

SUBSTRATE HOLDING APPARATUS

FIELD OF THE INVENTION

The present invention belongs to the technical field of integrated circuit manufacturing, and in particular relates to a substrate holding apparatus.

BACKGROUND

In the manufacturing process of semiconductor integrated circuits, the chemical electroplating process of substrates is an essential process for high-quality integrated circuits. In the chemical electroplating process, to achieve high-quality substrate electroplating, it is first necessary to ensure that no bubbles remain on the electroplating surface of a substrate after the substrate enters an electroplating solution. Once bubbles remain on the electroplating surface of the substrate, many problems will be caused. Areas on the electroplated surface of the substrate where bubbles are present are not exposed to the electroplating solution, and no electroplating will occur in these areas. The resulting electroplating defects may manifest as non-plated areas or regions with reduced plating thickness where bubbles are present, depending on the duration of bubble retention on the substrate and the length of time the bubbles remaining in the areas. In an inverted configuration (with the electroplating surface of the substrate facing downward), buoyancy tends to pull the bubbles upward onto the electroplating surface of the substrate. It is difficult to remove the bubbles from the substrate surface because no relevant mechanism is provided in an electroplating chamber that can drive the bubbles to the edge of the substrate, and the edge of the substrate constitutes the only path for the bubbles to leave the substrate surface. Therefore, when the substrate holding apparatus lowers the substrate into the electroplating solution, the substrate is usually controlled to enter the electroplating solution at an inclined angle while rotating, and then the substrate is adjusted to a horizontal angle (parallel to the surface of the electroplating solution), with the inclined angle of the substrate serving as a means to allow bubbles to escape and prevent bubbles from being trapped on the electroplating surface of the substrate. When the substrate holding apparatus holds the substrate and makes the substrate contact the electroplating solution at an inclined angle, the electroplating solution is likely to enter the substrate holding apparatus through the gap between the pressure plate and the cup of the substrate holding apparatus, coming into

contact with the conductive area of the substrate and resulting in a voltage rise during the electroplating process.

SUMMARY

To prevent the electroplating solution from entering the substrate holding apparatus through the gap between the peripheral side of the pressure plate and the upper end surface of the cup when the substrate holding apparatus secures and immerses the substrate into the electroplating solution, which can otherwise affect the electroplating quality, the present invention provides a substrate holding apparatus, comprising:

a cup, configured to carry a substrate;

a pressure plate, configured to press against the back surface of the substrate to secure the substrate relative to the cup, for holding the substrate;

a pressure plate driving device, connected to the pressure plate, configured to drive the pressure plate to descend or ascend, so that the pressure plate presses against the back surface of the substrate to clamp the substrate, or the pressure plate leaves the back surface of the substrate;

a sealing member, arranged on the pressure plate, including a fixing portion configured to secure the sealing member on the pressure plate and a first sealing portion protruding downward from the fixing portion, wherein the cross-sectional shape of the first sealing portion is the same as the cross-sectional shape of the gap between the peripheral side of the pressure plate and the cup when the pressure plate abuts against the cup, and the first sealing portion abuts against the upper end surface of the cup when pressed by the pressure plate, so as to define a sealing area.

According to a specific embodiment of the present application, the sealing member is an elastomer.

According to a specific embodiment of the present application, the sealing member further includes a second sealing portion extending downward and outward from the outer edge of the fixing portion.

According to a specific embodiment of the present application, the lower end surface of the second sealing portion is lower than the lower end surface of the first sealing portion, and the second sealing portion abuts against the upper end surface of the cup when pressed by the pressure plate, so as to define a sealing area.

According to a specific embodiment of the present application, when the second sealing portion abuts against the upper end surface of the cup, a part of the second sealing portion is pressed to a horizontal state, and the end part of the second sealing portion is substantially flush with the edge of the cup.

According to a specific embodiment of the present application, the sealing member further includes a third sealing portion formed by protruding downward from the lower end surface of the sealing member, and the third sealing portion is located between the first sealing portion and the second sealing portion.

According to a specific embodiment of the present application, the lower end surface of the third sealing portion is lower than the lower end surface of the first sealing portion.

According to a specific embodiment of the present application, the sealing member is arranged on the peripheral side of the pressure plate.

According to a specific embodiment of the present application, the fixing portion includes a limiting groove arranged on the inner side wall of the fixing portion, a limiting protrusion is arranged on the outer side wall of the pressure plate, and the limiting groove is configured to mate with the limiting protrusion to secure the sealing member to the peripheral side of the pressure plate.

According to a specific embodiment of the present application, the top end of the fixing portion is clamped in a fixing groove formed on the lower end surface of the pressure plate.

According to a specific embodiment of the present application, the pressure plate further includes a protective cover formed on the edge of the pressure plate and surrounding the outer side of the pressure plate driving device.

According to a specific embodiment of the present application, the sealing member is arranged on the protective cover at the area corresponding to the upper end surface of the cup.

According to a specific embodiment of the present application, a through hole is formed on the side wall of the pressure plate.

According to a specific embodiment of the present application, a protrusion extending downward is arranged on the lower surface of the pressure plate.

The substrate holding apparatus of the present invention achieves an improved sealing effect and protects a substrate by providing a sealing member on the peripheral side of a pressure plate, and the shape of the sealing member is the same as the cross-sectional shape of the gap between the peripheral side of the pressure plate and the upper area of a cup, such that when the pressure plate abuts against the cup, the gap between the peripheral side of the pressure plate and the upper end surface of the cup is blocked to form a fluid seal, thereby improving the electroplating quality of the substrate.

Meanwhile, multiple seals are arranged for the sealing member. When the pressure plate moves from a top plate toward the cup, a second sealing portion first closely contacts the upper end surface of the cup to achieve the first seal; when the pressure plate continues to move toward the cup, the lower end surface of a third sealing portion closely contacts the upper end of the cup to achieve the second seal; as the pressure plate continues to move toward the cup, the first sealing portion contacts the upper end surface of the cup and is pressed in the gap at the same time to achieve the third seal; when the pressure plate abuts against the cup, the vertical force from the pressure plate further compresses the sealing member to form a fluid seal. Under the combined action of the first sealing portion, the second sealing portion, and the third sealing portion of the sealing member, multiple seals are formed, which simultaneously achieves the fluid sealing effect in different directions, in different forms, and at different action positions, further ensuring the sealing effect.

The third sealing portion and the second sealing portion are located on the outer peripheral side relative to the gap, defining a larger sealing area. Meanwhile, the third

sealing portion and the second sealing portion contact the upper end surface of the cup before the first sealing portion, which can ensure an improved sealing effect.

Other features and advantages of the present invention will be set forth in the following specification, and some of the features and advantages will become apparent from the specification, or be understood by implementing the present invention. The objectives and other advantages of the present invention can be realized and obtained through the structures indicated in the specification and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

To further clarify the embodiments of the present invention or the technical solutions in the prior art, the following will briefly introduce the accompanying drawings needed in the description of the embodiments or the prior art. Obviously, the accompanying drawings in the following description are some embodiments of the present invention, and for those of ordinary skill in the art, other accompanying drawings can be obtained according to these accompanying drawings without making creative efforts.

FIG. 1 is a schematic structure diagram of a substrate holding apparatus according to an embodiment of the present invention;

FIG. 2 is a partial schematic structure diagram of a sealing member according to an embodiment of the present invention;

FIG. 3 is a schematic structure diagram of the relative position between a sealing member and a pressure plate according to an embodiment of the present invention;

FIG. 4 is a schematic structure diagram of the assembly of a sealing member and a pressure plate according to an embodiment of the present invention;

FIG. 5 is a schematic structure diagram of the state of a sealing member when a pressure plate abuts against a cup according to an embodiment of the present invention;

FIG. 6 is another schematic structure diagram of a substrate holding apparatus according to an embodiment of the present invention;

FIG. 7 is a three-dimensional schematic structure diagram of a pressure plate provided with a through hole according to an embodiment of the present invention;

FIG. 8 is a bottom schematic diagram of a pressure plate according to an embodiment of the present invention; and

FIG. 9 is a schematic structure diagram of a protrusion according to an embodiment of the present invention.

PREFERRED EMBODIMENTS OF THE INVENTION

To further clarify the objectives, technical solutions, and advantages of the embodiments of the present invention, the technical solutions in the embodiments of the present invention will be clearly and completely described below with reference to the accompanying drawings in the embodiments of the present invention. Obviously, the described embodiments are part of the embodiments of the present invention, rather than all the embodiments. Based on the embodiments of the present invention, all other embodiments obtained by those of ordinary skill in the art without making creative efforts shall fall within the protection scope of the present invention.

The present invention provides a substrate holding apparatus, as shown in FIG. 1. FIG. 1 is a schematic structure diagram of a substrate holding apparatus 100 according to an embodiment of the present invention. The substrate holding apparatus 100 comprises a cup 101, a pressure plate 102, a pressure plate driving device 106, and a sealing member 107. The cup 101 is configured to carry a substrate 400. The pressure plate 102 is configured to press against the back surface (the upper surface in the figure) of the substrate 400 to secure the substrate 400 relative to the cup 101 for holding the substrate 400. The pressure plate driving device 106 is connected to the pressure plate 102 and drives the pressure plate 102 to descend or ascend, so that the pressure plate 102 presses against the back surface of the substrate 400 to clamp the substrate 400, or the pressure plate 102 leaves the back surface of the substrate 400. The bottom of the cup 101 is wrapped with a sealing lip 105. When the substrate 400 is accommodated in the cup 101 and the pressure plate driving device 106 provides a vertical force between the cup 101 and the pressure plate 102 to secure the substrate 400 in the cup 101 by the pressure plate 102, the substrate 400 abuts against the sealing lip 105 to

form a fluid seal, so that the edge of the substrate 400 is isolated from an electroplating solution. The cup 101 is supported by support rods 103, and the support rods 103 are connected to a top plate 104. For the purpose of discussion, the assembly, including components 101 to 107, is collectively referred to as the substrate holding apparatus 100. However, it should be noted that the concept of the "substrate holding apparatus" generally extends to various combinations and sub-combinations of components that abut against the substrate 400 and allow the movement and positioning of the substrate 400.

As mentioned above, the cup 101 is supported by the support rods 103 and the top plate 104. Generally, the cup 101 is provided with a support member 1011, and the substrate 400 can be placed on the support member 1011. The cup 101 includes an opening, and the electroplating solution can pass through the opening and contact the electroplating surface of the substrate 400. Note that the substrate 400 has a front surface (the lower surface in the figure), and electroplating is performed on the front surface. The outer periphery of the substrate 400 is placed on the support member 1011 of the cup 101, and the pressure plate 102 presses down on the back surface of the substrate 400 to hold the substrate 400 between the pressure plate 102 and the cup 101.

To load the substrate 400 into the substrate holding apparatus 100, the pressure plate 102 is lifted from the depicted position via the pressure plate driving device 106, a certain accommodating space is created between the cup 101 and the pressure plate 102, and the substrate 400 can be inserted into the accommodating space, thereby being loaded into the cup 101. Then, as depicted, the pressure plate 102 is lowered to abut against the outer periphery of the cup 101 while the lower end surface of the pressure plate 102 abuts against the substrate 400. The pressure plate driving device 106 transmits a vertical force for pressing the pressure plate 102 against the substrate 400. The transmitted force is indicated by the arrow in FIG. 1.

In one embodiment, the sealing lip 105 arranged at the bottom of the cup 101 is an elastomer with a certain deformation capacity. When the pressure plate 102 is lowered to abut against the cup 101, and the pressure plate 102 and the cup 101 cooperate to clamp the substrate 400, the sealing lip 105 is elastically deformed under the extrusion of the substrate 400, and the sealing lip 105 closely contacts the substrate 400 to form a seal. The sealing lip 105 can prevent the electroplating solution from

contacting the back surface of the substrate 400, thereby ensuring the electroplating quality.

In one embodiment, the sealing member 107 is an elastomer, and the preparation material of the sealing member 107 in the embodiment of the present invention is selected from fluoroelastomer (e.g., perfluoroelastomer or fluoroelastomer containing fluorine), silicone rubber, and the like. Specifically, the sealing member 107 can be made of different materials according to different process applications. For example, a semi-fluorinated rubber with improved sealing performance and low hardness (such as Viton fluoroelastomer) can be used in copper electroplating, while a perfluoroelastomer can be used in high-temperature electroplating processes such as nickel or gold electroplating. In other embodiments, the sealing member 107 may be treated with a hydrophobic process so as to have hydrophobicity, thereby reducing adhesion of the electroplating solution on the surface of the sealing member 107. The sealing member 107 may be treated with a hydrophobic process in various manners, for example: (1) the sealing member 107 is made of a hydrophobic material (e.g., Teflon); (2) a hydrophobic coating (e.g., Teflon coating) is applied to the surface of the sealing member 107; and (3) a hydrophobic material (e.g., Teflon) is doped in the sealing member 107.

As shown in FIG. 1, when the edge of the pressure plate 102 abuts against the upper area of the cup 101, the sealing member 107 is located on the peripheral side of the pressure plate 102 and forms a seal with the upper end surface of the cup 101 to protect the back surface of the substrate 400, thereby avoiding any electroplating solution that may enter the interior of the substrate holding apparatus 100 from a gap 200. Herein, the gap 200 is the space between the upper end surface of the cup 101 and the peripheral side of the pressure plate 102 when the pressure plate 102 abuts against the upper end surface area of the cup 101.

The sealing member 107 is an overall three-dimensional annular structure, and more details of the sealing member 107 will be elaborated below. FIG. 2 is a partial schematic structure diagram of a sealing member according to an embodiment of the present invention; FIG. 3 is a schematic structure diagram of the relative position between a sealing member and a pressure plate according to an embodiment of the present invention. As shown in FIGS. 2 and 3, the sealing member 107 includes a

fixing portion 1071 and a first sealing portion 1072. The fixing portion 1071 is the main body of the sealing member 107 and is secured to the peripheral side of the pressure plate 102, and the first sealing portion 1072 protrudes downward from the fixing portion 1071. The cross-sectional shape of the first sealing portion 1072 is the same as the cross-sectional shape of the gap 200. When the pressure plate 102 abuts against the cup 101 and the edge of the pressure plate 102 abuts against the upper area of the cup 101, the gap 200 is formed between the peripheral side of the pressure plate 102 and the upper area of the cup 101. For example, as shown in FIG. 3, when the cross-sectional shape of the gap 200 is a triangle, the shape of the first sealing portion 1072 is approximately a prism, and the cross-sectional shape of the first sealing portion 1072 is a triangle corresponding to the cross-sectional shape of the gap 200. It should be understood that when the cross-sectional shape of the gap 200 is a rectangle, the first sealing portion 1072 is a cuboid with a rectangular cross-sectional shape. The cross-sectional shape of the gap 200 can be designed according to actual requirements. Therefore, the shape of the first sealing portion 1072 can be any shape corresponding to the gap 200. The first sealing portion 1072 abuts against the upper end surface of the cup 101 to block the gap 200 when pressed by the pressure plate 102, so as to define a sealing area, and the electroplating solution is substantially excluded from the sealing area during the electroplating process. Specifically, as shown in FIGS. 2 and 3, the fixing portion 1071 includes a limiting groove 109A arranged on the inner side wall of the fixing portion 1071, the outer side wall of the pressure plate 102 is provided with a limiting protrusion 109B corresponding to the limiting groove 109A, and the limiting groove 109A is configured to mate with the limiting protrusion 109B to limit and secure the sealing member 107 to the peripheral side of the pressure plate 102. As shown in FIG. 1, when the pressure plate 102 is driven by the vertical force provided by the pressure plate driving device 106 to abut against the cup 101, the vertical force from the pressure plate 102 compresses the sealing member 107 to form a fluid seal. The cross-sectional shape of the first sealing portion 1072 of the sealing member 107 corresponds to the cross-sectional shape of the gap 200 between the peripheral side of the pressure plate 102 and the upper end surface of the cup 101. Therefore, when the pressure plate 102 abuts against the cup 101, the first sealing portion 1072 is tightly pressed in the gap 200 to form a fluid seal, preventing the electroplating solution from entering the interior of the substrate holding apparatus 100 through the gap 200 between the pressure plate 102 and the cup 101, which would otherwise compromise

the electroplating quality.

Furthermore, as shown in FIG. 4, the top end of the fixing portion 1071 is clamped in a fixing groove 109C formed on the lower end surface of the pressure plate 102. The lateral fixation of the sealing member 107 is realized by clamping the fixing portion 1071 in the fixing groove 109C; the vertical fixation of the sealing member 107 is realized by the mating arrangement of the limiting groove 109A and the limiting protrusion 109B, thereby ensuring the stability of the sealing member 107 during installation.

In another embodiment, the sealing member 107 further includes a second sealing portion 1073 extending downward and outward from the outer edge of the fixing portion 1071. As shown in FIGS. 2 and 4, the downward and outward extension of the second sealing portion 1073 from the outer edge of the fixing portion 1071 is embodied as an inclined surface design. Furthermore, the lower end surface of the second sealing portion 1073 is lower than the lower end surface of the first sealing portion 1072, that is, when the pressure plate 102 moves from the top plate 104 toward the cup 101, the second sealing portion 1073 contacts the cup 101 first. This design enables the second sealing portion 1073 to have a blocking function while having a sealing function. When the electroplating solution splashes onto the upper end surface of the cup 101, the electroplating solution directly falls onto the upper end surface of the flattened second sealing portion 1073. When the pressure plate driving device 106 drives the pressure plate 102 to move toward the top plate 104, the second sealing portion 1073 restores to an inclined surface shape, thereby guiding the electroplating solution falling on the second sealing portion 1073 to the outer side of the cup 101, preventing the splashed electroplating solution from remaining on the upper end surface of the cup 101, and thus eliminating the possibility of the electroplating solution flowing into the interior of the cup 101. Secondly, the second sealing portion 1073 is an elastomer with an inclined surface design. When the pressure plate 102 abuts against the cup 101, the vertical force from the pressure plate 102 compresses the sealing member 107, so that the second sealing portion 1073 is arranged horizontally to closely fit the upper end surface of the cup 101 to form a fluid seal. A secondary seal is formed under the combined action of the first sealing portion 1072 and the second sealing portion 1073 of the sealing member 107, so as to achieve an improved sealing effect.

Furthermore, to further ensure that when the pressure plate driving device 106 drives the pressure plate 102 to move toward the top plate 104, the electroplating solution falling on the second sealing portion 1073 is guided to the outer side of the cup 101, it is required that the end part of the second sealing portion 1073 pressed to a horizontal state is substantially flush with the edge of the cup 101. It should be understood that in some cases, the horizontal distance between the end part of the second sealing portion 1073 pressed to a horizontal state and the edge of the cup 101 can be about 0.01 to 5 mm.

As shown in FIG. 2, in another embodiment, the sealing member 107 further includes a third sealing portion 1074 formed by protruding downward from the lower end surface of the sealing member 107 (more specifically, the fixing portion 1071). The third sealing portion 1074 is located between the first sealing portion 1072 and the second sealing portion 1073. Furthermore, the lower end surface of the third sealing portion 1074 is lower than the lower end surface of the first sealing portion 1072. When the pressure plate 102 moves from the top plate 104 toward the cup 101, the second sealing portion 1073 first closely contacts the upper end surface of the cup 101 to achieve the first seal. When the pressure plate 102 continues to move toward the cup 101, the lower end surface of the third sealing portion 1074 immediately closely contacts the upper end of the cup 101 to achieve the second seal. As the pressure plate 102 continues to move toward the cup 101, the first sealing portion 1072 contacts the upper end surface of the cup 101 and is pressed in the gap at the same time to achieve the third seal. When the pressure plate 102 abuts against the cup 101, the vertical force from the pressure plate 102 further compresses the sealing member 107 to form a fluid seal. When the pressure plate driving device 106 drives the pressure plate 102 to fully abut against the cup 101, and the first sealing portion 1072, the second sealing portion 1073, and the third sealing portion 1074 all form a seal with the upper end surface of the cup 101, as shown in FIG. 5, which is a schematic structure diagram of the state of a sealing member when a pressure plate abuts against a cup according to an embodiment of the present invention. Under the combined action of the first sealing portion 1072, the second sealing portion 1073, and the third sealing portion 1074 of the sealing member 107, multiple seals are formed, which simultaneously achieves the fluid sealing effect in different directions, in different forms, and at different action positions, further ensuring the sealing effect. The third sealing portion 1074 and the

second sealing portion 1073 are located on the outer peripheral side relative to the gap 200, defining a larger sealing area. Meanwhile, the third sealing portion 1074 and the second sealing portion 1073 contact the upper end surface of the cup 101 before the first sealing portion 1072, which can ensure an improved sealing effect.

Furthermore, the number of the third sealing portions 1074 is two or more. The sealing member 107 is an elastomer with a certain elasticity, and can be slightly deformed under the action of the vertical pressure of the pressure plate 102, so that multiple sealing portions of the sealing member 107 simultaneously achieve fluid sealing with the upper end surface of the cup 101, thereby realizing multi-stage sealing between the cup 101 and the pressure plate 102 and achieving an improved sealing effect.

Furthermore, as shown in FIG. 6, the pressure plate 102 further includes a protective cover 500 formed on the edge of the pressure plate 102 and surrounding the outer side of the pressure plate driving device 106. The protective cover 500 can be integrally manufactured with the pressure plate 102, or can be arranged independently relative to the pressure plate 102, and the pressure plate 102 and the protective cover 500 are fixedly connected by a fixing member. For example, in this embodiment, the protective cover 500 is fixedly connected to the pressure plate 102 by bolts. The protective cover 500 can play a role in protecting the pressure plate 102 and the pressure plate driving device 106 connected to the pressure plate 102, preventing the electroplating solution from splashing onto the upper end surface of the pressure plate 102, thereby preventing the electroplating solution from corroding the pressure plate 102 and the pressure plate driving device 106 connected to the pressure plate 102 under the long-term process environment, which affects the equipment safety and service life. In the depicted embodiment, the protective cover 500 is in a straight cylindrical shape, sleeved on the outer side of the pressure plate 102, and fixedly connected to the pressure plate 102 by bolts. When the pressure plate driving device 106 drives the pressure plate 102 to move up and down, the protective cover 500 moves up and down along with the pressure plate 102.

Furthermore, to prevent the protective cover 500 from affecting the normal operation of the substrate holding apparatus 100 itself, a certain distance is set between the inner side wall of the protective cover 500 and the edge of the top plate 104, for

example, the distance between the inner side wall of the protective cover 500 and the edge of the top plate 104 is 2 mm.

Furthermore, as shown in FIGS. 1 and 7, at least one through hole 1021 is formed on the side wall of the pressure plate 102. When the pressure plate 102 abuts against the cup 101, the sealing lip 105 arranged at the bottom of the cup 101 and the sealing member 107 arranged between the pressure plate 102 and the cup 101 simultaneously achieve a fluid sealing effect, and a negative pressure environment (compared with the pressure in the electroplating apparatus during the electroplating process) is formed in a space 300 at this time. When the pressure plate 102 needs to be separated from the substrate 400, the substrate 400 is easily sucked by the pressure plate 102, which is not conducive to the separation of the pressure plate 102 from the substrate 400. Therefore, after the through hole 1021 is provided, the gas pressure in the space 300 can be kept balanced with the gas pressure of the electroplating environment in the external electroplating apparatus, so as to facilitate the separation of the pressure plate 102 from the substrate 400.

Furthermore, as shown in FIGS. 8 and 9, the lower surface of the pressure plate 102 is further provided with protrusions 1022 protruding toward the substrate 400. When the pressure plate 102 contacts the substrate 400, only the protrusions 1022 on the lower surface of the pressure plate 102 contact the back surface of the substrate 400, while the rest of the lower surface of the pressure plate 102 does not contact the substrate 400. This design can reduce the contact area between the pressure plate 102 and the substrate 400 on the one hand, reducing scratches and contamination on the back surface of the substrate 400, and on the other hand, facilitating the equalization of the pressure on the back surface of the substrate 400 and the environmental pressure to facilitate the separation of the substrate 400 from the pressure plate 102 during unloading. It is found in the process that the design of the protrusions 1022 can well reduce scratches and pollution on the back surface of the substrate 400, but during the unloading of the substrate 400, the protrusions 1022 still occasionally adhere to the substrate 400, resulting in an unsatisfactory separation effect between the substrate 400 and the pressure plate 102. In response to this phenomenon, the researchers set grooves 1023 on the lower surface of the protrusions 1022 to further reduce the contact area between the protrusions 1022 and the substrate 400, further reducing the possibility of

scratches and contamination on the back surface of the substrate 400 while further facilitating the separation of the substrate 400 from the pressure plate 102 during unloading. It is worth noting that when the grooves 1023 are set, the grooves 1023 should be arranged symmetrically about the center of the protrusions 1022 to ensure that the contact between the protrusions 1022 and the substrate 400 is more stable and uniform.

In another embodiment, as shown in FIG. 6, the sealing member 107 is arranged on the protective cover 500. When the sealing member 107 is arranged on the protective cover 500, the arrangement manner is the same as the arrangement manner arranged on the pressure plate 102, which will not be repeated here.

Although the present invention has been described in detail with reference to the foregoing embodiments, those of ordinary skill in the art should understand that: Modifications can still be made to the technical solutions recorded in the foregoing embodiments, or equivalent substitutions can be made to some of the technical features; and such modifications or substitutions do not make the essence of the corresponding technical solutions depart from the spirit and scope of the technical solutions of the embodiments of the present invention.

What is claimed is:

1. A substrate holding apparatus, comprising:

a cup, configured to carry a substrate;

a pressure plate, configured to press against the back surface of the substrate to secure the substrate relative to the cup, for holding the substrate;

a pressure plate driving device, connected to the pressure plate, configured to drive the pressure plate to descend or ascend, so that the pressure plate presses against the back surface of the substrate to clamp the substrate, or the pressure plate leaves the back surface of the substrate;

a sealing member, arranged on the pressure plate, including a fixing portion secured to the pressure plate and a first sealing portion protruding downward from the fixing portion;

wherein the cross-sectional shape of the first sealing portion is the same as the cross-sectional shape of the gap between the peripheral side of the pressure plate and the cup when the pressure plate abuts against the cup, and the first sealing portion abuts against the upper end surface of the cup when pressed by the pressure plate, so as to define a sealing area.

2. The substrate holding apparatus according to claim 1, wherein the sealing member is an elastomer.

3. The substrate holding apparatus according to claim 2, wherein the sealing member further includes a second sealing portion extending downward and outward from the outer edge of the fixing portion.

4. The substrate holding apparatus according to claim 3, wherein, before the pressure plate abuts against the cup, the lower end surface of the second sealing portion is lower than the lower end surface of the first sealing portion, and the second sealing portion abuts against the upper end surface of the cup when pressed by the pressure plate, so as to define a sealing area.

5. The substrate holding apparatus according to claim 4, wherein, when the second sealing portion abuts against the upper end surface of the cup, a part of the second sealing portion is pressed to a horizontal state, and the end part of the second sealing portion is substantially flush with the edge of the cup.

6. The substrate holding apparatus according to claim 3, wherein the sealing member further includes a third sealing portion formed by protruding downward from the lower end surface of the fixing portion, and the third sealing portion is located between the first sealing portion and the second sealing portion.

7. The substrate holding apparatus according to claim 6, wherein, before the pressure plate abuts against the cup, the lower end surface of the third sealing portion is lower than the lower end surface of the first sealing portion.

8. The substrate holding apparatus according to claim 1, wherein the sealing member is arranged on the peripheral side of the pressure plate.

9. The substrate holding apparatus according to claim 8, wherein the fixing portion includes a limiting groove arranged on the inner side wall of the fixing portion, a limiting protrusion is arranged on the outer side wall of the pressure plate, and the limiting groove is configured to mate with the limiting protrusion to secure the fixing portion to the peripheral side of the pressure plate.

10. The substrate holding apparatus according to claim 9, wherein the top end of the fixing portion is clamped in a fixing groove formed on the lower end surface of the pressure plate.

11. The substrate holding apparatus according to claim 1, wherein the pressure plate further includes a protective cover formed on the edge of the pressure plate and surrounding the outer side of the pressure plate driving device.

12. The substrate holding apparatus according to claim 11, wherein the sealing member is arranged on the protective cover at the area corresponding to the upper end surface of the cup.

13. The substrate holding apparatus according to claim 1, wherein a through hole

is formed on the side wall of the pressure plate.

14. The substrate holding apparatus according to claim 1, wherein a protrusion extending downward is arranged on the lower surface of the pressure plate.