WAFER DIVIDING METHOD AND WAFER DIVIDING APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a wafer dividing method and a wafer dividing apparatus dividing a wafer having starting points of division formed along dividing lines into individual chips and maintaining an interval between adjacent chips.

Description of the Related Art

A plurality of devices such as integrated circuits (ICs) and large-scale integration circuits (LSIs) are individually formed in a plurality of regions partitioned along a plurality of crossing dividing lines on a front surface of a wafer, and the wafer thus obtained has starting points of division formed along the plurality of dividing lines by being irradiated with a laser beam by a laser processing apparatus. Then, an external force is applied to the wafer, resulting in dividing the wafer into individual device chips, so that each of the device chips thus divided are used for electrical equipment such as a mobile phone or a personal computer.

Examples of laser processing apparatuses include the following types (1) to (3), and a suitable laser

processing apparatus is selected depending on a kind of a workpiece, a processing accuracy, or the like.

(1) A type in which grooves serving as starting points of division are formed through ablation processing by applying, to a workpiece, a pulsed laser beam of a wavelength having absorptivity to the workpiece (see Japanese Patent Laid-open No. Hei10-305420, for example).

(2) A type in which modified layers serving as starting points of division are formed inside a workpiece by having a focal point of a pulsed laser beam of a wavelength passing through the workpiece positioned inside the workpiece and then applying the pulsed laser beam to the workpiece (see Japanese Patent No. 3408805, for example).

(3) A type in which a plurality of shield tunnels serving as starting points of division and each including a fine hole and an amorphous region formed around the fine hole for shielding the fine hole are formed by having a focal point of a pulsed laser beam of a wavelength passing through the workpiece positioned inside the workpiece and then applying the pulsed laser beam to the workpiece (see Japanese Patent Laid-open No. 2014-221483, for example).

Thus, a wafer in which the starting points of

division are formed along the dividing lines are divided into individual device chips by a dividing apparatus (see Japanese Patent Laid-open No. 2005-129607, for example). When a wafer is divided into individual device chips by a dividing apparatus described in Japanese Patent Laid-open No. 2005-129607, the wafer in which the starting points of division are formed along the dividing lines are accommodated in an annular frame having an opening through an adhesive tape, and the wafer is mounted on a wafer holding section of the dividing apparatus while the annular frame is fixed to a frame fixing section. Then, the wafer holding section and the frame fixing section are relatively moved so as to be separated from each other, to expand the adhesive tape, so that a tensile force is made to act radially on the wafer. In this manner, the wafer having the starting points of division formed along the dividing lines can be divided into individual device chips, and it is also possible to form an interval between adjacent device chips.

SUMMARY OF THE INVENTION

However, in a state in which the wafer is divided into individual device chips, when a suction force of the wafer holding section is made to act on the wafer to suck

and hold the wafer on a holding surface of the wafer holding section and then, the holding surface of the wafer holding section and a fixing surface of the frame fixing section are brought closer to each other until the holding surface of the wafer holding section and the fixing surface of the frame fixing section are on the same level, a slack occurs in the adhesive tape between the wafer and the annular frame in the middle of bringing the holding surface of the wafer holding section and the fixing surface of the frame fixing section closer to each other, thereby causing an air leakage between the adhesive tape and the holding surface to decrease the suction force on the holding surface. As a result, the adjacent device chips are brought closer, causing a problem that an interval between the adjacent device chips formed upon dividing may not be maintained.

It is therefore an object of the present invention to provide a wafer dividing method and a wafer dividing apparatus capable of dividing a wafer in which starting points of division are formed into individual chips, and maintaining an interval between the adjacent chips formed upon dividing.

In accordance with an aspect of the present invention, there is provided a wafer dividing method of

dividing a wafer, which is accommodated in an annular frame having an opening accommodating the wafer through an adhesive tape and has starting points of division formed along a plurality of crossing dividing lines, into individual chips and maintaining an interval between adjacent chips. The method includes a mounting step of mounting the wafer accommodated in the annular frame through the adhesive tape on a dividing apparatus including a wafer holding section having a holding surface sucking and holding the wafer through the adhesive tape, a frame fixing section having a fixing surface fixing the annular frame on a same level as the holding surface, and separating means relatively separating the wafer holding section and the frame fixing section from each other to expand the adhesive tape and dividing the wafer into individual chips. The method also includes an expanding step of expanding the adhesive tape by operating the separating means in a state in which no suction force of the wafer holding section is applied to the wafer mounted on the dividing apparatus to divide the wafer into individual chips and to form an interval between adjacent chips. The method further includes a sucking and holding step of applying a suction force of the wafer holding section with the adhesive tape expanded

to suck and hold the wafer through the adhesive tape, and a shrinking step of bringing the wafer holding section and the frame fixing section relatively closer to each other until the holding surface and the fixing surface are on a same level and heating a slaked portion of the adhesive tape between the wafer and the annular frame to shrink. In this method, the shrinking step includes a leak preventing sub-step of heating a slacked portion of the adhesive tape to shrink so as not to generate an air leakage on the holding surface on a way where the holding surface and the fixing surface are on the same level.

Preferably, the leak preventing sub-step is performed when a value of a pressure meter disposed in the wafer holding section is changed. It is preferred that the leak preventing sub-step is performed at a timing set in advance. Preferably, the leak preventing sub-step is performed in a state in which approach between the holding surface and the fixing surface is stopped.

In accordance with another aspect of the present invention, there is provided a wafer dividing apparatus dividing a wafer, which is accommodated in an annular frame having an opening accommodating the wafer through an adhesive tape and has starting points of division

formed along a plurality of crossing dividing lines, into individual chips and maintaining an interval between adjacent chips, the wafer dividing apparatus including a wafer holding section having a holding surface sucking and holding the wafer through the adhesive tape, a frame fixing section having a fixing surface fixing the annular frame on a same level as the holding surface, separating means relatively separating the wafer holding section and the frame fixing section from each other to expand the adhesive tape and dividing the wafer into individual chips, heating means heating a slacked portion of the adhesive tape between the wafer and the annular frame to shrink, and controlling means. The controlling means performs expanding control expanding the adhesive tape by operating the separating means in a state in which no suction force of the wafer holding section is applied to the wafer mounted on the wafer holding section to divide the wafer into individual chips and to form an interval between adjacent chips, sucking and holding control applying a suction force of the wafer holding section with the adhesive tape expanded to suck and hold the wafer through the adhesive tape, and shrinking control of bringing the wafer holding section and the frame fixing section relatively closer until the holding surface and

the fixing surface are on a same level and heating a slaked portion of the adhesive tape between the wafer and the annular frame to shrink. The controlling means heats a slacked portion of the adhesive tape to shrink so as not to generate an air leakage on the holding surface on a way where the holding surface and the fixing surface are on a same level.

Preferably, the wafer holding section has a pressure meter disposed therein, and the controlling means prevents an air leakage by causing the heating means to heat a slacked portion of the adhesive tape to shrink when a value of the pressure meter disposed in the wafer holding section is changed. Preferably, the controlling means prevents an air leakage by causing the heating means to heat a slacked portion of the adhesive tape to shrink at a timing set in advance. Preferably, the controlling means causes the heating means to heat a slacked portion of the adhesive tape to shrink in a state in which approach between the holding surface and the fixing surface is stopped.

According to the wafer dividing method of the present invention, since the shrinking step includes the leak preventing sub-step of heating the slacked portion of the adhesive tape to shrink so as not to generate an

air leakage on the holding surface on a way where the holding surface and the fixing surface are on the same level, it is possible to divide the wafer having the starting points formed therein into individual chips and to maintain an interval between adjacent chips formed upon dividing.

According to the wafer dividing apparatus of the present invention, since the controlling means perform shrinking control of heating the slacked portion of the adhesive tape to shrink so as not to generate an air leakage on the holding surface on a way where the holding surface and the fixing surface are on the same level, it is possible to divide the wafer having the starting points formed therein into individual chips and to maintain an interval between adjacent chips formed upon dividing.

The above and other objects, features and advantages of the present invention and the manner of realizing them will become more apparent, and the invention itself will best be understood from a study of the following description and appended claims with reference to the attached drawings showing a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view schematically illustrating a dividing apparatus of a wafer according to an embodiment of the present invention;

FIG. 2 is a cross-sectional view of the dividing apparatus illustrated in FIG. 1;

FIG. 3 is a cross-sectional view of the dividing apparatus illustrating a state in which a mounting step is performed;

FIG. 4 is a cross-sectional view of the dividing apparatus illustrating a state in which an expanding step is performed;

FIG. 5 is a cross-sectional view of the dividing apparatus illustrating a state in which a leak preventing step in a shrinking step is performed;

FIG. 6 is a cross-sectional view of the dividing apparatus illustrating a state in which a slack of an adhesive tape is eliminated after the leak preventing step is performed;

FIG. 7 is a cross-sectional view of the dividing apparatus illustrating a state in which another slack of the adhesive tape occurs and the leak preventing step is performed again; and

FIG. 8 is a cross-sectional view of the dividing

apparatus illustrating a state in which a holding surface of a wafer holding section and a fixing surface of a frame fixing section are on the same level.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

An embodiment of a wafer dividing method and a wafer dividing apparatus according to the present invention will be described with reference to the attached drawings. FIG. 1 illustrates a wafer 2 which can be divided into individual chips by the wafer dividing method and the wafer dividing apparatus according to the present invention. The disc-like wafer 2 is accommodated in an annular frame 4 having an opening 4a for accommodating the wafer 2 through an adhesive tape 6. More specifically, a peripheral edge of the adhesive tape 6 is fixed to the annular frame 4 so as to cover the opening 4a, a back surface 2b of the wafer 2 is attached to the adhesive tape 6. A front surface 2a of the wafer 2 is partitioned into a plurality of rectangular regions by a plurality of dividing lines (reference character omitted) in a grid pattern, and the plurality of rectangular regions have a plurality of devices 8 such as ICs or LSIs formed therein, respectively. Also, the wafer 2 has starting points of division 10 in a grid pattern

formed therein along the dividing lines by an appropriate laser processing apparatus. The starting points of division 10 may be formed of grooves formed in the front surface 2a of the wafer 2 through ablation processing, a modified layer formed inside the wafer 2, a plurality of shield tunnels each including a fine hole and an amorphous region formed around the fine hole for shielding the fine hole, or the like. Alternatively, the starting point of division 10 may be a cut groove formed in a cutting apparatus rotatably mounted with a cutting blade. As another alternative, the adhesive tape 6 which may be formed from a polyvinyl chloride (PVC) and the like has a heat shrinking property of shrinking when heated at a predetermined temperature or more. The annular frame 4 is formed from an appropriate metal material having a heat resistance, such as a stainless steel.

Referring to FIG. 1 and FIG. 2, a description will be given regarding a wafer dividing apparatus configured according to the present invention. A dividing apparatus 12 includes a wafer holding section 14 having a holding surface to hold and suck the wafer 2 through the adhesive tape 6, a frame fixing section 16 having a fixing surface to fix the annular frame 4 on the same level as the

holding surface, separating means 18 relatively separating the wafer holding section 14 and the frame fixing section 16 from each other to expand the adhesive tape 6, thereby dividing the wafer 2 into individual chips, heating means 20 heating a slacked portion of the adhesive tape 6 between the wafer 2 and the annular frame 4 to shrink, and controlling means 22 (see FIG. 2).

The wafer holding section 14 includes a circular base 24 (see FIG. 1), a cylindrical support column 26 extending upward from an upper surface of the base 24, a circular porous suction chuck 28 fixed to an upper end of the cylindrical support column 26, and a suction source 32 connected with the suction chuck 28 through a flow path 30 (see FIG. 2). As illustrated in FIG. 2, a diameter of the suction chuck 28 is larger than a diameter of the wafer 2 and is smaller than an inner diameter of the annular frame 4. In the flow path 30 of the wafer holding section 14, disposed are a pressure meter 34 measuring a pressure in the flow path 30, and a valve 36 opening/closing the flow path 30. Then, in the wafer holding section 14, the suction source 32 is operated in a state in which the valve 36 is opened to generate a suction force on an upper surface of the suction chuck 28, so that the wafer 2 mounted on the

upper surface of the suction chuck 28 can be sucked and held. In other words, in the present embodiment, the upper surface of the suction chuck 28 functions as the holding surface to suck and hold the wafer 2 through the adhesive tape 6.

The frame fixing section 16 and the separating means 18 will be described below. In the present embodiment, as illustrated in FIG. 1, the separating means 18 includes a plurality of electric cylinders extending upward from a peripheral edge portion of the upper surface of the base 24 at an interval in a circumferential direction. The plurality of electric cylinders constituting the separating means 18 is coupled with the frame fixing section 16 at an upper end of each of the electric cylinders, and the separating means 18 causes the frame fixing section 16 to move with respect to the wafer holding section 14 in an upward and downward directions and to stop at an arbitrary position. The frame fixing section 16 includes an annular elevating piece 38 coupled with the upper end of the separating means 18, and a plurality of clamps 40 each arranged at an outer peripheral edge of the elevating piece 38 at an interval in the circumferential direction. As illustrated in FIG. 1 and FIG. 2, an inner diameter of the elevating

piece 38 is larger than an outer diameter of the support column 26 of the wafer holding section 14, and there is a gap between an inner peripheral surface of the elevating piece 38 and an outer peripheral surface of the support column 26. Also, the inner diameter and an outer diameter of the elevating piece 38 are formed in a manner corresponding to an inner diameter and an outer diameter of the annular frame 4, respectively, and the annular frame 4 may be mounted on an upper surface of the elevating piece 38. Then, in the frame fixing section 16, it is possible to fix the annular frame 4 mounted on the upper surface of the elevating piece 38 with the plurality of clamps 40. In other words, in the present embodiment, the upper surface of the elevating piece 38 functions as the fixing surface of the frame fixing section 16 on which the annular frame 4 is fixed on the same level as the holding surface of the wafer holding section 14. Moreover, the separating means 18 moves the frame fixing section 16 downward with respect to the wafer holding section 14 so as to be separated from each other in a state in which the annular frame 4 is fixed to the frame fixing section 16, thereby expanding the adhesive tape 6 to divide the wafer 2 into individual device chips 8. Note that, although the separating means

18 in the present embodiment causes the frame fixing section 16 to be separated from the wafer holding section 14, it is sufficient only if the separating means relatively separate the wafer holding section and the frame fixing section from each other, and accordingly, the separating means may have a configuration in which the wafer holding section is moved upward so as to be separated from the frame fixing section, in an opposite manner to the present embodiment. Alternatively, the separating means may include an air cylinder.

As illustrated in FIG. 2, the heating means 20 includes a heater nozzle 42 in a circular plate shape as a whole, a heater 46 connected with the heater nozzle 42 through a flow path 44, and a valve 48 opening/closing the flow path 44. The heater nozzle 42 is formed with an annular ejecting port 42a at a lower surface thereof, and the ejecting port 42a is disposed above a portion between the suction chuck 28 and the elevating piece 38 (specifically, above the adhesive tape 6 between the wafer 2 and the annular frame 4 upon mounting the wafer 2 to the dividing apparatus 12). Then, the heating means 20 operates the heater 46 with the valve 48 opened to eject an air at a high temperature (at 600°C, for example) from the ejecting port 42a of the heater nozzle 42, thereby

heating a slacked portion of the adhesive tape 6 between the wafer 2 and the annular frame 4 to shrink.

The controlling means 22 made up of a computer includes a central processing unit (CPU) performing operational processing according to a control program, a read only memory (ROM) storing the control program and the like, a readable/rewritable random access memory (RAM) storing a result of operation and the like (any of them are not illustrated). The controlling means 22 is electrically connected to the suction source 32 and the valve 36 of the wafer holding section 14, the separating means 18, and the heater 46 and the valve 48 of the heating means 20 to control operation of the suction source 32 and the valve 36 of the wafer holding section 14, the separating means 18, and the heater 46 and the valve 48 of the heating means 20. Also, the controlling means 22 is electrically connected to the pressure meter 34 of the wafer holding section 14, and a value of pressure in the flow path 30 which is measured by the pressure meter 34 is sent to the controlling means 22.

Next, a wafer dividing method according to the present invention will be described. In the present specification, a wafer dividing method using the above-mentioned dividing apparatus 12 will be described. In the

wafer dividing method using the dividing apparatus 12, first, a mounting step of mounting the wafer 2 accommodated in the annular frame 4 through the adhesive tape 6 to the dividing apparatus 12 will be performed. In the mounting step as illustrated in FIG. 3, the separating means 18 is first operated to have the upper surface of the elevating piece 38 positioned on the same level as the upper surface of the suction chuck 28. Next, with the front surface 2a of the wafer 2 facing upward, the wafer 2 is mounted on the upper surface (holding surface) of the suction chuck 28 of the wafer holding section 14, while at the same time, the annular frame 4 is mounted on the upper surface (fixing surface) of the elevating piece 38 of the frame fixing section 16. Also, the clamps 40 fix the annular frame 4.

After the mounting step is performed, the controlling means 22 performs expanding control (expanding step) in which the separating means 18 is operated in a state in which no suction force of the wafer holding section 14 is applied to the wafer 2 mounted on the wafer holding section 14 of the dividing apparatus 12 to expand the adhesive tape 6, thereby dividing the wafer 2 into individual chips as well as forming an interval between adjacent chips. In the

expanding control (expanding step), first, the suction source 32 of the wafer holding section 14 is not operated, or the valve 36 of the wafer holding section 14 is closed, so as not to apply the suction force of the suction chuck 28 to the wafer 2. Next, as illustrated in FIG. 4, the separating means 18 moves the elevating piece 38 downward to separate the upper surface of the elevating piece 38 from the upper surface of the suction chuck 28. As a result, the annular frame 4 moves downward together with the elevating piece 38, so that the adhesive tape 6 fixed to the annular frame 4 at the peripheral edge thereof is expanded and a tensile force is radially act on the wafer 2. Accordingly, it is possible to divide the wafer 2 having the starting points of division 10 formed along the dividing lines into the individual device chips 8 and form an interval between adjacent chips.

After the expanding control (expanding step) is performed, the controlling means 22 performs sucking and holding control (sucking and holding step) of applying a suction force of the wafer holding section 14 with the adhesive tape 6 expanded to suck and hold the wafer 2 through the adhesive tape 6. In the sucking and holding control (sucking and holding step), with the adhesive tape 6 expanded, the valve 36 of the wafer holding

section 14 is opened, and the suction source 32 is operated, thereby generating a suction force on the upper surface of the suction chuck 28. Accordingly, it is possible to apply the suction force of the suction chuck 28 to the wafer 2 which is divided into the individual device chips 8 to suck and hold the wafer 2 through the adhesive tape 6.

After the sucking and holding control (sucking and holding step) is performed, the controlling means 22 performs shrinking control (shrinking step) in which the wafer holding section 14 and the frame fixing section 16 are relatively brought closer to each other until the holding surface and the fixing surface are on the same level and in which the slacked portion of the adhesive tape 6 between the wafer 2 and the annular frame 4 is heated by the heating means 20 to be shrunk. In the shrinking control (shrinking step) according to the present embodiment, when the separating means 18 causes the frame fixing section 16 to move upward with respect to the wafer holding section 14 until the upper surface (holding surface) of the suction chuck 28 of the wafer holding section 14 and the upper surface (fixing surface) of the elevating piece 38 of the frame fixing section 16 are on the same level, the controlling means 22 performs

leak preventing control (leak preventing step) of heating the slacked portion of the adhesive tape 6 to shrink by the heating means 20 so as not to generate an air leakage on the upper surface of the suction chuck 28 on a way where the upper surface of the suction chuck 28 and the upper surface of the elevating piece 38 are on the same level.

The leak preventing control (leak preventing step) may be performed, for example, when a value of the pressure meter 34 disposed in the wafer holding section 14 is changed. More specifically, the leak preventing step may be performed when a value (0.5 atm, for example) of the pressure meter 34 at the time of sucking and holding the wafer 2 on the upper surface of the suction chuck 28 through the adhesive tape 6 is changed by a predetermined value (by 0.01 atm, for example) or more. It is convenient to perform the leak preventing control (leak preventing step) in a state in which approach between the upper surface (holding surface) of the suction chuck 28 of the wafer holding section 14 and the upper surface (fixing surface) of the elevating piece 38 of the frame fixing section 16 is stopped. In the leak preventing control (leak preventing step), as illustrated in FIG. 5, the valve 48 of the heating means 20 is opened,

and the heater 46 is operated, whereby an air at a high temperature (at 600°C, for example) is ejected from the ejecting port 42a of the heater nozzle 42 toward the slacked portion of the adhesive tape 6 between the wafer 2 and the annular frame 4 thereby heating the slacked portion of the adhesive tape 6 to shrink. Accordingly, it is possible to maintain the suction force of the suction chuck 28 to the wafer 2 which is divided into the individual device chips 8 and to maintain an interval between the adjacent chips formed upon dividing. Then, as illustrated in FIG. 7, the controlling means 22 performs the shrinking step of heating the slacked portion of the adhesive tape 6 to shrink when the upper surface (holding surface) of the suction chuck 28 of the wafer holding section 14 and the upper surface (fixing surface) of the elevating piece 38 of the frame fixing section 16 are on the same level, and as illustrated in FIG. 8, a slack in the adhesive tape 6 is eliminated. Note that the number of heating the slacked portion of the adhesive tape 6 to shrink may be more than twice, or may be once.

As described above, in the present embodiment, the expanding control (expanding step), the sucking and holding control (sucking and holding step), and the shrinking control (shrinking step) are performed, and in

the shrinking control (shrinking step), the leak preventing control (leak preventing step) of heating the slacked portion of the adhesive tape 6 to shrink is performed so as not to generate an air leakage on the upper surface (holding surface) of the suction chuck 28 on a way where the upper surface (holding surface) of the suction chuck 28 of the wafer holding section 14 and the upper surface (fixing surface) of the elevating piece 38 of the frame fixing section 16 are on the same level. Accordingly, it is possible to divide the wafer 2 having the starting points of division 10 formed along the dividing lines into the individual device chips 8 and to maintain an interval between the adjacent chips formed upon dividing.

Note that the leak preventing control (leak preventing step) may be performed at a timing set in advance. More specifically, the leak preventing control (leak preventing step) may be performed at a timing at which the separating means 18 moves the frame fixing section 16 upward toward the wafer holding section 14 by a predetermined amount from a state in which the expanding control (expanding step) has been performed. Regarding a timing at which the leak preventing control (leak preventing step) is performed, for example, an

amount by which the frame fixing section 16 moves upward when a value of the pressure meter 34 obtained at a time of sucking and holding the wafer 2 on the upper surface of the suction chuck 28 through the adhesive tape 6 is changed by a predetermined value is acquired in advance by an experiment, the timing at which the leak preventing control (leak preventing step) is performed may be set to a timing at which the separating means 18 moves the frame fixing section 16 upward by the amount obtained in advance in the experiment.

The present invention is not limited to the details of the above described preferred embodiment. The scope of the invention is defined by the appended claims and all changes and modifications as fall within the equivalence of the scope of the claims are therefore to be embraced by the invention.

WHAT IS CLAIMED IS:

1. A wafer dividing method of dividing a wafer, which is accommodated in an annular frame having an opening accommodating the wafer through an adhesive tape and has starting points of division formed along a plurality of crossing dividing lines, into individual chips and maintaining an interval between adjacent chips, the method comprising:

a mounting step of mounting the wafer accommodated in the annular frame through the adhesive tape on a dividing apparatus including

a wafer holding section having a holding surface sucking and holding the wafer through the adhesive tape,

a frame fixing section having a fixing surface fixing the annular frame on a same level as the holding surface, and

separating means relatively separating the wafer holding section and the frame fixing section from each other to expand the adhesive tape and dividing the wafer into individual chips;

an expanding step of expanding the adhesive tape by operating the separating means in a state in which no suction force of the wafer holding section is applied to

the wafer mounted on the dividing apparatus to divide the wafer into individual chips and to form an interval between adjacent chips;

a sucking and holding step of applying a suction force of the wafer holding section with the adhesive tape expanded to suck and hold the wafer through the adhesive tape; and

a shrinking step of bringing the wafer holding section and the frame fixing section relatively closer to each other until the holding surface and the fixing surface are on a same level and heating a slaked portion of the adhesive tape between the wafer and the annular frame to shrink,

wherein the shrinking step includes a leak preventing sub-step of heating a slacked portion of the adhesive tape to shrink so as not to generate an air leakage on the holding surface on a way where the holding surface and the fixing surface are on the same level.

2. The wafer dividing method according to claim 1,

wherein the leak preventing sub-step is performed when a value of a pressure meter disposed in the wafer holding section is changed.

3. The wafer dividing method according to claim 1,

wherein the leak preventing sub-step is performed

at a timing set in advance.

4. The wafer dividing method according to claim 1,

wherein the leak preventing sub-step is performed in a state in which approach between the holding surface and the fixing surface is stopped.

5. A wafer dividing apparatus dividing a wafer, which is accommodated in an annular frame having an opening accommodating the wafer through an adhesive tape and has starting points of division formed along a plurality of crossing dividing lines, into individual chips and maintaining an interval between adjacent chips, the wafer dividing apparatus comprising:

a wafer holding section having a holding surface sucking and holding the wafer through the adhesive tape;

a frame fixing section having a fixing surface fixing the annular frame on a same level as the holding surface;

separating means relatively separating the wafer holding section and the frame fixing section from each other to expand the adhesive tape and dividing the wafer into individual chips;

heating means heating a slacked portion of the adhesive tape between the wafer and the annular frame to shrink; and

controlling means,

wherein the controlling means performs

expanding control expanding the adhesive tape by operating the separating means in a state in which no suction force of the wafer holding section is applied to the wafer mounted on the wafer holding section to divide the wafer into individual chips and to form an interval between adjacent chips,

sucking and holding control applying a suction force of the wafer holding section with the adhesive tape expanded to suck and hold the wafer through the adhesive tape, and

shrinking control of bringing the wafer holding section and the frame fixing section relatively closer to each other until the holding surface and the fixing surface are on a same level and heating a slaked portion of the adhesive tape between the wafer and the annular frame to shrink,

the controlling means heats a slacked portion of the adhesive tape to shrink so as not to generate an air leakage on the holding surface on a way where the holding surface and the fixing surface are on the same level.

6. The wafer dividing apparatus according to claim 5,

wherein the wafer holding section has a pressure meter disposed therein, and

the controlling means prevents an air leakage by causing the heating means to heat a slacked portion of the adhesive tape to shrink when a value of the pressure meter disposed in the wafer holding section is changed.

7. The wafer dividing apparatus according to claim 5,

wherein the controlling means prevents an air leakage by causing the heating means to heat a slacked portion of the adhesive tape to shrink at a timing set in advance.

8. The wafer dividing apparatus according to claim 5,

wherein the controlling means causes the heating means to heat a slacked portion of the adhesive tape to shrink in a state in which approach between the holding surface and the fixing surface is stopped.