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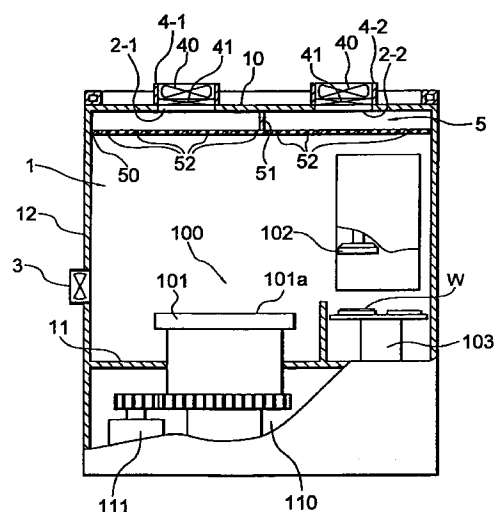
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(54) Ventilation structure of planarization chamber

(57) A ventilation structure of a planarization chamber for ventilating the inside of a planarization chamber (1) housing a planarization apparatus(100)which prevents scratching of the workpiece by making the flow of air in the planarization chamber substantially laminar and thereby eliminating the rising of the particles or turbulence. The structure includes intake ducts(2-1, 2-2)provided at a ceiling section (10) and having filter units (4-1, 4-2)attached, an exhaust blower (3) attached to a side section (12), and a perforated chamber(5) defined below the ceiling section(10) and having a large number of perforations (52). By making the outside air be ejected from the perforations (52) of the perforated chamber(5) to the inside of the planarization chamber (1), a laminar flow of the air descending to a lower platen (101) side is formed. This laminar flow pushes the particles in the air around the platen(101) down to the floor section (11) side. An exhaust blower (3) exhausts the particles to the outside of the planarization chamber (1).

FIG. 1



EP 0 962 720 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a ventilation structure of a planarization chamber housing a planarization apparatus such as a polishing or lapping apparatus.

2. Description of the Related Art

[0002] FIG. 10 is a schematic sectional view of a ventilation structure of a polishing chamber of the related art.

[0003] As shown in FIG. 10, a polishing chamber 1 housing a polishing apparatus 100 is defined by a ceiling section 10, a floor section 11, and four side sections 12.

[0004] The polishing apparatus 100 is provided with a lower platen 101 and a carrier 102 capable of picking up and holding a wafer W. This polishing apparatus, as shown by the two-dot chain line in FIG. 10, polishes the wafer W picked up and held by the carrier 102 by pressing and rotating the wafer W on the rotating lower platen 101.

[0005] At the time of polishing work, a not shown slurry is supplied on to the lower platen 101 to increase the efficiency of polishing the wafer W. Coagulated abrasive of the slurry, polishing dross, and other particles are sprayed into the air in the chamber 1.

[0006] The ventilation structure of the polishing chamber exhausts these particles to the outside and is comprised of intake ducts 2-1, 2-2 provided at the ceiling section 10 and an exhaust blower 3 provided at a side section 12.

[0007] That is, by operating ventilation fans 40 of filter units 4-1, 4-2 attached to the intake ducts 2-1, 2-2, the outside air is sucked into the polishing chamber 1 through the filter units 4-1, 4-2 and the intake ducts 2-1, 2-2. Further, by driving the exhaust blower 3 and exhausting the air together with the particles, the particles in the polishing chamber 1 generated during the polishing are removed.

[0008] In the above ventilation structure of a polishing chamber of the related art, however, since the outside air flowed directly from the small sized intake ducts 2-1, 2-2 to the inside of the polishing chamber 1, as shown in FIG. 11, turbulence and convection of the air A ended up occurring in the polishing chamber 1. Therefore, particles were swept up by this turbulence and convection and entered between the wafer W being polished and the lower platen 101 to cause scratches on the wafer W.

[0009] Further, in the ventilation structure of a polishing chamber of the related art, since the exhaust blower 3 was attached at a position higher than the polishing surface 101a of the lower platen 101, the particles lower

than the polishing surface 101a were liable to be lifted up to the polishing surface side of the lower platen 101 by the suction force of the exhaust blower 3, deposit on the polishing surface of the lower platen 101, and again enter between the wafer W and the lower platen 101.

SUMMARY OF THE INVENTION

[0010] An object of the present invention is to provide a ventilation structure of a planarization chamber which prevents the scratching of a workpiece by making the flow of air in the planarization chamber substantially laminar and thereby eliminating the lifting and agitation of the particles.

[0011] To achieve the above object, according to an aspect of the invention, there is provided a ventilation structure of a planarization chamber for ventilating a planarization chamber which houses a planarization apparatus having a rotatable platen and rotatable pressing member for pressing a workpiece to the platen and which has a first section into which the platen is built, comprising: an intake duct provided at a section of the planarization chamber having a second section facing the first section and to which a dust collecting filter is attached; an exhaust device provided at least at one of the sections of the planarization chamber having side sections connected air-tightly to the sides of the first and second sections and the first section; and a perforated chamber defined near the inside of the second section facing substantially the entire second section and having a large number of perforations formed substantially uniformly at a surface facing the first section.

[0012] Due to this configuration, by driving the exhaust device, the air outside the planarization chamber is sucked into the perforated chamber from the intake duct provided at the second section and fills the perforated chamber. Further, the air filled in the perforated chamber is ejected from the large number of perforations formed substantially uniformly at the surface facing the first section. The air forms a substantially laminar flow which flows to the first section side, then is exhausted outside of the chamber by the exhaust device.

[0013] It is preferable to set the diameter and number of the perforations so that all of the air flowing out from the large number of perforations heads toward the first section side. Therefore, as a preferred example, according to an aspect of the invention, the diameter of the perforations of the perforated chamber is set to a value between 3 mm and 5 mm and the number of the perforations is set so that the sum of the areas of the openings of the perforations becomes a value between 10 percent and 20 percent of the area of the surface at which the perforations are formed.

[0014] Further, according to an aspect of the invention, an exhaust chamber is defined by a partition, attached inside the planarization chamber in a state loosely fit over the platen of the planarization apparatus

by a hole so as to form a space around the platen, the first section, and the side sections and wherein an exhaust device is attached to at least one of the side sections and first section of the exhaust chamber.

[0015] Due to this configuration, air ejected from the perforations of the perforated chamber and forming a substantially laminar flow flows to the partition side of the exhaust chamber, passes through the space between the platen and the hole of the partition, and enters into the exhaust chamber. The air in the exhaust chamber is exhausted to the outside by the exhaust device.

[0016] It is possible however to not only make the air in the planarization chamber flow into the exhaust chamber from the space between the platen and the hole of the partition, but also to make it flow from other locations separate from the space into the exhaust chamber.

[0017] Therefore, according to an aspect of the invention, a predetermined number of intake holes are provided in the partition of the exhaust chamber.

[0018] Further, according to an aspect of the invention, there is provided a ventilation structure of a planarization chamber for ventilating a planarization chamber which houses a planarization apparatus having a rotatable platen and rotatable pressing member for pressing a workpiece to the platen and which has a first section into which the platen is built, comprising: an intake duct provided at a section of the planarization chamber comprising a second section facing the first section and to which a dust collecting filter is attached; an exhaust chamber defined by a partition, attached inside the planarization chamber in a state loosely fit over the platen of the planarization apparatus by a hole so as to form a space around the platen, the first section, and side sections; and an exhaust device attached to at least one of the side sections and first section of the exhaust chamber.

[0019] Further, according to an aspect of the invention, a predetermined number of holes are provided in the partition of the exhaust chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The above and other objects, features, and advantages of the present invention will become more readily apparent from the following description of presently preferred embodiments of the invention taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a schematic sectional view of a ventilation structure of a polishing chamber according to a first embodiment of the present invention;

FIG. 2 is a perspective view of a formation position of intake ducts;

FIG. 3 is a plan view of the state of substantially uniform formation of perforations covering the entire surface of a perforated plate;

FIG. 4 is a schematic sectional view of the state of formation of a laminar flow;

FIG. 5 is a schematic sectional view of the state of particles being pushed down to the floor section side by the laminar flow of air;

FIG. 6 is a schematic sectional view of a ventilation structure of a polishing chamber according to a second embodiment of the present invention;

FIG. 7 is a plan view of the space in the exhaust chamber;

FIG. 8 is a schematic sectional view of the state of exhaust of particles in the second embodiment;

FIG. 9 is a schematic sectional view of a ventilation structure of a polishing chamber according to a third embodiment of the present invention;

FIG. 10 is a schematic sectional view of a ventilation structure of a polishing chamber of the related art; and

FIG. 11 is a schematic sectional view of the state of occurrence of turbulence and convection inside a polishing chamber.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Preferred embodiments of the present invention will be explained below with reference to the drawings.

(First Embodiment)

[0022] FIG. 1 is a schematic sectional view of a ventilation structure of a polishing chamber according to a first embodiment of the present invention. Note that members the same as members shown in FIG. 10 and FIG. 11 are explained given the same reference numerals.

[0023] In FIG. 1, a lower platen 101 of a polishing apparatus 100 is arranged inside a polishing chamber 1 in a state with the polishing surface 101a facing upward. This lower platen 101 is designed to be driven to rotate by a motor 111 inside a drive chamber 110 below the floor section 11 defining part of the polishing chamber 1. Further, a carrier 102 (pressing member) of the polishing apparatus 100 is designed to be elevated or descend, oscillate, and rotate by a not shown elevator mechanism, oscillation mechanism, and rotation mechanism. Note that reference numeral 103 is an index table. The carrier 102 is designed to pick up an unpolished wafer W (workpiece) arranged on this index table 103 and convey it to the polishing surface 101a of the lower platen 101 and to return the polished wafer W to the index table 103.

[0024] The polishing chamber 1 houses the polishing apparatus 100. Specifically, the polishing chamber 1 is defined by a floor section 11 (first section), a ceiling section 10 facing the floor section 11 (second section), and four side sections 12 connected air-tightly to the sides of

the floor section 11 and ceiling section 10.

[0025] The ventilation structure of this polishing chamber 1 is comprised of intake ducts 2-1, 2-2 to which filter units 4-1, 4-2 are attached, a perforated chamber 5, and an exhaust blower 3 (exhaust device).

[0026] The intake ducts 2-1, 2-2 convey outside air to the inside of the polishing chamber 1. As shown in FIG. 2, the intake duct 2-1 is formed at substantially the center of the left half portion of the ceiling section 10 from the center line L, while the intake duct 2-2 is formed at substantially the center of the right half portion.

[0027] In FIG. 1, the filter units 4-1, 4-2 have ventilation fans 40 and dust-collecting filters 41 and are attached to the intake ducts 2-1, 2-2 in a state with the filters 41 facing downward. Due to this, when the ventilation fans 40 are driven, outside air can be made to flow into the polishing chamber 1.

[0028] The perforated chamber 5 is designed to make the air flowing from the intake ducts 2-1, 2-2 laminar and eject it to the inside of the polishing chamber 1 and is defined near the bottom of the ceiling section 10 facing substantially the entire surface of the ceiling section 10.

[0029] Specifically, a perforated plate 50 is attached in parallel to the bottom of the ceiling section 10. The center portion between the ceiling section 10 and the perforated plate 50 is partitioned by a partition 51.

[0030] Further, the perforated plate 50, as shown in FIG. 3, is formed with a large number of perforations 52 substantially uniformly across the entire surface of the perforated plate 50.

[0031] Due to this, after the air outside of the polishing chamber 1 is accumulated once in the perforated chamber 5, it is ejected into the polishing chamber 1 by a predetermined pressure through the large number of perforations 52.

[0032] In this embodiment, to obtain a substantially complete laminar flow, the diameter of the perforations 52 is set to a value between 3 mm and 5 mm and the number of the perforations 52 is set so that the sum of the areas of the openings of the perforations 52 becomes a value between 10 percent and 20 percent of the area of the perforated plate 50.

[0033] The exhaust blower 3 is for exhausting air descending in the laminar flow state from the perforated chamber 5 to the outside of the polishing chamber 1. The exhaust blower 3 is attached to the side section 12 of the left side in FIG. 1 and is arranged to be somewhat higher than the polishing surface 101a of the lower platen 101.

[0034] Next, an explanation will be given of the operation of the ventilation structure of a polishing chamber according to this embodiment.

[0035] As shown by the two-dot chain line of FIG. 4, an unpolished wafer W is held by the carrier 102. The wafer W is pressed against the polishing surface 101a of the rotating lower platen 101 and in that state the carrier 102 is made to rotate, whereupon the wafer W is

polished by the polishing surface 101a of the lower platen 101. Polishing dross or not shown coagulated abrasive etc. of slurry is sprayed around the lower platen 101 as the particles P.

5 [0036] If the filter units 4-1, 4-2 are driven before this polishing operation, the outside air is sucked through the intake ducts 2-1, 2-2 to the perforated chamber 5 and the pressure inside the perforated chamber 5 rises.

10 [0037] Due to this, the air A inside the perforated chamber 5 is ejected to the inside of the polishing chamber 1 from the large number of perforations 52 at a constant pressure. As shown by the arrows, it forms a laminar flow as a whole and descends.

15 [0038] As a result, as shown in FIG. 5, the particles P sprayed around the lower platen 101 are pushed down to the floor section 11 side by the laminar flow of air A.

20 [0039] Further, by driving the exhaust blower 3 substantially simultaneously with the driving of the filter units 4-1, 4-2, the particles P pushed down to the floor section 11 side are exhausted to the outside of the polishing chamber 1 together with the air A.

25 [0040] In this way, according to the ventilation structure of a polishing chamber of this embodiment, since the particles P sprayed around the lower platen during the polishing operation are pushed down to the floor section 11 side by the laminar flow of air A, the particles P will almost never rise up. As a result, the situation where the particles P enter between the wafer W and the polishing surface 101a and scratch the wafer W will almost never occur.

(Second Embodiment)

35 [0041] FIG. 6 is a schematic sectional view of a ventilation structure of a polishing chamber according to a second embodiment of the present invention. Note that members the same as members shown in FIG. 1 to FIG. 5 are explained given the same reference numerals.

40 [0042] The ventilation structure of a polishing chamber of this embodiment defines an exhaust chamber 6 below the lower platen 101 of the polishing apparatus 100 and has the exhaust blower 3 attached to this chamber 6.

45 [0043] Specifically, as shown in FIG. 6 and FIG. 7, a partition 60 having a hole 61 larger than the diameter of the lower platen 101 is loosely fit over the lower platen 101 through the hole 61, whereby a space 62 is formed between the hole 61 of the partition 60 and the lower platen 101. The peripheral edges of the partition 60 are attached to a partition 63 standing on the floor section 11 and the side sections 12 to define the exhaust chamber 6. Further, the partition 63 is provided an intake hole 64 for communicating the polishing chamber 1 and the exhaust chamber 6.

50 [0044] The exhaust blower 3 is attached at a location at the left side of FIG. 6 corresponding to the exhaust chamber 6.

[0045] Due to this configuration, as shown in FIG. 8,

the air A flowing from the intake ducts 2-1, 2-2 to the inside of the polishing chamber 1 is sucked into the exhaust chamber 6 from the space 62 between the hole 61 of the partition 60 and the lower platen 101 by the exhaust blower 3, then is exhausted to the outside of the polishing chamber 1.

[0046] Therefore, the particles P sprayed around the lower platen 101 during polishing operation are sucked into the exhaust chamber 6 together with the air A and then exhausted to the outside of the polishing chamber 1 by the exhaust blower 3.

[0047] The rest of the configuration, mode of operation, and advantageous effects are similar to those of the above first embodiment, so explanations thereof will be omitted.

(Third Embodiment)

[0048] FIG. 9 is a schematic sectional view of a ventilation structure of a polishing chamber according to a third embodiment of the present invention. Note that members the same as members shown in FIG. 1 to FIG. 8 are explained given the same reference numerals.

[0049] The ventilation structure of the polishing chamber of this embodiment is a combination of the ventilation structures of the first and second embodiments.

[0050] In the ventilation structure of the polishing chamber of the first embodiment, the exhaust blower 3 was arranged above the polishing surface 101a of the lower platen 101, so the situation might occur of the particles P pushed down to the floor section 11 side rising to close to the polishing surface 101a due to the suction force of the exhaust blower 3.

[0051] On the other hand, in the ventilation structure of the polishing chamber of the second embodiment, the majority of the particles P spray around the lower platen 101 was sucked from the space 62 to the inside of the exhaust chamber 6. There are also particles P however which are swept up by the turbulence etc. in the polishing chamber 1. The situation may arise of these particles depositing on the polishing surface 101a of the lower platen 101.

[0052] Therefore, in the ventilation structure of the polishing chamber of this embodiment, in the same way as the first embodiment, a perforated chamber 5 is provided below the ceiling section 10 having the intake ducts 2-1, 2-2 provided with the filter units 4-1, 4-2 and, in the same way as the second embodiment, an exhaust chamber 6 is provided below the lower platen 101 and an exhaust blower 3 is attached to this exhaust chamber 6.

[0053] Due to this configuration, the particles P sprayed around the lower platen 101 are pushed down to the partition 60 side of the exhaust chamber 6 by the laminar flow of air A, then are sucked from the space 62 to the inside of the exhaust chamber 6 and exhausted to the outside by the exhaust blower 3. As a result, the deposition of the sprayed particles p to the polishing

surface 101a is completely prevented.

[0054] The rest of the configuration, mode of operation, and advantageous effects are similar to those of the above first and second embodiments, so explanations thereof will be omitted.

[0055] Note that the present invention is not limited to the above embodiments. Various modifications and changes are possible within the scope of the gist of the invention.

[0056] For example, in the first and second embodiments, while the explanation was made of a polishing chamber and polishing apparatus, the invention may also of course be applied to a lapping chamber and lapping apparatus.

[0057] Further, while a partition plate 51 was provided in the perforated chamber 5 to divide the space in the perforated chamber into two, it is also possible not to provide the partition plate 51 and make the inside of the perforated chamber 5 a single space. In this case, it is also possible that the two intake ducts 2-1, 2-2 not be provided, but a single intake duct 2-1 be provided at the center of the ceiling section 10 and a single filter unit 4-1 be attached to this intake duct 2-1.

[0058] Summarizing the advantageous effects of the invention, according to the aspect of the invention, since the air ejected from the perforated chamber forms a substantially laminar flow which flows to a first section into which the platen of the polishing apparatus is built, the polishing dross of the workpiece formed during the polishing operation and the coagulated abrasive and other particles of the slurry are led to the first section side by the substantially laminar flow of air and exhausted by an exhaust device to the outside of the polishing chamber. As a result, it is possible to prevent the situation where the particles sprayed around the platen enter between the platen and workpiece and scratch the workpiece.

[0059] Further, according to the aspect of the invention, the air ejected from the perforated chamber can be made substantially completely a laminar flow in state and the effect of prevention of scratches can be further raised.

[0060] Further, according to the aspect of the invention, the particles sprayed around the platen are guided to the partition side of the exhaust chamber by the laminar flow of air and further the particles are sucked from the space between the platen and the hole of the partition to the inside of the exhaust chamber, so it is possible to reliably exhaust the particles sprayed around the platen to the outside of the polishing chamber.

[0061] Further, according to the aspect of the invention, the particles sprayed around the platen can be sucked through the space between the hole of the partition and the platen into the exhaust chamber and exhausted to the outside.

Claims

1. A ventilation structure of a planarization chamber for ventilating a planarization chamber which houses a planarization apparatus having a rotatable platen and rotatable pressing member for pressing a workpiece to the platen and which has a first section into which the platen is built, comprising:

an intake duct provided at a section of the planarization chamber having a second section facing the first section and to which a dust collecting filter is attached;

an exhaust device provided at least at one of the sections of the planarization chamber having side sections connected air-tightly to the sides of the first and second sections and the first section; and

a perforated chamber defined facing substantially the entire second section near the inside of the second section and having a large number of perforations formed substantially uniformly at a surface facing the first section.

2. A ventilation structure of a planarization chamber as set forth in claim 1, wherein the diameter of the perforations of said perforated chamber is set to a value between 3 mm and 5 mm and the number of the perforations is set so that the sum of the areas of the openings of the perforations becomes a value between 10 percent and 20 percent of the area of the surface at which the perforations are formed.

3. A ventilation structure of a planarization chamber as set forth in claim 1, wherein

an exhaust chamber is defined by a partition, attached inside the planarization chamber in a state loosely fit over the platen of the planarization apparatus by a hole so as to form a space around the platen, the first section, and the side sections; and

an exhaust device is attached to at least one of the side sections and first section of said exhaust chamber.

4. A ventilation structure of a planarization chamber as set forth in claim 3, wherein a predetermined number of intake holes are provided in the partition of said exhaust chamber.

5. A ventilation structure of a planarization chamber for ventilating a planarization chamber which houses a planarization apparatus having a rotatable platen and rotatable pressing member for pressing a workpiece to the platen and which has a first section into which the platen is built, comprising:

an intake duct provided at a section of the planarization chamber comprising a second section facing the first section and to which a dust collecting filter is attached;

an exhaust chamber defined by a partition, attached inside the planarization chamber in a state loosely fit over the platen of the planarization apparatus by a hole so as to form a space around the platen, the first section, and side sections; and

an exhaust device attached to at least one of the side sections and first section of said exhaust chamber.

6. A ventilation structure of a planarization chamber as set forth in claim 5, wherein a predetermined number of holes are provided in the partition of said exhaust chamber.

FIG. 1

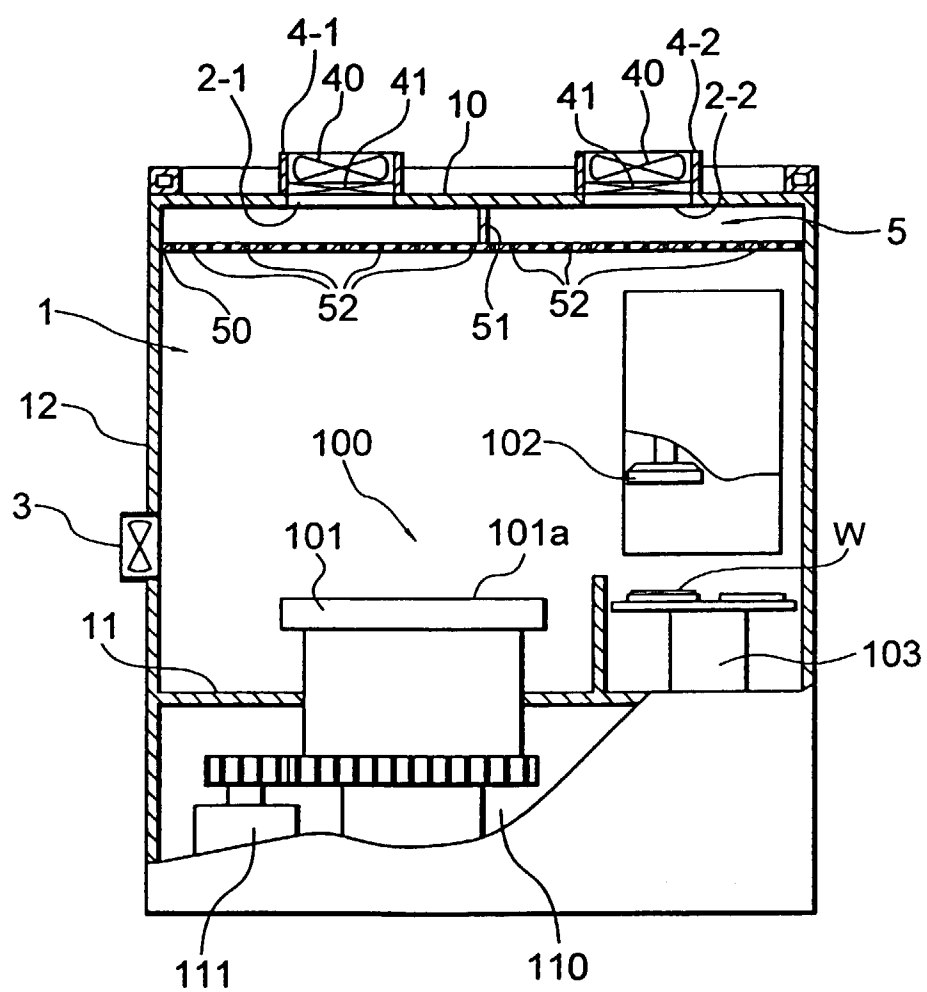


FIG. 2

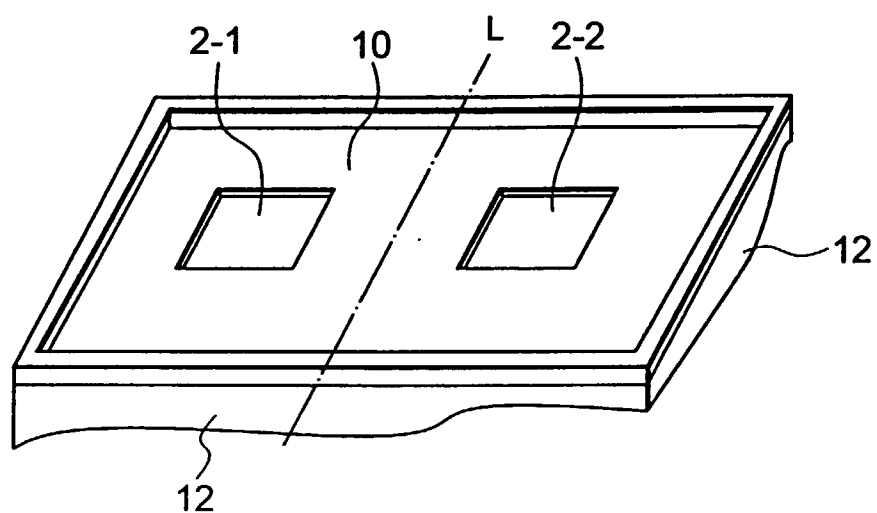


FIG. 3

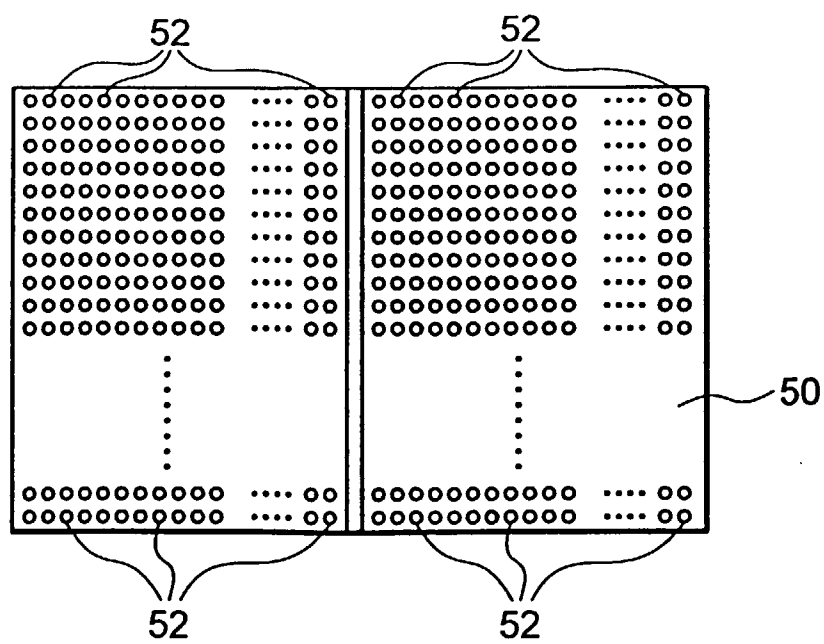


FIG. 4

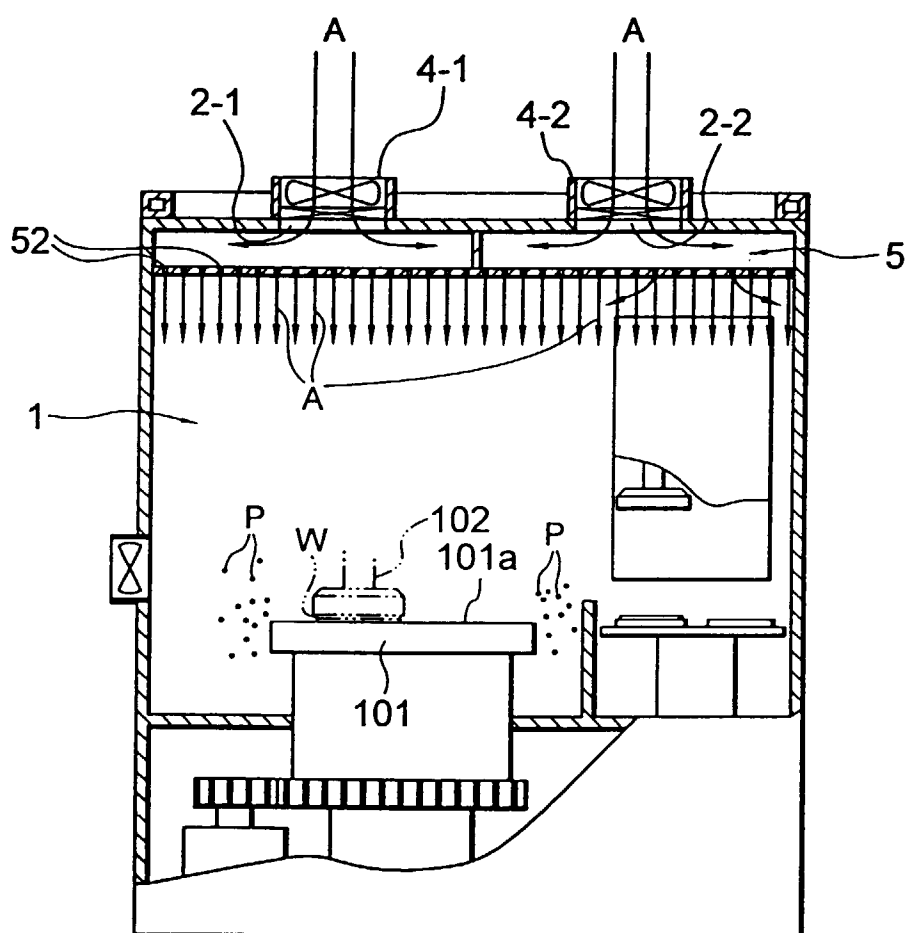


FIG. 5

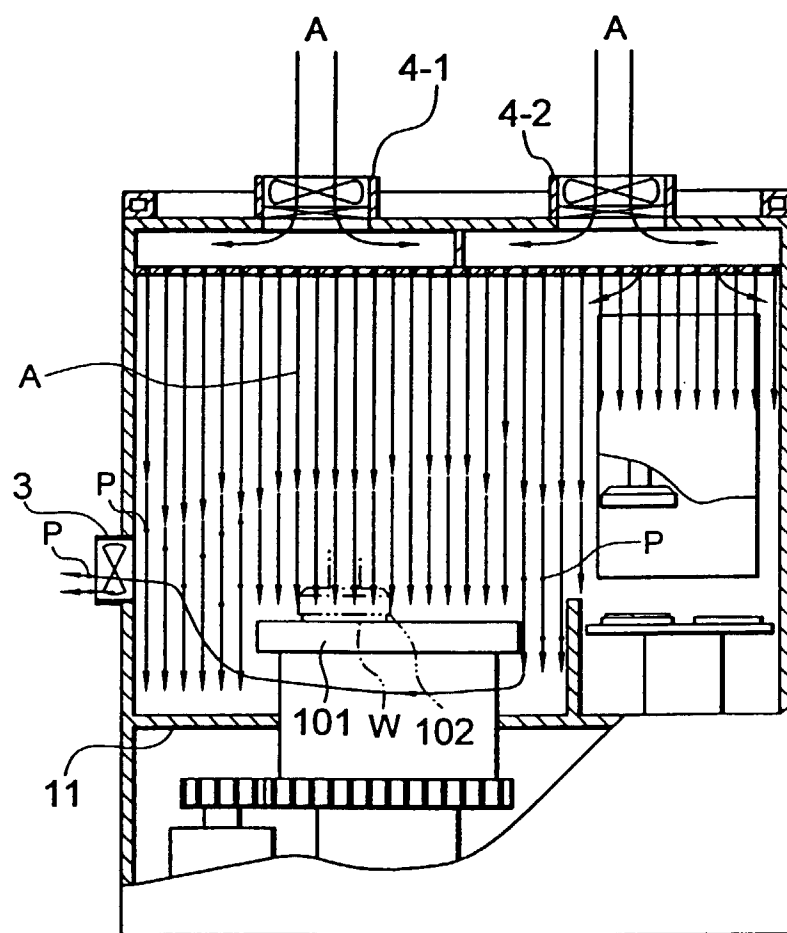


FIG. 6

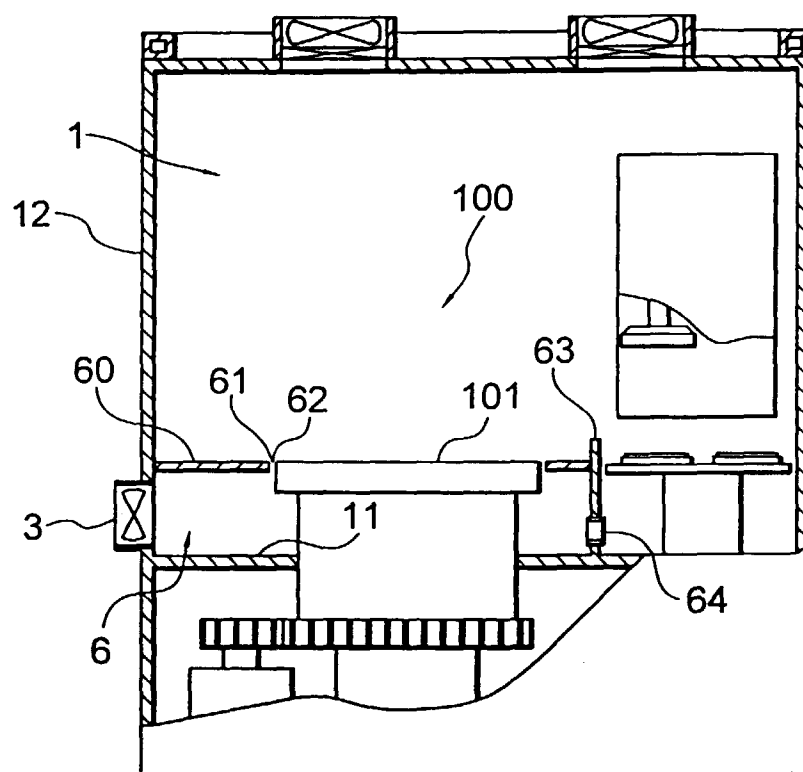


FIG. 7

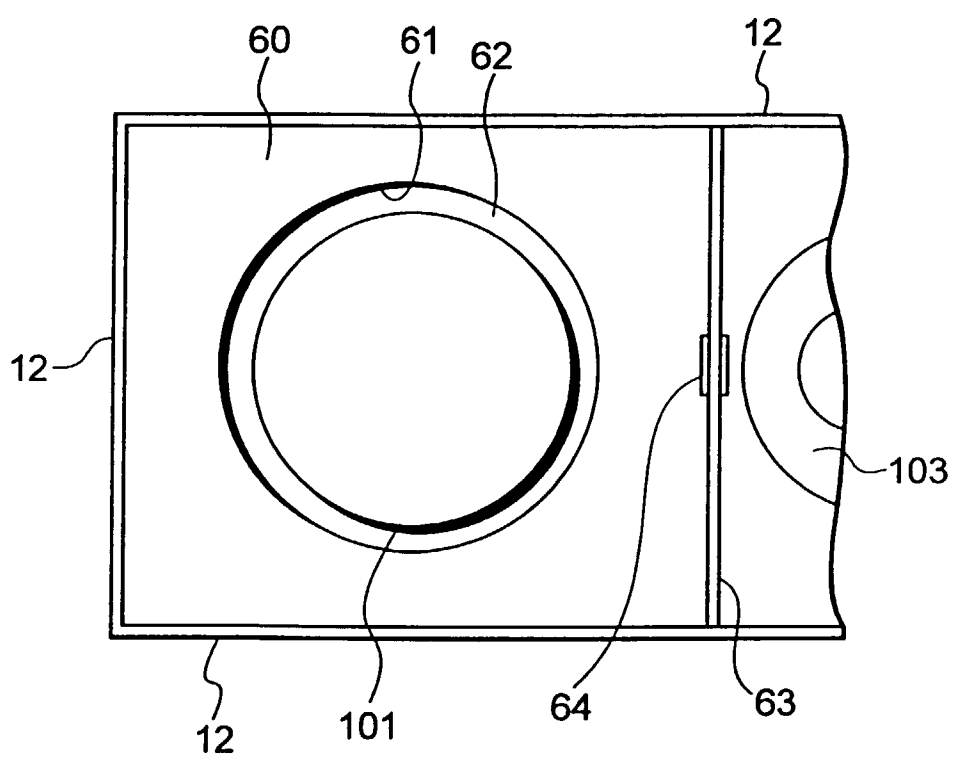


FIG. 8

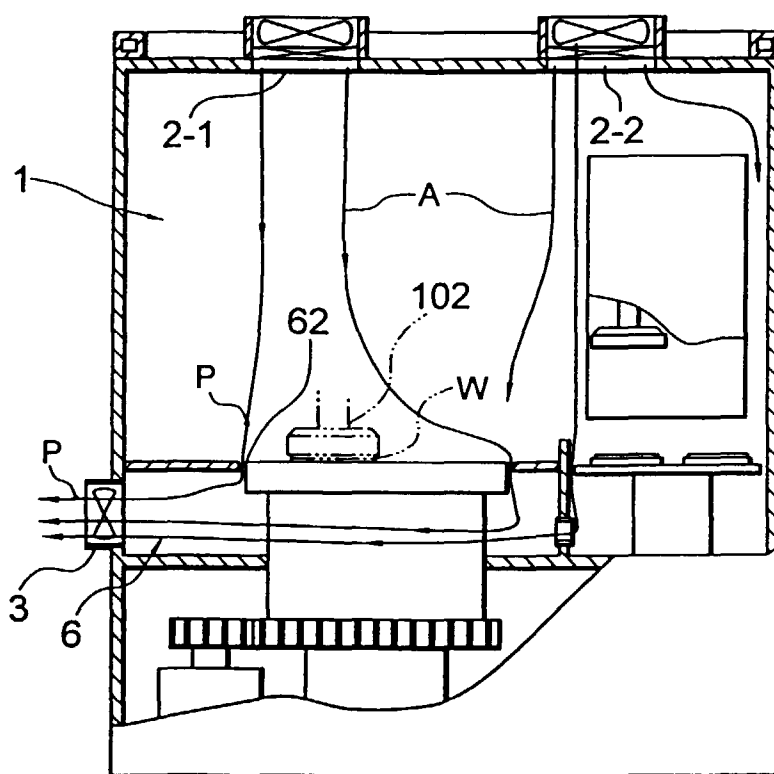


FIG. 9

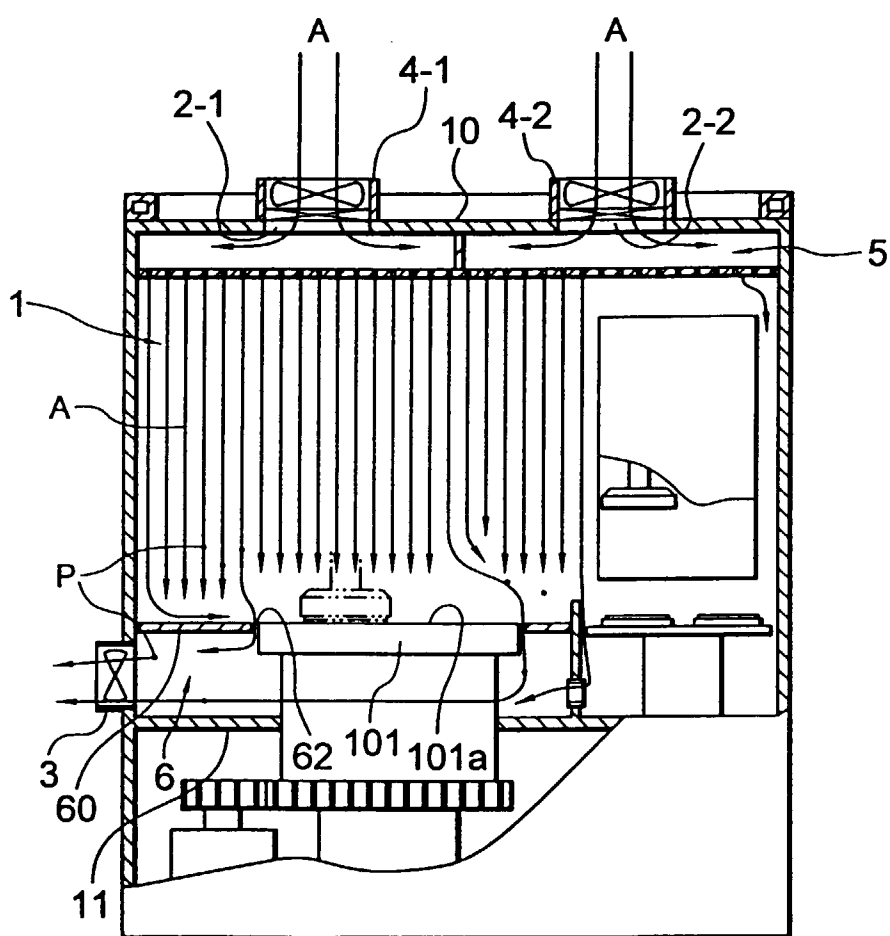


FIG. 10
(PRIOR ART)

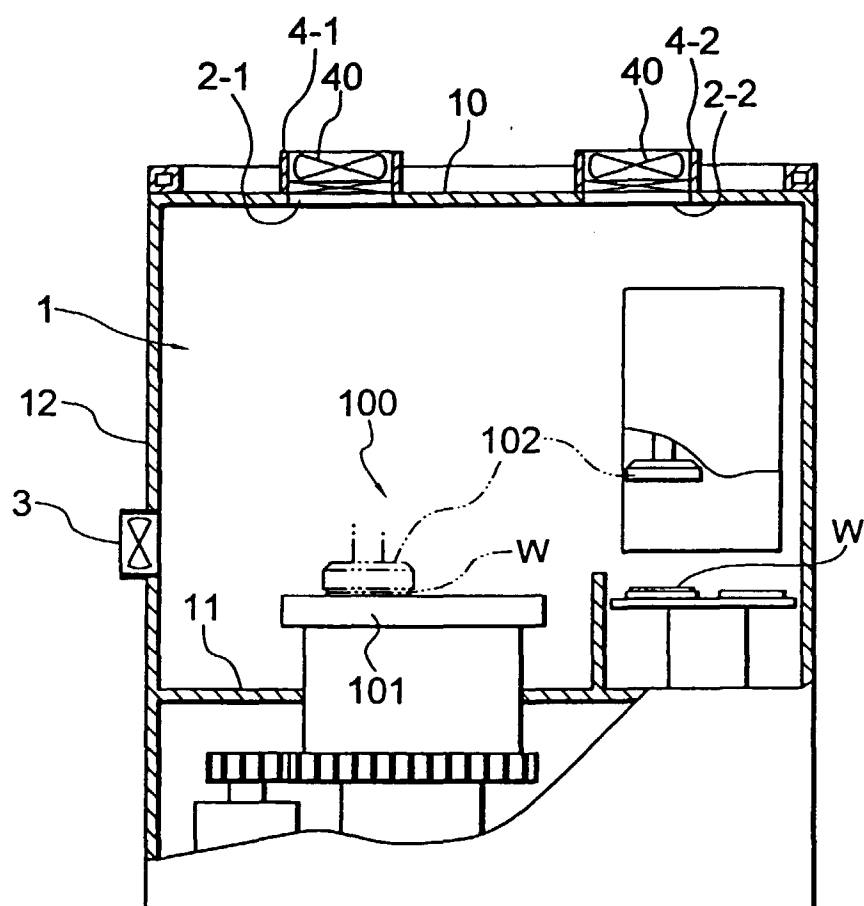


FIG. 11
(PRIOR ART)

