DESCRIPTION

Title of Invention: POSITIONING METHOD, METHOD OF MANUFACTURING DISK-SHAPED SUBSTRATE, POSITIONING DEVICE, AND DEVICE FOR MANUFACTURING DISK-SHAPED SUBSTRATE

Technical Field

[0001] The present disclosure relates to a positioning method, a method of manufacturing a disk-shaped substrate, a positioning device, and a device for manufacturing a disk-shaped substrate.

Background Art

[0002] Japanese Patent No. 2535089 and Japanese Patent Application Laid-Open (JP-A) Nos. 2007-283457 and 2013-103321 disclose a polishing device including an unprocessed-work collective transfer device that collectively transfers respective works standing by in an unprocessed-work standby unit to a polishing unit. In the polishing device of Japanese Patent No. 2535089, before unprocessed works are collectively transferred, a dish-shaped work receiving portion receives the unprocessed works and positions the unprocessed works. In the polishing devices of JP-A Nos. 2007-283457 and 2013-103321, before unprocessed works are collectively transferred, a loader dish receives the unprocessed works and positions the unprocessed works.

SUMMARY OF INVENTION

Technical Problem

[0003] As described above, in a case in which a dish-shaped member is used as a positioning portion for a disk-shaped substrate, such as a disk-shaped unprocessed work, the disk-shaped substrate is positioned by bringing an outer periphery into contact with the positioning portion. For this reason, each time an outer diameter of the disk-shaped substrate changes, a need arises to replace the dish-shaped member as the positioning portion with a member having an inner diameter matching the outer diameter. As a result, the efficiency of positioning processing for positioning the disk-shaped substrate decreases.

[0004] Therefore, an object of the disclosure is to provide a positioning method, a method of manufacturing a disk-shaped substrate, a positioning device, and a device for manufacturing a disk-shaped substrate, in which a decrease in efficiency of positioning processing is suppressed.

Solution to Problem

[0005] The disclosure includes the following aspects.

<1> A positioning method including

placing a disk-shaped substrate having an inner periphery and a hole surrounded by the inner periphery on a table, and bringing a contact portion inserted into the hole from a table side into contact with the inner periphery to position the disk-shaped substrate in a direction along a radial direction of the disk-shaped substrate before the disk-shaped substrate is conveyed to a predetermined position of a processing device.

<2> The positioning method according to <1>, further including

conveying the disk-shaped substrate in a state in which a plurality of holding portions are pressed against the inner periphery of the disk-shaped substrate to hold the disk-shaped substrate, placing the disk-shaped substrate on the table, and bringing the contact portion inserted into the hole from the table side into contact with the inner periphery to position the disk-shaped substrate in the direction along the radial direction of the disk-shaped substrate before the disk-shaped substrate is conveyed to the predetermined position of the processing device.

<3> The positioning method according to <1> or <2>, further including

positioning the disk-shaped substrate in a thickness direction of the substrate.

<4> The positioning method according to any one of <1> to <3>, further including bringing the contact portion into contact with the inner periphery of the disk-shaped substrate at a plurality of positions in a circumferential direction.

<5> The positioning method according to any one of <1> to <4>, further including

positioning the disk-shaped substrate, which has an outer periphery, in a state in which a positioning portion including the contact portion is not in contact with the outer periphery.

<6> A method of manufacturing a disk-shaped substrate including

a positioning step of placing a plurality of disk-shaped substrates, each having an inner periphery and a hole surrounded by the inner periphery, on a table, and bringing, for each of the plurality of disk-shaped substrates, a contact portion inserted into the hole from a table side into contact with the inner periphery to position each of the plurality of disk-shaped substrates in a direction along a radial direction of the disk-shaped substrate;

a conveying step of conveying the positioned disk-shaped substrates to a predetermined position of a processing device while maintaining a relative positional relationship of the plurality of disk-shaped substrates; and

a processing step of performing processing on the disk-shaped substrates conveyed to the predetermined position.

<7> The method of manufacturing a disk-shaped substrate according to <6>, in which, in the positioning step, the plurality of disk-shaped substrates are conveyed in a state in which

a plurality of holding portions are pressed against the inner periphery of each of the plurality of disk-shaped substrates to hold each disk-shaped substrate, the disk-shaped substrates are placed on the table, and, for each of the plurality of disk-shaped substrates, the contact portion inserted into the hole from the table side is brought into contact with the inner periphery to position each of the plurality of disk-shaped substrates in the direction along the radial direction of the disk-shaped substrate.

<8> A positioning device including

a table on which a disk-shaped substrate having an inner periphery and a hole surrounded by the inner periphery is placed; and

a contact portion provided at the table so as to be insertable into the hole, the contact portion coming into contact with the inner periphery to position the disk-shaped substrate in a direction along a radial direction of the disk-shaped substrate before the disk-shaped substrate is conveyed to a predetermined position of a processing device.

<9> The positioning device according to <8>, in which

the table is a table on which

the disk-shaped substrate, conveyed in a state in which a plurality of holding portions are pressed against the inner periphery of the disk-shaped substrate to hold the disk-shaped substrate, is placed.

<10> A device for manufacturing a disk-shaped substrate, including

a positioning device including a table on which a plurality of disk-shaped substrates, each having an inner periphery and a hole surrounded by the inner periphery, are placed, and a contact portion provided at the table so as to be insertable into the hole, the contact portion coming into contact with the inner periphery to position each of the plurality of disk-shaped substrates in a direction along a radial direction of the disk-shaped substrate;

a processing device that performs processing on the disk-shaped substrates; and

a conveying device that conveys the plurality of disk-shaped substrates to a predetermined position of the processing device while maintaining a relative positional relationship of the plurality of disk-shaped substrates.

<11> The device for manufacturing a disk-shaped substrate according to <10>, further including

a conveying device including a plurality of holding portions that are pressed against the inner periphery of each disk-shaped substrate to hold the disk-shaped substrate, the conveying device conveying each disk-shaped substrate to the table in a state in which the plurality of holding portions hold the disk-shaped substrate.

Advantageous Effects of Invention

[0006] According to the disclosure, it is possible to provide a positioning method, a method of manufacturing a disk-shaped substrate, a positioning device, and a device for manufacturing a disk-shaped substrate, in which a decrease in efficiency of positioning processing is suppressed.

BRIEF DESCRIPTION OF DRAWINGS

[0007] Fig. 1 is a perspective view illustrating a positioning device of an embodiment of the disclosure.

Fig. 2 is a plan view illustrating a positioning portion of the embodiment of the disclosure.

Fig. 3 is a side sectional view illustrating the positioning portion of the embodiment of the disclosure. Specifically, Fig. 3 is a sectional view taken along line 3-3 in Fig. 2.

Fig. 4 is a side sectional view illustrating the positioning portion and a conveying device of the embodiment of the disclosure.

Fig. 5 is a side view illustrating a manufacturing device of the embodiment of the disclosure.

Fig. 6 is a side view illustrating a state in which, in the manufacturing device of the embodiment of the disclosure, a suction portion suctions a disk-shaped substrate positioned by the positioning portion.

Fig. 7 is a side view illustrating a state in which, in the manufacturing device of the embodiment of the disclosure, the conveying device conveys the disk-shaped substrate from the positioning portion to a table of a processing device.

Fig. 8 is a side view illustrating a state in which, in the manufacturing device of the embodiment of the disclosure, the conveying device has conveyed the disk-shaped substrate to the table of the processing device.

Fig. 9 is a side view illustrating a state in which, in the manufacturing device of the embodiment of the disclosure, the processing device performs processing on the disk-shaped substrate.

DESCRIPTION OF EMBODIMENTS

[0008] Embodiments of the disclosure will be described below. However, the disclosure is not limited to the following embodiments. In the following embodiments, the constituent elements are not essential unless specifically stated otherwise.

In a case in which embodiments are described with reference to drawings in the disclosure, the configuration of the embodiment is not limited to the configuration illustrated in

the drawings. In addition, the sizes of the constituent elements in each drawing are conceptual. Accordingly, dimensional ratios of front-rear, left-right, and up-down dimensions in each constituent element, and dimensional ratios of front-rear, left-right, and up-down dimensions between the constituent elements, are not limited to the illustrated dimensional ratios. In addition, the dimensional ratios of front-rear, left-right, and up-down dimensions in each constituent element may differ from actual dimensional ratios.

In addition, unless otherwise specified in the disclosure, the number of each constituent element of the disclosure is not limited to one, and more than one constituent element may be present. Note that, in the following descriptions of the drawings, like reference signs are assigned to like portions.

[0009] <Manufacturing Device 90>

A manufacturing device 90 will be described below as an example of the device for manufacturing a disk-shaped substrate of the disclosure, with reference to the drawings. Note that the device for manufacturing a disk-shaped substrate of the disclosure is not limited to the manufacturing device 90.

[0010] The manufacturing device 90 is a device that performs processing on a disk-shaped substrate 100 to manufacture a disk-shaped substrate 200. That is, the disk-shaped substrate 200 is a processed disk-shaped substrate on which processing has been performed with respect to the disk-shaped substrate 100. As illustrated in Fig. 5, the manufacturing device 90 includes a positioning device 10, a conveying device 30, and a processing device 40. The disk-shaped substrate 100, respective units of the manufacturing device 90, and modifications of the manufacturing device 90 will be described below.

[0011] <Disk-Shaped Substrate 100>

As illustrated in Figs. 2 and 3, the disk-shaped substrate 100 is a substrate formed in a disk shape. Specifically, the disk-shaped substrate 100 is formed, in a plan view, in an annular shape having an inner periphery 100A, an outer periphery 100B, and a hole 100C surrounded by the inner periphery 100A. Note that the plan view here means a case in which the disk-shaped substrate 100 is viewed from one side in a thickness direction of the disk-shaped substrate 100. The disk-shaped substrate 100 is a substrate before processing by a processing device 40 described below.

[0012] Furthermore, the disk-shaped substrate 100 is formed in a plate shape having a surface 100J on one side and a surface 100K on the other side. Hereinafter, the surface 100J on the one side is referred to as the first surface 100J. Hereinafter, the surface 100K on the other side is referred to as the second surface 100K. Note that the boundary portion between the first surface 100J of the disk-shaped substrate 100 and the inner periphery 100A and the boundary portion

between the second surface 100K of the disk-shaped substrate 100 and the inner periphery 100A may be understood as part of the inner periphery 100A. In addition, the boundary portion between the first surface 100J of the disk-shaped substrate 100 and the outer periphery 100B and the boundary portion between the second surface 100K of the disk-shaped substrate 100 and the outer periphery 100B may be understood as part of the outer periphery 100B. Note that the boundary portions described above can also be said to be ridge line portions.

[0013] The disk-shaped substrate 100 may be, for example, a substrate for a magnetic recording medium. Furthermore, as the disk-shaped substrate 100, a substrate formed of a metal material such as aluminum or an aluminum alloy substrate, glass, or the like can be used. Hereinafter, aluminum substrates, aluminum alloy substrates, and glass substrates are also collectively referred to as "substrates". Hereinafter, aluminum substrates and aluminum alloy substrates are also collectively referred to as "aluminum substrates". A plating layer may be formed on a surface of the aluminum substrate. In addition, as the disk-shaped substrates 100 to be positioned by the positioning device 10, for example, a plurality of types of disk-shaped substrates 100 having the same inner diameter and different outer diameters can be used.

[0014] Note that the use, material, type, and the like of the disk-shaped substrate 100 are not limited to those described above, and various disk-shaped substrates can be used as the disk-shaped substrate 100.

[0015] <Positioning Device 10>

The positioning device 10 is an example of a positioning device of the disclosure. The positioning device 10 is a device that positions the disk-shaped substrate 100. Specifically, as illustrated in Fig. 1, the positioning device 10 includes, for example, a plurality of positioning portions 12 and a support body 14.

[0016] As illustrated in Fig. 1, the support body 14 has a function of supporting the positioning portions 12. The support body 14 is formed in a disk shape. Specifically, the support body 14 is formed, in a plan view, in a substantially circular shape having an outer periphery 14B. The plan view here means a case in which the support body 14 is viewed from one side in a thickness direction of the support body 14.

[0017] As illustrated in Figs. 2 and 3, each of the plurality of positioning portions 12 contacts the inner periphery 100A of the disk-shaped substrate 100 and positions the disk-shaped substrate 100 in a direction along a radial direction of the disk-shaped substrate 100. Note that the direction along the radial direction of the disk-shaped substrate 100 can also be said to be a direction along the first surface 100J or the second surface 100K of the disk-shaped substrate 100.

[0018] As illustrated in Fig. 1, the plurality of positioning portions 12 are provided, for

example, as five positioning portions on an upper surface of the support body 14. As illustrated in Figs. 1, 2, and 3, each of the plurality of positioning portions 12 has, for example, a table 20, a plurality of contact portions 21, a plurality of spaces 22, and a support portion 23. In Fig. 1, reference signs are assigned to respective units of one positioning portion 12 among the plurality of positioning portions 12.

[0019] As illustrated in Fig. 3, the disk-shaped substrate 100 is placed on an upper surface of the table 20. As illustrated in Fig. 1, the table 20 is formed, for example, in a disk shape. Specifically, as illustrated in Fig. 2, the table 20 is formed, in a plan view, in a circular shape having an outer periphery 20B. The plan view here means a case in which the table 20 is viewed from one side in a thickness direction of the table 20. Note that the disk-shaped substrates 100 having different outer diameters can be interchangeably placed on the table 20.

[0020] The table 20 has a smaller diameter than the disk-shaped substrate 100. As illustrated in Figs. 2 and 3, in a state in which the disk-shaped substrate 100 is placed on the table 20, the disk-shaped substrate 100 protrudes toward an outer periphery side of the table 20 beyond the outer periphery 20B of the table 20.

[0021] As illustrated in Figs. 2 and 3, each of the plurality of contact portions 21 is provided so as to be insertable into the hole 100C of the disk-shaped substrate 100 from the table 20 side. Each of the plurality of contact portions 21 is inserted into the hole 100C and contacts the inner periphery 100A of the disk-shaped substrate 100. The plurality of contact portions 21 are provided, for example, on an upper surface of the table 20 and at a central portion of the table 20 in a plan view. Furthermore, the plurality of contact portions 21 protrude upward from the table 20. The plurality of contact portions 21 are inserted into the hole 100C of the disk-shaped substrate 100 placed on the table 20. A tip of each contact portion 21 passes through from the second surface 100K side toward the first surface 100J side.

[0022] The plurality of contact portions 21 are arranged along a circumferential direction of the table 20. Accordingly, in the positioning portion 12, the plurality of contact portions 21 contact an inner periphery of the disk-shaped substrate 100 at a plurality of positions in the circumferential direction, thereby positioning the disk-shaped substrate 100 in the direction along the radial direction of the disk-shaped substrate 100.

[0023] Specifically, the plurality of contact portions 21 are arranged as three contact portions along the circumferential direction of the table 20. Accordingly, the contact portions 21 contact the inner periphery 100A of the disk-shaped substrate 100 at three positions in the circumferential direction. Note that the plurality of contact portions 21 are arranged, for example, at equal angular intervals.

[0024] In the positioning portion 12, as described above, the plurality of contact portions 21

contact the inner periphery 100A of the disk-shaped substrate 100, thereby positioning the disk-shaped substrate 100 in the radial direction of the disk-shaped substrate 100. In other words, in the positioning portion 12, the contact portions 21 contact the inner periphery 100A of the disk-shaped substrate 100, thereby restricting movement of the disk-shaped substrate 100 in the radial direction of the disk-shaped substrate 100.

Specifically, the positioning portion 12 positions, for example, the disk-shaped substrate 100 in two different directions along the radial direction of the disk-shaped substrate 100. The two different directions are, specifically, two orthogonal directions. The two different directions can be understood as, for example, a Y direction and an X direction in Fig. 2. Note that the contact portions 21 may be fixed to the table 20 or may be movable, as long as the contact portions 21 can contact the inner periphery 100A and position the disk-shaped substrate 100.

[0025] Each of the plurality of contact portions 21 has, for example, an outer peripheral surface 21B formed in an arc shape along the inner periphery 100A of the disk-shaped substrate 100. In each contact portion 21, the outer peripheral surface 21B contacts part of the inner periphery 100A of the disk-shaped substrate 100 in the circumferential direction. The outer peripheral surface 21B has a predetermined outer diameter. The predetermined outer diameter is specifically an outer diameter corresponding to an inner diameter of the disk-shaped substrate 100.

[0026] In the positioning portion 12, placing the disk-shaped substrate 100 on the table 20 positions the disk-shaped substrate 100 in the thickness direction of the disk-shaped substrate 100. As described above, the positioning portion 12 positions the disk-shaped substrate 100 in the radial direction and the thickness direction of the disk-shaped substrate 100.

[0027] The positioning portion 12 positions the disk-shaped substrate 100 in a state of not being in contact with the outer periphery 100B of the disk-shaped substrate 100. That is, in the present embodiment, the positioning portion 12 has no portion that contacts the outer periphery 100B of the disk-shaped substrate 100.

Note that an aspect in which a member other than the positioning portion 12, for example, an elastic member, a movable member, or the like, contacts the outer periphery 100B of the disk-shaped substrate 100 is not excluded within a range that does not impair the effects of the present embodiment.

[0028] The space 22 is a space for receiving a holding portion 82, described below, that holds the disk-shaped substrate 100. The spaces 22 are arranged between the plurality of contact portions 21 along a circumferential direction of the table 20.

[0029] As illustrated in Fig. 3, the support portion 23 has a function of supporting the second

surface 100K of the disk-shaped substrate 100 placed on the table 20. Specifically, as illustrated in Figs. 2 and 4, the support portion 23 supports the second surface 100K of the disk-shaped substrate 100 at a position facing a contact position at which a suction portion 33 described below contacts the first surface 100J of the disk-shaped substrate 100. Hereinafter, the position facing the contact position is referred to as an opposing position.

[0030] Note that the opposing position can also be said to be a position that overlaps the contact position in the thickness direction of the disk-shaped substrate 100. At least part of the opposing position need only overlap the contact position in the thickness direction of the disk-shaped substrate 100.

[0031] The support portion 23 is provided, for example, on an upper surface of the table 20 and on an outer peripheral side of the contact portions 21. The support portion 23 is formed, for example, in an annular shape along a circumferential direction of the disk-shaped substrate 100. Specifically, as the support portion 23, for example, an O-ring formed of an elastically deformable elastic body such as rubber is used. The support portion 23 is attached coaxially to the table 20 with a groove 25 formed in the upper surface of the table 20, in a state in which the support portion 23 protrudes upward beyond the upper surface of the table 20.

[0032] Here, as described below, a plurality of suction portions 33 are arranged along the circumferential direction of the disk-shaped substrate 100, and contact the first surface 100J of the disk-shaped substrate 100 at a plurality of contact positions along the circumferential direction. In contrast, the support portion 23 supports the second surface 100K of the disk-shaped substrate 100 at opposing positions facing the plurality of contact positions. Note that, in Fig. 2, the contact positions of the suction portions 33 are indicated by two-dot chain lines denoted by reference sign 33.

[0033] In addition, in the positioning portion 12, as illustrated in Fig. 3, for example, the disk-shaped substrate 100 arranged above the upper surface of the table 20 is supported only by the support portion 23. That is, a gap is formed between the disk-shaped substrate 100 supported by the support portion 23 and the table 20. Note that the support portion 23 may be regarded as a member that forms part of the table 20.

[0034] As described above, in the positioning portion 12, the contact portions 21 position the disk-shaped substrate 100 in the direction along the radial direction of the disk-shaped substrate 100 while the support portion 23 supports the second surface 100K at the opposing positions. In the positioning device 10, the contact portions 21 of each of the plurality of positioning portions 12 contact the inner periphery 100A of each of the plurality of disk-shaped substrates 100, and position the plurality of disk-shaped substrates 100 in the direction along the radial direction of the corresponding disk-shaped substrate 100.

[0035] <Modifications of Positioning Device 10>

In the positioning device 10, the disk-shaped substrate 100 is positioned in two orthogonal directions along the radial direction of the disk-shaped substrate 100, but the positioning device 10 is not limited to this configuration. The positioning device 10 may, for example, position the disk-shaped substrate 100 in two directions along the radial direction of the disk-shaped substrate 100 and intersecting at an angle less than 90 degrees. Furthermore, the positioning device 10 may, for example, position the disk-shaped substrate 100 in one direction along the radial direction of the disk-shaped substrate 100. That is, the positioning device 10 need only position the disk-shaped substrate 100 in any direction along the radial direction of the disk-shaped substrate 100. In other words, the positioning device 10 need only position the disk-shaped substrate 100 in any direction along the first surface 100J or the second surface 100K of the disk-shaped substrate 100. Note that the one direction along the radial direction of the disk-shaped substrate 100 is, for example, the X direction or the Y direction illustrated in Fig. 2.

[0036] In addition, in the positioning device 10, the contact portions 21 contact the inner periphery 100A of the disk-shaped substrate 100 at three positions in the circumferential direction and position the disk-shaped substrate 100 in a direction along the radial direction of the disk-shaped substrate 100, but the positioning device 10 is not limited to this configuration. In the positioning device 10, the contact portions 21 may contact the inner periphery 100A of the disk-shaped substrate 100 at four or more positions in the circumferential direction and position the disk-shaped substrate 100 in a direction along the radial direction of the disk-shaped substrate 100. Furthermore, in the positioning device 10, the contact portions 21 may contact the inner periphery 100A of the disk-shaped substrate 100 at one position or two positions in the circumferential direction and position the disk-shaped substrate 100 in the direction along the radial direction of the disk-shaped substrate 100.

[0037] In addition, in the positioning device 10, the positioning portion 12 positions the disk-shaped substrate 100 in the radial direction and the thickness direction of the disk-shaped substrate 100, but the positioning device 10 is not limited to this configuration. The positioning portion 12 need only position the disk-shaped substrate 100 at least in the radial direction of the disk-shaped substrate 100.

[0038] The positioning device 10 includes a plurality of positioning portions 12, but the positioning device 10 is not limited to this configuration. The positioning device 10 need only include at least one positioning portion 12, and the number of the positioning portions 12 is not limited to a plurality.

[0039] In addition, in Fig. 1, one support body 14 is illustrated, but the positioning device 10

may include a plurality of support bodies 14 each including one or more positioning portions 12. In a case in which the positioning device 10 includes the plurality of support bodies 14, the positioning device 10 may further include a support body that supports the plurality of support bodies 14.

[0040] The positioning device 10 includes the support body 14, but the positioning device 10 need not include the support body 14. In this case, for example, a member in which a plurality of positioning portions 12 are integrally formed as one positioning portion can be used. That is, in the positioning device 10, a plurality of disk-shaped substrates 100 may be positioned by one positioning portion.

[0041] The positioning portion 12 has the table 20, the plurality of contact portions 21, the plurality of spaces 22, and the support portion 23, but the positioning portion 12 is not limited to this configuration. The positioning portion 12 need only at least contact the inner periphery 100A of the disk-shaped substrate 100 and position the disk-shaped substrate 100 in a direction along the radial direction of the disk-shaped substrate 100.

[0042] In the positioning device 10, the support portion 23 is formed in an annular shape, but the positioning device 10 is not limited to this configuration. In the positioning device 10, the support portion 23 may be formed, in a plan view, in a polygonal frame shape such as, for example, a triangular shape or a quadrangular shape, and support portions 23 having various shapes can be used. In addition, the positioning device 10 may have a configuration in which a plurality of support portions 23 are arranged at contact positions along the circumferential direction of the disk-shaped substrate 100. That is, the support portion 23 is not limited to a support portion that is continuous along the circumferential direction of the disk-shaped substrate 100, and may be a plurality of support portions 23 arranged at intervals along the circumferential direction of the disk-shaped substrate 100.

[0043] The positioning portion 12 positions the disk-shaped substrate 100 in a direction along the radial direction of the disk-shaped substrate 100 while supporting the second surface 100K of the disk-shaped substrate 100 at opposing positions facing contact positions at which the suction portions 33 contact the first surface 100J of the disk-shaped substrate 100, but the positioning portion 12 is not limited to this configuration. The positioning portion 12 may position the disk-shaped substrate 100 in the direction along the radial direction of the disk-shaped substrate 100 while supporting the second surface 100K of the disk-shaped substrate 100 at positions different from the opposing positions.

[0044] <Conveying Device 30>

As illustrated in Figs. 5, 6, 7, and 8, the conveying device 30 is a device that conveys the disk-shaped substrate 100 positioned by the positioning device 10 to a predetermined

position of the processing device 40. Specifically, the conveying device 30 conveys the disk-shaped substrate 100 to the predetermined position, which is a conveyance destination, in a state in which part of the first surface 100J of the disk-shaped substrate 100 is suctioned by a suction portion 33 described below.

[0045] In the present embodiment, the conveying device 30 conveys the disk-shaped substrates 100 to the predetermined position while maintaining a relative positional relationship of the plurality of disk-shaped substrates 100 by moving the disk-shaped substrates 100 in a state in which the conveying device 30 holds the plurality of disk-shaped substrates 100. Specifically, the conveying device 30 has, for example, a holding portion 32 and a moving mechanism 34.

[0046] The holding portion 32 holds the disk-shaped substrate 100. Specifically, the holding portion 32 has, for example, a suction portion 33, and holds the disk-shaped substrate 100 by suctioning the first surface 100J of the disk-shaped substrate 100 with the suction portion 33. As the suction portion 33, for example, a suction cup can be used. Note that the suction portion 33 may suction by air intake, and other suction portions may be used.

[0047] As illustrated in Fig. 2, a plurality of suction portions 33 are arranged along the circumferential direction of the disk-shaped substrate 100, and contact the first surface 100J of the disk-shaped substrate 100 at a plurality of contact positions along the circumferential direction. Note that, as described above, in Fig. 2, the contact positions of the suction portions 33 are indicated by two-dot chain lines denoted by reference sign 33. The conveying device 30 conveys one disk-shaped substrate 100 in a state in which the disk-shaped substrate 100 is held by the plurality of suction portions 33. Note that the suction portions 33 are provided, for example, as three suction portions.

[0048] The moving mechanism 34 is a mechanism that moves the holding portion 32. The moving mechanism 34 conveys the disk-shaped substrate 100 by moving the holding portion 32 in a state in which the holding portion 32 holds the disk-shaped substrate 100. As the moving mechanism 34, for example, a three-axis robot movable in a front-rear direction, a left-right direction, and an up-down direction can be used. Note that the moving mechanism 34 is not limited to a three-axis robot, and a mechanism capable of moving the holding portion 32 can be used.

[0049] In the conveying device 30, as illustrated in Fig. 6, the holding portion 32 holds the disk-shaped substrate 100 by bringing the suction portion 33 into contact with and suctioning the disk-shaped substrate 100 positioned by the positioning device 10. Next, in the conveying device 30, in a state in which the holding portion 32 holds the disk-shaped substrate 100, the moving mechanism 34 moves the holding portion 32, for example, in a predetermined

movement direction as illustrated in Fig. 7, thereby conveying the disk-shaped substrate 100 to a predetermined position on the table 42 of the processing device 40. The movement direction is, for example, an arrow A direction and an arrow B direction in Fig. 7. Then, in the conveying device 30, the disk-shaped substrate 100 is placed at the predetermined position on the table 42 of the processing device 40 by releasing suction by the holding portion 32. Accordingly, as illustrated in Fig. 8, the conveying device 30 conveys the plurality of disk-shaped substrates 100 to the predetermined position on the table 42 of the processing device 40 while maintaining a relative positional relationship of the plurality of disk-shaped substrates 100.

[0050] <Modifications of Conveying Device 30>

The conveying device 30 conveys the disk-shaped substrates 100 positioned by the positioning device 10 to a predetermined position on the table 42 of the processing device 40 while maintaining a relative positional relationship of the plurality of disk-shaped substrates 100, but is not limited to this configuration. The conveying device of the disclosure may convey, for example, the plurality of disk-shaped substrates 100 while changing relative positions of the plurality of disk-shaped substrates 100. In addition, the conveying device of the disclosure may convey, for example, the plurality of disk-shaped substrates 100 one by one.

[0051] In the conveying device 30, the disk-shaped substrate 100 is held by the suction portion 33, but the conveying device 30 is not limited to this configuration. As the conveying device of the disclosure, for example, a holding portion that holds the disk-shaped substrate 100 by being pressed against at least one of the inner periphery 100A and the outer periphery 100B of the disk-shaped substrate 100 may be used.

[0052] <Processing Device 40>

The processing device 40 illustrated in Fig. 9 is a device that performs processing on the disk-shaped substrate 100 conveyed onto the table 42 by the conveying device 30. The processing device 40 performs processing on the disk-shaped substrate 100, for example, in a state in which the disk-shaped substrate 100 is placed on the table 42. As the processing device 40, as illustrated in Fig. 9, for example, a polishing device including the table 42 as a lower platen and an upper platen 44 can be used. In the polishing device, for example, the disk-shaped substrate 100 is accommodated in each of a plurality of accommodation holes 48 in a plate-shaped carrier 47 arranged between the table 42 and the upper platen 44. Then, for example, as the carrier 47, the table 42, and the upper platen 44 rotate, the disk-shaped substrate 100 rotates relative to the table 42 and the upper platen 44, and each of the first surface 100J and the second surface 100K of the disk-shaped substrate 100 is polished.

[0053] Note that the relative positional relationship of the plurality of accommodation holes 48 in the carrier 47 is the same as the relative positional relationship of the plurality of

positioning portions 12 in the support body 14. Note that the relative positional relationship of the plurality of accommodation holes 48 and the relative positional relationship of the plurality of positioning portions 12 may be shifted from each other within a range in which the plurality of disk-shaped substrates 100 can be accommodated in the accommodation holes 48 while maintaining the relative positional relationship in the positioning portions 12, and are not limited to a case of being completely identical. In the present embodiment, for example, the disk-shaped substrates 100 positioned by the plurality of positioning portions 12 are accommodated, by the conveying device 30, in the plurality of accommodation holes 48 in the carrier 47 while maintaining the relative positional relationship.

[0054] <Modifications of Processing Device 40>

The processing device of the disclosure is not limited to a polishing device. The processing device of the disclosure may be, for example, a grinding device that performs grinding on a disk-shaped substrate. Furthermore, the processing device of the disclosure may be a device that performs other processing executed on a table, and need only be a device capable of executing processing on a disk-shaped substrate.

[0055] <Modifications of Manufacturing Device 90>

As illustrated in Fig. 2, the manufacturing device 90 may include a conveying device 80 that conveys the disk-shaped substrate 100 to the positioning portion 12 of the positioning device 10. The conveying device 80 has, for example, a plurality of holding portions 82 that are pressed against the inner periphery 100A of the disk-shaped substrate 100 at a plurality of positions to hold the disk-shaped substrate 100. The plurality of holding portions 82 are provided, for example, as three holding portions along the circumferential direction of the disk-shaped substrate 100. In the conveying device 80, the disk-shaped substrate 100 is conveyed to the positioning portion 12 by moving the holding portions 82 to the table 20 of the positioning portion 12 in a state in which the plurality of holding portions 82 hold the disk-shaped substrate 100. At this time, for example, the three holding portions 82 are positioned in the spaces 22. Accordingly, the disk-shaped substrate 100 is arranged above the upper surface of the table 20 in a state in which the three contact portions 21 are inserted into the inner periphery 100A of the disk-shaped substrate 100.

[0056] According to the above-described configuration in which the holding portions 82 are pressed against the inner periphery 100A of the disk-shaped substrate 100 at a plurality of positions to hold the disk-shaped substrate 100, the disk-shaped substrate 100 can be held even in a case in which the first surface 100J and the second surface 100K of the disk-shaped substrate 100 are wet.

[0057] In addition, the manufacturing device 90 may further include one or more other devices

necessary for manufacturing a disk-shaped substrate. In addition, examples of the other devices include an accommodation rack that accommodates a disk-shaped substrate before or after processing, a cleaning device that cleans a disk-shaped substrate, and a drying device that dries a disk-shaped substrate.

[0058] <Method of Manufacturing Disk-Shaped Substrate 200>

An example of a method of manufacturing a disk-shaped substrate of the disclosure will be described below with reference to the drawings. Note that the method of manufacturing a disk-shaped substrate of the disclosure is not limited to the following examples.

[0059] The manufacturing method of the present embodiment is a method of manufacturing the disk-shaped substrate 200. The manufacturing method of the present embodiment includes a first conveying step, a positioning step, a second conveying step, and a processing step. In the manufacturing method of the present embodiment, the first conveying step, the positioning step, the second conveying step, and the processing step are executed in this order. The manufacturing method of the present embodiment can be executed, for example, by using the manufacturing device 90 described above. In this case, for example, before the first conveying step is performed, the manufacturing device 90 including the positioning device 10, the conveying device 30, and the processing device 40 is prepared.

[0060] <First Conveying Step>

The first conveying step is a step of conveying the disk-shaped substrate 100 to the positioning device 10. In the first conveying step, for example, the disk-shaped substrate 100 accommodated in an accommodation unit not illustrated is held by a holding portion, and the holding portion is moved to take out the disk-shaped substrate 100 from the accommodation unit.

[0061] Next, in the first conveying step, the holding portion holding the disk-shaped substrate 100 is moved to the positioning device 10, and the disk-shaped substrate 100 is conveyed to the positioning device 10. Next, in the first conveying step, the holding portion is lowered toward the positioning portion 12, and the disk-shaped substrate 100 is placed on the table 20 while the contact portions 21 are inserted into the inner periphery 100A of the disk-shaped substrate 100. As illustrated in Fig. 3, the disk-shaped substrate 100 placed on the table 20 is supported by the support portion 23.

[0062] In the first conveying step, conveyance of the disk-shaped substrate 100 is repeatedly performed until the disk-shaped substrate 100 is placed on the table 20 of every positioning portion 12. Note that, in the first conveying step, for example, a predetermined number of disk-shaped substrates 100 may be taken out from the accommodation unit at a time and conveyed to the positioning device 10. The predetermined number is, for example, plural.

[0063] <Positioning Step>

The positioning step is a step of bringing the positioning portion 12 into contact with the inner periphery 100A of each of the plurality of disk-shaped substrates 100 to position the disk-shaped substrates 100 before the disk-shaped substrates 100 are conveyed to a predetermined position on the table 42 of the processing device 40. In the positioning step, the disk-shaped substrate 100 placed on the table 20 is positioned in the direction along the radial direction of the disk-shaped substrate 100.

[0064] As described above, in the positioning step, the positioning portion 12 is brought into contact with the inner periphery 100A of the disk-shaped substrate 100, and therefore, even in a case in which an outer diameter of the disk-shaped substrate 100 as a positioning target changes, the disk-shaped substrate 100 can be positioned without replacing the positioning portion 12. Accordingly, a decrease in efficiency of positioning processing in the positioning step is suppressed. As a result, a decrease in productivity as the method of manufacturing the disk-shaped substrate 200 is suppressed.

[0065] Specifically, in the positioning step, as illustrated in Figs. 2 and 3, for example, the disk-shaped substrate 100 is positioned in two different directions along the radial direction of the disk-shaped substrate 100. In other words, in the positioning step of the present embodiment, movement of the disk-shaped substrate 100 in two different directions along the radial direction of the disk-shaped substrate 100 is restricted. Accordingly, positional displacement of the disk-shaped substrate 100 on the table 20 is suppressed.

Note that the two different directions are, for example, two orthogonal directions. The two different directions can be understood as, for example, the Y direction and the X direction in Fig. 2.

[0066] Furthermore, in the positioning step of the present embodiment, the disk-shaped substrate 100 is positioned in the thickness direction of the disk-shaped substrate 100. Accordingly, positional displacement of the disk-shaped substrate 100 along the thickness direction of the disk-shaped substrate 100 is suppressed.

[0067] In the positioning step of the present embodiment, the positioning portion 12 is brought into contact with the inner periphery 100A of the disk-shaped substrate 100 at a plurality of positions in a circumferential direction. Specifically, in the positioning step of the present embodiment, the positioning portion 12 is brought into contact with the inner periphery 100A of the disk-shaped substrate 100 at three positions in the circumferential direction. Accordingly, positional displacement of the disk-shaped substrate 100 on the table 20 is suppressed.

[0068] In the positioning step of the present embodiment, the disk-shaped substrate 100 is positioned in a state in which the positioning portion 12 is not in contact with the outer periphery

100B. Accordingly, even in a case in which an outer diameter of the disk-shaped substrate as a positioning target changes, the disk-shaped substrate 100 can be placed on the table 20, and therefore the positioning portion 12 need not be replaced. As a result, a decrease in efficiency of positioning processing in the positioning step is suppressed.

The positioning step of the present embodiment can be executed by using the positioning device 10 described above.

[0069] <Modifications of Positioning Step>

In the positioning step of the present embodiment, the disk-shaped substrate 100 is positioned in two orthogonal directions along the radial direction of the disk-shaped substrate 100, but the positioning step is not limited to this configuration. In the positioning step of the present embodiment, for example, the disk-shaped substrate 100 may be positioned in two directions along the radial direction of the disk-shaped substrate 100 and intersecting at an angle less than 90 degrees. Furthermore, in the positioning step of the present embodiment, for example, the disk-shaped substrate 100 may be positioned in one direction along the radial direction of the disk-shaped substrate 100.

[0070] In the positioning step of the present embodiment, the positioning portion 12 is brought into contact with the inner periphery 100A of the disk-shaped substrate 100 at three positions in the circumferential direction, and the disk-shaped substrate 100 is positioned in the direction along the radial direction of the disk-shaped substrate 100, but the positioning step is not limited to this configuration. In the positioning step of the present embodiment, the positioning portion 12 may be brought into contact with the inner periphery 100A of the disk-shaped substrate 100 at three or more positions in the circumferential direction, and the disk-shaped substrate 100 may be positioned in the direction along the radial direction of the disk-shaped substrate 100. Furthermore, in the positioning step of the present embodiment, the positioning portion 12 may be brought into contact with the inner periphery 100A of the disk-shaped substrate 100 at one position or two positions in the circumferential direction, and the disk-shaped substrate 100 may be positioned in the direction along the radial direction of the disk-shaped substrate 100.

[0071] In the positioning step of the present embodiment, the disk-shaped substrate 100 is positioned in the radial direction and the thickness direction of the disk-shaped substrate 100, but the positioning step is not limited to this configuration. In the positioning step, the disk-shaped substrate 100 need only be positioned at least in the radial direction of the disk-shaped substrate 100.

[0072] The positioning step of the present embodiment is executable by using the positioning device 10 described above, but may be executed without using the positioning device 10 described above.

In addition, the positioning step of the present embodiment may also be executed as an example of the positioning method of the disclosure. In a case in which the positioning step of the present embodiment is executed as a positioning method, the positioning step may be executed as a single step.

[0073] <Second Conveying Step>

The second conveying step of the present embodiment is a step of conveying the disk-shaped substrates 100 positioned in the positioning step to a predetermined position on the table 42 while maintaining a relative positional relationship of the plurality of disk-shaped substrates 100. In the second conveying step, for example, conveyance of the disk-shaped substrate 100 is started after preparation for execution of the processing step in the processing device 40 is completed. The second conveying step of the present embodiment can be executed, for example, by using the conveying device 30 described above.

[0074] In the second conveying step of the present embodiment, for example, as illustrated in Fig. 6, the holding portion 32 holds the disk-shaped substrate 100 by bringing the suction portion 33 into contact with and suctioning the disk-shaped substrate 100 positioned by the positioning device 10.

Next, in the second conveying step of the present embodiment, in a state in which the holding portion 32 holds the disk-shaped substrate 100, the moving mechanism 34 moves the holding portion 32, for example, in a predetermined movement direction as illustrated in Fig. 7, thereby conveying the disk-shaped substrate 100 to a predetermined position on the table 42 of the processing device 40.

[0075] Then, in the second conveying step of the present embodiment, the disk-shaped substrate 100 is placed at the predetermined position on the table 42 of the processing device 40 by releasing suction by the holding portion 32. Accordingly, in the second conveying step of the present embodiment, as illustrated in Fig. 8, the plurality of disk-shaped substrates 100 are conveyed to the predetermined position on the table 42 of the processing device 40 while maintaining a relative positional relationship of the plurality of disk-shaped substrates 100.

[0076] <Modifications of Second Conveying Step>

In the second conveying step of the present embodiment, the disk-shaped substrates 100 positioned by the positioning device 10 are conveyed to a predetermined position on the table 42 of the processing device 40 while maintaining a relative positional relationship of the plurality of disk-shaped substrates 100, but the second conveying step is not limited to this configuration. As the second conveying step of the disclosure, for example, the plurality of disk-shaped substrates 100 may be conveyed while changing relative positions of the plurality of disk-shaped substrates 100. In addition, as the second conveying step of the disclosure, for

example, the plurality of disk-shaped substrates 100 may be conveyed one by one.

[0077] In the second conveying step of the present embodiment, the disk-shaped substrate 100 is held by the suction portion 33, but the second conveying step is not limited to this configuration. As the second conveying step of the disclosure, for example, a holding portion that holds the disk-shaped substrate 100 by being pressed against at least one of the inner periphery 100A and the outer periphery 100B of the disk-shaped substrate 100 may be used.

In addition, the second conveying step of the present embodiment is executable by using the conveying device 30 described above, but may be executed without using the conveying device 30.

[0078] <Processing Step>

The processing step of the present embodiment performs processing on the disk-shaped substrate 100 conveyed onto the table 42 in the second conveying step. The processing is executed on the disk-shaped substrate 100 conveyed onto the table 42 in a state in which the disk-shaped substrate 100 is placed on the table 42. Examples of the processing include polishing. The processing step can be executed, for example, by using the processing device 40 described above.

[0079] <Modifications of Processing Step>

The processing executed in the processing step is not limited to polishing. The processing may be, for example, grinding. Furthermore, the processing may be other processing executed on the table 42, or the like, and need only be processing executed on the disk-shaped substrate 100.

In addition, the processing step is executable by using the processing device 40 described above, but may be executed without using the processing device 40.

[0080] <Modifications of Manufacturing Method>

The method of manufacturing a disk-shaped substrate of the disclosure is not limited to the examples described above, and need only include at least a positioning step, a conveying step, and a processing step.

In the disclosure, the method of manufacturing the disk-shaped substrate 200 may be configured to include one or more other ordinarily known processes necessary for manufacturing the disk-shaped substrate 200 according to the type of the disk-shaped substrate 200.

[0081] For example, in the case of an aluminum substrate, the method of manufacturing the disk-shaped substrate 200 includes the following steps.

Blank substrate preparing step: an aluminum alloy ingot is rolled to obtain an aluminum alloy plate material having a thickness of about 2 mm or less, and the obtained

aluminum alloy plate material is punched into a disk shape to prepare an aluminum substrate having desired dimensions.

Cutting step: chamfering of inner and outer diameters and cutting of both main surfaces are performed on the prepared aluminum alloy substrate.

Grinding step: in order to reduce surface roughness, undulation, and the like of the aluminum alloy substrate after cutting, grinding with a grindstone is performed on both main surfaces of the aluminum alloy substrate.

Plating step: with the aim of imparting surface hardness and suppressing surface defects to the substrate on which grinding has been performed, plating such as NiP is performed on a surface of the aluminum alloy substrate.

Polishing step: polishing processing is performed on both main surfaces of the aluminum alloy substrate on which a plating film has been formed.

In the case of an aluminum substrate, the manufacturing method according to the present embodiment may be carried out, for example, in either the grinding step or the polishing step, or may be carried out in both of these steps.

[0082] In the case of a glass substrate, the method of manufacturing the disk-shaped substrate 200 includes, for example, the following steps.

Blank substrate preparing step: a glass blank serving as a material of a plate-shaped glass substrate for a magnetic recording medium having a pair of main surfaces is produced by press molding, and a circular hole is formed in a central portion of the produced glass blank to make the produced glass blank annular. Next, shape processing is performed to obtain a glass substrate having chamfered surfaces. Grinding and polishing are performed on inner and outer peripheral end surfaces of the shape-processed glass substrate.

Grinding step: grinding with fixed abrasive grains is performed on a main surface of the glass substrate after end-surface polishing.

Polishing step: polishing with a predetermined polishing agent is performed on the main surface of the glass substrate after the grinding step and on the substrate on which grinding processing has been performed. Chemical strengthening treatment may be performed on the glass substrate during the polishing step.

In the case of a glass substrate, the manufacturing method according to the present embodiment may be carried out, for example, in either the grinding step or the polishing step, or may be carried out in both of these steps.

[0083] The disclosure of Japanese Patent Application No. 2024-057253 filed on March 29, 2024 is incorporated herein by reference in its entirety. All documents, patent applications, and technical standards described in the present specification are incorporated herein by reference

to the same extent as if each individual document, patent application, and technical standard were specifically and individually indicated to be incorporated by reference.

CLAIMS

Claim 1. A positioning method comprising:

placing a disk-shaped substrate having an inner periphery and a hole surrounded by the inner periphery on a table, and bringing a contact portion inserted into the hole from a table side into contact with the inner periphery to position the disk-shaped substrate in a direction along a radial direction of the disk-shaped substrate before the disk-shaped substrate is conveyed to a predetermined position of a processing device.

Claim 2. The positioning method according to claim 1, further comprising:

conveying the disk-shaped substrate in a state in which a plurality of holding portions are pressed against the inner periphery of the disk-shaped substrate to hold the disk-shaped substrate, placing the disk-shaped substrate on the table, and bringing the contact portion inserted into the hole from the table side into contact with the inner periphery to position the disk-shaped substrate in the direction along the radial direction of the disk-shaped substrate before the disk-shaped substrate is conveyed to the predetermined position of the processing device.

Claim 3. The positioning method according to claim 1, further comprising:

positioning the disk-shaped substrate in a thickness direction of the substrate.

Claim 4. The positioning method according to claim 1, further comprising:

bringing the contact portion into contact with the inner periphery of the disk-shaped substrate at a plurality of positions in a circumferential direction.

Claim 5. The positioning method according to claim 1, further comprising:

positioning the disk-shaped substrate, which has an outer periphery, in a state in which a positioning portion including the contact portion is not in contact with the outer periphery.

Claim 6. A method of manufacturing a disk-shaped substrate, comprising:

a positioning step of placing a plurality of disk-shaped substrates, each having an inner periphery and a hole surrounded by the inner periphery, on a table, and bringing, for each of the plurality of disk-shaped substrates, a contact portion inserted into the hole from a table side into contact with the inner periphery to position each of the plurality of disk-shaped substrates in a direction along a radial direction of the disk-shaped substrate;

a conveying step of conveying the positioned disk-shaped substrates to a predetermined position of a processing device while maintaining a relative positional relationship of the plurality of disk-shaped substrates; and

a processing step of performing processing on the disk-shaped substrates conveyed to the predetermined position.

Claim 7. The method of manufacturing a disk-shaped substrate according to claim 6, wherein, in the positioning step, the plurality of disk-shaped substrates are conveyed in a state in which a plurality of holding portions are pressed against the inner periphery of each of the plurality of disk-shaped substrates to hold each disk-shaped substrate, the disk-shaped substrates are placed on the table, and, for each of the plurality of disk-shaped substrates, the contact portion inserted into the hole from the table side is brought into contact with the inner periphery to position each of the plurality of disk-shaped substrates in the direction along the radial direction of the disk-shaped substrate.

Claim 8. A positioning device comprising:

a table on which a disk-shaped substrate having an inner periphery and a hole surrounded by the inner periphery is placed; and

a contact portion provided at the table so as to be insertable into the hole, the contact portion coming into contact with the inner periphery to position the disk-shaped substrate in a direction along a radial direction of the disk-shaped substrate before the disk-shaped substrate is conveyed to a predetermined position of a processing device.

Claim 9. The positioning device according to claim 8, wherein the table is a table on which the disk-shaped substrate, conveyed in a state in which a plurality of holding portions are pressed against the inner periphery of the disk-shaped substrate to hold the disk-shaped substrate, is placed.

Claim 10. A device for manufacturing a disk-shaped substrate, comprising:

a positioning device including a table on which a plurality of disk-shaped substrates, each having an inner periphery and a hole surrounded by the inner periphery, are placed, and a contact portion provided at the table so as to be insertable into the hole, the contact portion coming into contact with the inner periphery to position each of the plurality of disk-shaped substrates in a direction along a radial direction of the disk-shaped substrate;

a processing device that performs processing on the disk-shaped substrates; and

a conveying device that conveys the plurality of disk-shaped substrates to a predetermined position of the processing device while maintaining a relative positional relationship of the plurality of disk-shaped substrates.

Claim 11. The device for manufacturing a disk-shaped substrate according to claim 10, further comprising:

a conveying device including a plurality of holding portions that are pressed against the inner periphery of each disk-shaped substrate to hold the disk-shaped substrate, the conveying device conveying each disk-shaped substrate to the table in a state in which the plurality of holding portions hold the disk-shaped substrate.