provide an elastic force to the piston.

[0021] Desirably, the second driving part may include an elastic member disposed in an inner space between the cylinder and the piston and elastically supporting the piston to provide an elastic force to the piston.

[0022] Desirably, the first driving part may include: a plurality of cylinders; and a plurality of pistons inserted into the plurality of cylinders, respectively, to define a plurality of inner spaces and ascending and descending at the same time.

[0023] Desirably, the plurality of cylinders may include first, second, and third cylinders, which are provided in a row, the plurality of pistons may include first, second, and third pistons inserted into the first, second, and third cylinders, respectively, to define first, second, and third inner spaces, and each of the first and third inner spaces or the second inner space may include the elastic member and has a height greater than that of each of other inner spaces.

ADVANTAGEOUS EFFECTS

[0024] As described above, since the present invention includes the first and second driving parts to provide the driving force that is sufficient to lift the nozzle, the nozzle may smoothly ascend when the wafer container is separated from the upper portion of the nozzle to prevent the purge gas from being wasted.

[0025] Also, as the present invention allows the ascending and descending of the nozzle to be smoothly driven, the productivity of the wafer processing process may be enhanced.

[0026] Also, as the present invention includes the plurality of pistons, the ascending driving force provided to the nozzle may increase.

[0027] Also, as the present invention includes the seat detecting part for detecting whether the wafer container is seated on the stage part, the purge gas may be supplied only when the wafer container is seated on the stage part to prevent the purge gas from being wasted and, at the same time, enhance the efficiency of processing the purge gas.

[0028] Also, as the present invention allows the seat detecting part to detect whether the wafer container is seated in a contact or non-contact manner, the seat detecting part may easily detect whether the wafer container is seated.

[0029] Also, as the present invention includes the gas entrance part including the gas inlet and the gas outlet, which are disposed on positions different from each other, the purge gas may be easily injected and discharged, and, at the same time, the flowability of the purge gas may be enhanced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] FIG. 1 is a view illustrating configuration of an apparatus for supplying a gas for a wafer container in accordance with a first embodiment of the present invention.

[0031] FIG. 2 is an exploded view illustrating the apparatus for supplying a gas for a wafer container in accordance with the first embodiment of the present invention.

[0032] FIG. 3 is a front cross-sectional view illustrating a state in which a nozzle of the apparatus for supplying a gas for a wafer container in accordance with the first embodiment of the present invention ascends.

[0033] FIG. 4 is a cross-sectional view taken along 'A' in FIG. 3.

[0034] FIG. 5 is a front cross-sectional view illustrating a state in which a nozzle of the apparatus for supplying a gas for a wafer container in accordance with the first embodiment of the present invention descends.

[0035] FIG. 6 is a cross-sectional view taken along 'B' in FIG. 5.

[0036] FIG. 7 is an exploded view illustrating an apparatus for supplying a gas for a wafer container in accordance with a second embodiment of the present invention.

[0037] FIG. 8 is a front cross-sectional view illustrating a state in which a nozzle of the apparatus for supplying a gas for a wafer container in accordance with the second embodiment of the present invention ascends.

[0038] FIG. 9 is a cross-sectional view taken along 'C' in FIG. 3.

[0039] FIG. 10 is a cross-sectional view taken along 'D' in FIG. 9.

[0040] FIG. 11 is a front cross-sectional view illustrating a state in which a nozzle of the apparatus for supplying a gas for a wafer container in accordance with the second embodiment of the present invention descends.

[0041] FIG. 12 is a cross-sectional view taken along 'E' in FIG. 11.

[0042] FIG. 13 is a cross-sectional view taken along 'F' in FIG. 12.

MODE FOR CARRYING OUT THE INVENTION

[0043] Hereinafter, embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0044] FIG. 1 is a view illustrating configuration of an apparatus for supplying a gas for a wafer container in accordance with a first embodiment of the present invention, FIG. 2 is an exploded view illustrating the apparatus for supplying a gas for a wafer container in accordance with the first embodiment of the present invention, FIG. 3 is a front cross-sectional view illustrating a state in which a nozzle of the apparatus for supplying a gas for a wafer container in accordance with the first embodiment of the present invention ascends, FIG. 4 is a cross-sectional view taken along 'A' in FIG. 3, FIG. 5 is a front cross-sectional view illustrating a state in which a nozzle of the apparatus for supplying a gas for a wafer container in accordance with the first embodiment of the present invention descends, FIG. 6 is a cross-sectional view taken along 'B' in FIG. 5, FIG. 7 is an exploded view illustrating an apparatus for supplying a gas for a wafer container in accordance with a second embodiment of the present invention, FIG. 8 is a front cross-sectional view illustrating a state in which a nozzle of the apparatus for supplying a gas for a wafer container in accordance with the second embodiment of the present invention ascends, FIG. 9 is a cross-

sectional view taken along 'C' in FIG. 3, FIG. 10 is a cross-sectional view taken along 'D' in FIG. 9, FIG. 11 is a front cross-sectional view illustrating a state in which a nozzle of the apparatus for supplying a gas for a wafer container in accordance with the second embodiment of the present invention descends, FIG. 12 is a cross-sectional view taken along 'E' in FIG. 11, and FIG. 13 is a cross-sectional view taken along 'F' in FIG. 12.

[0045] The apparatus for supplying a gas for a wafer container (hereinafter, referred to as a "gas supplying apparatus of a wafer container") in accordance with the present invention may include first and second embodiments, and the embodiments may have the same components as each other, but have differences in some components. In every possible case, like reference numerals are used for referring to the same or similar elements in the description and drawings.

[0046] As illustrated in FIG. 1, the gas supplying apparatus of the wafer container in accordance with the first embodiment of the present invention includes a stage part 10, a gas entrance part 20, a first driving part 30, and a second driving part 40. The gas supplying apparatus injects a purge gas into a wafer container 100 that accommodates a substrate such as a semiconductor wafer to transfer the substrate.

[0047] The wafer container 100 accommodates a plurality of wafers in a predetermined unit in order to protect the wafers from external impact and pollutants while the wafers are stored and transferred in a semiconductor manufacturing process. The wafer container 100 includes a front opening unified pod (FOUP).

[0048] The wafer container 100 may be used for at least one of a deposition process, a polishing process, a photolithography process, an etching process, an ion implantation process, a cleaning process, an inspection process, and a heat treatment process.

[0049] Also, although the purge gas injected into the wafer container 100 includes

various kinds of gases such as a heated air, a non-heated air, a non-oxide gas, or an inert gas in order to adjust humidity in the wafer container 100 and reduce a damage on an oxide layer of the semiconductor wafer due to pollution, a nitrogen gas is desirably used as the purge gas used in the embodiment.

[0050] The stage part 10 is a seat unit, on which the wafer container accommodating and transferring the substrate such as a semiconductor wafer is seated, and installed at the front of a wafer station that is the gas supplying apparatus of the wafer container, which injects the purge gas into the wafer container when the wafer container, in which the semiconductor wafer is accommodated, is transferred, to prevent the wafer from being polluted.

[0051] Also, a coupling hole 11 may be defined in a top surface of the stage part 10 so that a gas entrance part 20 is disposed in correspondence to positions of a gas inlet and a gas outlet, which are defined in a lower portion of the wafer container 100, and a fastening-fixing unit for fixing the gas entrance part 20 such as a bolt may be installed around the coupling hole 11.

[0052] The gas entrance part 20 is a gas entrance unit defined in the stage part 10, on which the wafer container 100 is seated, to inject and discharge the purge gas into and from the wafer container 100. The gas entrance part 20 includes at least one gas injection part and at least one gas discharge part.

[0053] The gas entrance part 20 protrudes from the top surface of the stage part 10 in correspondence to the positions of the gas inlet and the gas outlet, which are defined in the lower portion of the wafer container 100. Also, the gas entrance part 20 includes a sealing member 23 that is attached or fixedly coupled to a contact portion in which the gas entrance part 20 contacts the wafer container 100.

[0054] The gas injection part is an injection unit that is installed on one end of the stage part 10 to inject the purge gas into the wafer container 100, and the gas discharge part is a discharge unit that is installed on the other end of the stage part 10 to discharge the purge gas injected into the wafer container 100. As illustrated in FIGS. 2 to 6, each of the gas injection part and the gas discharge part includes a housing 21, a nozzle 22, and a sealing member 23.

[0055] As the gas injection part and the gas discharge part are disposed on different positions from each other, the purge gas may be easily injected and discharged, and, at the same time, flowability of the purge gas in the wafer container 100 may be enhanced.

[0056] The housing 21 is coupled and fixed to a lower portion of the stage part 10. The housing 21 includes an insertion hole defined inside the housing 21 and along which the nozzle 22 slides and a coupling hole defined in a top surface of the housing 21 in order to be coupled to the stage part 10 through a fastening-fixing unit.

[0057] The nozzle 22 is a flow path member inserted into the insertion hole of the housing 21 in an ascending and descending manner and through which the purge gas flows. A through-hole, which is defined in an inner central portion of the nozzle 22 to pass from an upper end to a lower end of nozzle 22, forms a flow path through which the purge gas flows.

[0058] Also, the upper end of the nozzle 22 protrudes to contact or be coupled to the gas inlet or the gas outlet of the wafer container 100, thereby communicating with the wafer container 100, and the lower end of the nozzle 22 is connected to a supply pipe of a gas supply unit for supplying the purge gas or a discharge pipe of a gas discharge unit for discharging the purge gas through an elbow 24.

[0059] As the upper end of the nozzle 22 protrudes from the top surfaced of the stage

part 10, when the nozzle 22 contacts the wafer container 100, a contact position may be easily recognized and, at the same time, prevent the wafer container 100 from being damaged.

[0060] The sealing member 23 is installed on an upper portion of the nozzle 22 to serve as a sealing member that seals between the nozzle 22 and the wafer container 100 when the wafer container 100 is seated on the top surface of the stage part 10. The sealing member 23 may include a bushing and a sealing pad.

[0061] A bushing 23a is a protection member installed on the upper portion of the nozzle 22 to protect an upper end circumference, which is exposed from the top surface of the stage part 10, of the nozzle 22. The bushing 23a has an approximately cylindrical shape and is desirably made of a buffer material such as hard rubber in order to reduce an impact load when the wafer container 100 is seated.

[0062] A sealing pad 23b is installed on a top surface of the bushing in order to maintain air-tightness by contacting the wafer container 100 when the wafer container 100 is seated. The sealing pad 23b is desirably made of a sealing material such as soft rubber that has ductility instead of the hard rubber, which is used for the bushing.

[0063] The bushing 23a and the sealing pad 23b may be forcibly inserted to the nozzle 22 and thus fixed to the upper portion of the nozzle 22.

[0064] For example, a protruding portion 22a is provided on an upper outer circumference of the nozzle 22, and a recessed portion 22b is provided on a lower outer circumference of the nozzle 22. As a concave portion may be defined along an inner circumference of the bushing 23a and fixedly inserted into the recessed portion 22b of the nozzle 22, and a groove portion may be defined along an inner circumference of the sealing pad 23b and fixedly inserted into the protruding portion 22a of the nozzle 22.

[0065] Here, the bushing 23a and the sealing pad 23b may be fixed to the upper portion of the nozzle 22 by using a separated fixing member.

[0066] As described above, as the sealing member is fixedly coupled to the gas entrance part, when the wafer container contacts the gas entrance part for a long time period, the sealing member may be prevented from being adhered or adsorbed due to a weight of the wafer container, and the nozzle or the sealing member may be prevented from being separated, so as to improve productivity of a wafer processing process.

[0067] The first driving part 30 is a driving unit that ascends and descends while connected to the nozzle 22 and providing an ascending driving force to ascend the nozzle 22. The first driving part 30 includes a cylinder 31, a piston 32, a connecting part 33, and a fluid entrance part 34.

[0068] The cylinder 31 is coupled to the housing 21 below the stage part 10 and includes an inner hole along which the piston 32 ascends and descends. The inner hole is opened to the lower portion of the cylinder 31. The cylinder 31 may be provided in plurality. In the first embodiment, the cylinder 31 may include first, second, and third cylinders 31a, 31b, and 31c, and the first, second, and third cylinders 31a, 31b, and 31c may be integrated with each other.

[0069] The piston 32 is inserted to ascend and descend in the cylinder 31, and an inner space 35 is defined between the cylinder 31 and the piston 32 according to the ascending and descending movement of the piston 32. The piston 32 may be provided in plurality and inserted into a plurality of cylinders, respectively, to define a plurality of inner spaces. In the first embodiment, the piston 32 may include first, second, third pistons 32a, 32b, and 32c, which are inserted into the first, second, and third cylinders 31a, 31b, and 31c, respectively, the first, second, and third pistons 32a, 32b, and 32c are integrated with each

other to ascend and descend at the same time, and first, second, and third inner spaces 35a, 35b, and 35c are defined between the first, second, and third cylinders 31a, 31b, and 31c and the first, second, and third pistons 32a, 32b, and 32c, respectively.

[0070] The connecting part 33 connects the piston 32 to the nozzle 22 so that the piston 32 and the nozzle 22 ascends and descends at the same time, and transmits an ascending driving force from the piston 32 to the nozzle 22.

[0071] The fluid entrance part 34 allows fluid to be introduced to and discharged from the inner space 35 between the cylinder 31 and the piston 32 to lift the piston 32 by an inner pressure of the cylinder 31.

[0072] When the nozzle 22 descends while the wafer container 100 is seated on the nozzle 22, the piston 32, which is connected to the nozzle through the connecting part 33, of the first driving part 30 descends together with the nozzle 22. Thereafter, when the wafer container 100 is separated, as the fluid entrance part 34 discharges the fluid from the inner space 35 to allow the inner space 35 to be narrowed and the piston 32 to ascend, an ascending driving force is provided to the nozzle 22 connected to the piston 32, thereby lifting the nozzle 22.

[0073] Also, as the first driving part 30 includes a plurality of cylinders and a plurality of pistons, the first driving part 30 may include a plurality of inner spaces, and thus may increase the ascending driving force provided to the nozzle due to the fluid pressure.

[0074] The second driving part 40 is driving unit for elastically supporting the first driving part 30 to provide an elastic force in a direction in which the first driving part 30 ascends. The second driving part 40 includes a fixing member 41, a moving member 42, and an elastic member 43.

[0075] The fixing member 41 is fixed to the lower portion of the stage part 10 and

includes a groove having an opened top portion so that the moving member 42 slides therein. The fixing member 41 is connected and fixed to the cylinder 31 by the supporting member 45, and the supporting member 45 fixes the fixing member 41 by connecting the fixing member 41 to at least one of the stage part 10, the housing 21, and the cylinder 31.

[0076] The moving member 42 is inserted into the groove of the fixing member 41 in order to slide in the fixing member 41 and transmits the elastic driving force from the elastic member 43 to the piston 32. The moving member 42 has an extension portion, in which an upper portion has a horizontal cross-sectional area greater than that of a lower portion, and an upper end of the extension portion pushes upward a lower end of the connecting part 33 or the piston 32 by using an elastic force.

[0077] The elastic member 43 is installed in the groove of the fixing member 41 to elastically support the moving member 42. The elastic driving force generated from the elastic member 43 is transmitted to the piston 32 through the moving member 42 to allow the piston to easily ascend. The elastic member 43 may include a coil spring.

[0078] In particular, a gap is defined between an inner circumferential surface of the groove of the fixing member 41 and an outer circumferential surface of the lower portion of the moving member 42, and, in this gap space, the elastic member 43 is provided. The elastic member 43 elastically support between a bottom surface of the groove of the fixing member 41 and a bottom surface of the extension portion of the moving member 42 and provide the elastic force in a direction in which the moving member 42 ascends.

[0079] As the second driving part 40 provides the elastic force to the piston 32, the ascending force of the piston 32 may increase, and, resultantly, the ascending force of the nozzle 22 may increase.

[0080] Hereinafter, a process of driving the gas supply apparatus of the wafer container in accordance with the first embodiment will be described in detail with reference to FIGS. 3 to 6.

[0081] FIGS. 3 and 4 illustrate a state in which the nozzle 22 ascends before the wafer container is seated on the stage part 10.

[0082] When the wafer container is seated on the stage part 10, as illustrated in FIGS. 5 and 6, the nozzle 22 descends by the weight of the wafer container, the piston 32 descends together with the nozzle 22 by the connecting part 33, a fluid is introduced into the inner space 35 as the inner space 35 between the cylinder 31 and the piston 32 is widened, and the moving member 42 disposed below the piston 32 also descends. Here, the elastic member 43 is compressed.

[0083] As illustrated in FIGS. 3 and 4 again, when the wafer container is separated from the stage part 10, as the weight of the wafer container is removed, the nozzle 22 ascends again. Here, as the fluid is discharged from the inner space 35, and the inner space 35 is narrowed to lift the piston 32, the ascending force of the nozzle 22 increases. Also, as the compressed elastic member 43 applies the elastic force to the ascending force of the piston, the ascending force of the nozzle 22 may further increase.

[0084] Thus, as the gas supply apparatus of the wafer container in accordance with the present invention includes the first and second driving parts to provide the ascending driving force caused by the fluid pressure and the elastic driving force caused by the elastic member to the nozzle when the nozzle ascends, the nozzle may smoothly ascend when the wafer container is separated from the upper portion of the nozzle to prevent the purge gas from being wasted.

[0085] Also, as the ascending and descending of the nozzle in accordance with the

present invention are smoothly driven, productivity of the wafer processing process may be enhanced.

[0086] Also, since the nozzle is fixed to the stage part or receives the ascending force by the first and second driving parts, a contact support force and an air-tightness between the wafer container and the nozzle may be simultaneously enhanced.

[0087] The gas supply apparatus of the wafer container in accordance with the present invention may further include a seat detecting part 40 disposed on the stage part 10 to detect whether the wafer container 100 is seated.

[0088] The seat detecting part 50 is a seat detecting unit installed on the lower portion of the stage part 10 to detect whether the wafer container 100 is seated. The seat detecting part 50 detects whether the wafer container 100 is seated by detecting a seated weight of the wafer container 100 in a contact manner or a non-contact manner by using an element such as a detection sensor.

[0089] As illustrated in FIG. 1, the seat detecting part 50 includes a pusher 51, a bracket 52, and a detecting unit 53 in order to detect the seated weight when the wafer container 100 is seated on the top surface of the stage part 10.

[0090] The pusher 51 is installed on the top surface of the stage part 10 in an ascending and descending manner, and moves downward by the seated weight of the wafer container 100 when the wafer container 100 is seated to provide a ground to determine whether the wafer container 100 is seated.

[0091] The bracket 52 is installed below a position of the stage part 10, on which the wafer container 100 is seated, and supports the pusher 51 to ascend and descend. Here, the detecting unit 53 for detecting the ascending and descending movement of the pusher 51 is installed on a lower end of the bracket 52.

[0092] The detecting unit 53 detects the ascending and descending movement of the pusher 51 by the seated weight when the wafer container 100 is seated or separated to provide the ground for determining whether the wafer container 100 is seated or separated.

[0093] As the detecting unit 53, various kinds of sensors including various kinds of switches such as a limit switch, a proximity sensor, a position sensor, and a pressure sensor may be applied. Besides, various kinds of detecting units for detecting the ascending and descending movement of the pusher 51 may be also applied as the detecting unit 53.

[0094] As the seat detecting part 50 for detecting whether the wafer container 100 is seated on the stage part 10 is installed, the purge gas is supplied only when the wafer container 100 is seated on the stage part 10 to prevent the purge gas from being wasted and, at the same time, enhance a processing efficiency of the purge gas.

[0095] Also, as the seat detecting part detects whether the wafer container is seated in a contact or non-contact manner, the seat detecting part may easily detect whether the wafer container is seated.

[0096] A second embodiment of the present invention is different from the first embodiment in structure of the first and second driving parts. Hereinafter, description on the same components as those of the first embodiment will be omitted, and different components from those of the first embodiment will be mainly described with reference to FIGS. 7 to 13.

[0097] A first driving part 30 is a driving unit that ascends and descends while connected to a nozzle 22 and provides an ascending driving force so that the nozzle ascends. The first driving part 30 includes a cylinder 31, a piston 32, a connecting part 33, and a fluid entrance part 34.

[0098] The cylinder 31 is fixed to a lower portion of a lower portion of a stage part 10

and includes an inner hole so that the piston 32 ascends and descends. The inner hole is opened to an upper portion of the cylinder 31. The cylinder 31 may be provided in plurality. In the second embodiment, the cylinder 31 may include first, second, and third cylinders 31a, 31b, and 31c, which are provided in a row, and the first, second, and third cylinders 31a, 31b, and 31c may be integrated with each other.

[0099] The piston 32 is inserted into the cylinder 31 in an ascending and descending manner, and an inner space 35 may be defined between the cylinder 31 and the piston 32 according to the ascending and descending of the piston 32. The piston 32 may be provided in plurality and inserted into a plurality of cylinders, respectively, to define a plurality of inner spaces. In the second embodiment, the piston 32 may include first, second, and third pistons 32a, 32b, and 32c inserted into the first, second, and third cylinders 31a, 31b, and 31c, respectively, the first, second, and third pistons 32a, 32b, and 32c may be integrated to ascend and descend at the same time, and first, second, and third inner spaces 35a, 35b, and 35c may be defined between the first, second, and third cylinders 31a, 31b, and 31c and the first, second, and third pistons 32a, 32b, and 32c.

[00100] Here, each of the first and third inner spaces 35a and 35c may have a height greater than that of the second inner space 35b.

[00101] The connecting part 33 is connected to the piston 32 and the nozzle 22 so that the piston 32 and the nozzle 22 ascend and descend at the same time, and provides an ascending driving force from the piston 32 to the nozzle 22.

[00102] The fluid entrance part 34 allows the fluid to be introduced to and discharged from the inner space 35 between the cylinder 31 and the piston 32 and lifts the piston 32 by an inner pressure of the cylinder 31.

[00103] When the wafer container 100 is seated on the nozzle 22, and the nozzle 22

descends, the piston 32, which is connected to the nozzle 22 through the connecting part 33, of the first driving part 30 descends together with the nozzle 22. Thereafter, when the wafer container 100 is separated, the fluid entrance part 34 allows the fluid to be introduced into the inner space 35 to widen the inner space 35 and lift the piston 32, an ascending driving force is provided to the nozzle 22 connected to the piston 32, thereby lifting the nozzle 22.

[00104] Also, as the first driving part 30 includes a plurality of cylinders and a plurality of pistons, a plurality of inner spaces may be provided, and thus the ascending driving force provided to the nozzle by the fluid pressure may increase.

[00105] When the wafer container 100 is seated on the nozzle 22, and the nozzle 22 descends, the piston 32, which is connected to the nozzle 22 through the connecting part 33, of the first driving part 30 descends together with the nozzle 22. Thereafter, when the wafer container 100 is separated, the fluid entrance part 34 allows the fluid to be introduced into the inner space 35 to lift the piston 32, the ascending driving force is provided to the nozzle 22 connected to the piston 32, thereby lifting the nozzle 22.

[00106] As described above, the plurality of cylinders and the plurality of pistons are provided, the ascending driving force provided to the nozzle may increase.

[00107] The second driving part 40 is a driving unit providing an elastic force in a direction, in which the first driving part 30 ascends, by elastically supporting the first driving part 30, and includes an elastic member 44.

[00108] The elastic member 44 is disposed in the inner space 35 between the cylinder 31 and the piston 32 to elastically support the piston 31 in order to provide an elastic force to the piston 31. The elastic driving force generated from the elastic member 44 is transmitted to the piston 32 to allow the piston to easily ascend. The elastic member 44

may include a coil spring.

[00109] In particular, the elastic member 44 is disposed in each of the first and third inner spaces 35a and 35c, and each of the first and third inner spaces 35a and 35c has a height greater than that of the second inner space 35b. accordingly, although the piston 32 descends, and a lower end of the second piston 32b contacts the second cylinder 31b, since each of the first and third inner spaces 35a and 35c has a predetermined height, a space in which the elastic member 44 is disposed may be maintained, and the piston 32 may be restricted from descending by the second piston 32b.

[00110] Alternatively, the elastic member 33 may be disposed in the second inner space 35b, and the second inner space 35b may have a height greater than that of each of the first and third inner spaces 35a and 35c.

[00111] Whether the elastic member 44 is provided and the height of the inner space may be variously determined, and the elastic member 44 may be desirably provided symmetric to a central axis of the force, which causes the ascending driving force, of the piston 32.

[00112] As the second driving part 40 provides the elastic force to the piston 32, the ascending force of the piston 32 may increase, and, resultantly, the ascending force of the nozzle 22 may increase.

[00113] Hereinafter, a process of driving the gas supply apparatus of the wafer container in accordance with the second embodiment will be described in detail with reference to FIGS. 8 to 13.

[00114] FIGS. 8 and 10 illustrate a state in which the nozzle 22 ascends before the wafer container is seated on the stage part 10.

[00115] When the wafer container is seated on the stage part 10, as illustrated in FIGS.

11 and 13, the nozzle 22 descends by the weight of the wafer container, the piston 32, which is connected to the nozzle 22 through the connecting part 33, descends together with the nozzle 22, the fluid is discharged from the inner space 35 as the inner space 35 between the cylinder 31 and the piston 32 is narrowed, and the elastic member 44 disposed in each of the first and third inner spaces 35a and 35c is compressed.

[00116] As illustrated in FIGS. 8 and 10 again, when the wafer container is separated from the stage part 10, as the weight of the wafer container is removed, the nozzle 22 ascends again. Here, as the fluid is introduced into the inner space 35, and the inner space 35 is widened to lift the piston 32, the ascending force of the nozzle 22 increases. Also, as the compressed elastic member 44 applies the elastic force to the ascending force of the piston 32, the ascending force of the nozzle 22 may further increase.

[00117] The present invention may be embodied in different forms without being out of the scope, technical idea and essential features of the present invention. Thus, the preferred embodiments should be considered in descriptive sense only and are not for purposes of limitation.

CLAIMS

1. An apparatus for supplying a gas for a wafer container, which injects a purge gas into a wafer container (100) accommodating and transferring a wafer, the apparatus comprising:

a stage part (10) on which the wafer container (100) is seated;

a gas entrance part (20) disposed in correspondence to a position of each of a gas inlet and a gas outlet, which are defined in the wafer container (100), and comprising a housing (21) coupled to the stage part (10) and a nozzle (22) inserted into the housing (21) to ascend and descend in the housing (21) and in which a flow path, through which a purge gas flows, is defined;

a driving part (30) installed on one side of the nozzle (22) and providing an ascending driving force to the nozzle (22); and

an elastic part (40) elastically supporting the first driving part (30) to provide an elastic force in a direction in which the first driving part (30) ascends,

wherein the nozzle (22) descends by the weight of the wafer container (100) and supplies the purge gas when the wafer container (100) is seated on the stage part (10), and ascends by the ascending driving force of the driving part (30) and elastic force of the elastic part (40) and stops to supply the purge gas when the wafer container (100) is separated from the stage part (10).

2. The apparatus of claim 1, wherein the driving part (30) comprises:

a cylinder (31) fixed to a lower portion of the stage part (10);

a piston (32) ascending and descending in the cylinder (31);

a connecting part (33) connecting the piston (31) to the nozzle (22) so that the piston (31) and the nozzle (22) ascend and descend at the same time; and

a fluid entrance part (34) allowing a fluid to be introduced to and discharged from an inner space (35) between the cylinder (31) and the piston (32) in order to lift the piston (32) by an inner pressure of the cylinder (31).

3. The apparatus of claim 2, wherein the elastic part (40) comprises:
 a fixing member (41) fixed to the lower portion of the stage part (10);
 a moving member (42) inserted into the fixing member (41) in a slidable manner
 and transmitting an elastic force so that the piston (32) ascends; and
 an elastic member (43) installed in the fixing member (41) and elastically
 supporting the moving member (42) to provide an elastic force to the piston (32).

4. The apparatus of claim 2, wherein the elastic part (40) comprises
 an elastic member (44) disposed in an inner space (35) between the cylinder (31)
 and the piston (32) and elastically supporting the piston (32) to provide an elastic force to
 the piston (32).

5. The apparatus of claim 4, wherein the first driving part (30) comprises:
 a plurality of cylinders (31); and
 a plurality of pistons (32) inserted into the plurality of cylinders (31), respectively,
 to define a plurality of inner spaces (35) and ascending and descending at the same time.

6. The apparatus of claim 5, wherein the plurality of cylinders (31) comprise
 first, second, and third cylinders (31a, 31b, 31c), which are provided in a row,
 the plurality of pistons (32) comprise first, second, and third pistons (32a, 32b,
 32c) inserted into the first, second, and third cylinders (31a, 31b, 31c), respectively, to
 define first, second, and third inner spaces (35a, 35b, 35c), and
 each of the first and third inner spaces (35a, 35c) or the second inner space (35b)

comprises the elastic member (44) and has a height greater than that of each of other inner spaces.