DESCRIPTION

[Title of Invention]

SUBSTRATE POSITIONING ASSISTANCE JIG AND SUBSTRATE MANUFACTURING METHOD

[Technical Field]

[0001] The present invention relates to a substrate arrangement assisting jig for arranging a plurality of substrates respectively in substrate holding holes in a carrier in order to polish main surfaces of the substrates while holding the substrates in the substrate holding holes in the carrier, and a method for producing substrates in which polishing is performed using the substrate arrangement assisting jig.

[Background Art]

[0002] Nowadays, in order to record data, hard disk drives (HDDs) are incorporated in personal computers, DVD (Digital Versatile Disc) recording apparatuses, and the like.

A magnetic disk obtained by providing a magnetic layer on a substrate is used in a hard disk drive, and magnetic recording information is recorded in, or read from, the magnetic layer by using a magnetic head that is made to float slightly above the surface of the magnetic disk. Magnetic recording density has been increased in order to increase the storage capacity of hard disk drives. In order to be able to increase the magnetic recording density, surface unevenness of main surfaces of a substrate to be used as a substrate of a magnetic disk is minimized as much as possible. Therefore, high precision polishing is performed in the production of a substrate used for a magnetic disk.

[0003] A polishing apparatus, for example, polishes the main surfaces of a substrate with polishing pads while holding the substrate between upper and lower surface plates provided with the polishing pads and rotating the upper and lower surface plates. At this time, a polishing liquid is supplied between the polishing pads and

the main surfaces of the substrate. The polishing liquid contains abrasive polishing particles having a small particle size, such as ceria or colloidal silica. The polishing liquid is supplied to the main surfaces of the substrate. As a result of the substrate held between the upper and lower surface plates moving between the upper and lower surface plates in such a manner as to revolve around the central axis of rotation of the upper surface plate while rotating on its own axis, the main surfaces of the substrate are polished.

[0004] In the polishing apparatus, substrates are held respectively in a plurality of, for example, six holding holes that are provided in a flat plate-shaped carrier, the carrier is sandwiched between the upper and lower surface plates provided with the polishing pads on their surfaces, and main surfaces of the substrates are polished by moving the carrier relative to the upper and lower surface plates while the polishing liquid is supplied between the upper and lower surface plates. That is, polishing is performed simultaneously in a state where a plurality of substrates are arranged in a single carrier and several carriers holding substrates are sandwiched between the upper and lower surface plates, and accordingly it takes a long time to prepare for polishing due to arranging the substrates respectively in the substrate holding holes of all of the carriers.

[0005] To address this, a polishing-target object loading jig is proposed for efficiently loading a plurality of substrates in a polishing step of polishing polishing-target objects, such as substrates, that are to be held in a carrier arranged between upper and lower surface plates of a double-side polishing apparatus (PTL1).

The polishing-target object loading jig is an apparatus for simultaneously loading a plurality of polishing-target objects respectively in a plurality of holding holes that are provided in the carrier, in the polishing step of polishing the polishing-target objects, such as substrates, held in the carrier arranged between the upper and lower surface plates. The polishing-target object loading jig includes a first jig that has a plurality of insertion holes that are arranged to be located opposite to the plurality of holding holes in the carrier, and a second jig that is overlaid on an upper surface of the first jig and has a plurality of standby holes for keeping a plurality of

polishing-target objects, which are to be loaded into the plurality of holding holes in the carrier, on standby. The first jig and the second jig are supported such that their surfaces in contact with each other can slide against each other in the horizontal direction. The second jig is overlaid in contact with the upper surface of the first jig such that respective centers of rotation of the first jig and the second jig coincide with each other and the standby holes and the insertion holes are located in different directions from each other with respect to the centers of rotation of circular shapes. At this time, the polishing-target objects are arranged in the standby holes in the second jig. When the standby holes coincide with the insertion holes as a result of the second jig being slid around the center of rotation, the plurality of polishing-target objects arranged in the second jig simultaneously fall passing through the respective insertion holes and are set in the respective holding holes in the carrier under the first jig.

[Citation List]

[Patent Literature]

[0006] [PTL1]: JP 2012-76191A

[Summary of Invention]

[Technical Problem]

[0007] In this polishing-target object loading jig, when the second jig is slid around the center of rotation, main surfaces of the polishing-target objects, such as substrates, that are arranged in the standby holes in the second jig are rubbed against the surface of the first jig while being in contact therewith, and therefore there is a problem in that the surfaces of the polishing-target objects cannot be kept from being damaged even if the first jig is made of a resin material that is unlikely to damage surfaces of substrates. In particular, it is preferable that surface unevenness of main surfaces of substrates, such as main surfaces of substrates used for magnetic disks, is minimized as much as possible, and therefore it is not preferable that the main surfaces are damaged before polishing.

[0008] In view of this, an object of the present invention is to provide a substrate arrangement assisting jig that has a configuration that is different from the above-

described polishing-target object loading jig and with which substrates can be efficiently arranged in holding holes in a carrier while main surfaces and outer circumferential end portions of the substrates are kept from being damaged, and a method for producing substrates that includes polishing processing for polishing substrates using the jig.

[Solution to Problem]

[0009] An aspect of the present invention is a substrate arrangement assisting jig for arranging substrates respectively in a plurality of substrate holding holes that are provided in a carrier, in order to polish main surfaces of the substrates. The substrate arrangement assisting jig includes:

a plate-shaped jig main body that has a plurality of standby holes that are provided in correspondence with positions of the plurality of substrate holding holes in the carrier and in which substrates are arrangeable; and

claw portions that are provided on the jig main body, protrude from at least one position on an edge of each of the standby holes, and hold the substrates while being in contact with outer circumferential ends of the substrates.

The claw portions are configured to freely protrude into or retract from regions of the standby holes so that the substrates are held in the respective standby holes as a result of the claw portions protruding and the substrates are released from the respective standby holes and fall to be arranged in the respective substrate holding holes in the carrier located below as a result of the claw portions being retracted in a state where the jig main body is located above the carrier.

[0010] It is preferable that the claw portions are provided at two or more positions on a circumference surface of each of the standby holes,

the claw portions each have an inclined surface that is configured not to come into contact with main surfaces of a corresponding one of the substrates and is configured to come into contact with a chamfered surface that is provided at an outer circumferential end of the corresponding substrate, and

the substrates are held in the respective standby holes as a result of each claw portion supporting a corresponding one of the substrates from below with the

inclined surface being in contact with the chamfered surface.

[0011] It is preferable that the claw portions each include a projecting portion that projects inward from an edge of a corresponding one of the standby holes and abuts against a side wall surface that is provided at an outer circumferential end of a corresponding one of the substrates and is perpendicular to main surfaces of the corresponding substrate, and

the substrates are held in the respective standby holes as a result of the projecting portion abutting against the side wall surface from a direction perpendicular to the side wall surface and pressing the corresponding substrate against a wall of the corresponding standby hole.

[0012] It is preferable that the claw portions provided in the respective standby holes are configured to retract simultaneously with each other.

It is preferable that a surface of the jig main body that faces the carrier is provided with a projection or a hole that is locked to a hole or a projection provided on a surface of the carrier so that positions of the standby holes correspond to positions of the substrate holding holes in the carrier.

[0013] Another aspect of the present invention is a method for producing substrates that includes polishing processing for polishing main surfaces of the substrates in a state where the substrates are held respectively in a plurality of substrate holding holes that are provided in a carrier. The method includes:

in a state where the substrates are held respectively in the standby holes in the above-described substrate arrangement assisting jig by the claw portions protruding from edges of the standby holes, retracting the claw portions of the jig main body at a position above the carrier that is arranged on a lower surface plate, to release the substrates from the standby holes and cause the substrates to fall and be arranged respectively in the substrate holding holes in the carrier located below; and

polishing the substrates arranged in the carrier by sandwiching the substrates between an upper surface plate and the lower surface plate and moving the substrates relative to the upper surface plate and the lower surface plate.

[Advantageous Effects of the Invention]

[0014] According to the above-described substrate arrangement assisting jig and the method for producing substrates in which substrates are polished using the jig, substrates can be efficiently arranged in the substrate holding holes in the carrier while the main surfaces and the outer circumferential end portions of the substrates are kept from being damaged.

[Brief Description of Drawings]

[0015] FIG. 1 is a diagram showing a schematic configuration of a substrate arrangement assisting jig according to an embodiment of the invention.

FIG. 2 is a diagram showing claw portions for holding a substrate in a ~~substrate holding~~standby hole according to an embodiment of the invention.

FIG. 3 is a diagram showing a claw portion for holding a substrate in a ~~substrate holding~~ standby hole according to another embodiment of the invention.

FIG. 4 is a diagram showing a state in which a substrate leaves a ~~substrate holding~~standby hole in a substrate arrangement assisting jig according to an embodiment of the invention.

FIG. 5 is a diagram showing a configuration of a polishing apparatus used for polishing processing according to an embodiment of the invention.

FIG. 6 is a diagram showing a configuration of a polishing apparatus used for polishing processing according to an embodiment of the invention.

[Description of Embodiments]

[0016] The following describes a substrate arrangement assisting jig and a method for producing substrates according to an embodiment of the invention with reference to the accompanying drawings.

[0017] (Substrate Arrangement Assisting Jig)

FIG. 1 is a diagram showing a schematic configuration of a substrate arrangement assisting jig according to an embodiment of the invention.

A substrate arrangement assisting jig 10 is an arrangement assisting jig for arranging substrates respectively in a plurality of substrate holding holes that are provided in a carrier 12, in order to polish main surfaces of the substrates.

"Polishing" referred to in the present specification encompasses processing in which surfaces of the substrates are roughly ground in order to change dimensions or the shape of the substrates, i.e., "grinding (lapping)", as well as "polishing" in which the surfaces are polished in order to reduce surface roughness of the substrates after grinding. When processing in which surfaces of the substrates are polished in order to reduce surface roughness of the substrates after "grinding" is distinguished from grinding and referred to as "polishing", the substrate arrangement assisting jig 10 is an arrangement assisting jig for arranging the substrates respectively in the plurality of substrate holding holes provided in the carrier 12, in order to "grind" or "polish" the main surfaces of the substrates. In other words, the substrate arrangement assisting jig 10 can be used irrespective of processing methods when the main surfaces of the substrates are processed using the carrier 12 as described above.

As shown in FIG. 1, the substrate arrangement assisting jig 10 includes a plate-shaped jig main body 16. A plurality of standby holes 18 in which substrates S are arrangeable are provided in the jig main body 16 in correspondence with positions of a plurality of substrate holding holes 14 in the carrier 12. Six substrate holding holes 14 are provided in the carrier 12, and six standby holes 18 are provided in the jig main body 16 at positions that correspond to the positions of the substrate holding holes.

Although six substrate holding holes 14 are provided in the carrier 12 in the example shown in FIG. 1, the number of substrate holding holes 14 is not limited to six and is only required to be two or more. The number of substrate holding holes 14 is preferably five or more, and more preferably ten or more.

It should be noted that teeth portions are provided in an outer circumferential surface of the carrier 12 shown in FIG. 1, though they are not shown, and the teeth portions engage with an internal gear (a gear 62 shown in FIG. 5) that is provided in a lower surface plate as described later.

[0018] Claw portions are provided at at least one position on an edge of each standby hole 18 in the jig main body 16, and each claw portion protrudes from the

edge and holds a substrate S while being in contact with an outer circumferential end of the substrate S. The claw portions freely protrude into or retract from regions of the standby holes 18 so that the substrates S are held in the respective standby holes 18 as a result of the claw portions protruding and the substrates S are released from the respective standby holes 18 and fall to be arranged in the respective substrate holding holes 14 in the carrier 12 located below as a result of the claw portions retracting in a state where the jig main body 16 is moved to a position above the carrier 12 that is placed on the lower surface plate. A claw portion being in contact with the outer circumferential end of the substrate S when holding the substrate S means that the claw portion is in contact with at least a portion of the outer circumferential end. The outer circumferential end includes a boundary portion between an end face and a main surface (in a case where a chamfered surface is formed in the end face, a boundary portion between the chamfered surface and the main surface), in addition to the end face.

Each claw portion is only required to be formed so as to protrude and hold a substrate S by being in contact with at least a portion of the outer circumferential end of the substrate S, and does not necessarily have to have a claw-like shape.

[0019] FIG. 2 is a diagram showing claw portions for holding a substrate S in a standby hole 18 according to an embodiment of the invention. Each claw portion 20 shown in FIG. 2 has an inclined surface 24 that is configured not to come into contact with main surfaces of the substrate S and is configured to come into contact with a chamfered surface 22 that is provided at an outer circumferential end of the substrate S. As a result of each claw portion 20 supporting a substrate S from below with the inclined surface 24 being in contact with the chamfered surface 22 (including a boundary portion between the chamfered surface 22 and a main surface) as shown in FIG. 2, the substrates S are held in the respective standby holes 18. The claw portions 20 freely protrude into or retract from the regions of the standby holes 18 as a result of operation portions 26 shown in FIG. 1 being pressed by an operator or a pressing force applied to the operation portions 26 being reduced.

The chamfered surface 22 is a surface that is located between a side wall surface 25 (see FIG. 3) that is substantially perpendicular to a main surface of the substrate S (at an angle of 89 to 91 degrees) and the main surface. The chamfered surface 22 is smoothly connected to the main surface and extends toward the side wall surface 25.

[0020] The mechanism for causing the claw portions 20 to protrude or retract is not specifically limited. For example, it is possible to use a mechanism in which a spring member is used and the claw portions 20 constantly protrude into the standby hole 18 while being biased by the spring member, and when the operation portions 26 are pressed, the claw portions 20 retract against the biasing force of the spring member. It is also possible to use a mechanism in which a cam mechanism is used and each standby hole 18 is provided with a gear that rotationally moves along an inner circumference of the standby hole, and the claw portions 20 protrude or retract as a result of the cam mechanism, which is connected to the claw portions 20, operating along with rotational movement of the gear. The claw portions 20 are provided at two or more positions on the circumferential surface of each standby hole 18. With this configuration, the substrates S can be stably held in the respective standby holes 18.

The inclined surface 24 of each claw portion 20 merely supports the chamfered surface 22 from below, and the area of contact between the inclined surface and the substrate S is small, and therefore hardly any damage is formed in the chamfered surface 22.

The number of claw portions 20 is not specifically limited, but is preferably two or three because an apparatus configuration becomes complex if the number of claw portions 20 is four or more. In a case where two claw portions 20 are provided, the claw portions 20 are preferably provided at about 180° intervals, and in a case where three claw portions 20 are provided, the claw portions 20 are preferably provided at about 120° intervals, on the circumferential surface of each standby hole 18.

[0021] FIG. 3 is a diagram showing a claw portion for holding a substrate S in a

standby hole 18 according to another embodiment of the invention.

A claw portion 20 shown in FIG. 3 includes a projecting portion 28 that projects from the edge of the standby hole 18 toward the inside of the standby hole 18 and abuts against the side wall surface 25 that is provided at the outer circumferential end of the substrate S and is perpendicular to the main surfaces of the substrate S. As a result of the projecting portion 28 abutting against the side wall surface 25 from a direction perpendicular to the side wall surface and pressing the substrate S against a wall of the standby hole 18 (a wall portion that is located opposite to the projecting portion 28), each substrate S is held in the standby hole 18 by a friction force. Although the projecting portion 28 of the claw portion 20 presses the side wall surface 25 from a side thereof, the area of contact between the projecting portion 28 and the substrate S is small, and therefore hardly any damage is formed in the side wall surface 25.

The mechanism for causing the claw portion 20 shown in FIG. 3 to protrude or retract is also not specifically limited as described above, and it is possible to use a mechanism in which a spring member is used or a mechanism in which a cam mechanism is used.

[0022] As a result of such a claw portion 20 retracting, the substrate S held in the standby hole 18 falls from the standby hole 18 and can be arranged in a substrate holding hole 14 in the carrier 12 that is placed on the lower surface plate located below, as shown in FIG. 4. FIG. 4 is a diagram showing a state in which the substrate S leaves the standby hole 18 in a substrate arrangement assisting jig according to an embodiment of the invention.

In this case, it cannot be ensured that the substrate S will be arranged in the substrate holding hole 14 unless the standby hole 18 and the substrate holding hole 14 are precisely aligned with each other in the vertical direction. Therefore, according to an embodiment, the jig main body 16 is provided with a positioning portion that can be locked with a positioning portion that is provided on the carrier 12. In this case, the jig main body 16 can be properly positioned with respect to the carrier 12. The positioning portion provided on the jig main body 16 is, for example,

a projection that projects from the jig main body 16 toward the carrier 12 or a hole, and the positioning portion provided on the carrier 12 is, for example, a hole to which the projection can be locked or a projection that projects toward the jig main body 16.

[0023] As described above, the claw portions 20 are configured to freely protrude into or retract from the regions of the standby holes 18 so that the substrates S are released from the respective standby holes 18 and fall to be arranged in the respective substrate holding holes 14 in the carrier 12 located below, and therefore the substrates S can be efficiently arranged in the substrate holding holes 14 in the carrier 12 while the main surfaces and the outer circumferential end portions of the substrates S are kept from being damaged.

[0024] It is preferable that the claw portions 20 provided in the respective standby holes 18 are configured to retract simultaneously with each other in terms of simultaneously arranging the substrates S in the substrate holding holes 14 in the carrier 12.

[0025] The above-described substrate arrangement assisting jig 10 can be favorably used in a case where polishing processing is performed in a state where the substrates S are held in the substrate holding holes 14 in the carrier 12. In particular, before the start of polishing processing that is performed using a polishing apparatus, a setting operation for arranging the substrates S in the substrate holding holes 14 is performed within a limited space that is formed by moving the upper surface plate upward relative to the lower surface plate, and accordingly it is preferable to use the substrate arrangement assisting jig 10 to efficiently perform the setting operation of the substrates S within the limited space. Therefore, according to an embodiment, the substrate arrangement assisting jig 10 is used in a method for producing substrates S that includes polishing processing for polishing main surfaces of the substrates S in a state where the substrates S are held respectively in a plurality of substrate holding holes 14 provided in the carrier 12. That is, in the method for producing substrates, in a state where the substrates S are held respectively in the standby holes 18 of the above-described substrate

arrangement assisting jig 10 by the claw portions 20 protruding from the edges of the standby holes 18, the claw portions 20 of the jig main body 16 are retracted at a position above the carrier 12 that is arranged on the lower surface plate, and thus the substrates S are released from the standby holes 18 and fall. As a result, the substrates S are arranged respectively in the substrate holding holes 14 in the carrier 12 located below. Thereafter, the substrates S arranged in the carrier 12 are polished by sandwiching the substrates S between the upper and lower surface plates and moving the substrates relative to the upper and lower surface plates. When the jig main body 16 is positioned above the carrier 12, the jig main body 16 may be overlaid on the carrier 12 such that a surface (main surface) of the carrier 12 and a surface (main surface) of the jig main body 16 come into contact with each other, or the jig main body 16 may be positioned such that the surface (main surface) of the jig main body 16 is slightly spaced apart from the surface (main surface) of the carrier 12, for example.

[0026] (Polishing Apparatus)

The following describes the configuration of the polishing apparatus in more detail with reference to FIGS. 5 and 6. FIGS. 5 and 6 are diagrams showing the configuration of the polishing apparatus that is used for polishing processing according to an embodiment of the invention.

In the polishing apparatus, polishing pads 30 are affixed respectively to an upper surface of a lower surface plate 60 and a lower surface of an upper surface plate 40. The polishing pad 30 shown in FIG. 5 is formed into a sheet. The polishing pads 30 are made of urethane foam, for example.

[0027] The material of substrates S to be polished using the polishing apparatus and the method for producing the substrates S are not specifically limited. The material of the substrates S is, for example, glass or an aluminum alloy. A layer of a NiP (nickel phosphorus) alloy may be formed on surfaces of the substrates S made of such a material. If the substrates S are substrates for magnetic disks, the substrates S have the size of a substrate for a nominal 3.5-inch magnetic disk or a substrate for a nominal 2.5-inch magnetic disk, for example. If the substrates S are

substrates for nominal 3.5-inch magnetic disks, the substrates have an outer diameter of 94 mm to 98 mm and an inner diameter of about 25 mm, for example. If the substrates S are substrates for nominal 2.5-inch magnetic disks, the substrates have an outer diameter of 56 mm to 68 mm and an inner diameter of about 20 mm, for example. The substrates S have a thickness of 0.20 mm to 1.3 mm, for example, and preferably 0.30 mm to 0.7 mm. If the substrates S are glass plates, disk-shaped glass plates are formed by performing scribing and cutting on a large glass sheet, for example. That is, a method is used in which a cutting line is formed in the glass sheet using a scriber and the glass sheet is cracked and split along the cutting line through heating or the like.

Alternatively, if the substrates S are glass plates, circular plate-shaped glass plates that are slightly larger than the substrates S may be formed from a large glass plate using a laser beam, for example. Alternatively, circular plate-shaped glass plates may be formed through wet etching using an etching solution of hydrofluoric acid or the like.

A large glass sheet from which a glass blank is cut out is, for example, a glass plate that is produced through a floating method or a down draw method and has a constant thickness. Alternatively, the substrates may be produced by pressing a glass mass using a mold.

Further, a concentric circular hole is formed in a circular plate-shaped glass blank using a scriber. The circular hole may be formed through irradiation with a laser beam or etching, instead of using a scriber. In order to form chamfered surfaces 22 at end faces (an end face of the outer circumferential end portion and an end face of an inner circumferential end portion) of the thus obtained disk-shaped substrate S, shape processing is performed using a formed grindstone. Shape processing may be performed using a laser beam L, instead of using a formed grindstone.

[0028] The carrier 12 has the substrate holding holes 14 for holding the disk-shaped substrates S when polishing processing is performed on the main surfaces of the substrates S while the substrates S are sandwiched between the upper surface plate

40 and the lower surface plate 60. The carrier 12 includes teeth portions 31, which are provided on an outer circumferential portion thereof and engage with a sun gear 61 and an internal gear 62, and the plurality of substrate holding holes 14 for accommodating and holding the substrates S. The sun gear 61, the internal gear 62, which is provided along an outer edge, and the carrier 12, which is disk-shaped, constitute a planetary gear mechanism that has a central axis CTR (see FIG. 6). The disk-shaped carrier 12 engages with the sun gear 61 on the inner side of the polishing apparatus, engages with the internal gear 62 on the outer side of the polishing apparatus, and accommodates and holds the plurality of substrates S. The carrier 12, which serves as a planetary gear, revolves while rotating on the lower surface plate 60, and as a result, the substrates S move relative to the lower surface plate 60. If the sun gear 61 rotates in the counterclockwise direction, for example, the carrier 12 rotates in the clockwise direction and the internal gear 62 rotates in the counterclockwise direction. As a result, the lower surface plate 60 and the substrates S move relative to each other. Similarly, the substrates S and the upper surface plate 40 move relative to each other.

[0029] During the above-described relative movement, the upper surface plate 40 is pressed against the substrates S held by the carrier 12 with a predetermined pressure (i.e., in the vertical direction), and as a result, the polishing pads 30 are pressed against the substrates S. Further, as shown in FIG. 6, a polishing slurry is supplied between the substrates S and the polishing pads 30 from a supply tank 71 via one or more pipes 72 by a pump (not shown).

The main surfaces of the substrates S are polished using the above-described polishing apparatus.

[0030] According to an embodiment, the polishing processing performed on the substrates S includes first polishing and second polishing.

In the first polishing, the main surfaces on both sides of the substrates S are polished while outer end faces of the substrates S are held in the substrate holding holes 14 provided in the carrier 12 of the above-described double-side polishing apparatus. The first polishing is for adjusting minute surface unevenness

(microwaviness, roughness).

The first polishing is performed using, for example, cerium oxide abrasive particles or zirconia abrasive particles as loose abrasive particles. The average particle diameter (D50) of the abrasive polishing particles is in the range of 0.5 to 3 μm, for example.

[0031] If the substrates S are glass plates, the glass plates may be chemically strengthened after the first polishing. In this case, for example, a molten liquid mixture in which potassium nitrate and sodium nitrate are mixed is used as a chemical strengthening liquid, and the glass plates are immersed in the chemical strengthening liquid. As a result, compressive stress layers can be formed on surfaces of the glass plates through ion exchange.

[0032] Next, the second polishing is performed on the substrates S. In the second polishing, the main surfaces on both sides of the substrates S are polished while the substrates S are held in the substrate holding holes 14 provided in the carrier 12 of the above-described double-side polishing apparatus. The second polishing differs from the first polishing in the type and the particle size of loose abrasive particles and the hardness of resin polishers. It is preferable that the second polishing is performed using a resin polisher that has a lower hardness than a resin polisher used in the first polishing has. The main surfaces of the glass plates are polished while supplying, for example, a polishing liquid that contains colloidal silica as loose abrasive particles between the polishing pads of the double-side polishing apparatus and the main surfaces of the glass plates. It is preferable that the abrasive polishing particles used in the second polishing have an average particle diameter (D50) in the range of 5 to 50 nm, for example.

It should be noted that “grinding” processing may be performed on the disk-shaped substrates S before the first polishing. In a case where an apparatus that includes a carrier similar to the carrier of the polishing apparatus is used in the “grinding” processing, the substrate arrangement assisting jig 10 can be used. In the embodiment described above, polishing is performed twice, but polishing may be performed once.

Thus, the first polishing and the second polishing are performed on the substrates S to produce substrates that have desired surface unevenness.

[0033] Although circular plate-shaped substrates that do not have inner holes are described above as the substrates S to be applied to the substrate arrangement assisting jig 10, the substrates S may be disk-shaped substrates that have concentric inner holes, polygonal substrates that have rectangular shapes, or semiconductor substrates such as silicon wafers, as well as circular substrates.

[0034] Although the substrate arrangement assisting jig and the method for producing substrates according to the present invention have been described in detail, the present invention is not limited to the above-described embodiment, and it will be appreciated that various improvements and modifications can be made without departing from the gist of the present invention.

[List of Reference Numerals]

[0035]

10	Substrate arrangement assisting jig
12	Carrier
14	Substrate holding hole
16	Jig main body
18	Standby hole
20	Claw portion
22	Chamfered surface
24	Inclined surface
25	Side wall surface
26	Operation portion
28	Projecting portion
30	Polishing pad
31	Teeth portion
40	Upper surface plate
60	Lower surface plate
61	Sun gear
62	Internal gear

71 Tank

72 Pipe

CLAIMS

1. A substrate arrangement assisting jig for arranging substrates respectively in a plurality of substrate holding holes that are provided in a carrier, in order to polish main surfaces of the substrates, comprising:

a plate-shaped jig main body that has a plurality of standby holes that are provided in correspondence with positions of the plurality of substrate holding holes in the carrier and in which substrates are arrangeable; and

claw portions that are provided on the jig main body, protrude from at least one position on an edge of each of the standby holes, and hold the substrates while being in contact with outer circumferential ends of the substrates,

wherein the claw portions are configured to freely protrude into or retract from regions of the standby holes so that the substrates are held in the respective standby holes as a result of the claw portions being caused to protrude and the substrates are released from the respective standby holes and fall to be arranged in the respective substrate holding holes in the carrier located below as a result of the claw portions being retracted in a state where the jig main body is located above the carrier.

2. The substrate arrangement assisting jig according to claim 1,

wherein the claw portions are provided at two or more positions on a circumferential surface of each of the standby holes,

the claw portions each have an inclined surface that is configured not to come into contact with main surfaces of a corresponding one of the substrates and is configured to come into contact with a chamfered surface that is provided at an outer circumferential end of the corresponding substrate, and

the substrates are held in the respective standby holes as a result of each claw portion supporting a corresponding one of the substrates from below with the inclined surface being in contact with the chamfered surface.

3. The substrate arrangement assisting jig according to claim 1,

wherein the claw portions each include a projecting portion that projects inward from an edge of a corresponding one of the standby holes and abuts against a side wall surface that is provided at an outer circumferential end of a corresponding one of the substrates and is perpendicular to main surfaces of the corresponding substrate, and

the substrates are held in the respective standby holes as a result of the projecting portion abutting against the side wall surface from a direction perpendicular to the side wall surface and pressing the corresponding substrate against a wall of the corresponding standby hole.

4. The substrate arrangement assisting jig according to any one of claims 1 to 3,

wherein the claw portions provided in the respective standby holes are configured to retract simultaneously with each other.

5. The substrate arrangement assisting jig according to any one of claims 1 to 4,

wherein a surface of the jig main body that faces the carrier is provided with a projection or a hole that is locked to a hole or a projection provided on a surface of the carrier so that positions of the standby holes correspond to positions of the substrate holding holes in the carrier.

6. A method for producing substrates that includes polishing processing for polishing main surfaces of the substrates in a state where the substrates are held respectively in a plurality of substrate holding holes that are provided in a carrier, the method comprising:

in a state where the substrates are held respectively in the standby holes in the substrate arrangement assisting jig according to any one of claims 1 to 5 by the claw portions protruding from edges of the standby holes, retracting the claw

portions of the jig main body at a position above the carrier ~~that is arranged on the lower surface plate~~, to release the substrates from the standby holes and cause the substrates to fall and be arranged respectively in the substrate holding holes in the carrier located below, and

polishing the substrates arranged in the carrier ~~by sandwiching the substrates between an upper surface plate and the lower surface plate and moving the substrates relative to the upper surface plate and the lower surface plate~~.