DEVICE WITH LIFTING AND LOWERING DRAIN TANK FOR WET ETCHING WAFERS

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ABSTRACT

The present invention discloses a device for spin cleaning and etching wet processor. The support is kept in a fixed level, and the drain tank can be lifting and lowering to collect and drain out the liquid from the support. This device consists of a support, a set of drain tank and a lifting and lowering device to move the drain tank so that one of the drain tank is in the same level with the support. The support is used to support a wafer to process etching and cleaning, can spin with different speed and supply etching solution and DI water. The number of drain tanks are selected by the number of etching solutions and DI water. A stationary axaust apparatuus kept in a fixed level as the support is used to axaust the acidic gas from the drain tanks.
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BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

The present invention relates to a device for etching wafers. In particular, the present invention relates to a device with lifting and lowering drain tank for etching wafers, so that the support need only spinning and need not moving up and down, the drain tank can lift up or lower down to the level of the support according to the kinds of the etching solution to collect and drain out the liquid and acidic gas from the support.

[0002] 2. Description of the Related Art

Generally, a spin cleaning and etching device is used for photoresist coating, cleaning or etching wafers or substrates. The spin cleaning and etching device consists of a support and a drain tank. During cleaning or etching wafers, the liquid from the support is collect and drained out by the drain tank. The support is lifting and lowering with respect to the tank to select a proper duct for the support to drain different liquids from the support, and the acidic gas from every drain tank is gather up then drainout by one exhaust tube. The technology is used in U.S. Pat. No. 4/903,717 to Franz Sumntsch et al. The problem is that the drain tanks is contaminated each other, and lifting and lowering the suspet is very complex since the conduct of the liquid and the joint aperture should be moved together.

[0003] What is need is to have a cleaning and etching device to solve the above problem and drain out different liquids from the support to the drain tank.

OBJECTS OF THE INVENTION

[0004] It is therefore an object of the invention to provide a device with lifting and lowering drain tank for etching wafers, so that the support of the wafer can be kept in a fixed level to simplify the mechanic structure of the support.

[0005] It is another object of the invention to provide a device with lifting and lowering drain tank for etching wafers in an especially simple way, the etching solution or rinse water being separately collected and passed on to re-use more accurately.

DISCLOSURE OF THE INVENTION

[0006] In order to achieve the above and other objects, a first aspect of the present invention teaches a device for wet etching and cleaning with lifting and lowering drain tank, the support is kept in a fixed level and the selected annular duck of the drain tank can be lifting and lowering to the level of the support to collect and drain out the liquid from the support. The device consists of a support, kept in a fixed level, having a circular surface for supporting a wafer, is used for spin wet etching and cleaning the wafer;

[0007] a drain tank, is disposed around the concentrate circle of the support, the drain tank comprising at least two annular ducks to drain the liquid from the support, each annular ducks has an annular aperture connected to an air-extracting window of a stationary exhaust apparatus with a connecting window to remove the gas of the liquid; an stationary exhaust apparatus, with a main air-extracting window, a plurality of secondary air-extracting window, a main exhaust tube and a secondary exhaust tube; means for lifting and lowering the drain tank such that selected annular duck can be aligned with the surface of the support to drain the liquid from the support. The means for lifting and lowering the drain tank is a lifting gear driving by a motor or a pneumatic tool.

[0008] Another preferred embodiment of the present invention teaches a device for wet etching and cleaning with lifting and lowering drain tank, wherein the stationary exhaust apparatus further consists of an isolating brush, connecting the connecting window with the air-extracting window of the stationary exhaust apparatus by soft contact to isolate the main exhaust stream and the secondary exhaust stream; a driving apparatus, matching the air-extracting window with said connecting window during the drain tank moving up or down to isolate the secondary exhaust tube and shut up the secondary air-extracting window without drain tank; a sealing partition, isolating each connecting window with the outer environment to isolate the acidic gas once more. Wherein the main air-extracting window is in the central position of all the air-extracting windows and the number of the secondary air-extracting windows is totally 2N−1, N−1 in the upper side and N−1 in the lower side of the main air-extracting window.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The foregoing and other advantages of the invention will be more fully understood with reference to the description of the best embodiment and the drawings wherein:

[0012] FIG. 1 is a schematic diagram of a device for wet etching and cleaning with lifting and lowering drain tank in accordance to one embodiment of the present invention;

[0013] FIG. 2 is a cross sectional and perspective view of a device for wet etching and cleaning with lifting and lowering drain tank in accordance to one embodiment of the present invention;

[0014] FIG. 3 is a cross sectional and perspective view of the stationary suction apparatus in accordance to one embodiment of the present invention;

[0015] FIG. 3 (A) shown the main exhaust stream, and

[0016] FIG. 3 (B) shown the secondary exhaust stream.

[0017] FIG. 4 is a perspective view of an isolating brush in accordance to one embodiment of the present invention;

[0018] FIG. 5 is a cross sectional and perspective view when the drain tank is connected to the stationary exhaust apparatus with an isolating brush in accordance to one embodiment of the present invention;

[0019] FIG. 6 is another cross sectional view when the drain tank is connected to the stationary exhaust apparatus with an isolating brush in accordance to one embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] Refer to FIG. 1, FIG. 1 is a schematic diagram of a device for wet etching and cleaning with lifting and lowering drain tank in accordance to one embodiment of the present invention. Support 102 is kept in a fixed level, this support 102 has a circular surface to support a wafer 104, support 102 is driving by a spin axis 110 to spin and etch or clean wafer 104, wafer 104 is fixed on the support 102 by a vacuum suction mechanism 108 or other mechanism such as mechanical gripper. A spin motor 106 provides the spin power. The necessary acidic liquids or DI water for etching and cleaning are supply by conduits 134,136,138 and 140 from containers 142,144, 146 and 148. Drain tank 112 is disposed around the concentrate circle of the support 102, the drain tank 112 comprising
at least two annular ducks 114, the preferred embodiment of the present invention has four annular ducks 114, the number of the annular ducks is based on the kinds of the acid plus one for the DI water. The four annular ducks 114 are lifting up and down as indicated with arrow 113 by a lifting and lowering device 202 (see FIG. 2), such that a suitable annular ducks 114 may move to the level of the support 102 and align accurately to drain separately the acidic liquid from the support 102, in this embodiment, the second annular ducks 114 is aligned with the support 102. Every annular ducks 114 has an aperture 118 connected to a stationary suction apparatus 124 via a connection window 120 to axust the acidic gas from the drain tank. Restriction 116 is used to restrict the splashing acidic liquid and the DI water can not enter the aperture 118 but leave in the annular duck 114, the acidic liquid and the DI water is then drained via the discharge conduits 160,162,164 or 166 and the three way valves 150,152,154 or 156 and then enter the container 142,144,146 or 148 for reuse or enter the waste liquid drain 158 to drain out. Thus the acid or the clean DI water can be re-used. In one side of the annular ducks 114, there are connection windows 120 connected to the air-extracting window 122 of the stationary exhaust apparatus 124. The acidic gas producing by the acidic liquid go through the aperture 118 via the main exhaust stream 128 then enter the main axust tube 126 to drain out. The acidic gas producing by the other annular ducks 114 are drain via the secondary exhaust stream 132 then enter the secondary exhaust tube 130 and then drain out. Thus the stronger acid can be drain out from the main exhaust tube 126, cross contamination will not happen easy.

[0021] Refer to FIG. 2. FIG. 2 is a cross sectional and perspective view of a device for wet etching and cleaning with lifting and lowering drain tank in according to one embodiment of the present invention. Rotating motor 106 provides spin force to the support 102. As shown in the figure, four annular ducks 114 can lift up and down as indicated with arrow 117 by a lifting and lowering device 202. In this embodiment, the 4th connection window 120 of the stationary suction apparatus 124 so that the acidic gas is drained through the main air-extracting window 121 of the stationary suction apparatus 124 and enter the main exhaust tube 126. The acidic gas is come from the aperture 118 (see FIG. 1). Restriction 116 is used to restrict the splashing acidic liquid and the DI water which can not enter the aperture 118 but leave in the annular duck 114, the acidic liquid and the DI water are drained to the conduits (not shown, see FIG. 1) to re-use or drain out.

[0022] Because the the drain tank 112 can lift up and down, if the suction apparatus moves together with the drain tank 112, the structure would be very complicate. Thus the present invention adopt a stationary exhaust apparatus 124.

[0023] Refer to FIG. 3, FIG. 3 is a cross sectional and perspective view of the stationary suction apparatus in according to one embodiment of the present invention. FIG. 3 (A) shown the main exhaust stream and FIG. 3 (B), shown the secondary exhaust stream. From FIG. 3 (A) we can see the connection window 120 of the drain tank 112, the main air-extracting window 121 of the stationary exhaust apparatus 124, the acidic gas producing by the acidic liquid go through the main air-extracting window 121 via the main exhaust stream 128 then enter the main exhaust tube 126 to drain out. From FIG. 3 (B) we can also see the connection window 120 of the drain tank 112, the secondary air-extracting window 122 of the stationary exhaust apparatus 124, the acidic gas go through the three secondary air-extracting window 122 via the secondary exhaust stream 132 then enter the secondary exhaust tube 130 to drain out.

[0024] Refer to FIG. 4, FIG. 4 is a perspective view of an isolating brush in according to one embodiment of the present invention. An isolation brush 402 is equipped around the main air-extracting window 121 or the secondary air-extracting window 122. Please refer to FIG. 3 again, when the connection window 120 of the drain tank 112 forms a soft contact with the main air-extracting window 121 and the secondary air-extracting window 122 of the stationary exhaust apparatus 124, thus isolates the main exhaust stream 128 with the secondary exhaust stream 132, a steady pressure is kept between every connection window by the isolating brush 402.

[0025] Refer to FIG. 5. FIG. 5 is a cross sectional and perspective view when the drain tank is connected to the stationary exhaust apparatus with an isolating brush in according to one embodiment of the present invention. The interface 502 of the connection window 120 of the drain tank 112 and the main air-extracting window 121 of the stationary exhaust apparatus 124 forms a soft contact by the isolating brush 402.

[0026] Refer to FIG. 6. FIG. 6 is another cross sectional view when the drain tank is connected to the stationary exhaust apparatus with an isolating brush in according to one embodiment of the present invention. The connection window 120 of the drain tank 112 is connected to the main air-extracting window 121 by an isolating brush 402, sealing partition 602 isolates the connection window 120 with the external environment to isolate the acidic gas again. The driving apparatus 604 is used to align the connection window 120 to a predetermined position when the drain tank 112 is lifting up and down along the stationary exhaust apparatus 124, isolate the secondary exhaust tube 130 on time, and shut up all the other air-extracting windows without drain tank connected to it.

[0027] Although specific embodiments of the invention have been disclosed, it will be understood by those having skill in the art that minor changes can be made to the form and details of the specific embodiments disclosed herein, without departing from the scope of the invention. The embodiments presented above are for purposes of example only and are not to be taken to limit the scope of the appended claims.

What is claimed is:

1. A device for wet etching and cleaning with lifting and lowering drain tank, the support is kept in a fixed level and the selected annular duck of the drain tank can be lifting and lowering to the level of said support to collect and drain out the liquid from the support, comprising:
   - a support, kept in a fixed level, having a circular surface for supporting a wafer, is used for spin wet etching and cleaning said wafer;
   - a drain tank, is disposed around the concentrate circle of said support, said drain tank comprising at least two annular ducks to drain the liquid from said support, each annular ducks has an annular aperture connected to an air-extracting window of a stationary fixed bellows with a connecting window to remove the gas of the liquid;
   - a stationary exhaust apparatus, with a main air-extracting window, a plurality of secondary air-extracting window, a main exhaust tube and a secondary exhaust tube;
   - means for lifting and lowering said drain tank such that selected annular duck can be aligned with the surface of said support to drain the liquid from said support.

2. A device as recited in claim 1, wherein said means for lifting and lowering is a lifting gear driving by a motor.
3. A device as recited in claim 1, wherein said means for lifting and lowering is a pneumatic tool.

4. A device as recited in claim 1, wherein said fixed exhaust apparatus further comprising:
   - an isolating brush, connecting said connecting window with said air-extracting window of said stationary exhaust apparatus by soft contact to isolate the main exhaust stream and the secondary exhaust stream;
   - a driving apparatus, matching said air-extracting window with said connecting window during said drain tank moving up or down to isolate said secondary exhaust tube and shut up said secondary air-extracting windows without drain tank;

   a sealing partition, isolating each connecting window with the outer environment to isolate the acidic gas once more.

5. A device as recited in claim 4, wherein said main air-extracting window is in the central position of all the air-extracting windows.

6. A device as recited in claim 4, wherein the number of said secondary air-extracting windows is totally 2N−1, N−1 in the upper side and N−1 in the lower side of said main air-extracting window.

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