

What is claimed is:

1. An elastic membrane for use in a substrate holding apparatus, comprising:
a contact portion to be brought into contact with a substrate for pressing the
5 substrate against a polishing pad;
a first edge circumferential wall extending upwardly from a peripheral edge of
the contact portion; and
a second edge circumferential wall having a horizontal portion connected to an
inner circumferential surface of the first edge circumferential wall,
10 wherein the inner circumferential surface of the first edge circumferential wall
includes an upper inner circumferential surface and a lower inner circumferential surface,
both of which are perpendicular to the contact portion,
the upper inner circumferential surface extends upwardly from the horizontal
portion of the second edge circumferential wall, and
15 the lower inner circumferential surface extends downwardly from the horizontal
portion of the second edge peripheral wall.
2. The elastic membrane according to claim 1, wherein the upper inner
circumferential surface and the lower inner circumferential surface lie in a same plane.
20
3. The elastic membrane according to claim 1, wherein an annular groove
extending in a circumferential direction of the first edge circumferential wall is formed in
the lower inner circumferential surface.
- 25 4. The elastic membrane according to claim 3, wherein the annular groove is
located at a lower end of the lower inner circumferential surface.
5. The elastic membrane according to claim 1, further comprising:

a third edge circumferential wall located radially inwardly of the second edge circumferential wall, the third edge circumferential wall having a lower end connected to the contact portion, the lower end of the third edge circumferential wall being located adjacent to the first edge circumferential wall.

5

6. A substrate holding apparatus comprising:

an elastic membrane that forms pressure chambers for pressing a substrate;

a head body to which the elastic membrane is secured; and

a retaining ring surrounding the elastic membrane,

10

wherein the elastic membrane comprises

(i) a contact portion to be brought into contact with the substrate for pressing the substrate against a polishing pad,

(ii) a first edge circumferential wall extending upwardly from a peripheral edge of the contact portion, and

15

(iii) a second edge circumferential wall having a horizontal portion connected to an inner circumferential surface of the first edge circumferential wall,

the inner circumferential surface of the first edge circumferential wall includes an upper inner circumferential surface and a lower inner circumferential surface, both of which are perpendicular to the contact portion,

20

the upper inner circumferential surface extends upwardly from the horizontal portion of the second edge circumferential wall, and

the lower inner circumferential surface extends downwardly from the horizontal portion of the second edge peripheral wall.

25

7. The substrate holding apparatus according to claim 6, wherein the upper inner circumferential surface and the lower inner circumferential surface lie in a same plane.

8. The substrate holding apparatus according to claim 6, wherein an annular groove extending in a circumferential direction of the first edge circumferential wall is formed in the lower inner circumferential surface.

5 9. The substrate holding apparatus according to claim 8, wherein the annular groove is located at a lower end of the lower inner circumferential surface.

10 10. The substrate holding apparatus according to claim 6, wherein the elastic membrane further comprises a third edge circumferential wall located radially inwardly of the second edge circumferential wall, the third edge circumferential wall having a lower end connected to the contact portion, the lower end of the third edge circumferential wall being located adjacent to the first edge circumferential wall.

15 11. A polishing apparatus comprising:
a polishing table for supporting a polishing pad; and
a substrate holding apparatus configured to press a substrate against the polishing pad, the substrate holding apparatus including an elastic membrane that forms pressure chambers for pressing the substrate, a head body to which the elastic membrane is secured, and a retaining ring surrounding the elastic membrane,
20 wherein the elastic membrane comprises
(i) a contact portion to be brought into contact with the substrate for pressing the substrate against the polishing pad,
(ii) a first edge circumferential wall extending upwardly from a peripheral edge of the contact portion, and
25 (iii) a second edge circumferential wall having a horizontal portion connected to an inner circumferential surface of the first edge circumferential wall,

the inner circumferential surface of the first edge circumferential wall includes an upper inner circumferential surface and a lower inner circumferential surface, both of which are perpendicular to the contact portion,

the upper inner circumferential surface extends upwardly from the horizontal
5 portion of the second edge circumferential wall, and

the lower inner circumferential surface extends downwardly from the horizontal portion of the second edge peripheral wall.

12. The polishing apparatus according to claim 11, wherein the upper inner
10 circumferential surface and the lower inner circumferential surface lie in a same plane.

13. The polishing apparatus according to claim 11, wherein an annular groove
extending in a circumferential direction of the first edge circumferential wall is formed in
the lower inner circumferential surface.

15

14. The polishing apparatus according to claim 13, wherein the annular groove is
located at a lower end of the lower inner circumferential surface.

15. The polishing apparatus according to claim 11, wherein the elastic membrane
20 further comprises a third edge circumferential wall located radially inwardly of the
second edge circumferential wall, the third edge circumferential wall having a lower end
connected to the contact portion, the lower end of the third edge circumferential wall
being located adjacent to the first edge circumferential wall.

25

What is claimed is:

1. An elastic membrane for use in a substrate holding apparatus, comprising:
 - a contact portion to be brought into contact with a substrate for pressing the substrate against a polishing pad;
 - a first edge circumferential wall extending upwardly from a peripheral edge of the contact portion;
 - a second edge circumferential wall connected to the first edge circumferential wall; and
 - a third edge circumferential wall having a slope portion connected to an upper surface of the contact portion.
2. The elastic membrane according to claim 1, wherein the first edge circumferential wall and the second edge circumferential wall defines a first pressure chamber therebetween, and the second edge circumferential wall and the third edge circumferential wall defines a second pressure chamber therebetween.
3. The elastic membrane according to claim 2, further comprising:
 - a fourth circumferential wall located more inwardly than the third edge circumferential wall, the third edge circumferential wall and the fourth circumferential wall defining a third pressure chamber therebetween, at least a part of the second pressure chamber being located above the third pressure chamber.
4. The elastic membrane according to claim 1, wherein the slope portion is located below the second edge circumferential wall and above the contact portion.
5. The elastic membrane according to claim 1, wherein the first edge circumferential wall is perpendicular to the upper surface of the contact portion.

6. The elastic membrane according to claim 1, wherein a distance between a lower end of the third edge circumferential wall and an inner circumferential surface of the first edge circumferential wall is in a range of 1 mm to 10 mm.

7. The elastic membrane according to claim 6, wherein the distance is in a range of 1 mm to 5 mm.

8. A substrate holding apparatus comprising:

an elastic membrane that forms pressure chambers for pressing a substrate;

a head body to which the elastic membrane is secured; and

a retaining ring surrounding the elastic membrane,

wherein the elastic membrane comprises

(i) a contact portion to be brought into contact with a substrate for pressing the substrate against a polishing pad;

(ii) a first edge circumferential wall extending upwardly from a peripheral edge of the contact portion;

(iii) a second edge circumferential wall connected to the first edge circumferential wall; and

(iv) a third edge circumferential wall having a slope portion connected to an upper surface of the contact portion.

9. The substrate holding apparatus according to claim 8, wherein the first edge circumferential wall and the second edge circumferential wall defines a first pressure chamber therebetween, and the second edge circumferential wall and the third edge circumferential wall defines a second pressure chamber therebetween.

10. The substrate holding apparatus according to claim 9, wherein the elastic membrane further comprises a fourth circumferential wall located more inwardly than the third edge circumferential wall, the third edge circumferential wall and the fourth circumferential wall defining a third pressure chamber therebetween, at least a part of the second pressure chamber being located above the third pressure chamber.

11. The substrate holding apparatus according to claim 8, wherein the slope portion is located below the second edge circumferential wall and above the contact portion.

12. The substrate holding apparatus according to claim 8, wherein the first edge circumferential wall is perpendicular to the upper surface of the contact portion.

13. The substrate holding apparatus according to claim 8, wherein a distance between a lower end of the third edge circumferential wall and an inner circumferential surface of the first edge circumferential wall is in a range of 1 mm to 10 mm.

14. The substrate holding apparatus according to claim 13, wherein the distance is in a range of 1 mm to 5 mm.

15. A polishing apparatus comprising:

a polishing table for supporting a polishing pad; and

a substrate holding apparatus configured to press a substrate against the polishing pad, the substrate holding apparatus including an elastic membrane that forms pressure chambers for pressing the substrate, a head body to which the elastic membrane is secured, and a retaining ring surrounding the elastic membrane,

wherein the elastic membrane comprises

(i) a contact portion to be brought into contact with a substrate for pressing the substrate against a polishing pad;

(ii) a first edge circumferential wall extending upwardly from a peripheral edge of the contact portion;

(iii) a second edge circumferential wall connected to the first edge circumferential wall; and

(iv) a third edge circumferential wall having a slope portion connected to an upper surface of the contact portion.

16. The polishing apparatus according to claim 15, wherein the first edge circumferential wall and the second edge circumferential wall defines a first pressure chamber therebetween, and the second edge circumferential wall and the third edge circumferential wall defines a second pressure chamber therebetween.

17. The polishing apparatus according to claim 16, wherein the elastic membrane further comprises a fourth circumferential wall located more inwardly than the third edge circumferential wall, the third edge circumferential wall and the fourth circumferential wall defining a third pressure chamber therebetween, at least a part of the second pressure chamber being located above the third pressure chamber.

18. The polishing apparatus according to claim 15, wherein the slope portion is located below the second edge circumferential wall and above the contact portion.

19. The polishing apparatus according to claim 15, wherein the first edge circumferential wall is perpendicular to the upper surface of the contact portion.

20. The polishing apparatus according to claim 15, wherein a distance between a lower end of the third edge circumferential wall and an inner circumferential surface of the first edge circumferential wall is in a range of 1 mm to 10 mm.

21. The polishing apparatus according to claim 20, wherein the distance is in a range of 1 mm to 5 mm.