WAFER CLAMPING RING

This invention relates to a wafer clamping ring, and more particularly to a wafer clamping ring having an annular base wall provided with a plurality of first spacing pads and a wafer confining wall provided with a plurality of second spacing pads for spacing an edge of a wafer from the annular base wall and the wafer confining wall.

Figs. 1 to 3 illustrate a conventional wafer clamping ring 10 that is used to cooperate with a wafer pedestal 18 (see Fig. 3) to clamp an edge of a wafer 16 for subsequent processing, such as vapor deposition, sputtering deposition, etc. The wafer clamping ring 10 includes an annular base wall 11 having an inner edge 111, a plurality of circular positioning walls 112 extending axially from the annular base wall 11, and a circular wafer confining wall 12 extending axially from the annular base wall 11 so that the annular base wall 11 has a clamping part 13 extending from the wafer confining wall 12 to the inner edge 111 and cooperating with the wafer confining wall 12 to define an accommodating space 101 (see Fig. 3) for receiving the edge of the wafer 16. When received in the accommodating space 101, the edge of the wafer 16 is substantially in contact with the wafer confining wall 12. The clamping part 13 has a plurality of tongues 14 protruding radially from the inner edge 111, and is provided with a plurality

of spacing pads 15, each of which has a portion protruding from a respective one of the tongues 14.

In use, referring to Fig. 3, the wafer 16 is placed on the wafer pedestal 18, followed by disposing the wafer clamping ring 10 on the edge of the wafer 16 and then securing the wafer clamping ring 10 to the wafer pedestal 18 so as to clamp the edge of the wafer 16 between the wafer clamping ring 10 and the wafer pedestal 18 for subsequent processing.

The conventional wafer clamping ring 10 is disadvantageous in that, during deposition, deposits 17 (see Fig. 3) on the wafer 16, are likely to enter and accumulate in a clearance between the edge of the wafer 16 and the wafer confining wall 12, which results in undesired sticking of the edge of the wafer 16 to the wafer confining wall, which in turn can cause the wafer 16 to break while being removed from the wafer pedestal 18.

Therefore, an object of the present invention is to provide a wafer clamping ring that can overcome the aforesaid drawback associated with the prior art.

According to the present invention, there is provided a wafer clamping ring adapted to be disposed on top of a wafer pedestal to clamp an edge of a wafer against the wafer pedestal. The wafer clamping ring comprises: an annular base wall including inner and outer edges, and a clamping part, the inner edge

defining a central opening for exposing the wafer to a processing environment, the clamping part being annular and extending radially outward from the inner edge to a distance; an annular wafer confining wall extending axially from the annular base wall around the clamping part, the wafer confining wall forming a corner with the clamping part, which defines an accommodating space for receiving the edge of the wafer; a plurality of spaced apart first spacing pads, each of which protrudes axially from the clamping part into the accommodating space; and a plurality of spaced apart second spacing pads protruding radially from the wafer confining wall into the accommodating space.

In drawings which illustrate embodiments of the invention,

Fig. 1 is a perspective view of a conventional wafer clamping ring;

Fig. 2 is a bottom view of the conventional wafer clamping ring;

Fig. 3 is a fragmentary sectional view of the conventional wafer clamping ring securing an edge of a wafer to a wafer pedestal;

Fig. 4 is a perspective view of the first preferred embodiment of a wafer clamping ring according to the present invention;

Fig. 5 is a bottom view of the first preferred embodiment;

Fig. 6 is a fragmentary top view of the first preferred embodiment;

Fig. 7 is a fragmentary sectional view of the first preferred embodiment taken along line VII - VII shown in Fig. 6;

Fig. 8 is a fragmentary sectional view of the first preferred embodiment taken along line VIII - VIII shown in Fig. 6; and

Fig. 9 is a perspective view of the second preferred embodiment of the wafer clamping ring according to the present invention.

Before the present invention is described in greater detail with reference to the accompanying preferred embodiments, it should be noted herein that like elements are denoted by the same reference numerals throughout the disclosure.

Figs. 4 to 8 illustrate the first preferred embodiment of a wafer clamping ring 100 according to the present invention. The wafer clamping ring 100 is adapted to be disposed on top of a wafer pedestal 18 (see Figs. 7 and 8) to clamp an edge of a wafer 16 against the wafer pedestal (18), and includes: an annular base wall 2 including inner and outer edges 21, 22, and a clamping part 23, the inner edge 21 defining a central opening 210 for exposing the wafer 16 to a processing environment, the clamping part 23 being annular and extending radially outward from the

inner edge 21 to a distance; an annular wafer confining wall 4 extending axially from the annular base wall 2 around the clamping part 23, the wafer confining wall 4 forming a corner with the clamping part 23, which defines an accommodating space 201 for receiving the edge of the wafer 16; a plurality of circular positioning walls 52, 53, 54 coaxially disposed around the axis (X) of the annular base wall 2 and extending axially from the annular base wall 2 at positions between the wafer confining wall 4 and the outer edge 22, one of the positioning walls 53 being formed with a plurality of screw holes 51 for fastening the wafer clamping ring 100 to the wafer pedestal 18; a plurality of spaced apart first spacing pads 7, each of which protrudes axially from the clamping part 23 into the accommodating space 201; and a plurality of spaced apart second spacing pads 8 protruding radially from the wafer confining wall 4 into the accommodating space 201.

The clamping part 23 of the annular base wall 2 has a plurality of tongues 231 protruding radially and inwardly from the inner edge 21. Each of the first spacing pads 7 has a portion 71 extending to the respective one of the tongues 231. The first spacing pads 7 are equiangularly spaced apart from each other around the axis (X) of the annular base wall 2.

The second spacing pads 8 are equiangularly

spaced apart from each other around the axis (X) of the annular base wall 2. In this embodiment, each of the second spacing pads 8 has a first end 81 that is disposed adjacent to the annular base wall 2 and that meets an end 72 of the respective first spacing pads 7. Each second spacing pad 8 is disposed at the same angular position as the respective first spacing pad 7 around the axis (X), and cooperates with the respective first spacing pads 7 to form an L-shaped spacer.

Each second spacing pad 8 further has a second end 82 opposite to the first end 81, and a clamping surface 83 extending from the first end 81 to the second end 82 and adapted to contact the edge of the wafer 16. The radial distance (r_1) between the clamping surface 83 of each second spacing pad 8 and the axis (X) of the annular base wall 2 is gradually increased from the first end 81 toward the second end 82. As a consequence, the contact area between the clamping surface 83 and the edge of the wafer 16 can be considerably reduced.

The wafer confining wall 4 has a connecting end 41 connected to the annular base wall 2, a free end 42 opposite to the connecting end 41, and an inner surface 43 extending from the connecting end 41 to the free end 42. Each second spacing pad 8 protrudes radially inward from the inner surface 43 of the wafer

confining wall 4. The radial distance (r_2) between the inner surface 43 and the axis (X) of the annular base wall 2 is gradually increased from the connecting end 41 toward the free end 42.

Referring to Figs. 7 and 8, in combination with Fig. 4, the wafer 16 is placed on the wafer pedestal 18, followed by disposing the wafer clamping ring 100 on the edge of the wafer 16 and then securing the wafer clamping ring 100 to the wafer pedestal 18 to clamp the edge of the wafer 16 between the wafer clamping ring 100 and the wafer pedestal 18 for subsequent deposition processing. With the use of the second spacing pads 8, except the regions where the second spacing pads are present, most part of the clearance between the wafer confining wall 4 and the edge of the wafer 16 are enlarged so that the deposits 17 will not easily accumulate and get stuck in the clearance during the process for deposition. Accordingly, the sticking problem encountered in the prior art can be alleviated.

Fig. 9 illustrates the second preferred embodiment of the wafer clamping ring 100 according to the present invention. The second preferred embodiment differs from the previous embodiment in that the second spacing pads 8 and the first spacing pads 7 are alternately disposed around the axis (X) of the annular base wall 2.

CLAIMS:

1. A wafer clamping ring adapted to be disposed on top of a wafer pedestal to clamp an edge of a wafer against the wafer pedestal, said wafer clamping ring comprising:

an annular base wall including inner and outer edges, and a clamping part, said inner edge defining a central opening for exposing the wafer to a processing environment, said clamping part being annular and extending radially outward from said inner edge to a distance;

an annular wafer confining wall extending axially from said annular base wall around said clamping part, said wafer confining wall forming a corner with said clamping part, which defines an accommodating space for receiving the edge of the wafer;

a plurality of spaced apart first spacing pads, each of which protrudes axially from said clamping part into said accommodating space; and

a plurality of spaced apart second spacing pads protruding radially from said wafer confining wall into said accommodating space.

2. The wafer clamping ring of claim 1, wherein each of said second spacing pads has a first end disposed adjacent to said annular base wall, a second end opposite to said first end, and a clamping surface extending from said first end to said second end and

adapted to contact the edge of the wafer, the radial distance between said clamping surface of each of said second spacing pads and the axis of said annular base wall being gradually increased from said first end to said second end.

3. The wafer clamping ring of claim 2, wherein said wafer confining wall has a connecting end connected to said annular base wall, a free end opposite to said connecting end, and an inner surface extending from said connecting end to said free end, each of said second spacing pads protruding radially and inwardly from said inner surface, the radial distance between said inner surface and the axis of said annular base wall being gradually increased from said connecting end to said free end.

4. The wafer clamping ring of claim 1, wherein each of said second spacing pads has an end that meets an end of a respective one of said first spacing pads.

5. The wafer clamping ring of claim 1, wherein said second spacing pads and said first spacing pads are alternately disposed around the axis of said annular base wall.

6. The wafer clamping ring of claim 5, wherein said second spacing pads are equiangularly spaced apart from each other around the axis.

7. The wafer clamping ring of claim 1, wherein said clamping part of said annular base wall has a plurality

of tongues protruding radially inward from said inner edge, each of said first spacing pads having a portion extending to a respective one of said tongues.

8. The wafer clamping ring of claim 1, wherein said first spacing pads are equiangularly spaced apart from each other around the axis.

9. The wafer clamping ring of claim 1, wherein said wafer confining wall is circular in shape.

10. The wafer clamping ring of claim 1, further comprising a circular positioning wall extending axially from said annular base wall at a position between said wafer confining wall and said outer edge and formed with a plurality of screw holes for fastening the wafer clamping ring to the wafer pedestal.