

Claims

1. A substrate holding apparatus comprising:

a top ring body;

an elastic film comprising a first face and a second face opposite the first face, a plurality of areas being formed between the first face and the top ring body, the second face being capable of holding a substrate;

a first line communicating with a first area among the plurality of areas and capable of pressuring the first area;

a second line communicating with the first area and capable of exhausting the first area;

a measurement instrument whose measurement value varies based on a flow volume of the first area;

a third line communicating with a second area among the plurality of areas and different from the first area, the third line being capable of pressuring or depressurizing the second area,

a controller configured to, when the substrate is adsorbed to the second face, depressurize the second area through the third line and pressure the first area through the first line and make a fluid through the second line, and

a determiner configured to determine whether the substrate is adsorbed to the second face based on the measurement value when the substrate is adsorbed to the second face.

2. A substrate holding apparatus comprising:

a top ring body;

an elastic film comprising a first face and a second face opposite the first face, a plurality of areas being formed between the first face and the top ring body, the second face being capable of holding a substrate;

a first line communicating with a first area among the plurality of areas and capable of pressuring the first area;

a second line communicating with the first area and capable of exhausting the first area;

a measurement instrument whose measurement value varies based on a flow volume of the first area;

a third line communicating with a second area among the plurality of areas and different from the first area, the third line being capable of pressuring or depressurizing the second area, and

a determiner configured to determine whether the substrate is adsorbed to the second face based on the measurement value when the substrate is adsorbed to the second face,

wherein no holes are formed on the elastic film.

3 A substrate holding apparatus comprising:

a top ring body;

an elastic film comprising a first face and a second face opposite the first face, a plurality of areas being formed between the first face and the top ring body, the second face being capable of holding a substrate;

a first line communicating with a first area among the plurality of areas and capable of pressuring the first area;

a second line communicating with the first area and capable of exhausting the first area;

a measurement instrument whose measurement value varies based on a flow volume of the first area;

a third line communicating with a second area among the plurality of areas and different from the first area, the third line being capable of pressuring or depressurizing the second area, and

a determiner configured to determine whether the substrate is adsorbed to the second face based on the measurement value when the substrate is adsorbed to the second face,

wherein a convex portion toward the top ring body is provided on the first face, and

the convex portion is formed annularly, and is located at a position which corresponds to an outside of a hole communicating with the first line of the top ring body and corresponds to an inside of a hole communicating with the second line of the top ring body.

4 A substrate holding apparatus comprising:

a top ring body;

an elastic film comprising a first face and a second face opposite the first face, a plurality of areas being formed between the first face and the top ring body, the second face

being capable of holding a substrate;

a first line communicating with a first area among the plurality of areas and capable of pressuring the first area;

a second line communicating with the first area and capable of exhausting the first area;

a measurement instrument whose measurement value varies based on a flow volume of the first area;

a third line communicating with a second area among the plurality of areas and different from the first area, the third line being capable of pressuring or depressurizing the second area, and

a determiner configured to determine whether the substrate is adsorbed to the second face based on the measurement value when the substrate is adsorbed to the second face,

wherein a convex portion toward the first face is provided on the top ring body, and

the convex portion is formed annularly, and is located at a position which is an outside of a hole communicating with the first line of the top ring body and is an inside of a hole communicating with the second line of the top ring body.

5. A substrate holding apparatus comprising:

a top ring body;

an elastic film comprising a first face and a second face opposite the first face, a plurality of areas being formed between the first face and the top ring body, the second face

being capable of holding a substrate;

a first line communicating with a first area among the plurality of areas and capable of pressuring the first area;

a second line communicating with the first area and capable of exhausting the first area;

a measurement instrument whose measurement value varies based on a flow volume of the first area;

a third line communicating with a second area among the plurality of areas and different from the first area, the third line being capable of pressuring or depressurizing the second area, and

a controller configured to control a pressure of the second area through the third line based on the measurement value.

6. The substrate holding apparatus according to claim 5, wherein the controller controls the pressure of the second area so that the measurement value falls within a predetermined range.

7. The substrate holding apparatus according to claim 5 or 6, wherein the controller, when the substrate held by the second face is released, pressures the first area through the first line and make a fluid into the first area through the second line, and controls the second area through the third line based on the measurement value.

8. The substrate holding apparatus according to one of claims 5-7, wherein the controller controls the pressure of the second area so that a fluid is injected to a predetermined position from a release nozzle.

9. The substrate holding apparatus according to claim 8, wherein the predetermined position is between the second face and the hold substrate.

10. The substrate holding apparatus according to one of claims 1-9, wherein the measurement instrument is a flow meter capable of measuring a flow volume of the second line.

11. The substrate holding apparatus according to one of claims 1-10, wherein the measurement instrument is a pressure gauge capable of measuring a pressure of the first line or the second line.

12. The substrate holding apparatus according to claim 1, wherein the determiner determines whether the substrate is adsorbed to the second face based on the measurement value measured by the measurement instrument after a predetermined time from a start of depressurizing the second area.

13. The substrate holding apparatus according to one of claims 1-12, wherein the second area is not adjacent to the first area.

14. The substrate holding apparatus according to one of claims 1-13 further comprising a retainer ring provided at an outer circumference of the elastic film.

15. The substrate holding apparatus according to claim 14, wherein the retainer ring comprises an inner ring and an outer ring outside the inner ring.

16. A substrate polishing apparatus comprising:
the substrate holding apparatus according to one of claims 1-15; and
a polishing table configured to polish the substrate held by the substrate holding apparatus.

17. A substrate adsorption determination method for a substrate holding apparatus, the method comprising:
depressurizing a second area formed between a top ring body and a first face of an elastic film in the substrate holding apparatus, pressuring, via a first line, a first area formed between the top ring body and the first face of the elastic film different from the second area and making a fluid through a second line communicating with the first area; and after that,
determining whether the substrate is adsorbed to a second face of the elastic film opposite the first face based on a measurement value varying according to a flow volume of the first area.

18. The substrate adsorption determination method according to claim 17, wherein the first area is sealed by a convex portion provided on the first face of the elastic film contacting the top ring body.

19. The substrate adsorption determination method according to claim 17, wherein the first area is sealed by the first face of the elastic film contacting a convex portion provided on the top ring body.

20. A pressure control method for a substrate holding apparatus, the method comprising:

while pressurizing, via a first line, a first area formed between a top ring body and a first face of an elastic film in the substrate holding apparatus, and making a fluid through a second line communicating with the first area, controlling a second area formed between the top ring body and the first face of the elastic film different from the first area based on a measurement value varying according to a flow volume of the first area.

21. A substrate holding apparatus comprising:

a top ring body provided with a first hole at an outside of a first portion and a second hole at an inside of the first portion;

an elastic film comprising:

a first face provided with a second portion capable of being engaged with the first portion, a plurality of areas being formed between the first face and the top ring body; and

a second face opposite the first face, the second face being capable of holding a substrate;

a first line being capable of pressuring a first area through the first hole positioned at the first area among the plurality of areas;

a second line capable of depressurizing the first area through the second hole positioned at the first area;

a measurement instrument whose measurement value varies based on a flow volume of the first area; and

a third line communicating with a second area among the plurality of areas and different from the first area, the third line being capable of pressuring or depressurizing the second area, and

a determiner configured to determine whether the substrate is adsorbed to the second face based on the measurement value when the substrate is adsorbed to the second face,

wherein a radially extending groove is provided in a portion of the top ring body corresponding to the first area.

22. A substrate holding apparatus comprising:

a top ring body provided with a first hole at an outside of a first portion and a second hole at an inside of the first portion;

an elastic film comprising:

a first face provided with a second portion capable of being engaged with the first portion, a plurality of areas being formed between the first face and the top ring body; and

a second face opposite the first face, the second face being capable of holding a substrate;

a first line being capable of pressuring a first area through the first hole positioned at the first area among the plurality of areas;

a second line capable of depressurizing the first area through the second hole positioned at the first area;

a measurement instrument whose measurement value varies based on a flow volume of the first area; and

a third line communicating with a second area among the plurality of areas and different from the first area, the third line being capable of pressuring or depressurizing the second area,

a bypass line bypassing the first line and the second line, a valve provided on the bypass line, and

a determiner configured to determine whether the substrate is adsorbed to the second face based on the measurement value when the substrate is adsorbed to the second face.