

POSITIONING MECHANISM, AND PROCESSING DEVICE AND POSITIONING METHOD THEREFOR

5 **[0001]** The present application claims the priority to Chinese Patent Application No. 202311751749.5, titled "POSITIONING MECHANISM, AND PROCESSING DEVICE AND POSITIONING METHOD THEREFOR", filed on December 18, 2023 with the China National Intellectual Property Administration, which is incorporated herein by reference in its entirety.

FIELD

[0002] The present application relates to the technical field of semiconductor manufacturing equipment, and in particular to a positioning mechanism, a processing device, and a positioning method therefor.

BACKGROUND

[0003] Processing devices such as wafer dicing machines and wafer breakers are frequently used in the semiconductor manufacturing process. These processing devices typically have a positioning mechanism to position wafers or other objects before processing. Currently, the conventional positioning mechanism includes a support frame and a motor. The support frame is provided with a slide rail, and two sets of clamping arms that can move in opposite directions are slidably connected to the sliding rail. An output end of the motor is connected with a transmission belt, and the two sets of clamping arms are connected to the driving belt. In this way, wafers or other objects can be mechanically positioned by the two sets of clamping arms. This positioning method requires a driving device, such as the motor, resulting in high costs and a large footprint.

SUMMARY

[0004] A first object of the present application is to provide a positioning mechanism with a simplified structure, thereby eliminating the need for electrical devices during positioning,

and reducing costs as well as space occupancy.

[0005] A second object of the present application is to provide a processing device including the positioning mechanism described above and a positioning method for the processing device.

5 **[0006]** To achieve the foregoing objects, the following technical solutions are provided according to the present application.

[0007] A positioning mechanism is provided according to a first aspect of the present application, including a positioning main body and multiple elastic positioning units. The positioning main body is provided with an accommodation space for accommodating a
10 to-be-positioned object. The accommodation space is provided with an access opening that is formed at a side of the positioning main body, allowing entry and exit of the to-be-positioned object. The multiple elastic positioning units are symmetrically arranged in the accommodation space on both sides with respect to a direction in which the to-be-positioned object enters and exits the accommodation space through the access opening. Each of the
15 elastic positioning units includes a sliding part and an elastic part. The sliding part is arranged in the accommodation space and is slidable back and forth, and the elastic part is disposed between the sliding part and the positioning main body. The elastic parts are configured to apply forces on the respective sliding parts to move the sliding parts of the symmetrically arranged elastic positioning units towards each other, so as to clamp the to-be-positioned
20 object and adjust a position of the to-be-positioned object.

[0008] In a possible implementation, the sliding part includes a guiding module and a positioning module. The guiding module is fixedly arranged on the positioning main body in the accommodation space, and the positioning module is in sliding fit with the guiding module. The positioning module is configured to be in contact with the to-be-positioned
25 object to cooperate with the to-be-positioned object, and the elastic part is arranged on the guiding module and located between the positioning module and the positioning main body.

[0009] In a possible implementation, the positioning module includes a support block and a positioning bearing. The support block is in sliding fit with the guiding module, the positioning bearing is rotatably arranged on the support block, and an outer circumferential
30 surface of the positioning bearing is configured to be in contact with the to-be-positioned object to cooperate with the to-be-positioned object.

[0010] In a possible implementation, the positioning bearing is arranged on an upper surface or a lower surface of the support block. An inner ring of the positioning bearing is fixedly connected to the support block. A surface of the inner ring of the positioning bearing facing the support block protrudes beyond an outer ring of the positioning bearing, and/or a boss is provided on a surface of the support block facing the positioning bearing, so as to form a gap between the outer ring of the positioning bearing and the support block.

[0011] In a possible implementation, the guiding module is a guide rod, which is fixedly arranged on the positioning main body. The support block is provided with a guide hole that runs through the support block, and the guide rod passes through the guide hole of the positioning module to be in sliding fit with the support block.

[0012] In a possible implementation, the elastic part is a compression spring. The compression spring is sleeved over the guide rod, and both ends of the compression spring respectively abut against the positioning main body and the support block.

[0013] In a possible implementation, the positioning main body includes two positioning bases. Each of the positioning bases is provided with a slide groove, and an end of each of the positioning bases is provided with an opening in communication with the slide groove. Groove openings of the slide grooves of the two positioning bases are arranged facing each other to form the accommodation space, and the openings of the two positioning bases form the access opening. The elastic positioning units are arranged in the slide grooves.

[0014] In a possible implementation, an inclined guide surface is provided between the opening of the positioning base and the slide groove to facilitate the entry of the to-be-positioned object into the slide groove.

[0015] In a possible implementation, the positioning main body further includes a positioning platform, and a position of at least one of the two positioning bases on the positioning platform is adjustable, so that the two positioning bases are allowed to move close to or away from each other.

[0016] In a possible implementation, the positioning bases are detachably connected to the positioning platform via threaded fasteners. One of the at least one of the two positioning bases and the positioning platform is provided with an elongated hole, and the other one of the at least one of the two positioning bases and the positioning platform is provided with a

mounting hole. A threaded fastener is in fit with the elongated hole and the mounting hole to fix the at least one of the two positioning bases on the positioning platform at an adjustable position.

[0017] In a possible implementation, a surface light source is provided on the positioning platform between the two positioning bases.

[0018] In a possible implementation, a limiting protrusion is provided at an end, located away from the opening of the positioning base, of at least one of two opposite groove walls of the slide groove. The limiting protrusion protrudes into the slide groove in a direction perpendicular to the direction in which the to-be-positioned object enters and exits the slide groove, and the limiting protrusion is configured to cooperate with the to-be-positioned object to prevent the to-be-positioned object from tilting.

[0019] A processing device is provided according to a second aspect of the present application, including the positioning mechanism according to any one of the above solutions.

[0020] In a possible implementation, the processing device further includes a material picking mechanism for conveying the to-be-positioned object to the positioning mechanism.

[0021] In a possible implementation, the processing device further includes an image acquisition module, and a center of a field of view of the image acquisition module is located at a positioning location of the positioning mechanism.

[0022] A positioning method for the processing device described above is provided according to a third aspect of the present application. The processing device further includes a material picking mechanism for conveying the to-be-positioned object to the positioning mechanism, and the positioning method includes the following steps:

[0023] picking up the to-be-positioned object and conveying the to-be-positioned object to a positioning preparation position close to the positioning mechanism, where the to-be-positioned object is aligned with the access opening of the positioning mechanism at the positioning preparation position;

[0024] conveying the to-be-positioned object into the accommodation space of the positioning mechanism until the to-be-positioned object reaches a final positioning position, where the to-be-positioned object applies forces on the elastic positioning units of the positioning mechanism, causing the sliding parts of the symmetrically arranged elastic

positioning units to move away from each other; and

[0025] releasing the to-be-positioned object, so that the to-be-positioned object is automatically centered and positioned at a middle position between the elastic positioning units on the both sides under actions of the elastic positioning units symmetrically arranged on the both sides.

[0026] As can be seen from the above technical solutions, a positioning mechanism is disclosed according to the present application. The positioning mechanism includes a positioning main body and elastic positioning units. The positioning main body has an accommodation space for accommodating a to-be-positioned object, and the accommodation space has an access opening formed on a side of the positioning main body for entry and exit of the to-be-positioned object. Multiple elastic positioning units are symmetrically arranged in the accommodation space on both sides with respect to a direction in which the to-be-positioned object enters and exits the accommodation space through the access opening. Each of the elastic positioning units includes a sliding part and an elastic part. The sliding part is arranged in the accommodation space and is slidable back and forth, and the elastic part is disposed between the sliding part and the positioning main body. The elastic parts are configured to apply forces on the respective sliding parts, causing the sliding parts of the symmetrically arranged elastic positioning units to move towards each other to clamp the to-be-positioned object.

[0027] In actual applications, when the to-be-positioned object, such as a wafer, is conveyed into the accommodation space through the access opening, the elastic positioning units on both sides are subjected to forces. Since the to-be-positioned object may be offset towards one side, the elastic potential energy of the elastic positioning unit on this side is greater than that of the elastic positioning unit on the other side. After the to-be-positioned object is moved in place, it is released. The elastic positioning units on the both sides are also released. Due to the symmetric arrangement of the elastic positioning units on the both sides, after the external force is removed, the elastic positioning units on the both sides will reach equilibrium after oscillating for a certain period of time, and the to-be-positioned object will be automatically centered, thereby achieving the centered positioning function. It can be seen that the above-mentioned positioning mechanism does not require the use of electrical devices such as motors. Instead, the to-be-positioned object can be centered by the symmetric elastic forces of

the elastic positioning units on the both sides. Since motors and their accessories are eliminated, the above-mentioned positioning mechanism has a simpler structure and a lower cost, and occupies less space. Particularly, when multiple elastic positioning units are arranged on each side, the positioning precision can also be improved, avoiding the influence of the precision of the electrical devices such as motors on the positioning precision.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] In order to more clearly illustrate embodiments of the present application or the technical solutions in the related art, drawings referred to in the description of the embodiments or the related art are briefly described hereinafter. Apparently, the drawings in the following description are only some examples of the present application, and other drawings may be obtained by those skilled in the art based on these drawings without any creative efforts.

[0029] FIG. 1 is a schematic structural view of a positioning mechanism according to an embodiment of the present application;

[0030] FIG. 2 is a front view of the positioning mechanism according to the embodiment of the present application;

[0031] FIG. 3 is a side view of the positioning mechanism according to the embodiment of the present application;

[0032] FIG. 4 is cross-sectional view taken along a line A-A in FIG. 3;

[0033] FIG. 5 is a partially enlarged schematic view of a part B in FIG. 4;

[0034] FIG. 6 is a schematic structural view of an elastic positioning unit of the positioning mechanism according to an embodiment of the present application; and

[0035] FIG. 7 is a cross-sectional view of the elastic positioning unit of the positioning mechanism according to an embodiment of the present application.

[0036] Reference numerals in the drawings are as follows:

1	positioning main body;	110	positioning platform;
120	positioning base;	121	bottom plate;
122	cover plate;	123	side plate;

	130	inclined guide surface;	140	elongated hole;
	150	slide groove;	160	limiting protrusion;
	170	opening;	2	elastic positioning unit;
	210	guide rod;	220	positioning module;
5	221	support block;	222	positioning bearing;
	223	boss;	230	compression spring;
3		to-be-positioned object.		

DETAILED DESCRIPTION OF THE EMBODIMENTS

10 **[0037]** According to an aspect of the present application, a positioning mechanism is provided. The positioning mechanism features a simplified structure, eliminating the need for electrical devices for positioning, and reducing costs as well as space occupancy.

[0038] According to another aspect of the present application, a processing device including the positioning mechanism described above and a positioning method therefor are provided.

15 **[0039]** Hereinafter, technical solutions in the embodiments of the present application are described clearly and completely in conjunction with the drawings in the embodiments of the present application. Apparently, the described embodiments are only some rather than all of the embodiments of the present application. Based on the embodiments of the present application, all other embodiments obtained by those skilled in the art without any creative
20 work fall into the protection scope of the present application.

[0040] It should be understood that if terms such as "system", "device", "unit" and/or "module" are used herein, they are used merely for distinguishing between different assemblies, elements, components, portions or assembly configurations at different levels. These terms may be replaced by other expressions that can realize the same purpose.

25 **[0041]** References are made to FIGS. 1 to 5. FIG. 1 is a schematic structural view of a positioning mechanism according to an embodiment of the present application. FIG. 2 is a front view of the positioning mechanism according to the embodiment of the present application. FIG. 3 is a side view of the positioning mechanism according to the embodiment of the present application. FIG. 4 is cross-sectional view taken along a line A-A in FIG. 3.

FIG. 5 is a partially enlarged schematic view of a part B in FIG. 4.

[0042] In an embodiment of the present application, a positioning mechanism is disclosed. The positioning mechanism includes a positioning main body 1 and multiple elastic positioning units 2.

5 **[0043]** The positioning main body 1 has an accommodation space for accommodating a to-be-positioned object 3. The accommodation space has an access opening, which is formed at a side of the positioning main body 1, allowing the to-be-positioned object 3 to enter and exit. The access opening is slightly larger than a width or diameter of the to-be-positioned object 3. There may be one or two access openings. That is, two access openings may be
10 provided at two ends of the accommodation space respectively, enabling the to-be-positioned object 3 to enter and exit from either end of the accommodation space. The multiple elastic positioning units 2 are symmetrically arranged in the accommodation space on both sides with respect to a direction in which the to-be-positioned object 3 enters and exits the accommodation space through the access opening. Herein, the term "multiple" refers to an
15 even number, i.e., the number of the elastic positioning units 2 may be 2, 4, 6, or the like. When the number of elastic positioning units 2 is small, such as only 2 or 4, contact areas between the elastic positioning units 2 and the to-be-positioned object 3 may be designed to be longer in the direction in which the to-be-positioned object 3 enters and exits through the access opening, so as to provide more stable support for the to-be-positioned object 3.

20 **[0044]** Each of the elastic positioning units 2 includes a sliding part and an elastic part. The sliding part is arranged in the accommodation space and can slide back and forth. In an embodiment, the accommodation space includes a first accommodation space and a second accommodation space. The to-be-positioned object is accommodated in the first accommodation space, and the sliding part is arranged in the accommodation space and can
25 slide back and forth. In another embodiment, the first accommodation space is in communication with the second accommodation space. The sliding part is configured to contact and cooperate with the to-be-positioned object 3. The sliding parts of two symmetrically arranged elastic positioning units 2 are configured to cooperate with each other to clamp the to-be-positioned object 3. Each elastic part is disposed between the sliding part and the positioning main body 1. When the elastic parts apply forces on the sliding parts, the
30 sliding parts of the symmetrically arranged elastic positioning units 2 move towards each

other to clamp the to-be-positioned object 3 and adjust a position of the to-be-positioned object 3.

[0045] Compared with the related art, during application of the positioning mechanism according to an embodiment of the present application, the to-be-positioned object 3, such as a wafer, is conveyed into the accommodation space through the access opening. At this time, the elastic positioning units 2 on the both sides are subjected to forces. Since the to-be-positioned object 3 may be offset towards one side, the elastic potential energy of the elastic positioning unit 2 on this side is greater than that of the elastic positioning unit 2 on the other side. After the to-be-positioned object 3 is moved in place, the to-be-positioned object 3 is released. The elastic positioning units 2 on the both sides are also released. Due to the symmetric arrangement of the elastic positioning units 2 on the both sides, after the external force is removed, the elastic positioning units 2 on the both sides will oscillate for a period of time and then reach equilibrium. The to-be-positioned object 3 will be automatically centered, thereby achieving the centered positioning function.

[0046] It can be seen that the above-mentioned positioning mechanism does not require the use of electrical devices such as motors. Instead, the to-be-positioned object 3 can be centered and positioned by the symmetric elastic forces of the elastic positioning units 2 on the both sides. By eliminating the motor and its accessories, the structure of the above-mentioned positioning mechanism is simpler, the cost is lower, and the space occupancy is smaller. Particularly, when multiple elastic positioning units are provided on each of the both sides, the positioning precision can be improved, avoiding the influence of the precision of the electrical devices such as motors on the positioning precision.

[0047] Preferably, in an embodiment of the present application, in order to ensure that the sliding part can slide in an orderly manner in a preset direction, the sliding part includes a guiding module and a positioning module 220. The guiding module is fixedly arranged on the positioning main body 1 and may be a guiding slide groove, a guide rod 210, a guiding rail, or the like. One positioning module 220 may be in fit with multiple guiding slide grooves, guide rods 210, or guiding rails that are arranged in parallel. The positioning module 220 is in sliding fit with the guiding module and is configured to contact and cooperate with the to-be-positioned object 3. The elastic part is arranged on the guiding module and is located between the positioning module 220 and the positioning main body 1.

[0048] Specifically, as shown in FIG. 6, to reduce friction between the to-be-positioned object 3 and the positioning module 220, in an embodiment of the present application, the positioning module 220 includes a support block 221 and a positioning bearing 222. The support block 221 is in sliding fit with the guiding module, and the positioning bearing 222 is rotatably arranged on the support block 221. An outer circumferential surface of the positioning bearing 222 is configured to contact and cooperate with the to-be-positioned object 3. The positioning bearing 222 may be arranged on an upper surface or a lower surface of the support block 221, or on a surface of the support block 221 facing the elastic positioning unit 2 on the other side. The positioning bearing 222 may be directly arranged outside the support block 221 or partially embedded in the support block 221.

[0049] Preferably, as shown in FIG. 6, in an embodiment of the present application, the positioning bearing 222 is arranged on the upper surface or the lower surface of the support block 221, and an inner ring of the positioning bearing 222 is fixedly connected to the support block 221. To prevent friction between an outer ring of the positioning bearing 222 and the support block 221, which could affect the rotation of the positioning bearing 222, a surface of the inner ring of the positioning bearing 222 facing the support block 221 protrudes beyond a surface of the outer ring of the positioning bearing 222 facing the support block 221, forming a boss 223, thereby creating a gap between the outer ring of the positioning bearing 222 and the support block 221.

[0050] Alternatively, a boss may be arranged on the upper surface of the support block 221 at a position facing the inner ring of the positioning bearing 222 to support the inner ring of the positioning bearing 222, thereby creating a gap between the outer ring of the positioning bearing 222 and the support block 221. Certainly, it is also possible to not only make the surface of the inner ring of the positioning bearing 222 facing the support block 221 protrude beyond the surface of the outer ring of the positioning bearing 222 facing the support block 221 to form a boss, but also provide another boss on the upper surface of the support block 221 at a position facing the inner ring of the positioning bearing 222, and these two bosses abutting against each other to create a gap between the outer ring of the positioning bearing 222 and the support block 221.

[0051] To prevent the positioning bearing 222 from wearing the to-be-positioned object 3, in an embodiment of the present application, an elastic cushion layer is arranged on an outer

circumferential surface of the outer ring of the positioning bearing 222. This elastic cushion layer is made of a flexible or elastic material, such as felt, rubber, silicone, or the like, which is not limited herein.

[0052] To further optimize the above technical solution, in an embodiment of the present application, a limiting ring groove is provided on the outer circumferential surface of the outer ring of the positioning bearing 222 and is configured to cooperate with an edge of the to-be-positioned object 3. The limiting ring groove has a width greater than a thickness of the edge of the to-be-positioned object 3 to limit and support the to-be-positioned object 3 during the positioning process. The limiting ring groove is configured to limit the to-be-positioned object in an axial direction of the positioning bearing 222.

[0053] In an embodiment of the present application, the guiding module is a guide rod 210, which is fixedly arranged on the positioning main body 1. The support block 221 is provided with a guide hole that runs through the support block 221, and the guide rod 210 passes through this guide hole to be in sliding fit with the support block 221. The cross-section of the guide rod 210 may be circular, polygonal, elliptical, or irregular in shape. As shown in FIG. 6, the support block 221 of the positioning module 220 is in fit with the guide rod 210.

[0054] As shown in FIG. 6, in an embodiment of the present application, the elastic part is a compression spring 230, which is sleeved over the guide rod 210. Two ends of the compression spring 230 respectively abut against the positioning main body 1 and the support block 221. Alternatively, the elastic part may be a tension spring or other types of elastic components, which is not limited herein.

[0055] The positioning main body 1 may have an integrated structure or separate structures. As shown in FIGS. 1 to 4, in an embodiment of the present application, the positioning main body 1 includes two positioning bases 120. Each of the positioning bases 120 is provided with a slide groove 150, and an end of the positioning base 120 is provided with an opening 170 in communication with the slide groove 150. Groove openings of the slide grooves 150 of the two positioning bases 120 face each other to form the accommodation space, and the openings 170 of the two positioning bases 120 form the access opening. The elastic positioning units 2 are arranged in the slide grooves 150.

[0056] Specifically, as shown in FIG. 1, the positioning base 120 includes a bottom plate 121, a cover plate 122, and a side plate 123. The bottom plate 121, the cover plate 122, and

the side plate 123 define the slide groove 150. Sides of the bottom plate 121 and the cover plate 122 away from the side plate 123 form the groove opening of the slide groove 150. An end of the guide rod 210 of the elastic positioning unit 2 is fixed to the side plate 123.

[0057] As shown in FIGS. 1 and 2, to facilitate the entry of the to-be-positioned object 3 into the slide groove 150, in an embodiment of the present application, an inclined guide surface 130 is provided between the opening 170 and the slide groove 150. One or multiple inclined guide surfaces 130 may be provided to expand the size of the opening 170, thereby facilitating the entry of the to-be-positioned object 3 into the slide groove 150.

[0058] To further optimize the above technical solution, in an embodiment of the present application, the positioning main body 1 further includes a positioning platform 110. At least one of the two positioning bases 120 is position-adjustably arranged on the positioning platform 110, enabling the two positioning bases 120 to move close to or away from each other. This enables the adjustment of a relative distance between the two positioning bases 120 based on the size of the to-be-positioned object 3, thereby meeting the positioning requirements of various to-be-positioned objects 3 and enhancing the adaptability of the positioning mechanism.

[0059] To further optimize the above technical solution, as shown in FIGS. 1 and 4, the positioning base 120 and the positioning platform 110 are detachably connected via a threaded fastener. One of the at least one of the two positioning bases 120 and the positioning platform 110 is provided with an elongated hole 140, and the other one of the at least one of the two positioning bases 120 and the positioning platform 110 is provided with a mounting hole. A threaded fastener is in fit with the elongated hole 140 and the mounting hole to fix the at least one of the two positioning bases 120 on the positioning platform 110 at an adjustable position. The threaded fastener may be a bolt or a combination of a bolt and a nut. If the threaded fastener is a bolt, the mounting hole is a threaded hole. If the threaded fastener includes a bolt and a nut, the mounting hole is a plain hole. Certainly, in addition to the above-mentioned position adjustment structure, other position adjustment structures may be adopted. For example, the surface of the positioning platform 110 is provided with a slide groove for sliding of the positioning base 120 and a locking member for securing the positioning base 120 relative to the positioning platform 110.

[0060] To ensure that a center of the two positioning bases 120 remains at the same position,

it is preferable that the two positioning bases 120 are both position-adjustably arranged on the positioning platform 110. To facilitate the synchronous adjustment of the two positioning bases 120, a structure in which a gear cooperates with two racks may be employed. Specifically, two identical racks are centrally symmetric, and the gear is located at the center and cooperates with the two racks at the center. Ends of the two racks away from the gear are respectively connected to the two positioning bases 120. Thus, when the gear is rotated, the gear drives the two positioning bases 120 to move synchronously towards each other through the two racks, ensuring that the positioning center remains at the same position.

[0061] To adapt to to-be-positioned objects 3 of different specifications, scale markings are provided on the positioning platform 110 to accurately show a distance between the two positioning bases 120, thereby helping operators quickly adjust the positions of the positioning bases 120.

[0062] As shown in FIG. 1, in an embodiment of the present application, a surface light source is arranged on the positioning platform 110 between the two positioning bases 120. This surface light source can illuminate the back of the to-be-positioned object 3, facilitating the capture of the contour of the to-be-positioned object 3 by a vision camera.

[0063] Preferably, at least one of two oppositely arranged groove walls of the slide groove 150 is provided with a limiting protrusion 160 at an end away from the opening 170. The limiting protrusion 160 protrudes into the slide groove 150 in a direction perpendicular to a direction in which the to-be-positioned object 3 enters and exits the slide groove 150. The limiting protrusion 160 is configured to cooperate with the to-be-positioned object 3 to prevent it from tilting. A roller may be provided at an end of the limiting protrusion 160 to reduce wear between the limiting protrusion 160 and the to-be-positioned object 3.

[0064] Specifically, the limiting protrusion 160 consists of a top plane and a guiding slope connected to an end of the top plane close to the opening 170. The guiding slope has a gentle incline, that is, a ratio of a vertical distance between two ends of the guiding slope to a horizontal distance between the two ends of the guiding slope is small. It should be noted that the horizontal distance between the two ends of the guiding slope is measured in a direction parallel to the top plane. It is foreseeable that the to-be-positioned object needs to simultaneously contact and cooperate with the positioning bearings 222 of the multiple elastic positioning units 2. Therefore, it is essential to ensure that the contact position between the

to-be-positioned object and each positioning bearing 222 remains consistent, since this is crucial to maintaining a uniform movement path of the to-be-positioned object in the positioning mechanism. In the aforementioned embodiments, the limiting ring groove is provided on the circumferential surface of the positioning bearing 222 to limit the to-be-positioned object in the axial direction of the positioning bearing 222. In order to further improve the positioning effect on the to-be-positioned object, in an embodiment of the present application, the limiting protrusion 160 is provided at the end of the slide groove 150 away from the opening 170, thereby achieving a better limiting effect on the to-be-positioned object.

[0065] A processing device is further provided according to an embodiment of the present application, which includes the positioning mechanism described in the above embodiments. The processing device may be, but is not limited to, a wafer dicing machine or a wafer breaker. Since the processing device has the positioning mechanism in the aforementioned embodiments, the technical effects of the processing device may be referred to the above embodiments.

[0066] Preferably, the processing device further includes a material picking mechanism for conveying the to-be-positioned object 3 to the positioning mechanism. The material picking mechanism is configured to pick up the to-be-positioned object 3 and convey the to-be-positioned object 3 to the positioning mechanism for positioning. The material picking mechanism includes, but is not limited to, a robotic arm or a suction cup.

[0067] Further, in an embodiment of the present application, the processing device further includes an image acquisition module. A center of a field of view of the image acquisition module is aligned with a positioning location of the positioning mechanism to facilitate image capture. This image acquisition module is a vision camera that utilizes vision algorithms to obtain the contour of the to-be-positioned object 3.

[0068] A positioning method for the processing device is further provided according to an embodiment of the present application. The processing device further includes a material picking mechanism for conveying the to-be-positioned object to the positioning mechanism. The positioning method includes the following steps.

[0069] The to-be-positioned object 3 is picked up and conveyed to a positioning preparation location close to the positioning mechanism, where the to-be-positioned object 3 is aligned

with the access opening of the positioning mechanism at the positioning preparation location.

[0070] The material picking mechanism picks up the to-be-positioned object 3 and conveys the to-be-positioned object 3 to the positioning preparation location. The material picking mechanism may be composed of a robotic arm and a suction cup, or composed of a robotic arm and a clamping jaw, which is not limited herein.

[0071] The to-be-positioned object 3 is conveyed into the accommodation space of the positioning mechanism until it reaches a final positioning location. During this process, the to-be-positioned object 3 applies forces on the elastic positioning units 2 of the positioning mechanism, causing the sliding parts of the symmetrically arranged elastic positioning units 2 to move away from each other.

[0072] After the to-be-positioned object 3 is conveyed by the material picking mechanism to the positioning preparation location and is aligned with the access opening of the positioning mechanism, the material picking mechanism continues to move the to-be-positioned object 3 towards the access opening of the positioning mechanism until the to-be-positioned object 3 is inserted into the accommodation space of the positioning mechanism. After inserting the to-be-positioned object 3 into the positioning mechanism, the material picking mechanism disengages from the to-be-positioned object 3 to prepare for a next material picking operation.

[0073] The to-be-positioned object 3 is released, and is automatically centered and positioned at a middle position between the elastic positioning units 2 on the both sides under actions of the symmetrically arranged elastic positioning units 2 on the both sides.

[0074] After being released by the material picking mechanism, the to-be-positioned object 3 is only subjected to the forces applied by the elastic positioning units 2 on the both sides of the positioning mechanism. Since the elastic positioning units 2 are symmetrically arranged on the both sides of the positioning mechanism, the forces applied by the elastic positioning units 2 on the both sides of the to-be-positioned object 3 are balanced, and the deformation amounts thereof are equal, thereby achieving the automatic centered positioning function.

[0075] Embodiments are described as follows.

[0076] In Embodiment 1, a positioning mechanism is provided, including a positioning main body 1 and multiple elastic positioning units 2. The positioning main body 1 has an accommodation space for accommodating a to-be-positioned object 3. The accommodation

space is provided with an access opening formed at a side of the positioning main body 1, allowing entry and exit of the to-be-positioned object 3. The multiple elastic positioning units 2 are symmetrically arranged in the accommodation space on both sides with respect to a direction in which the to-be-positioned object 3 enters and exits the accommodation space through the access opening. Each of the elastic positioning units 2 includes a sliding part and an elastic part. The sliding part is arranged in the accommodation space and is slidable back and forth, and the elastic part is disposed between the sliding part and the positioning main body 1. The elastic part are configured to apply forces on the sliding parts to move the sliding parts of the symmetrically arranged elastic positioning units 2 towards each other, so as to clamp the to-be-positioned object 3 and adjust a position thereof.

[0077] Embodiment 2 is described based on the positioning mechanism according to Example 1. The sliding part includes a guiding module and a positioning module 220, and the guiding module is fixedly arranged on the positioning main body 1. The positioning module 220 is in sliding fit with the guiding module, and the positioning module 220 is configured to contact and cooperate with the to-be-positioned object 3. The elastic part is disposed on the guiding module and located between the positioning module 220 and the positioning main body 1.

[0078] Embodiment 3 is described based on the positioning mechanism according to Embodiment 1 or 2. The positioning module 220 includes a support block 221 and a positioning bearing 222, and the support block 221 is in sliding fit with the guiding module. The positioning bearing 222 is rotatably arranged on the support block 221, and an outer circumferential surface of the positioning bearing 222 is configured to contact and cooperate with the to-be-positioned object 3.

[0079] Embodiment 4 is described based on the positioning mechanism according to any one of Embodiments 1 to 3. The positioning bearing 222 is arranged on an upper surface or a lower surface of the support block 221, and an inner ring of the positioning bearing 222 is fixedly connected to the support block 221. A surface of the inner ring of the positioning bearing 222 facing the support block 221 protrudes beyond an outer ring of the positioning bearing 222, and/or, a boss 223 is provided on a surface of the support block 221 facing the positioning bearing, so as to form a gap between the outer ring of the positioning bearing 222 and the support block 221.

[0080] Embodiment 5 is described based on the positioning mechanism according to any one of Embodiments 1 to 4. The guiding module is a guide rod 210 fixedly arranged on the positioning main body 1, and the support block 221 is provided with a guide hole that runs through the support block 221. The guide rod 210 passes through the guide hole for sliding fit with the support block 221.

[0081] Embodiment 6 is described based on the positioning mechanism according to any one of Embodiments 1 to 5. The elastic part is a compression spring 230, which is sleeved over the guide rod 210. Two ends of the compression spring 230 respectively abut against the positioning main body 1 and the support block 221.

[0082] Embodiment 7 is described based on the positioning mechanism according to any one of Embodiments 1 to 6. The positioning main body 1 includes two positioning bases 120. Each of the positioning bases 120 is provided with a slide groove 150, and an end of each of the positioning bases 120 is provided with an opening 170 in communication with the slide groove 150. Groove openings of the slide grooves 150 of the two positioning bases 120 face each other to form the accommodation space, and the openings 170 of the two positioning bases 120 form the access opening. The elastic positioning units 2 are arranged in the slide grooves 150.

[0083] Embodiment 8 is described based on the positioning mechanism according to any one of Embodiments 1 to 7. An inclined guide surface 130 is provided between the opening 170 of the positioning base 120 and the slide groove 150 to facilitate the entry of the to-be-positioned object 3 into the slide groove 150.

[0084] Embodiment 9 is described based on the positioning mechanism according to any one of Embodiments 1 to 8. The positioning main body 1 further includes a positioning platform 110, and a position of at least one of the two positioning bases 120 on the positioning platform 110 is adjustable, allowing the two positioning bases 120 to move close to or away from each other.

[0085] Embodiment 10 is described based on the positioning mechanism according to any one of Embodiments 1 to 9. The positioning bases 120 are detachably connected to the positioning platform 110 by threaded fasteners. One of the at least one of the two positioning bases 120 and the positioning platform 110 is provided with an elongated hole 140, and the other one of the at least one of the two positioning bases 120 and the positioning platform 110

is provided with a mounting hole. A threaded fastener is in fit with the elongated hole 140 and the mounting hole to fix the at least one of the two positioning bases 120 on the positioning platform 110 at an adjustable position.

[0086] Embodiment 11 is described based on the positioning mechanism according to any one of Embodiments 1 to 10. A limiting protrusion 160 is provided at an end of at least one of two opposite groove walls of the slide groove 150 away from the opening 170 of the positioning base 120. The limiting protrusion 160 protrudes into the slide groove 150 in a direction perpendicular to the direction in which the to-be-positioned object 3 enters and exits the slide groove 150, and the limiting protrusion 160 is configured to cooperate with the to-be-positioned object 3 to prevent it from tilting.

[0087] In Embodiment 12, a processing device is provided, including the positioning mechanism described in any one of Embodiments 1 to 11.

[0088] In Embodiment 13, a positioning method for the processing device described in Embodiment 12 is provided. The processing device further includes a material picking mechanism for conveying the to-be-positioned object 3 to the positioning mechanism, and the positioning method includes the following steps.

[0089] The to-be-positioned object 3 is picked up and conveyed to a positioning preparation location close to the positioning mechanism, where the to-be-positioned object 3 is aligned with the access opening of the positioning mechanism at the positioning preparation position.

[0090] The to-be-positioned object 3 is conveyed into the accommodation space of the positioning mechanism until the to-be-positioned object 3 reaches a final positioning location. During this process, the to-be-positioned object 3 applies forces on the elastic positioning units 2 of the positioning mechanism, causing the sliding parts of the symmetrically arranged elastic positioning units 2 to move away from each other.

[0091] The to-be-positioned object 3 is released, so that the to-be-positioned object 3 is automatically centered and positioned at a middle position between the elastic positioning units 2 on the both sides under actions of the elastic positioning units 2 symmetrically arranged on the both sides.

[0092] It should be noted that the embodiments in this specification are described in a progressive way, and each embodiment focuses on its differences from other embodiments.

The same and similar parts among the embodiments can be referred to each other.

[0093] As shown in the present application and the claims, the words "a", "one", "a type of" and/or "this" do not specifically refer to the singular form, but may also include the plural form, unless the context clearly indicates exceptions. Generally, the terms "include" and "comprise" only indicate inclusion of steps and elements that have been clearly identified, and these steps and elements do not constitute an exclusive list. A method or an apparatus may also contain other steps or elements. The elements limited by the statement "comprising/including a..." do not exclude the existence of other identical elements in the process, method, product or apparatus that includes the elements.

[0094] It should be noted that in the present application, the terms such as "include", "comprise" or any other variants are intended to be non-exclusive. Therefore, an article or a device including a series of elements includes not only these elements but also other elements that are not enumerated, or also include the inherent elements of the article or the device. Unless expressively limited, the statement "comprising/including a ..." does not exclude other similar elements that may exist in the article or the device other than the enumerated elements.

[0095] Specific embodiments are used herein to explain the principle and implementation of the present application, and the descriptions of the above embodiments are only used to facilitate understanding of the core idea of the present application. It should be noted that, for those skilled in the art, several improvements and modifications may be made to the present application without departing from the principle of the present application, and these improvements and modifications also fall within the protection scope of the claims of the present application.

CLAIMS

1. A positioning mechanism, comprising:

a positioning main body; and

5 a plurality of elastic positioning units, wherein

the positioning main body is provided with an accommodation space for accommodating a to-be-positioned object, and the accommodation space is provided with an access opening that is formed at a side of the positioning main body, allowing entry and exit of the to-be-positioned object;

10 the plurality of elastic positioning units are symmetrically arranged in the accommodation space on both sides with respect to a direction in which the to-be-positioned object enters and exits the accommodation space through the access opening, each of the elastic positioning units comprises a sliding part and an elastic part, the sliding part is arranged in the accommodation space and is slidable back and forth, and the elastic part is
15 disposed between the sliding part and the positioning main body; and

the elastic parts are configured to apply forces on the respective sliding parts to move the sliding parts of the symmetrically arranged elastic positioning units towards each other, so as to clamp the to-be-positioned object and adjust a position of the to-be-positioned object.

20 2. The positioning mechanism according to claim 1, wherein the sliding part comprises a guiding module and a positioning module, the guiding module is fixedly arranged on the positioning main body, the positioning module is in sliding fit with the guiding module, the positioning module is configured to be in contact with the to-be-positioned object to cooperate with the to-be-positioned object, and the elastic part is arranged on the guiding
25 module and located between the positioning module and the positioning main body.

3. The positioning mechanism according to claim 2, wherein the positioning module comprises a support block and a positioning bearing, the support block is in sliding fit with the guiding module, the positioning bearing is rotatably arranged on the support block, and an

outer circumferential surface of the positioning bearing is configured to be in contact with the to-be-positioned object to cooperate with the to-be-positioned object.

4. The positioning mechanism according to claim 3, wherein

5 the positioning bearing is arranged on an upper surface or a lower surface of the support block, and an inner ring of the positioning bearing is fixedly connected to the support block; and

a surface of the inner ring of the positioning bearing facing the support block protrudes beyond an outer ring of the positioning bearing, and/or a boss is provided on a surface of the support block facing the positioning bearing, so as to form a gap between the outer ring of the positioning bearing and the support block.

5. The positioning mechanism according to claim 3 or 4, wherein the guiding module is a guide rod, which is fixedly arranged on the positioning main body, the support block is provided with a guide hole that runs through the support block, and the guide rod passes through the guide hole to be in sliding fit with the support block.

6. The positioning mechanism according to claim 5, wherein the elastic part is a compression spring, the compression spring is sleeved over the guide rod, and both ends of the compression spring respectively abut against the positioning main body and the support block.

7. The positioning mechanism according to any one of claims 1 to 6, wherein

the positioning main body comprises two positioning bases, each of the positioning bases is provided with a slide groove, and an end of each of the positioning bases is provided with an opening in communication with the slide groove; and

groove openings of the slide grooves of the two positioning bases are arranged facing each other to form the accommodation space, the openings of the two positioning bases form the access opening, and the elastic positioning units are arranged in the slide grooves.

8. The positioning mechanism according to claim 7, wherein an inclined guide surface is provided between the opening of the positioning base and the slide groove to facilitate the entry of the to-be-positioned object into the slide groove.

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9. The positioning mechanism according to claim 7 or 8, wherein the positioning main body further comprises a positioning platform, and a position of at least one of the two positioning bases on the positioning platform is adjustable, so that the two positioning bases are allowed to move close to or away from each other.

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10. The positioning mechanism according to claim 9, wherein the positioning bases are detachably connected to the positioning platform via threaded fasteners, one of the at least one of the two positioning bases and the positioning platform is provided with an elongated hole, the other one of the at least one of the two positioning bases and the positioning platform is provided with a mounting hole, and a threaded fastener is in fit with the elongated hole and the mounting hole to fixed the at least one of the two positioning bases on the positioning platform at an adjustable position.

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11. The positioning mechanism according to any one of claims 7 to 9, wherein a limiting protrusion is provided at an end, located away from the opening of the positioning base, of at least one of two opposite groove walls of the slide groove, the limiting protrusion protrudes into the slide groove in a direction perpendicular to the direction in which the to-be-positioned object enters and exits the slide groove, and the limiting protrusion is configured to cooperate with the to-be-positioned object to prevent the to-be-positioned object from tilting.

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12. A processing device, comprising the positioning mechanism according to any one of claims 1 to 11.

13. A positioning method for the processing device according to claim 12, the processing

device further comprising a material picking mechanism for conveying the to-be-positioned object to the positioning mechanism, wherein the positioning method comprises:

5 picking up the to-be-positioned object and conveying the to-be-positioned object to a positioning preparation position close to the positioning mechanism, wherein the to-be-positioned object is aligned with the access opening of the positioning mechanism at the positioning preparation position;

10 conveying the to-be-positioned object into the accommodation space of the positioning mechanism until the to-be-positioned object reaches a final positioning position, wherein the to-be-positioned object applies forces on the elastic positioning units of the positioning mechanism, causing the sliding parts of the symmetrically arranged elastic positioning units to move away from each other; and

 releasing the to-be-positioned object, so that the to-be-positioned object is automatically centered and positioned at a middle position between the elastic positioning units on the both sides under actions of the elastic positioning units symmetrically arranged on the both sides.