CLAIMS

1. A polishing treatment device, comprising: a polishing table having a polishing pad; and a polishing head that holds a substrate to be polished and brings a polished surface of the substrate into sliding contact with the polishing pad,

wherein the polishing head comprises:

a head housing that has a first flange part that extends outward from an upper position of a circumferential surface of a cylindrical body and a second flange part that extends outward from a lower position of the circumferential surface;

an annular body that is sized to surround an outer circumference of the second flange part and has a third flange part that is formed at an upper end part thereof and located between the first flange part and the second flange part;

an elastic body that covers a lower end-side opening part of the annular body and holds the substrate with a packing film pasted to a front surface thereof interposed therebetween;

a retainer ring formed in a shape to surround an outer circumference of the substrate; and

driving means that integrally horizontally rotates the head housing, the annular body, and the retainer ring,

an annular elastic body is arranged on a back surface of the elastic body, and a corrective pressing ring that applies a pressure to an upper surface of the annular elastic body is arranged inside the annular body,

the polishing head comprises:

first pressure adjusting means that adjusts a processing pressure applied to a back side of the substrate opposite to the

polished surface by adjusting a pressure in a space surrounded by the head housing, the annular body, and the elastic body;

second pressure adjusting means that adjusts a pressure applied to the polishing pad by the retainer ring by means of the first flange part;

third pressure adjusting means that adjusts, by means of the second flange, a processing pressure applied to a back-side circumference of the substrate opposite to the polished surface by raising or lowering the annular body via the third flange part;

fourth pressure adjusting means that adjusts, by means of the second flange, a compensating pressure applied to a back-side outer circumference vicinity of the substrate opposite to the polished surface by the corrective pressing ring via the annular elastic body; and

controlling means that controls operations of the driving means and the first, second, third, and fourth pressure adjusting means, and

as s first step, the controlling means controls the first pressure adjusting means to apply a processing pressure to the back side of the substrate opposite to the polished surface, controls the second pressure adjusting means to apply a pressure to the polishing pad, and controls the third pressure adjusting means to raise the annular body to reduce the processing pressure on the back-side circumference of the substrate opposite to the polished surface compared with the processing pressure applied by the first pressure adjusting means, and

as a second step, the controlling means controls the first pressure adjusting means to stop applying the processing pressure, controls the second pressure adjusting means to apply the pressure to the polishing pad, controls the third pressure adjusting means

to lower the annular body to stop reducing the processing pressure on the back-side circumference of the substrate opposite to the polished surface, and controls the fourth pressure adjusting means to apply a compensating pressure to a back-side outer circumference vicinity of the substrate opposite to the polished surface.

2. The polishing treatment device according to claim 1, wherein the second pressure adjusting means adjust the pressure applied to the polishing pad by the retainer ring by adjusting a pressure fluid flowed into an air bag arranged between the first flange part and the retainer ring under the control of the controlling means.

3. The polishing treatment device according to claim 1 or 2, wherein the third pressure adjusting means adjust a pressurized area in which the processing pressure is applied to the back-side circumference of the substrate opposite to the polished surface by raising or lowering the annular body by adjusting a pressure fluid flowed into an air bag arranged between the second flange part and the third flange part under the control of the controlling means.

4. The polishing treatment device according to claim 1 or 2, wherein the fourth pressure adjusting means adjusts the compensating pressure applied to the back-side outer circumference vicinity of the substrate opposite to the polished surface by the annular elastic body by adjusting a pressure fluid flowed into an air bag arranged between the third flange part and the corrective pressing ring under the control of the controlling means.

5. The polishing treatment device according to any one of claims 1 or 2, further comprising:

restraining means that restrain the raising of the annular body by the third pressure adjusting means within a predetermined range.

6. The polishing treatment device according to any one of claims 1 or 2, wherein the annular elastic body is formed to have a smaller size than the substrate.

7. The polishing treatment device according to any one of claims 1 or 2, wherein the annular body is connected to a flexible plate connected to the head housing, and the retainer ring is connected to the annular body by a drive pin.

8. A polishing head that is provided in a polishing treatment device having a polishing pad that rotates horizontally, holds a substrate to be polished, and brings a polished surface of the substrate into sliding contact with the polishing pad, comprising:

a head housing that has a first flange part that extends outward from an upper position of a circumferential surface of a cylindrical body and a second flange part that extends outward from a lower position of the circumferential surface;

an annular body that is sized to surround an outer circumference of the second flange part and has a third flange part that is formed at an upper end part thereof and located between the first flange part and the second flange part;

an elastic body that covers a lower end-side opening part of the annular body and holds the substrate with a packing film pasted to a front surface thereof interposed therebetween;

a retainer ring formed in a shape to surround an outer circumference of the substrate; and

driving means that integrally horizontally rotates the head housing, the annular body, and the retainer ring,

an annular elastic body being arranged on a back surface of the elastic body, and a corrective pressing ring that applies a pressure to an upper surface of the annular elastic body being arranged inside the annular body,

the polishing head comprising:

first pressure adjusting means that adjusts a processing pressure applied to a back side of the substrate opposite to the polished surface by adjusting a pressure in a space surrounded by the head housing, the annular body, and the elastic body;

second pressure adjusting means that adjusts a pressure applied to the polishing pad by the retainer ring by means of the first flange part;

third pressure adjusting means that adjusts, by means of the second flange, a pressurized area in which the processing pressure is applied to a back-side circumference of the substrate opposite to the polished surface by raising or lowering the annular body via the third flange part;

fourth pressure adjusting means that adjusts, by means of the second flange, a compensating pressure applied to a back-side outer circumference vicinity of the substrate opposite to the polished surface by the corrective pressing ring via the annular elastic body; and

controlling means that controls operations of the driving means and the first, second, third, and fourth pressure adjusting means,

wherein as a first step, the controlling means controls the first pressure adjusting means to apply a processing pressure to the back side of the substrate opposite to the polished surface, controls the second pressure adjusting means to apply a pressure to

the polishing pad, and controls the third pressure adjusting means to raise the annular body to reduce the processing pressure on the back-side circumference of the substrate opposite to the polished surface compared with the processing pressure applied by the first pressure adjusting means, and

as a second step, the controlling means controls the first pressure adjusting means to stop applying the processing pressure, controls the second pressure adjusting means to apply the pressure to the polishing pad, controls the third pressure adjusting means to lower the annular body to stop reducing the processing pressure on the back-side circumference of the substrate opposite to the polished surface, and controls the fourth pressure adjusting means to apply a compensating pressure to a back-side outer circumference vicinity of the substrate opposite to the polished surface.

9. A polishing treatment method by a polishing head that is provided in a polishing treatment device having a polishing pad that rotates horizontally, holds a substrate to be polished, and brings a polished surface of the substrate into sliding contact with the polishing pad,

wherein the polishing head comprises:

a head housing that has a first flange part that extends outward from an upper position of a circumferential surface of a cylindrical body and a second flange part that extends outward from a lower position of the circumferential surface;

an annular body that is sized to surround an outer circumference of the second flange part and has a third flange part that is formed at an upper end part thereof and located between the first flange part and the second flange part;

an elastic body that covers a lower end-side opening part of the annular body and holds the substrate with a packing film pasted to a front surface thereof interposed therebetween;

a retainer ring formed in a shape to surround an outer circumference of the substrate; and

driving means that integrally horizontally rotates the head housing, the annular body, and the retainer ring,

an annular elastic body being arranged on a back surface of the elastic body, and a corrective pressing ring that applies a pressure to an upper surface of the annular elastic body being arranged inside the annular body,

the polishing head comprises:

first pressure adjusting means that adjusts a processing pressure applied to a back side of the substrate opposite to the polished surface by adjusting a pressure in a space surrounded by the head housing, the annular body, and the elastic body;

second pressure adjusting means that adjusts a pressure applied to the polishing pad by the retainer ring by means of the first flange part;

third pressure adjusting means that adjusts, by means of the second flange, a pressurized area in which the processing pressure is applied to a back-side circumference of the substrate opposite to the polished surface by raising or lowering the annular body via the third flange part;

fourth pressure adjusting means that adjusts, by means of the second flange, a compensating pressure applied to a back-side outer circumference vicinity of the substrate opposite to the polished surface by the corrective pressing ring via the annular elastic body; and

controlling means that controls operations of the driving means and the first, second, third, and fourth pressure adjusting means, and

the polishing treatment method comprises:

a first step in which the controlling means controls the first pressure adjusting means to apply a processing pressure to the back side of the substrate opposite to the polished surface, controls the second pressure adjusting means to apply a pressure to the polishing pad, and controls the third pressure adjusting means to raise the annular body to reduce the processing pressure on the back-side circumference of the substrate opposite to the polished surface compared with the processing pressure applied by the first pressure adjusting means; and

a second step in which the controlling means controls the first pressure adjusting means to stop apply the processing pressure, controls the second pressure adjusting means to apply the pressure to the polishing pad, controls the third pressure adjusting means to lower the annular body to stop reducing the processing pressure on the back-side circumference of the substrate opposite to the polished surface, and controls the fourth pressure adjusting means to apply a compensating pressure to a back-side outer circumference vicinity of the substrate opposite to the polished surface.

10. A polishing treatment device, comprising: a polishing table having a polishing pad; and a polishing head that holds a substrate to be polished and brings a polished surface of the substrate into sliding contact with the polishing pad,

wherein the polishing head comprises:

a head housing;

an annular body that has an inner diameter enough to surround an outer circumference of the substrate to be polished and is connected to the head housing;

an elastic body that covers a lower end-side opening part of the annular body and holds the substrate with a packing film pasted to a front surface thereof interposed therebetween;

a retainer ring formed in a shape to surround an outer circumference of the substrate;

driving means that integrally horizontally rotates the head housing, the annular body, and the retainer ring,

an annular elastic body that is arranged on a back surface of the elastic body and applies a compensating pressure to a back-side outer circumference vicinity of the substrate opposite to the polished surface;

first pressure adjusting means that adjusts a processing pressure applied to a back side of the substrate opposite to the polished surface by adjusting a pressure in a space surrounded by the head housing, the annular body, and the elastic body;

second pressure adjusting means that adjusts a pressure applied to the polishing pad by the retainer ring by means of the annular body;

fourth pressure adjusting means that adjusts the compensating pressure applied to the back-side outer circumference vicinity by the annular elastic body; and

controlling means that controls operations of the driving means and the first, second, and fourth pressure adjusting means, and

as a first step, the controlling means controls the first pressure adjusting means to apply a processing pressure to the back side of the substrate opposite to the polished surface, and controls

the second pressure adjusting means to apply a pressure to the polishing pad, and

as a second step, the controlling means controls the first pressure adjusting means to stop applying the processing pressure, controls the second pressure adjusting means to apply the pressure to the polishing pad, and controls the fourth pressure adjusting means to apply a compensating pressure to the back-side outer circumference vicinity of the substrate opposite to the polished surface.

11. The polishing treatment device according to claim 10, wherein the fourth pressure adjusting means is configured to apply a pressure to the annular elastic body via a corrective pressing ring arranged inside the annular body.

12. The polishing treatment device according to claim 11, wherein the annular elastic body is divided into a first annular elastic body on an inner side and a second annular elastic body on an outer side,

the corrective pressing ring is formed by a first corrective pressing ring that applies a pressure to the first annular elastic body and a second corrective pressing ring that applies a pressure to the second annular elastic body, and the compensating pressure applied to the back-side outer circumference vicinity of the substrate opposite to the polished surface is partially applied by the first annular elastic body on the inner side, and partially applied by the second annular elastic body on the outer side.

13. The polishing treatment device according to claim 12, wherein a deformation prevention ring is arranged between the first annular elastic body and the second annular elastic body.

14. The polishing treatment device according to claim 12, wherein the first annular elastic body is formed in a trapezoidal shape with an inner side surface being an inclined surface,

the second annular elastic body is formed in a trapezoidal shape with an outer side surface being an inclined surface,

the first corrective pressing ring is configured to cover at least a part of the inclined surface of the first annular elastic body on the inner side, and

the second corrective pressing ring is configured to cover at least a part of the inclined surface of the second annular elastic body on the outer side.

15. The polishing treatment device according to claim 14, wherein the first corrective pressing ring is configured to cover an upper surface of the first annular elastic body to apply thereto a pressure from the fourth pressure adjusting means, and is configured to cover the upper surface of the first annular elastic body so that the processing pressure applied to the back side of the substrate opposite to the polished surface by the first pressure adjusting means is also applied to the upper surface of the first annular elastic body.

16. A polishing head that is provided in a polishing treatment device having a polishing pad that rotates horizontally, holds a substrate to be polished, and brings a polished surface of the substrate into sliding contact with the polishing pad, comprising:

a head housing;

an annular body that has an inner diameter enough to surround an outer circumference of the substrate to be polished and is connected to the head housing;

an elastic body that covers a lower end-side opening part of the annular body and holds the substrate with a packing film pasted to a front surface thereof interposed therebetween;

a retainer ring formed in a shape to surround an outer circumference of the substrate;

driving means that integrally horizontally rotates the head housing, the annular body, and the retainer ring,

an annular elastic body that is arranged on a back surface of the elastic body and applies a compensating pressure to a back-side outer circumference vicinity of the substrate opposite to the polished surface;

first pressure adjusting means that adjusts a processing pressure applied to a back side of the substrate opposite to the polished surface by adjusting a pressure in a space surrounded by the head housing, the annular body, and the elastic body;

second pressure adjusting means that adjusts a pressure applied to the polishing pad by the retainer ring by means of the annular body;

fourth pressure adjusting means that adjusts the compensating pressure applied to the back-side outer circumference vicinity by the annular elastic body; and

controlling means that controls operations of the driving means and the first, second, and fourth pressure adjusting means,

wherein as a first step, the controlling means controls the first pressure adjusting means to apply a processing pressure to the back side of the substrate opposite to the polished surface,

and controls the second pressure adjusting means to apply a pressure to the polishing pad, and

as a second step, the controlling means controls the first pressure adjusting means to stop applying the processing pressure, controls the second pressure adjusting means to apply the pressure to the polishing pad, and controls the fourth pressure adjusting means to apply a compensating pressure to the back-side outer circumference vicinity of the substrate opposite to the polished surface.