Appeal decision

Appeal No. 2018-15931

Appellant Samco Inc.

Patent Attorney Kyoto International Patent Law Office

The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2014-245193, entitled "Substrate holding device", [the application published on Jun. 20, 2016: Japanese Unexamined Patent Application Publication No. 2016-111093] has resulted in the following appeal decision:

Conclusion

The appeal of the case was groundless.

Reason

No. 1 History of the procedures

The present application is an application filed on Dec. 3, 2014, a written amendment was submitted on Sep. 1, 2017, and reasons for refusal were notified as of May 9, 2018. Although a written opinion and a written amendment were submitted on Jul. 11 of the same year, a decision of refusal (Examiner's decision) was made as of Aug. 29 of the same year, and, against this, an appeal against the examiner's decision of refusal was requested on Nov. 30 of the same year and, at the same time, a written amendment was submitted. Then, a written statement was submitted on Jan. 29, 2019.

No. 2 Determination of dismissal of the amendment according to the written amendment submitted on Nov. 30, 2018

[Conclusion of Decision to Dismiss Amendment]

The amendment according to the written amendment submitted on Nov. 30, 2018 (hereinafter, referred to as "the Amendment") shall be dismissed.

[Reason]

1 Details of the Amendment

The Amendment is an amendment to amend Claims 1-2 of the Scope of Claims before amendment to Claims 1-2 of the Scope of Claims after amendment, and,

together with this, to amend the description. Claim 1 before and after amendment are as follows, respectively.

(Before amendment)
"[Claim 1]

A substrate holding device comprising:

a) a substrate placing table in which an electrostatic holding mechanism is embedded, the substrate placing table having a flat upper surface;

b) a fluid groove provided on the upper surface of the substrate placing table;

c) at least three fluid holes provided at positions matched with the fluid groove so as to vertically penetrate the substrate placing table;

d) a lifting pin configured to move up and down within the fluid hole in a state that at least a part of the lifting pin is not in contact with an internal wall of the fluid hole; and

e) a switching valve capable of switching between suction of a gas from the fluid hole and supply of a fluid to the fluid hole."

(After amendment)
"[Claim 1]

A substrate holding device comprising:

a) a substrate placing table in which an electrostatic holding mechanism is embedded, the substrate placing table having a flat upper surface;

b) a fluid groove provided on the upper surface of the substrate placing table;

c) at least three fluid holes provided at positions matched with the fluid groove so as to vertically penetrate the substrate placing table;

d) a lifting pin configured to move up and down within the fluid hole in a state that at least a part of the lifting pin is not in contact with an internal wall of the fluid hole; and

e) a switching valve capable of switching between suction of a gas from the fluid hole for sucking a substrate placed on the substrate placing table and supply of a fluid to the fluid hole for cooling the substrate."

2 Examination regarding the Amendment

(1) The Amendment is an amendment that includes an amendment regarding Claim 1 (hereinafter, referred to as "Amended Matter 1"), and Amended Matter 1 is an amendment to limit "switching valve" regarding Claim 1 before amendment; therefore, it is an amendment for the purpose of restriction of the Scope of Claims in which the

invention before amendment and the invention after amendment have a field of industrial application and problems to be solved that are identical.

Therefore, Amended Matter 1 in question falls under the category of ones for the purpose of restriction of the scope of claims stipulated in Article 17-2(5)(ii) of the Patent Act.

Then, since the Amendment includes an amendment for the purpose of restriction of the scope of claims stipulated in Article 17-2(5)(ii) of the Patent Act, it will be examined hereinafter whether the invention specified by the matters recited in the Scope of Claims after amendment is one for which the Appellant can be granted a patent independently at the time of filing of the patent application (whether it complies with the provision of Article 126(7) of the Patent Act as applied mutatis mutandis pursuant to the provisions of Article 17-2(6) of the same Act).

(2) Judgment on independent requirements for patentability

A The invention after the Amendment

The invention according to Claim 1 after the Amendment (hereinafter, referred to as "the Amended Invention") is as has been described in "(After amendment)" of the above-mentioned "1 Details of the Amendment".

B Descriptions in cited documents and Cited Invention

(A) Cited Document 1

a Descriptions in Cited Document 1

There are the following descriptions, together with drawings, in Japanese Unexamined Patent Application Publication No. 2004-134437 that is cited in the reasons for refusal stated in the examiner's decision and was distributed or made available to public through electric communication lines in Japan or abroad before the application of the present application (hereinafter, referred to as "Cited Document 1") (underlines were added by the body, and the same applies hereinafter).

(a) "[0001]

[Field of the Invention]

The present invention relates to semiconductor device manufacturing technology, and more particularly to electrostatic chucking and holding a semiconductor wafer (a wafer in which an integrated circuit including a semiconductor element is formed; hereinafter referred to as a wafer). For example, the present invention relates to a technique that is effective for use in a dry etching technique."

(b) "[0011]

[Embodiments of the invention]

An embodiment of the present invention will be described below with reference to the drawings.

[0012]

In the present embodiment, in the method of manufacturing a semiconductor device according to the present invention, the step of performing the process with the substrate held by the electrostatic chucking portion is configured as a dry etching step to etch a silicon oxide film of a GaAs wafer, and is performed by a dry etching apparatus shown in FIG. 1.

[0013]

The dry etching apparatus 10 shown in FIG. 1 is configured as a parallel plate type reactive ion etching apparatus, and includes a housing 11 that forms an etching chamber 12 that can withstand a pressure of about 8 Pa. A wafer loading/unloading port 13 for loading/unloading a GaAs wafer (hereinafter referred to as a wafer) 1 having a silicon oxide film 2 formed thereon into/from the etching chamber 12 is opened on the side wall of the housing 11. The wafer loading/unloading port 13 is configured to be opened and closed by a gate valve 14. An insulator 15 is entirely lined on the inner surface of the etching chamber 12. An exhaust port 16 is formed in the bottom wall of the housing 11, and an exhaust device (not shown) such as a vacuum pump is connected to the exhaust port 16. An upper electrode 17 that also serves as an etching gas blowing head is suspended from the upper portion of the etching chamber 12. The upper electrode 17 is formed in a disk-shaped hollow body, and a plurality of outlets 18 are formed on the lower wall so as to blow out etching gas in a shower form. A supply pipe 19 that supplies an etching gas 20 is connected to the center line of the upper surface wall of the upper electrode 17. A lower electrode 21 in which an electrostatic chuck 30 is incorporated is installed in the lower part of the etching chamber 12 so as to face the upper electrode 17, and, between the lower electrode 21 and the upper electrode 17, a high frequency power (13.56 MHz, maximum output 1000 W) is applied from a high-frequency power source 22 having a matching unit 23.

[0014]

The lower electrode 21 in which the electrostatic chuck 30 is incorporated is supported horizontally by a support 31, and a DC power supply 32 for electrostatic chuck is connected to the lower electrode 21 via a low-pass filter circuit 33 in parallel to the high-frequency power source 22. The DC power supply 32 is configured to apply a

DC voltage of 500 V or less to the lower electrode 21 serving as a power feeding plate of the electrostatic chuck 30. The lower electrode 21 is formed in a disk shape using a metal having good conductivity such as aluminum, and its outer diameter is set slightly smaller than that of the wafer 1. The electrostatic chuck 30 incorporated in the lower electrode 21 includes an electrostatic chucking portion 34 that electrostatically chucks and holds the wafer 1, and the electrostatic chucking portion 34 is configured by a dielectric thin film having a film thickness t of about 300 μm. The electrostatic chucking portion 34 according to the present embodiment is a dielectric thin film formed on the upper surface of the lower electrode 21 by mixing a small amount of conductor powder into a ceramic (insulator) powder such as alumina (Al_2O_3) and thermal spraying the mixed product.

[0015]

A groove (hereinafter referred to as a cooling groove) 35 for forcibly cooling the wafer 1 by holding helium gas as a coolant is laid in the overall upper surface, which is the holding surface of the electrostatic chucking portion 34. As shown in FIG. 2, the cooling groove 35 includes a plurality of annular grooves 36 (three in the illustrated example) arranged in concentric circles, and a plurality of (four in the illustrated example) connecting grooves 37 arranged radially so as to connect the annular grooves 36. A supply/discharge port 38 for supplying and discharging helium gas to and from the cooling groove 35 is connected to a portion of the lower electrode 21 corresponding to the middle of the connecting groove 37 so as to communicate with the inside of the cooling groove 35, and the supply/discharge port 38 is configured by a through hole that penetrates the lower electrode 21 in the thickness direction. A supply/discharge passage 39 for supplying and discharging helium gas is connected to the supply/discharge port 38, and a helium gas supply/discharge device 40 is connected to the supply/discharge passage 39. The helium gas supply/discharge device 40 includes a helium gas supply source 41, a mass flow controller (flow rate control valve) 42, a pressure gauge 43, a variable flow rate control valve 44, and a pump 45, and is configured so that it can supply and discharge helium gas 46 to and from the supply/discharge passage 39.

[0016]

The depth D of the cooling groove 35 is preferably set to 5 μm to 50 μm, and the depth D of the cooling groove 35 according to the present embodiment is formed to 10 μm. As described above, since the depth D of the cooling groove 35 is extremely shallow, it is difficult to form the cooling groove 35 by ordinary grinding. Therefore, the cooling groove 35 according to the present embodiment is formed by sandblasting in a state

where the surface of the electrostatic chucking portion 34 is masked.

[0017]

In the present embodiment, the supply/discharge port 38 is configured to serve also as a guide hole for the lift pin 24 for lifting the wafer. That is, the lift pin 24 is slidably inserted into the supply/discharge port 38 formed of a through hole. Therefore, the supply/discharge port 38 is substantially filled with the lift pin 24, and the influence of the blank of the supply/discharge port 38 in the electrostatic chuck 30 is suppressed.

[0018]

Next, the operation of the dry etching apparatus according to the above-described structure will be described with reference to a dry etching process for etching a silicon oxide film on a wafer in a method of manufacturing a semiconductor device according to an embodiment of the present invention. The wafer 1 as a workpiece supplied to the dry etching process has a silicon oxide film 2 formed on the main surface on the active area side, and a resist film (not shown) is patterned on the silicon oxide film as a mask.

[0019]

The wafer 1 is loaded into the etching chamber 12 from the wafer loading/unloading port 13 and is transferred onto the lift pins 24 raised above the electrostatic chuck 30. The lift pins 24 are lowered, and the wafer 1 is, as shown in FIG. 1, transferred onto the electrostatic chucking portion 34 of the electrostatic chuck 30. When the wafer 1 is transferred to the electrostatic chucking portion 34, DC power is applied to the lower electrode 21 by the DC power supply 32. Due to the application of the DC power, negative static electricity is generated in the electrostatic chucking portion 34 through the lower electrode 21, so that the wafer 1 is electrostatically chucked and held by the electrostatic chucking portion 34.

[0020]

When the wafer 1 is chucked by the electrostatic chuck 30, the helium gas 46 is supplied to the supply/discharge port 38 by the helium gas supply/discharge device 40, and the etching chamber 12 is evacuated to a predetermined degree of vacuum (about 8 Pa). Then, CHF_3 (60 ml/min) and CF_4 (40 ml/min) are supplied to the supply pipe 19 as an etching gas 20, and high-frequency power (13.56 MHz, 700 W) is supplied between the lower electrode 21 and the upper electrode 17 by the high-frequency power source 22. Thereby, the plasma 25 is excited between the lower electrode 21 and the upper electrode 17 by the high-frequency power, and the etching process is performed on the wafer 1 by the chemical reaction of the etching gas 20. At this time, ions 26 formed in the plasma 25 are attracted by the lower electrode 21 and collide with the wafer 1, thereby also causing reactive ion etching. Thereby, the silicon oxide film 2 on

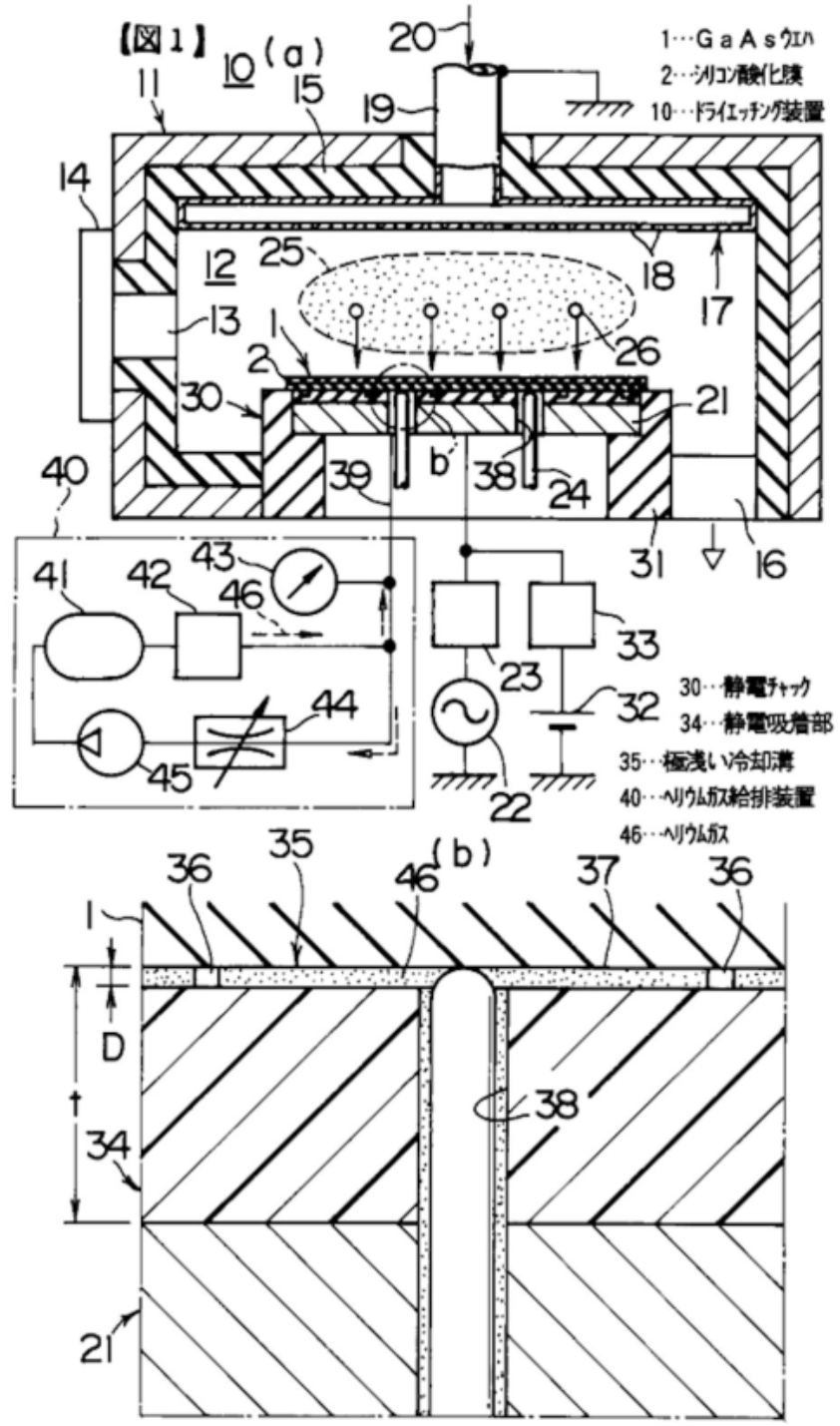
the wafer 1 is etched using the resist pattern as a mask, and the silicon oxide film 2 is patterned.

[0021]

In the etching process described above, the heat of the plasma 25 is incident on the wafer, so that the temperature of the wafer 1 rises above the heat resistance temperature of the resist and the resist is damaged. Therefore, the temperature of the wafer 1 is controlled to 80 to 100°C. by supplying the helium gas 46. That is, the helium gas 46 supplied from the helium gas supply/discharge device 40 to the supply/discharge port 38 is injected into the cooling groove 35 and diffused as a whole, and comes into direct contact with the back surface of the wafer 1 to take away heat from the wafer 1 and cool the same. Incidentally, the supply amount of the helium gas 46 is controlled by adjusting the variable flow rate control valve 44 based on the measured pressure of the pressure gauge 43. Further, the helium gas 46 in the cooling groove 35, the supply/discharge port 38, and the supply/discharge passage 39 is exhausted by the exhaust force of the pump 45."

(c) FIG. 1 is as follows.

【図１】

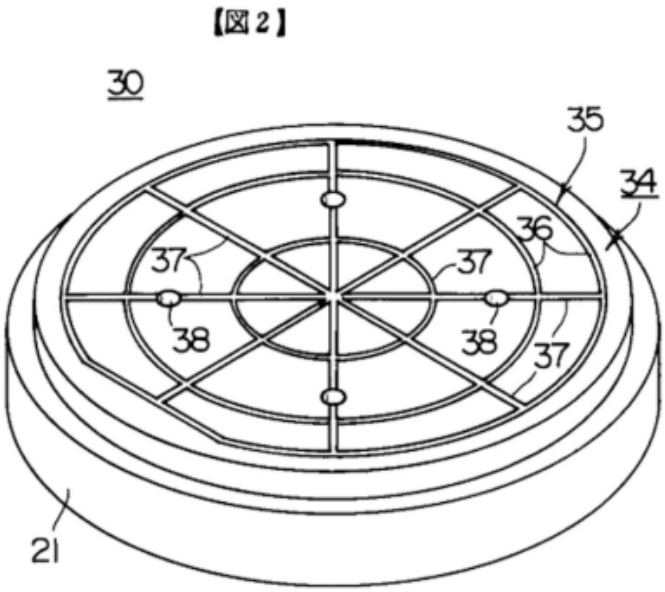


GaAs ウエハ	GaAs wafer
シリコン酸化膜	Silicon oxide film
ドライエッチング装置	Dry etching apparatus
静電チャック	Electrostatic chuck
静電吸着部	Electrostatic chucking portion

極浅い冷却溝	Extremely shallow cooling groove
ヘリウムガス給排装置	Helium gas supply/discharge device
ヘリウムガス	Helium gas

(d) FIG. 2 is as follows, and it is recognized that the supply/discharge port 38 is connected to each of the four connecting grooves 37 arranged radially.

【図２】



【図２】　　[FIG. 2]

b　Cited invention

Therefore, it is recognized that, in Cited Document 1, there is described the following invention (hereinafter, referred to as "Cited Invention").

"A semiconductor wafer electrostatic chucking and holding device, comprising a lower electrode 21 in which an electrostatic chuck 30 is incorporated, wherein

the electrostatic chuck 30 incorporated in the lower electrode 21 includes an electrostatic chucking portion 34 that electrostatically chucks and holds a wafer 1, and the electrostatic chucking portion 34 is configured by a dielectric thin film,

a cooling groove 35 for forcibly cooling the wafer 1 by holding helium gas as a coolant is laid in the overall upper surface, which is a holding surface of the electrostatic chucking portion 34,

a supply/discharge port 38 for supplying and discharging helium gas to and from the cooling groove 35 is connected to a portion of the lower electrode 21 corresponding to the middle of each of four connecting grooves 37 so as to communicate with the inside of the cooling groove 35, and the supply/discharge port 38 is configured by a through hole that penetrates the lower electrode 21 in the thickness direction,

a supply/discharge passage 39 for supplying and discharging helium gas is connected to the supply/discharge port 38, and a helium gas supply/discharge device 40 is connected to the supply/discharge passage 39,

the helium gas supply/discharge device 40 includes a helium gas supply source 41, a mass flow controller (flow rate control valve) 42, a pressure gauge 43, a variable flow rate control valve 44, and a pump 45, and is configured so that it can supply and discharge helium gas 46 to and from the supply/discharge passage 39, and

the supply/discharge port 38 is configured to serve also as a guide hole for the lift pin 24 for lifting the wafer."

(B) Cited Document 2

a Descriptions of Cited Document 2

There are the following descriptions, together with drawings, in Japanese Unexamined Patent Application Publication No. H7-231034 (hereinafter, referred to as "Cited Document 2"), which is similarly cited in Examiner's decision, and was distributed or available to public through electric communication lines in Japan or abroad before the filing of the present application.

(a) "[0001]

[Industrial Application Field] The present invention relates to a method and an apparatus for fixing a plate-like object and a plasma processing technique, and more particularly, to a technique which is effective in application for an operation of fixing a semiconductor wafer in a manufacturing process of a semiconductor device."

(b) "[0008] Accordingly, it is an object of the present invention to provide a technique for fixing a plate-like object capable of securely fixing a plate-like object by electrostatic attraction without being affected by an external force, deformation of a plate-like object, or the like, and without causing concern, such as concern for dust generation."

(c) "[0021]

[Examples] Hereinafter, the examples of the present invention will be described in detail based on drawings.

[0022] FIG. 1 is a conceptual diagram showing an example of a method and an apparatus for fixing a plate-like object and a plasma processing apparatus according to an embodiment of the present invention, and FIG. 2 is a flowchart showing an example of the operation thereof.

[0023] In this embodiment, as an example of a plate-like object, a case in which the present invention is applied to a wafer in a manufacturing process of a semiconductor device will be described.

[0024] The plasma processing chamber 3 is provided with a process gas supply mechanism 3a for supplying a desired process gas g, an exhaust mechanism 3b including a vacuum pump and the like for exhausting the inside of the plasma processing chamber 3 to a desired vacuum degree, and an exhaust control valve 3c. Inside the plasma processing chamber 3, an electrostatic chuck 8 comprising a chuck body 6 made of a conductor and a dielectric layer 7 is provided horizontally, and a wafer 5 to be taken in and out through a load lock mechanism (not shown) provided in a part of the plasma processing chamber 3 is placed on the dielectric layer 7 in a state of being electrically insulated from the chuck body 6. The dielectric layer 7 is made of, for example, a dielectric material such as ceramics.

[0025] A DC power supply 9 for electrostatic attraction is connected to the chuck body 6 of the electrostatic chuck 8, and a negative DC voltage, for example, can be applied.

[0026] A fluid passage 6a for temperature control is formed inside the chuck body 6, and it is possible to control the temperature of the wafer 5 placed on the chuck body 6 in a temperature range of, for example, about minus several dozen degrees Celsius to about plus a hundred and several dozen degrees Celsius by circulating the heat medium 6b at a desired temperature.

[0027] At a position opposed to the chuck body 6, a plasma generating electrode 2 connected to the high-frequency power source 1 is arranged, and the plasma 4 of the processing gas g is formed between the chuck body 6 and the plasma generating electrode 2 by applying high-frequency power between the chuck body 6 and the plasma generating electrode 2.

[0028] In this case, on a mounting surface of the wafer 5 in the dielectric layer 7 constituting the electrostatic chuck 8, a fluid groove 7a is engraved in an area covered by the wafer 5. The fluid groove 7a is connected to the exhaust mechanism 3b and the gas supply mechanism 7e via the fluid passage 7b, the suction control valve 7c, and the

gas control valve 7d.

[0029] The gas supply mechanism 7e performs an operation of supplying a heat transfer gas g1, such as a helium gas, having high thermal conductivity to the fluid groove 7a at any time via the gas control valve 7d and the fluid passage 7b.

[0030] Further, by opening the suction control valve 7c in a state in which the gas control valve 7d is closed, the fluid groove 7a, which is concealed by being covered by the wafer 5, is exhausted at any time.

[0031] Hereinafter, an example of a method and an apparatus for fixing a plate-like object of this embodiment and an operation of a plasma processing apparatus will be described with reference to a flowchart of FIG. 2.

[0032] First, the wafer 5 is carried into the plasma processing chamber 3 via a load lock mechanism (not shown) or the like and placed on the electrostatic chuck 8 (Step 21). At this time, the inside of the plasma processing chamber 3 has been evacuated to a degree of vacuum of, e.g., about 10^{-4} Torr.

[0033] Thereafter, the suction control valve 7c is opened, and the suction operation of the fluid groove 7a located on the lower side of the back surface of the wafer 5 is started, and, in addition, an evacuation operation is performed to maintain the inside of the plasma processing chamber 3 at a predetermined vacuum degree of, for example, about 10^{-4} Torr (Step 22).

[0034] Next, a process gas g is supplied from the process gas supply mechanism 3a to the inside of the plasma processing chamber 3 so that the pressure of the plasma processing chamber 3 becomes, for example, about 5 to 10^{-1} Torr. At this time, the wafer 5 on the electrostatic chuck 8 is temporarily fixed in a state in which it is in close contact with the dielectric layer 7 over the entire surface by the pressure difference between the fluid groove 7a in the back side and the plasma processing chamber 3 in the front side (Step 23) (First stage).

[0035] In this state, a DC voltage of negative polarity of, for example, about 300 to 500 V is applied from the DC power supply 9 for electrostatic attraction with respect to the chuck body 6, and, in addition, a relatively low high-frequency power is applied between the plasma generating electrode 2 and the chuck body 6 from the high-frequency power source 1, thereby forming a plasma 4. Thus, a potential difference is generated in the dielectric layer 7 interposed between the chuck body 6 and the wafer 5 grounded by the plasma 4, and the wafer 5 is electrostatically attracted to the chuck body 6 of negative polarity by Coulomb force and is brought into a close contact state over the entire surface (Step 24) (Second stage).

[0036] Thereafter, the suction control valve 7c is closed and the gas control valve 7d is

opened, so that the heat conduction gas g1 is filled into the fluid groove 7a sealed by the back surface of the wafer 5, and further into the fine gaps between the back surface of the wafer 5 and the dielectric layer 7 and the like (Step 25) (Third stage).

[0037] Thus, in the wafer 5 adhered to the electrostatic chuck 8, the entire back surface is thermally uniformly coupled to the electrostatic chuck 8, and the entire wafer 5 is uniformly and accurately controlled to the temperature of the heat medium 5b flowing through the inside of the electrostatic chuck 8, and in this state, the wafer 5 is subjected to predetermined processing with the plasma 4 (Step 26).

[0038] By this, it is possible to perform uniform and good plasma processing without causing concern such as the deviation of the temperature distribution of the wafer 5 during processing.

[0039] When the processing for the wafer 5 is completed while maintaining the state of Step 26 for a predetermined time (Step 27), the supply of the heat conduction gas g1 to the fluid groove 7a is stopped (Step 28), and further, the application of the DC voltage from the DC power supply 9 for electrostatic attraction to the electrostatic chuck 8 is stopped (Step 29). Further, the suction state of the wafer 5 is released through the respective operations of stopping the high-frequency power source 1 (Step 30) and stopping the supply of the process gas g (Step 31), and the wafer 5 is unloaded (Step 32).

[0040] As described above, according to the method and apparatus for fixing a plate-like object and the plasma processing apparatus according to the present embodiment, prior to the electrostatic attraction of the wafer 5 to the electrostatic chuck 8, temporary fixing in which the wafer 5 is brought into close contact with the entire surface of the electrostatic chuck 8 is performed by a pressure difference caused between the fluid groove 7a formed in the dielectric layer 7 of the electrostatic chuck 8 supporting the back surface of the wafer 5 and the space on the front surface side of the wafer 5, and then the original electrostatic attraction is performed by applying a DC voltage to the electrostatic chuck 8. Therefore, there is no fear of dust generation caused by mechanically pressing the surface of the wafer 5 with a jig or the like.

[0041] Further, even if there is a defect in flatness of the back surface of the wafer 5 and deformation such as warpage, distortion, and the like, these deformations are reliably corrected before the electrostatic attraction, and the back surface of the wafer 5 is uniformly adhered to the dielectric layer 7 over the entire surface thereof. Thus, it is possible to prevent the occurrence of troubles such as instability of electrostatic attraction, reduction of electrostatic attraction force, damage of the dielectric layer 7 due to poor electrostatic attraction, and the like, and also to shorten the time required for fixing operation of the wafer 5 due to electrostatic attraction."

(d) FIG. 1 is as follows.

【図１】

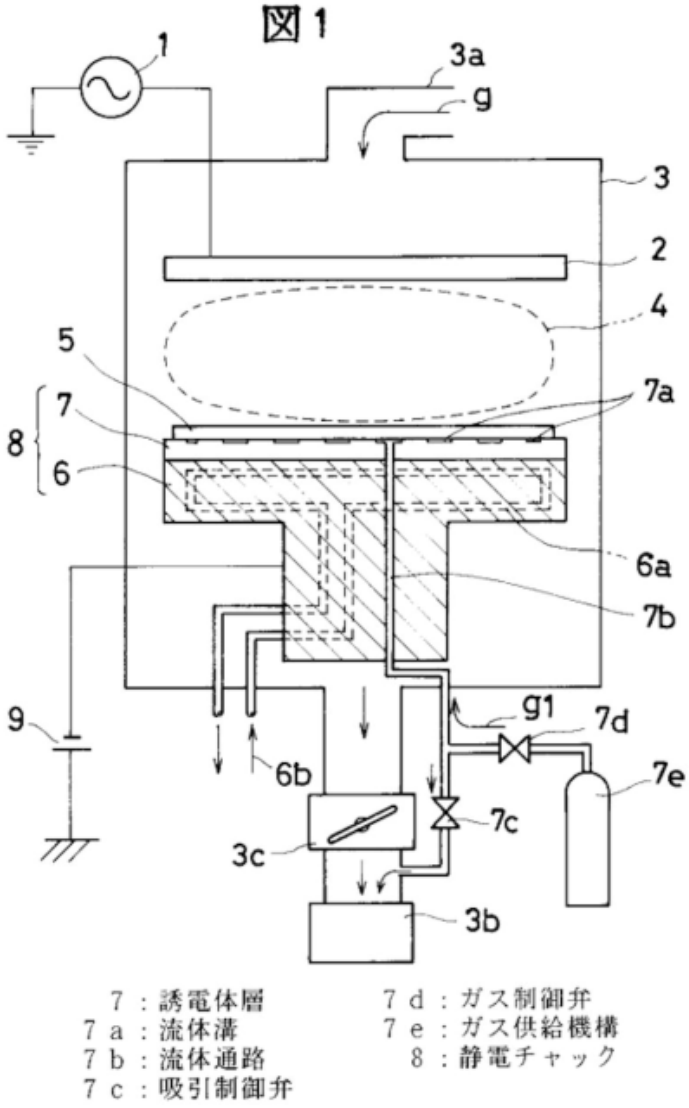


図１　FIG. 1

誘電体層	Dielectric layer
流体溝	Fluid groove
流体通路	Fluid passage
吸引制御弁	Suction control valve
ガス制御弁	Gas control valve
ガス供給機構	Gas supply mechanism
静電チャック	Electrostatic chuck

b Technology described in Cited Document 2

It is recognized that there is described, in Cited Document 2, the following technology.

"A fixing technology of a semiconductor wafer that is performed in a plasma processing apparatus that comprises

an electrostatic chuck 8 in which a fluid groove 7a is engraved, wherein

the fluid groove 7a is connected to the exhaust mechanism 3b and the gas supply mechanism 7e via the fluid passage 7b, the suction control valve 7c, and the gas control valve 7d, the fixing technology comprising:

a step of opening the suction control valve 7c to start the suction operation of the fluid groove 7a located on the lower side of the back surface of a wafer 5, and performing an evacuation operation to maintain the inside of a plasma processing chamber 3 at a predetermined vacuum degree of, for example, about 10^{-4} Torr (step 22);

a step of supplying a process gas g from a process gas supply mechanism 3a to the inside of the plasma processing chamber 3 so that the pressure of the plasma processing chamber 3 becomes, for example, about 5 to 10^{-1} Torr, wherein, at this time, the wafer 5 on the electrostatic chuck 8 is temporarily fixed in a state in which it is in close contact with the dielectric layer 7 over the entire surface thereof by the pressure difference between the fluid groove 7a in the back side and the plasma processing chamber 3 in the front side (Step 23) (First stage); and

a step of closing the suction control valve 7c and opening the gas control valve 7d, so that a heat conduction gas g1, such as helium gas, is filled into the fluid groove 7a sealed by the back surface of the wafer 5, and further into the fine gaps between the back surface of the wafer 5 and the dielectric layer 7 and the like (Step 25) (Third stage), wherein

the fixing technology is capable of securely fixing a semiconductor wafer by electrostatic attraction without being affected by an external force, deformation of a semiconductor wafer, or the like, and without causing concern, such as concern for dust generation."

C Comparison with Cited Invention

The Amended Invention and Cited Invention will be compared.

(A) Cited Invention is of "a semiconductor wafer electrostatic chucking and holding device" in which "the electrostatic chuck 30 incorporated in the lower electrode 21

includes an electrostatic chucking portion 34 that electrostatically chucks and holds a wafer 1, and the electrostatic chucking portion 34 is configured by a dielectric thin film", and "the wafer 1", "the electrostatic chucking portion 34", and "a semiconductor wafer electrostatic chucking and holding device" thereof respectively correspond to "substrate", "electrostatic holding mechanism", and "substrate holding device" of the Amended Invention.

In addition, it is described, in paragraph [0015] of the description of the present application, that "the substrate table 20 includes a dielectric layer 31 in the upper side and a lower electrode 32 in the lower side", and, in Cited Invention, "an electrostatic chucking portion 34" included in "the electrostatic chuck 30" "is configured by a dielectric thin film"; therefore, it can be said that "<<the electrostatic chuck 30>> and <<the lower electrode 21>>" of Cited Invention correspond to "substrate placing table" of the Amended Invention.

Accordingly, the Amended Invention and Cited Invention are common in a point of being "a substrate holding device" having "a substrate placing table in which an electrostatic holding mechanism is embedded, the substrate placing table having a flat upper surface".

(B) Cited Invention is an invention in which "a cooling groove 35 for forcibly cooling the wafer 1 by holding helium gas as a coolant is laid in the overall upper surface, which is a holding surface of the electrostatic chucking portion 34", and "the cooling groove 35" corresponds to "fluid groove" of the Amended Invention; therefore, the Amended Invention and Cited Invention are identical in a point of including "a fluid groove provided on the upper surface of the substrate placing table".

(C) Cited Invention is an invention in which "a supply/discharge port 38 for supplying and discharging helium gas to and from the cooling groove 35 is connected to a portion of the lower electrode 21 corresponding to the middle of each of four connecting grooves 37 so as to communicate with the inside of the cooling groove 35, and the supply/discharge port 38 is configured by a through hole that penetrates the lower electrode 21 in the thickness direction", and "the supply/discharge port 38" is a "penetration hole", and "helium gas" is a fluid. Therefore, the Amended Invention and Cited Invention are identical in a point of including "at least three fluid holes provided at positions matched with the fluid groove so as to vertically penetrate the substrate placing table".

(D) Cited Invention is an invention in which "the supply/discharge port 38 is configured to serve also as a guide hole for the lift pin 24 for lifting the wafer".

Furthermore, as summarized in the above B(A)a(b), in paragraph [0017] of Cited Document 1, it is described that "the lift pin 24 is slidably inserted into the supply/discharge port 38 formed of a through hole. Therefore, the supply/discharge port 38 is substantially filled with the lift pin 24, and the influence of the blank of the supply/discharge port 38 in the electrostatic chuck 30 is suppressed.", and, in paragraphs [0019]-[0020], it is described that "[0019] The wafer 1 is loaded into the etching chamber 12 from the wafer loading/unloading port 13 and is transferred onto the lift pins 24 raised above the electrostatic chuck 30. The lift pins 24 are lowered, and the wafer 1 is, as shown in FIG. 1, transferred onto the electrostatic chucking portion 34 of the electrostatic chuck 30. When the wafer 1 is transferred to the electrostatic chucking portion 34, DC power is applied to the lower electrode 21 by the DC power supply 32. Due to the application of the DC power, negative static electricity is generated in the electrostatic chucking portion 34 through the lower electrode 21, so that the wafer 1 is electrostatically chucked and held by the electrostatic chucking portion 34. [0020] When the wafer 1 is chucked by the electrostatic chuck 30, the helium gas 46 is supplied to the supply/discharge port 38 by the helium gas supply/discharge device 40", and, further, in paragraph [0021], it is described that "In the etching process described above, the heat of the plasma 25 is incident on the wafer, so that the temperature of the wafer 1 rises above the heat resistance temperature of the resist and the resist is damaged. Therefore, the temperature of the wafer 1 is controlled to 80 to 100°C. by supplying the helium gas 46. That is, the helium gas 46 supplied from the helium gas supply/discharge device 40 to the supply/discharge port 38 is injected into the cooling groove 35 and diffused as a whole, and comes into direct contact with the back surface of the wafer 1 to take away heat from the wafer 1 and cool the same. Incidentally, the supply amount of the helium gas 46 is controlled by adjusting the variable flow rate control valve 44 based on the measured pressure of the pressure gauge 43. Further, the helium gas 46 in the cooling groove 35, the supply/discharge port 38, and the supply/discharge passage 39 is exhausted by the exhaust force of the pump 45."

Then, from the description of the above-mentioned paragraphs [0019]-[0020], when the wafer 1 is chucked in a state that the lift pin 24 is lowered, the helium gas 46 is supplied as shown in FIG. 1 (a), (b) of Cited Document 1. In addition, from the description of paragraph [0021], it is obvious that supply and exhaust of the helium gas 46 is performed for the purpose of temperature control of the wafer 1 in etching

processing; that is, it is performed in a state that the wafer 1 is being chucked, and it is obvious, also from the description of paragraph [0017], that, a state that the wafer 1 is being chucked as shown in FIG. 1 (b) is a state that the supply/discharge port 38 is almost filled with the lift pin 24.

From the above, it can be said that supply and exhaust of a helium gas is performed in a state that the supply/discharge port 38 is almost filled with the lift pin 24, and thus it is obvious that the lift pin 24 does not contact with the internal wall of the supply/discharge port 38, at least at a part.

Therefore, the Amended Invention and Cited Invention are identical in a point of including "a lift pin configured to move up and down within the fluid hole in a state that at least a part of the lift pin is not in contact with an internal wall of the fluid hole".

(E) Since Cited Invention is an invention in which "a cooling groove 35 for forcibly cooling the wafer 1 by holding helium gas as a coolant is laid in the overall upper surface, which is a holding surface of the electrostatic chucking portion 34", it can be said that the helium gas 46 is a fluid for cooling the wafer 1.

In addition, in Cited Invention, "a supply/discharge passage 39 for supplying and discharging helium gas is connected to the supply/discharge port 38, and a helium gas supply/discharge device 40 is connected to the supply/discharge passage 39", and "the helium gas supply/discharge device 40" includes "a helium gas supply source 41" and "is configured so that it can" "supply the helium gas 46 to the supply/discharge passage 39"; therefore, it can be said that the helium gas supply/discharge device 40 is a mechanism that can supply the helium gas 46 to the supply/discharge port 38.

Accordingly, the Amended Invention and Cited Invention are common in a point of including "a mechanism that can supply a fluid for cooling the substrate to the fluid hole".

(F) From the above, the corresponding feature and different features between the Amended Invention and Cited Invention are as follows.

<Corresponding Feature>

"A substrate holding device comprising:

a) a substrate placing table in which an electrostatic holding mechanism is embedded, the substrate placing table having a flat upper surface;

b) a fluid groove provided on the upper surface of the substrate placing table;

c) at least three fluid holes provided at positions matched with the fluid

groove so as to vertically penetrate the substrate placing table;

d) a lifting pin configured to move up and down within the fluid hole in a state that at least a part of the lifting pin is not in contact with an internal wall of the fluid hole; and

e)' a mechanism that can supply a fluid for cooling the substrate to the fluid hole."

<Different Feature>

A point that the Amended Invention includes "a switching valve capable of switching between suction of a gas from the fluid hole for sucking a substrate placed on the substrate placing table and supply of a fluid to the fluid hole", whereas, in Cited Invention, the above-mentioned constitution of the Amended Invention is not specified although Cited Invention is an invention in which "a supply/discharge passage 39 for supplying and discharging helium gas is connected to the supply/discharge port 38, a helium gas supply/discharge device 40 is connected to the supply/discharge passage 39, and the helium gas supply/discharge device 40 includes a helium gas supply source 41, a mass flow controller (flow rate control valve) 42, a pressure gauge 43, a variable flow rate control valve 44, and a pump 45, and is configured so that it can supply and discharge helium gas 46 to and from the supply/discharge passage 39", and includes the helium gas supply/discharge device 40 that can supply a fluid to a fluid hole (the supply/discharge port 38).

D Judgment

Hereinafter, the Different Feature will be discussed below.

The technology described in Cited Document 2 "is performed in a plasma processing apparatus that comprises an electrostatic chuck 8 in which a fluid groove 7a is engraved, wherein the fluid groove 7a is connected to the exhaust mechanism 3b and the gas supply mechanism 7e via the fluid passage 7b, the suction control valve 7c, and the gas control valve 7d", includes "a step of closing the suction control valve 7c and opening the gas control valve 7d, so that a heat conduction gas g1, such as helium gas, is filled into the fluid groove 7a sealed by the back surface of the wafer 5, and further into the fine gaps between the back surface of the wafer 5 and the dielectric layer 7 and the like (Step 25) (Third stage)", and is "a fixing technology of a semiconductor wafer capable of securely fixing a semiconductor wafer by electrostatic attraction without being affected by an external force, deformation of a semiconductor wafer, or the like, and without causing concern, such as concern for dust generation". Therefore, it can

be said that it is a semiconductor wafer fixation technology that includes the electrostatic chuck 8 in which the electrostatic holding mechanism is incorporated, the fluid groove 7a provided in the electrostatic chuck 8, the fluid passage 7b provided in a manner penetrating the electrostatic chuck 8, the suction control valve 7c, and the gas control valve 7d, and, is capable of supplying the heat conduction gas g1 such as helium to the fluid passage 7b in Step 25.

Therefore, Cited Invention and the technology described in Cited Document 2 are common in a point of being a substrate holding device or a substrate fixing technology that includes a substrate placing table in which an electrostatic holding mechanism is embedded, a fluid groove provided on the substrate placing table, and fluid holes provided so as to penetrate the substrate placing table.

On the other hand, Cited Invention is of a "semiconductor wafer electrostatic chucking and holding device" including the lower electrode 21 in which "the electrostatic chuck 30" provided with "the electrostatic chucking portion 34" is incorporated, and is one for performing fixation of a wafer by electrostatic chucking; therefore, it can be said that there is motivation in a person skilled in the art to employ, in Cited Invention, the technology described in Cited Document 2, thereby enabling "securely fixing a semiconductor wafer by electrostatic attraction without being affected by an external force, deformation of a semiconductor wafer, or the like, and without causing concern, such as concern for dust generation".

Then, since in the technology described in Cited Document 2, suctioning operation of the fluid groove 7a is started at Step 22, it can be said that Step 22 in question is a step of suctioning gas from the fluid passage 7b for sucking a wafer placed on an electrostatic chuck. In addition, it can be said that the suction control valve 7c and the gas control valve 7d are a switching valve as a whole that can switch suction of the relevant gas and supply of the heat transfer gas g1 such as helium.

Accordingly, in Cited Invention, it would have been achieved by a person skilled in the art with ease to adopt, in order to be able to reliably perform fixation of a substrate (wafer 1), a device of a constitution including a switching valve that can switch between suctioning of gas from a fluid hole (the supply/discharge port 38) for sucking a substrate placed on a substrate placing table and supply of a fluid (helium gas) to the fluid hole as the helium gas supply/discharge device 40, based on the technology

described in Cited Document 2.

As described above, it would have been achieved by a person skilled in the art with ease to adopt, in Cited Invention, the constitution of the Amended Invention concerning the Different Feature.

Therefore, the Amended Invention is one that could have been invented by a person skilled in the art with ease in Cited Invention based on the technology described in Cited Document 2, and thus the Appellant should not be granted a patent for that independently at the time of patent application under the provisions of Article 29(2) of the Patent Act.

E Summary of Judgment on independent requirements for patentability

Therefore, since the Appellant should not be granted a patent for the invention specified by the matters described in Claim 1 of the Scope of Claims after amendment independently at the time of patent application, the Amendment does not comply with the provisions of Article 126(7) of the Patent Act as applied mutatis mutandis pursuant to the provisions of Article 17-2(6) of the same Act.

3 Closing regarding the decision to dismiss the Amendment

As described above, since the Amendment does not comply with provisions of Article 126(7) of the Patent Act as applied mutatis mutandis pursuant to the provisions of Article 17-2(6) of the same Act, it should be dismissed under the provisions of Article 53(1) of the same Act which is applied mutatis mutandis by replacing certain terms pursuant to the provisions of Article 159(1) of the same Act.

No. 3 Regarding the invention

1 The Invention

As the Amendment has been dismissed as above, the inventions according to Claims 1-2 of the present application are, as viewed from the descriptions of the description, the Scope of Claims, and drawings amended as of Jul. 11, 2018, ones that are specified by the matters described in Claims 1-2 of the Scope of Claims thereof. Between the two, the invention according to Claim 1 (hereinafter, referred to as "the Invention") is one that is specified by the matters recited in Claim 1 thereof, and is one as has been described in the above-mentioned "No. 2 1 Details of the Amendment" "(Before amendment)".

2 Reasons for refusal stated in the examiner's decision

The reason for refusal stated in the examiner's decision is that the Invention is one that could have been invented with ease by a person ordinarily skilled in the art in the technical field of the Invention before the application was filed, based on the inventions described in the following Cited Documents A to C.

<List of Cited Documents, etc.>

(1) Cited Document A : Japanese Unexamined Patent Application Publication No. 2004-134437 (Cited Document 1 in the above-mentioned No. 2 2(2)B(A))

(2) Cited Document B : Japanese Unexamined Patent Application Publication No. H7-231034 (a document indicating a well-known art; Cited Document 2 in the above-mentioned No. 2 2(2)B(B))

(3) Cited Documents C : Japanese Unexamined Patent Application Publication No. 2003-318160 (a document indicating a well-known art)

3 Descriptions of Cited Documents and Cited Invention

In Cited Document A (Cited Document 1, see above) cited in the reasons for refusal stated in the examiner's decision, there is described the matters that have been described in the above-mentioned "No. 2 2(2)B(A)a Cited Document 1", and there is described, in Cited Document 1, Cited Invention as has been described in the above-mentioned "No. 2 2(2)B(A)b Cited Invention". Furthermore, in Cited Document B (Cited Document 2, see above) presented in the reasons for refusal stated in the examiner's decision, there are described the matters described in the above-mentioned "No. 2 2(2)B(B) Cited Document 2".

4 Comparison / judgment

The Invention is an invention made by eliminating the limitation matter in the Amended Invention examined in the above-mentioned "No. 2 2 Examination regarding the Amendment".

Then, as has been examined in the above-mentioned "No. 2 2 Examination regarding the Amendment", the Amended Invention could have been invented by a person skilled in the art with ease based on Cited Invention and the technology described in Cited Document 2, and, therefore, the Invention also is an invention that could have been invented by a person skilled in the art with ease based on Cited Invention and the technology described in Cited Document 2, for a similar reason.

Accordingly, the Appellant should not be granted a patent for the Invention

under the provisions of Article 29(2) of the Patent Act.

No. 4 Closing

As described above, without examining other claims, the present application should be rejected.

Therefore, the appeal decision shall be made as described in the conclusion.

July 17, 2019

Chief administrative judge: FUKAZAWA, Masashi

Administrative judge: ONDA, Haruka

Administrative judge: SUZUKI, Kazuki