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(54) **Title:** DEVICE FOR SUPPORTING WORKPIECE

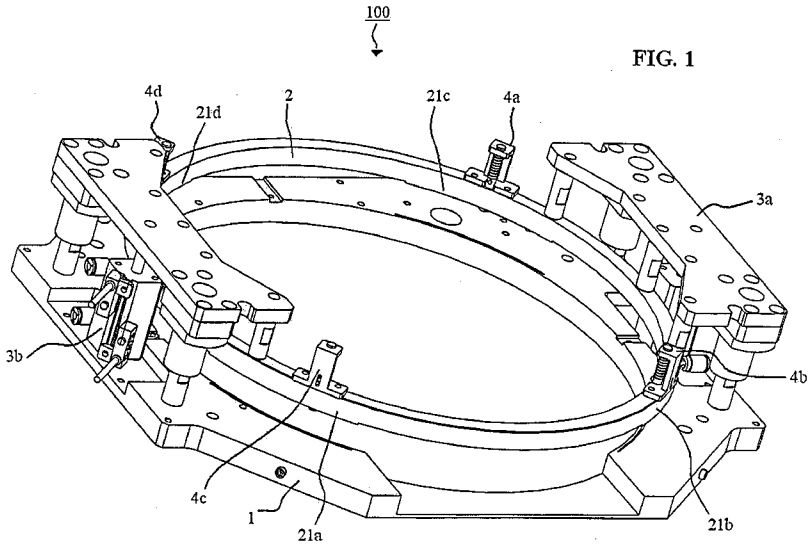


FIG. 1

(57) **Abstract:** The invention provides a device for supporting work piece in a substantially planar form, in particular for supporting a semiconductor wafer during backside marking process. The device is capable of handling warped and unwarped wafers, and is compatible with various existing wafer transferring and processing techniques. The device comprises a continuous base and a continuous clamp for holding the work piece in between. The base has a planar supporting surface with a though opening therein. The clamp has a plurality of clamp jaws with individual clamping surface falling within a common planar plan. At least one ejector is coupled to the clamp for facilitating the release of work piece from the clamping surfaces.

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DEVICE FOR SUPPORTING WORKPIECE

Field of the Invention

[0001] The present invention generally relates to semiconductor manufacturing, and in particular to a device for supporting a semiconductor wafer, especially a warped one, in a substantially planar form during backside marking process.

Background of the Invention

[0002] During manufacturing process, semiconductor wafers are prone to warp as a result of various steps including repeated high temperature annealing, wafer thinning, and compressive and tensile file deposition. Warped wafers not only easily fracture, causing substantial manufacturing yield loss, but also hamper the precision in manufacture under an automated environment, leading to variation in quality of end products. Wafer warpage is especially of note in backside marking process, where thin wafers tend to assume a bowl-like shape under the gravity force, due to lack of central support to the backside. The non-planar wafer surface results in misplacement of marks.

[0003] US Patent No. 7, 015, 418 suggests a chuck system for edge supporting a semiconductor wafer during a backside marking process. The chuck system comprises several separated positioners. Each positioner has a support base, a horizontal and a vertical linear drive for finely positioning the support base, and a rotatory clamping mechanism for holding the wafer on the support base. However, in practice, the configuration of this system poses a big challenge to synchronize and coordinate operation of individual positioners in order to achieve a sufficient level of planarity of the supported wafer. Any imprecise collective movement of the rotatory clamping mechanisms may cause a shifting movement of the wafer, which ruins the precision backside marking. And any error in the relative positions of the positioners, or uneven force exerted on different parts of the wafer by individual clamping mechanisms may even worsen deformation of the wafer.

[0004] In addition, there are situations where a wafer adheres to and moves upwards with the clamping mechanisms away from the support base after unclamping. When the wafer eventually drops off the clamping mechanism under the gravity force and falls onto the support base, the instant impact on the wafer may destroy its functionality.

[0005] In view of the above-mentioned problems, there is a need for a device to support a wafer and improve the planarity thereof, which is easy to control, and with additional wafer protection.

Summary of the Invention

[0006] In order to address the problem associated with the prior art, the present invention provides a device for supporting a work piece, which comprises a continuous base having a planar supporting surface for holding the work piece disposed thereon, and an opening through the base for partially exposing the back surface of the work piece; and a continuous clamp having a planar clamping surface parallel to the supporting surface for clamping the work piece thereover.

[0007] According to one aspect of the invention, there is provided a device, wherein the base further comprises at least one vacuum slot which has a first opening to the supporting surface, and a second opening in communication with a vacuum source, wherein a negative pressure is generated in the at least one vacuum slot so as to stabilize the contact between the work piece and the supporting surface, when the vacuum source is switched on.

[0008] According to another aspect of the invention, there is provided a device, wherein the clamp has a plurality of extended clamp jaws, each having a planar clamping surface; and wherein the clamping surfaces fall within a common planar plane.

[0009] According to yet another aspect of the invention, there is provided a device, which further comprises at least one mechanical drive for adjusting the relative distance between the clamping surface and the supporting surface.

[0010] According to further another aspect of the invention, there is provided a device, which further comprises at least one ejector coupled to the clamp for ejecting the

work piece from the clamping surface when the clamp is unclamped and moved away from the supporting surface.

[0011] According to another aspect of the invention, there is provided a device, wherein the base further has a recess in the supporting surface for allowing an end effector to pass through so as to load/unload the work piece onto/from the device without collision with any parts of the device.

[0012] The objectives and advantages of the present invention will become apparent from the following detailed description of embodiments thereof in connection with the accompanying drawings.

Brief Description of the Drawings

[0013] Preferred embodiments according to the present invention will now be described with reference to the Figures accompanied herein, in which like reference numerals denote like elements.

[0014] FIG. 1 shows a perspective view of a supporting device in accordance with one embodiment of the present invention.

[0015] FIG. 2 shows a side view of the supporting device in FIG. 1.

[0016] FIG. 3 shows an exploded view of the supporting device in FIG. 1.

[0017] FIG. 4A and 4B show partial cross section views of the supporting device when the clamp is in a standby and clamp position respectively.

[0018] FIG. 5 is a partial enlarged view of FIG. 4B.

Detailed Description of the Invention

[0019] The present invention may be understood more readily by reference to the following detailed description of certain embodiments of the invention.

[0020] Now referring to FIG. 1 and 2, there are provided a perspective view and a side view of a supporting device in accordance with one embodiment of the present invention respectively. The supporting device **100** comprises a base **1** for supporting a wafer **101** (not shown in FIG. 1) disposed thereon; a clamp **2** for clamping the wafer **101** over the base **1** so as to reduce bending of the wafer **101**; two mechanical drives **3a** and

3b for cooperatively adjusting the vertical distance between the clamp **2** and the base **1**; and four ejectors **4a, 4b, 4c, 4d** for facilitating the release of the wafer **101** from the clamp **2**.

[0021] Now referring to FIG. 3, there is provided an exploded view of the supporting device **100** in FIG. 1, illustrating assembly of the components in detail. The base **1** has a planar supporting surface **11** with a through opening **12** therein. The opening **12** is so dimensioned that in operation, the wafer **101** (not shown in FIG. 3) disposed on the base **1** has sufficient contact with the supporting surface **11** to secure a firm support, while the marking region on backside of the wafer **101** is fully exposed to a marking apparatus located beneath the opening **12**.

[0022] In an automated manufacturing environment, wafers are often transferred by an end effector of a robot. In view of this, a recess **13** is carved on one side of the supporting surface **11**, for allowing the end effector to go through, so that the wafer **101** transferred by the end effector can be properly positioned above and gently disposed onto the supporting surface **11**.

[0023] As shown in FIG. 3, the outer contour of the base **1** is a symmetric octagon, while the contour of the opening **12** is a circle that is coaxial with the octagon. However, it is to be understood by a person skilled in the art that the configuration of the base **1** is not so limited. For example, in one embodiment, the outer contour of the base **1** and the opening **12** are in a rectangular shape. In another embodiment, the outer contour of the base **1** and the opening **12** are both in a circular shape.

[0024] In the embodiment of the base as shown in FIG. 3, the base **1** further has four vacuum slots **14a, 14b, 14c and 14d** (not shown in FIG. 3) cut into the supporting surface **11.** The details of the vacuum slots **14** are illustrated in FIG. 4A and 4B that provide partial cross section views of the supporting device **100**. Each vacuum slot **14** extends vertically into the base **1**, with a first opening **141** to the supporting surface **11** and the second opening **142** in communication with a first end **141** of a horizontal air passage **14** in the base **1**. The air passage **15** has a second end **152** at the side of the base **1,** blocked by a plug screw **16**. An aperture **17** is drilled into the base **1** from the lower side of the base **1**, with a first opening **171** connected to the air passage **15**, and a second opening **172** operable to be coupled to a vacuum source. In operation, when the wafer **101** is disposed onto the supporting surface **11** and the first opening **141** of each vacuum

slot **14** is covered by the back surface of the wafer **101**, the vacuum source connected to the aperture **17** is actuated. Sequentially, air is removed from the air passage **15** and the vacuum slot **14**; a negative pressure is generated therein, which causes the wafer **101** to stick firmly to the supporting surface **11**.

[0025] Now referring back to FIG. 1, the four vacuum slots **14** are in an arch shape and evenly spaced on the inner edge of the base **1**. However, it is to be understood by a person skilled in the art that the number, size, shape and location of the vacuum slots **14** are not so limited. For example, in one embodiment, the base **1** has three arch-shaped vacuum slots **14** evenly spaced. In another embodiment, a plurality of vacuum slots **14** is spaced on the base **1**, each being cut in a straight line.

[0026] Still referring to FIG. 1, the clamp **2**, having an outer dimension larger than that of the opening **12**, is co-axially mounted above the base **1**. In order to minimize contact-induced damage to the wafer **101** during clamping, instead of having a continuous clamping surface, the clamp **2** has four protruded clamp jaws **21a**, **21b**, **21c** and **21d** evenly spaced, each defining an individual clamping surface **22** (not shown in FIG. 1). The four clamp jaws **21** are so configured that the corresponding clamping surfaces **22** fall in a common planar plane parallel to the supporting surface **11** of the base **1**.

[0027] As shown in FIG. 1, the clamp **2** is a circular ring. However, it is to be understood by a person skilled in the art that the shape of the clamp is not so limited. For example, in one embodiment, the clamp **2** is a rectangular ring.

[0028] In one embodiment of the clamp, the clamp jaws **21** are configured to be in alignment with the vacuum slots **14**. In operation, when the clamp **2** gradually approaches the wafer **101** disposed on the base **1**, the clamps jaws **21** eventually contact and impose clamping force on the wafer **101**, flattening the bent edge portion of the wafer **101** over the first opening **141** of the vacuum slot **14**, thereby forming a closed space for generating negative pressure therein. However, it is to be understood by a person skilled in the art that the configuration of the clamp jaws are not so limited. An exact match with the vacuum slots is not required.

[0029] Still referring to FIG. 1 and 2, the two mechanical drives **3** are disposed on the base **1** at two opposite sides of the clamp **2**, for cooperatively controlling the relative movement of the clamp **2** to the base **1**. FIG. 3 illustrates the details of each mechanical

drive. Each mechanical drive comprises two guide shafts **31**, two guide bushes **32**, two spacer blocks **33**, a carrier plate **34** and a driving means **35**. Each guide shafts **31** is secured to the base **1** with a screw, and having one guide bush **32** coupled thereto. The driving means **35** is operable to actuate the two guide bushes **32** to simultaneously slide along the coupled guide shafts **31**. The carrier plate **34** is connected to the clamp **2** via three connectors **341**, and to the two guide bushes **32** with two spacer blocks **33** disposed in between, for transmitting the movement of the guide bushes **32** to the clamp **2**.

[0030] In operation, the two mechanical drives **3** move the clamp **2** vertically between a pre-determined standby position and a pre-determined clamp position with respect to the base **1**. Now referring again to FIG. 4A and 4B, there are provided partial cross sectional views of the supporting device at the pre-determined standby position and clamp position respectively. At the standby position as shown in FIG. 4A, the clamp **2** is away from the base **1**, creating a space in between which allows the end effector to position the wafer **101** therein without colliding any part of the wafer **101** with either the clamp **2** or the base **1**. The end effector conducts fine positional adjustment in the X, Y directions, so that the wafer **101** is coaxial with the base **1**. When the alignment is achieved, the end effector is lowered into the recess **13** until the edge of the wafer **101** gets in contact with the supporting surface **11**. Then the two mechanical drives **3** lower the clamp **2** to the clamp position. At the clamp position as shown in FIG. 4B, the clamping surface **22** is in contact with the wafer **101**, imposing an appropriate pressure thereon to flatten warped edge without causing damage to the wafer surface. When proper supporting of the wafer is secured by the clamp **2** and supporting surface **11**, the end effect is further lowered towards the bottom of the recess **13** away from the wafer **101**, and then withdrawn therefrom.

[0031] In one embodiment of the mechanical drive, the driving means **35** is a two positional, open loop system such as pneumatic cylinder. In another embodiment, the driving means **35** is a multi-positional, closed loop system such as a linear stepper or servo and guide.

[0032] It is to be understood by a person skilled in the art that the number and location of the mechanical drive **3** is not so limited as illustrated in FIG. 1. For example, in one embodiment, the supporting device **100** has three mechanical drives **3** evenly distributed on the base **1**.

[0033] As shown in FIG. 1 and 2, four ejectors **4** are coupled to the clamp **2** for ejecting the wafer **101** from the clamping surfaces **22** after unclamping. Now referring to FIG. 3, 4A and 4B, there are provided details of the ejectors **4**. Each ejector **4** comprises a support **41**, an ejector pin **42**, a stopper **43**, and a biasing element **44**. The support **41** is fixed to the clamp **2**, and having a through hole **411** in the top surface **413**, which is vertically aligned with a through hole **23** in the clamp **2** for receiving the ejector pin **42**. The ejector pin **42** disposed therein is operable to move up and down with respect to the clamp **2**. The stopper **43** has one end coupled to the ejector pin **41** and the other end located in a vertical slot **412** on the side of the support **41**. The width of the vertical slot **412** restrains the horizontal movement of the stopper **43**, thereby minimizing the rotation of the ejector pin 42 about the longitudinal axis thereof. The length of the vertical slot **412** defines the vertical traveling range of the stopper **43**, which in turn determines the vertical movement range of the ejector pin **42**. The biasing element **44** is disposed between the stopper **43** and the top surface **413** of the support **43**, for biasing the stopper **43** towards the lower end of the slot **412**, which in turn defines a default position of the ejector pin **42** accordingly. At the default position as shown in FIG. 4A, the lower end **421** of the ejector pin **42** protrudes from the clamping surface **22** for a pre-determined distance.

[0034] Now referring to FIG. 4A, 4B and 5, the lower end **421** of the ejector pin **42** is a step end, having a protruding portion **422** and a recess portion **423**. When the clamp **2** is in the clamp position as shown in FIG. 4B and 5, the protruding portion **422** is forced against the base **1** and the pre-determined distance between the protruding portion **422** and the clamping surface **22** is shortened. However, there is no direct contact between the recess portion **423** and the wafer **101**. Therefore, no biasing force is transmitted to the wafer **101** via the ejector pin **42**.

[0035] In the operation to unload the marked wafer **101** from the device **100**, the end effector was moved through the recess **13** in order to be located beneath the wafer **101**, and moved upward to come in contact with the wafer **101**. Then the clamp **2** is unclamped and moved upwards away from the clamp position to the standby position. There is a delay in the corresponding movement of the ejector pin **42** in the same direction, due to the biasing force exerted thereon. The protruding portion **422** keeps in touch with the base **1**, until the pre-determined distance to the clamping surface **22** is

recovered. As a result, the wafer **101** that adheres to the clamping surface **22** can only travel upwards as far as the step height, before being ejected by the recess portion **423**. In this way, the destructive impact on the wafer **101** is minimized, by controlling the maximum dropping distance of the wafer **101**. When the wafer **101** is completely released from the clamp **2**, the end effector with the wafer supported thereon is moved up away from the base **1**, and then out of the device **100**.

[0036] In one embodiment of the ejector, the biasing means **44** is a compression spring. In another embodiment, the biasing means **44** is a pneumatic pin.

[0037] In the embodiment shown in FIG. 1, each ejector **4** is mounted at the center of one clamp jaw **21**. However, it is to be understood by a person skilled in the art that the number and location of the ejectors **4** are not so limited. For example, in one embodiment, two ejectors **4** are coupled to two ends of each clamp jaw **21**.

[0038] While the present invention has been described with reference to particular embodiments, it will be understood that the embodiments are illustrative and that the invention scope is not so limited. Alternative embodiments of the present invention will become apparent to those having ordinary skill in the art to which the present invention pertains. Such alternate embodiments are considered to be encompassed within the spirit and scope of the present invention. Accordingly, the scope of the present invention is described by the appended claims and is supported by the foregoing description.

Claims

1. A device for supporting a work piece, the device comprising

a continuous base having a planar supporting surface for holding the work piece disposed thereon, and an opening through the base for partially exposing the back surface of the work piece; and

a continuous clamp having a planar clamping surface parallel to the supporting surface, for clamping the work piece thereover.

2. A device according to claim 1, wherein the base further has at least one vacuum slot carved therein, which has a first opening to the supporting surface, and a second opening in communication with a vacuum source; wherein a negative pressure is generated in the at least one vacuum slot so as to stabilize the contact between the work piece and the supporting surface, when the vacuum source is switched on.

3. A device according to claim 1, wherein the base further has a recess in the supporting surface for allowing an end effector to pass through so as to load/unload the wafer onto/from the supporting surface.

4. A device according to claim 1, wherein the opening through the base is so dimensioned that the region to be marked on the back surface of the wafer is fully exposed.

5. A device according to claim 1, wherein the opening through the base is circular.

6. A device according to claim 1, wherein the opening through the base is rectangular.

7. A device according to claim 1, wherein the clamp is a circular ring.

8. A device according to claim 1, wherein the clamp is a rectangular ring.

9. A device according to claim 1, wherein the clamp comprises a plurality of extended clamp jaws, each having a planar clamping surface; and wherein the clamping surfaces fall within a common planar plane.

10. A device according to claim 1, which further comprises at least one mechanical drive for adjusting the relative distance between the clamping surface and the supporting surface.

11. A device according to claim 10, wherein the at least mechanical drive is a pneumatic cylinder.

12. A device according to claim 10, wherein the at least mechanical drive is a linear stepper.

13. A device according to claim 1, which further comprises at least one ejector coupled to the clamp for ejecting the work piece from the clamping surface when the clamp is unclamped and moved away from the supporting surface.

14. A device according to claim 13, wherein the at least one ejector comprises:

an ejector pin movable with respect to the clamp, and having a step end; and

a biasing element for biasing the ejector pin towards a default position where the step end protrudes from the clamping surface for a pre-determined distance;

wherein during clamping, the step end is in contact with the supporting surface but not with the work piece, so that biasing force exerted on the ejector pin is not transmitted to the work piece; and

wherein after unclamping, the step end keeps in contact with the supporting surface until the pre-determined distance between the step end and the clamping surface is recovered, thereby stopping the work piece from adhering to and moving with the clamp further.

15. A device according to claim 14, wherein the at least one ejector further comprises:

a support member secured to the clamp and holding the ejector pin therein, the support member having a side slot and a top surface; and

a stopper having a first end associated with the ejector pin, and a second end movably disposed in the side slot;

wherein the biasing element is disposed between the top surface of the support member and the stopper.

16. A device according to claim 14, wherein the biasing means is a compression spring.

17. A device according to claim 14, wherein the biasing means is a pneumatic pin.

18. A device for supporting a work piece, the device comprising:

a continuous base having a planar supporting surface for holding the work piece disposed thereon, an opening through the base for partially exposing the back surface of the work piece, and at least one vacuum slot carved in the base through which a negative pressure is applied so as to stabilize the contact between the work piece and the supporting surface; and

a continuous clamp for clamping the work piece over the supporting surface, the clamp having a plurality of extended clamp jaws, each with a planar clamping surface, wherein the clamping surfaces fall within a common planar plane parallel to the supporting surface.

19. A device according to claim 18, wherein the at least one vacuum slot is configured to be vertically in alignment with one of the plurality of clamp jaws.

20. A device according to claim 18, which further comprises at least one ejector coupled to the clamp for ejecting the work piece from the at least one clamping surface when the clamp is unclamped and moved away from the supporting surface.

21. A device according to claim 20, wherein the at least one ejector is coupled to one of the plurality of clamp jaws.

AMENDED CLAIMS
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1. A device for supporting a work piece, the device comprising

a continuous base having:

a planar supporting surface for holding the work piece disposed thereon;

an opening through the base for partially exposing the back surface of the work piece; and

a recess in the supporting surface for allowing an end effector to pass through so as to load/unload the wafer onto/from the supporting surface; and

a continuous clamp having a planar clamping surface parallel to the supporting surface, for clamping the work piece thereover.

2. A device according to claim 1, wherein the base further has at least one vacuum slot carved therein, which has a first opening to the supporting surface, and a second opening in communication with a vacuum source; wherein a negative pressure is generated in the at least one vacuum slot so as to stabilize the contact between the work piece and the supporting surface, when the vacuum source is switched on.

3. A device according to claim 1 or 2, wherein the opening through the base is so dimensioned that the region to be marked on the back surface of the wafer is fully exposed.

4. A device according to any one of claims 1-3, wherein the opening through the base is circular.

5. A device according to any one of claims 1-3, wherein the opening through the base is rectangular.

6. A device according to any one of claims 1-5, wherein the clamp is a circular ring.

7. A device according to any one of claims 1-5, wherein the clamp is a rectangular ring.

8. A device according to any one of claims 1-7, wherein the clamp comprises a plurality of extended clamp jaws, each having a planar clamping surface; and wherein the clamping surfaces fall within a common planar plane.

9. A device according to any one of claims 1-8, further comprises at least one mechanical drive for adjusting the relative distance between the clamping surface and the supporting surface.

10. A device according to claim 9, wherein the at least mechanical drive is a pneumatic cylinder.

11. A device according to claim 99, wherein the at least mechanical drive is a linear stepper.

12. A device according to any one of claims 1-11, further comprises at least one ejector coupled to the clamp for ejecting the work piece from the clamping surface when the clamp is unclamped and moved away from the supporting surface.

13. A device according to claim 12, wherein the at least one ejector comprises:

an ejector pin movable with respect to the clamp, and having a step end; and

a biasing element for biasing the ejector pin towards a default position where the step end protrudes from the clamping surface for a pre-determined distance;

wherein during clamping, the step end is in contact with the supporting surface but not with the work piece, so that biasing force exerted on the ejector pin is not transmitted to the work piece; and

wherein after unclamping, the step end keeps in contact with the supporting surface until the pre-determined distance between the step end and the clamping surface is recovered, thereby stopping the work piece from adhering to and moving with the clamp further.

14. A device according to claim 13, wherein the at least one ejector further comprises:

a support member secured to the clamp and holding the ejector pin therein, the support member having a side slot and a top surface; and

a stopper having a first end associated with the ejector pin, and a second end movably disposed in the side slot;

wherein the biasing element is disposed between the top surface of the support member and the stopper.

15. A device according to claim 13 or 14, wherein the biasing means is a compression spring.

16. A device according to claim 13 or 14, wherein the biasing means is a pneumatic pin.

17. A device for supporting a work piece, the device comprising:

a continuous base having:

a planar supporting surface for holding the work piece disposed thereon,

an opening through the base for partially exposing the back surface of the work piece,

a recess in the supporting surface for allowing an end effector to pass through so as to load/unload the wafer onto/from the supporting surface; and

at least one vacuum slot carved in the base through which a negative pressure is applied so as to stabilize the contact between the work piece and the supporting surface; and

a continuous clamp for clamping the work piece over the supporting surface, the clamp having a plurality of extended clamp jaws, each with a planar clamping surface, wherein the clamping surfaces fall within a common planar plane parallel to the supporting surface.

18. A device according to claim 17, wherein the at least one vacuum slot is configured to be vertically in alignment with one of the plurality of clamp jaws.

19. A device according to claim 17 or 18, further comprises at least one ejector coupled to the clamp for ejecting the work piece from the at least one clamping surface when the clamp is unclamped and moved away from the supporting surface.

20. A device according to claim 19, wherein the at least one ejector is coupled to one of the plurality of clamp jaws.

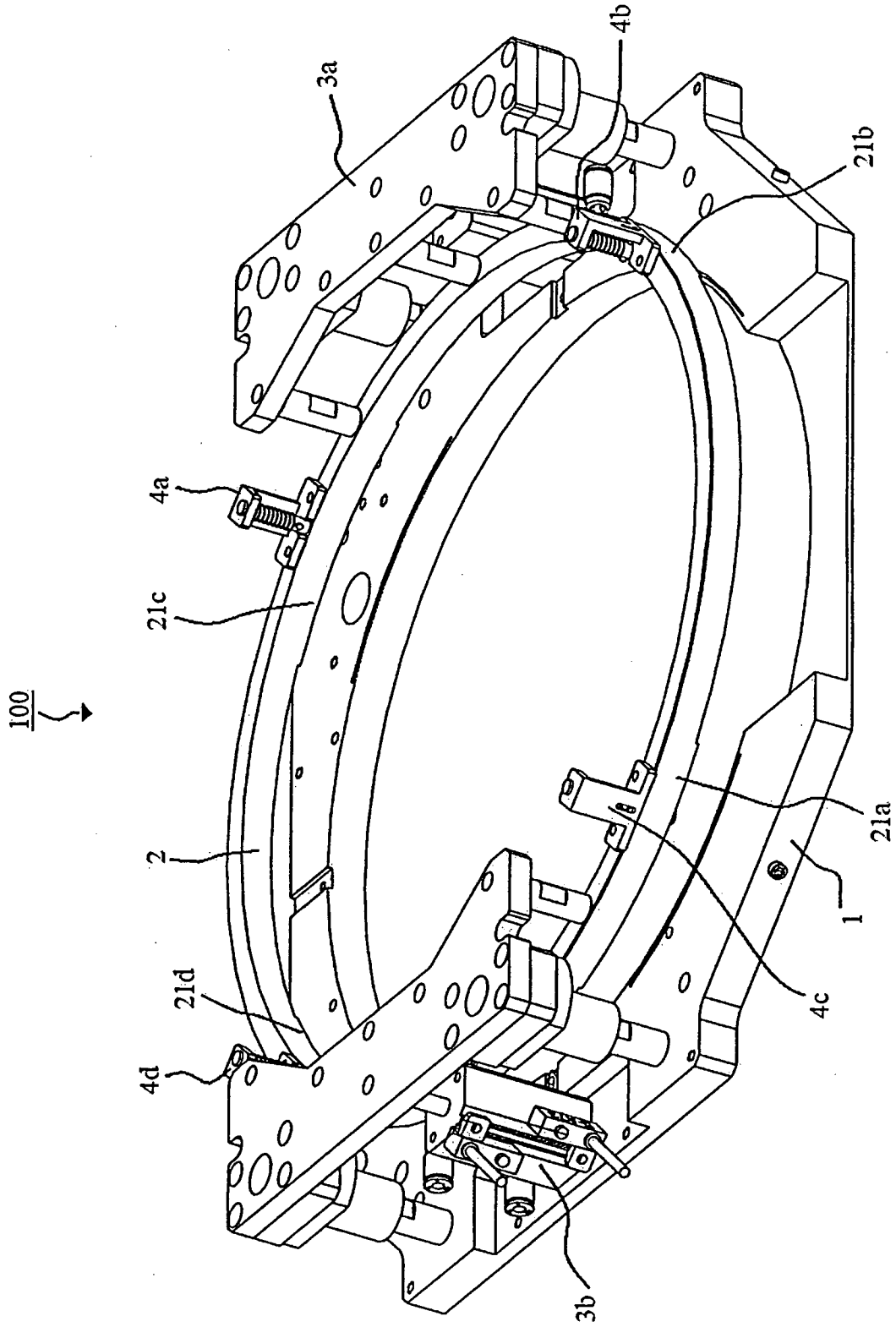


FIG. 1

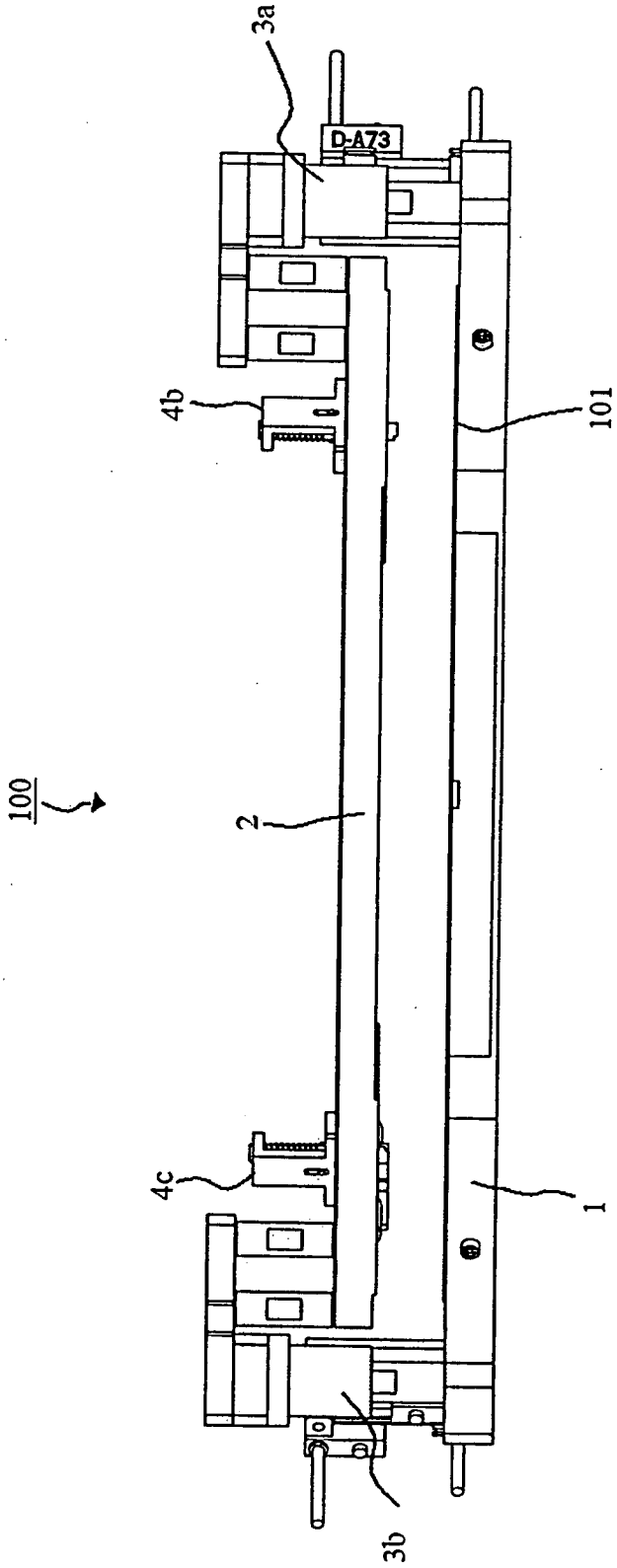


FIG. 2

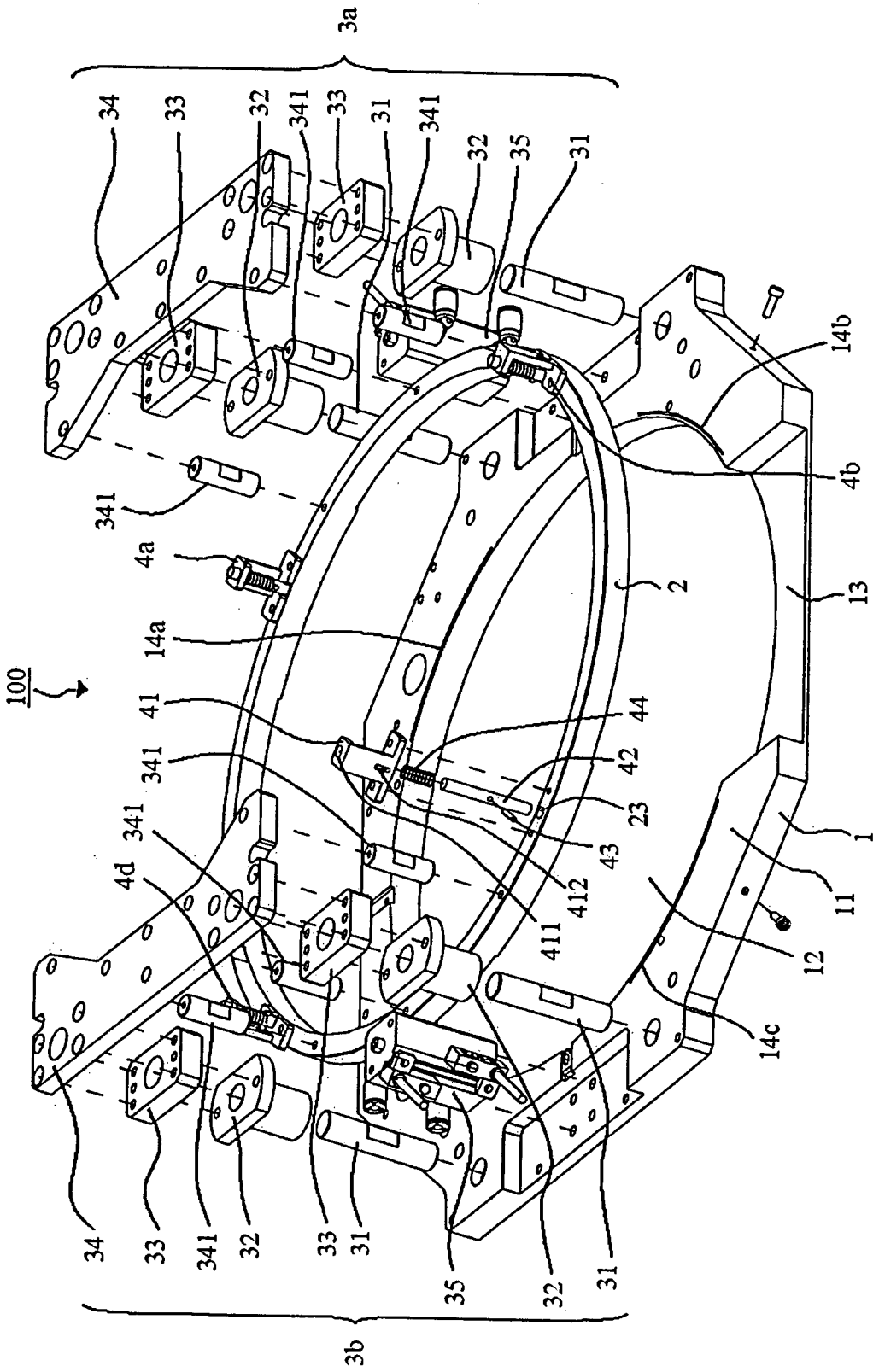

3a
34
33
32
341
33
31
341
32
35
31
14b
4b
341
4a
2
13
14a
100
41
44
341
42
23
341
43
4d
412
411
11
1
12
14c
34
33
341
32
33
31
35
32
31
3b

FIG. 3

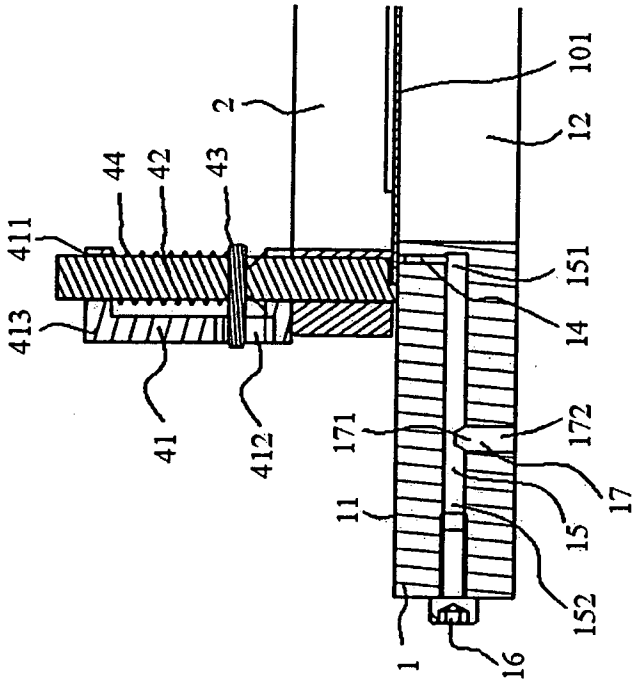

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FIG. 4B

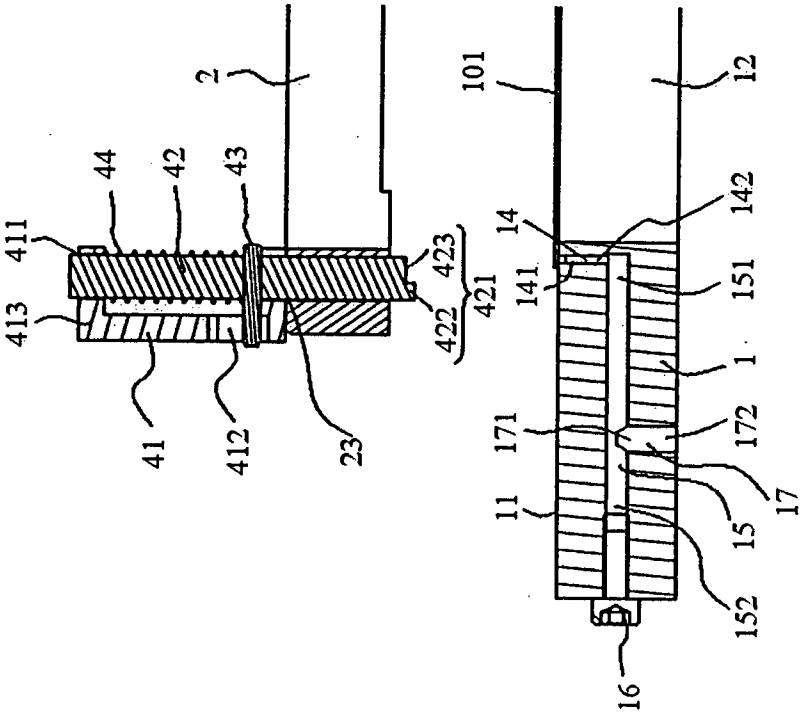

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FIG. 4A

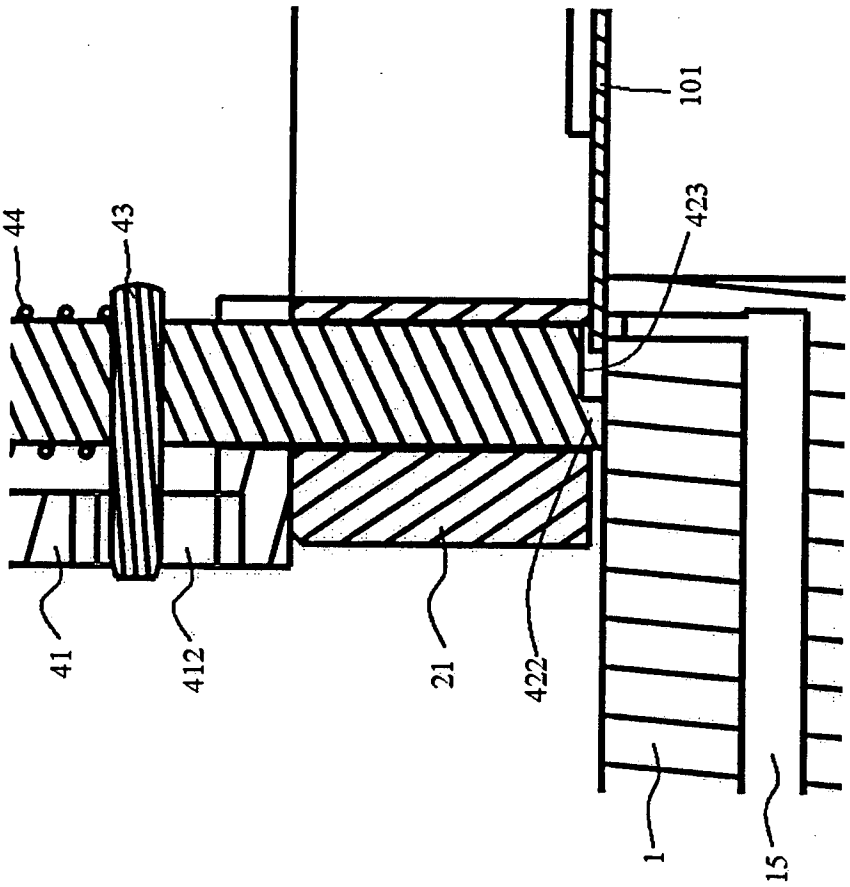


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SG2008/000316

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

H01L 21/67 (2006.01) ***B25B 5/00*** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPODOC, WPI Keywords: (silicon 1d wafer), semi conductor, pcb, circuit board, clamp+, hold+, secure+, circular ring, circumfer+, peripher+, continuous clamp

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 7161785 A (SUMITOMO ELECTRIC INDUSTRIES) 23 June 1995 WPI Abstract and Drawings	1, 4-12 2, 18, 19
Y	JP 2003158169 (TOMUKO KK) 30 May 2003 WPI Abstract and Drawings	2, 18, 19

☐ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 November 2008	5 - DEC 2008
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. +61 2 6283 7999	Authorized officer **RITESH THATTE** AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 2 6283 2645

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/SG2008/000316

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member
JP	7161785	NONE
JP	2003158169	NONE

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX