

SEMICONDUCTOR STRIP SAWING APPARATUS

Technical Field (Field of the Invention)

5 [01] The present invention relates to semiconductor strip
sawing apparatuses, and more particularly, to a semiconductor
strip sawing apparatus in which air pressure can be uniformly and
efficiently applied to a drying device, thereby enabling both a
ball up type process and a ball down type process, and which can
10 be operated under various requirements.

Background Art

 [02] A semiconductor strip sawing apparatus means an
apparatus for sawing a packaged semiconductor strip into a
15 plurality of semiconductor packages.

 [03] The semiconductor strip sawing apparatus may have not
only a function of simply sawing a semiconductor strip into
semiconductor packages but also a function of sawing, cleaning,
drying the semiconductor packages, testing whether the
20 semiconductor packages are defective or not by photographing
images of top and bottom surfaces of the semiconductor packages,
sorting out the semiconductor packages into normal semiconductors

and defective semiconductors based on a test result, and discharging the semiconductor packages via a discharging tray.

[04] In general, a semiconductor strip sawing apparatus may be classified as a ball down type apparatus or a ball up type apparatus according to a form in which semiconductor packages that are tested and discharged are stacked.

[05] For the semiconductor strip sawing apparatus, a flipping process of flipping semiconductor packages during a process may be needed to be performed according to a user's demand or a strip type.

[06] In detail, whether the flipping process is to be performed may be determined according to whether a lead frame or a ball formed on a bottom surface of a semiconductor strip that is to be sawn faces upward or downward when the semiconductor strip is provided to the semiconductor strip sawing apparatus and whether a lead frame or a ball formed on a bottom surface of a tested semiconductor package faces upward or downward when the tested semiconductor package is discharged.

[07] Thus, there may be various combinations of methods of providing a semiconductor strip and methods of discharging semiconductor packages. However, when a semiconductor strip sawing apparatus is separately manufactured or designed for each of various combinations, the utilization of the semiconductor

strip sawing apparatus may be low and high costs may be incurred to perform a process of sawing a semiconductor strip.

[08] A semiconductor strip sawing apparatus that can be used as both a ball up type apparatus and a ball down type apparatus has been suggested.

[09] Korean Laid-Open Patent Publication No. 2012-0026745 discloses a semiconductor strip sawing apparatus that can be used as both a ball down type apparatus and a ball up type apparatus. However, when a semiconductor strip sawing apparatus is switched from the ball down type to the ball up type, a flipper or a flipper elevating device should be eliminated, thereby causing user inconvenience. When the semiconductor strip sawing apparatus is operated as the ball down type apparatus, a process of transferring a semiconductor strip or semiconductor packages should be performed a plurality of times, thereby causing various errors to occur.

Disclosure of the invention

Technical problem

[01] The technical purpose of the present invention is providing a semiconductor strip sawing apparatus in which air pressure can be uniformly and efficiently applied to a drying device, thereby enabling both a ball up type process and a ball

down type process, and which can be operated under various requirements.

Technical solution

5 **[02]** The semiconductor strip sawing apparatus of the present invention may comprise an on-loading part configured to provide a semiconductor package in a state in which the semiconductor package may be placed in a magazine, a pusher or a drawer configured to draw the semiconductor package from the
10 magazine to the outside of the on-loading part, an inlet rail on which the semiconductor package drawn from the pusher or the drawer may be placed, a strip picker configured to suck the semiconductor package placed on the inlet rail, and transfer the semiconductor package to a chuck table in a state in which a mold
15 surface of the semiconductor package faces downward, a sawing device configured to receive the semiconductor package from the strip picker, saw the semiconductor package on the chuck table into a plurality of semiconductor packages, and clean top surfaces of the plurality of semiconductor package with cleaning
20 water, a unit picker configured to simultaneously suck the plurality of semiconductor packages sawn by the sawing device and the top surfaces of which may be cleaned, and to transfer the sucked semiconductor packages to a drying device via a cleaning

device, the cleaning device configured to clean bottom surfaces of the semiconductor packages in a state in which the semiconductor packages may be sucked by the unit picker, the drying device including a sucking plate configured to suck the semiconductor packages cleaned by the cleaning device and transferred by the unit picker, wherein the sucking plate may be movable on an XY plane in an X-axis direction or a Y-axis direction and may be rotatable with respect to a Y-axis on the XY plane if needed, a first vision unit disposed in a movement path of the sucking plate of the drying device, and configured to be moved within the XY plane in a predetermined direction perpendicular to a moving direction of the sucking plate and to test the semiconductor packages, a first arrangement table and a second arrangement table in which loading grooves in which the semiconductor packages sucked on the sucking plate may be loaded and non-groove portions in which the semiconductor packages may be not loaded may be alternately formed in the X-axis direction and the Y-axis direction, and configured to transfer and load the semiconductor packages sucked on the sucking plate in the loading grooves and to be independently transferred in the Y-axis direction, a second vision unit configured to test the semiconductor package loaded in the loading grooves in the first arrangement table and the second arrangement table and a sorting

device configured to transfer the semiconductor packages in the X-axis direction, and sort out and store the semiconductor packages based on results of testing the semiconductor packages.

[03] And the sucking plate of the drying device may be
5 rotated by 180° with respect to the Y-axis on the XY plane to flip the semiconductor packages, which may be sucked on the sucking plate and dried, upside-down by moving the semiconductor packages relative to a Z-axis direction to be transferred into the loading grooves in the first arrangement table or the second
10 arrangement table.

[04] And the sucking plate may comprise a base member including a first pneumatic line and a second pneumatic line for selectively applying air pressure to a top surface and a bottom surface of the sucking plate, a first distribution member
15 configured to communicate with a top surface of the sucking plate, and including a distribution channel that communicates with the first pneumatic line of the base member to distribute air pressure and a second distribution member configured to communicate with a bottom surface of the sucking plate, and
20 including a distribution channel that communicates with the second pneumatic line of the base member to distribute air pressure.

[05] And a first sucking part and a second sucking part may be disposed on the top surface and the bottom surface of the sucking plate, respectively, wherein sucking ports that suck the semiconductor packages and non-sucking parts that do not suck the semiconductor packages may be formed on each of the first and second sucking parts to be intersected one another in the X-axis and the Y-axis direction, and the first distribution member communicates with the sucking ports formed on the first sucking part, and the second distribution member communicates with the sucking ports formed on the second sucking part.

[06] Some of the semiconductor packages sucked by the unit picker may be loaded on the first sucking part, and the other semiconductor packages sucked by the unit picker may be sequentially distributed and loaded on the second sucking part by rotating the sucking plate with respect to the Y-axis, and the unit picker may comprise first sucking ports and second sucking ports that may be alternately disposed, a first pneumatic line configured to communicate with the first sucking ports, a second pneumatic line configured to communicate with the second sucking ports and to be separated from the first pneumatic line, and a vacuum unit configured to selectively apply vacuum pressure to the first pneumatic line and the second pneumatic line.

[07] In order to blow a gas onto the semiconductor packages sucked on the first sucking part and the second sucking part to remove moisture on the semiconductor packages, further may comprise a downward blower mounted toward the first sucking part
5 and an upward blower mounted toward the second sucking part.

[08] And Ball surfaces or lead surfaces of the semiconductor packages sucked on the sucking plate may be tested by the first vision unit in a state in which the sucking plate of the drying device may be rotated by 180° with respect to the Y-
10 axis on the XY plane, and the tested semiconductor packages may be transferred into the loading grooves in the first arrangement table or the second arrangement table, and mold surfaces of the semiconductor packages loaded in the first arrangement table or the second arrangement table may be tested by the second vision
15 unit.

[09] And the semiconductor strip sawing apparatus of the present invention may further comprise an arrangement table picker configured to be movable in the X-axis direction or the Y-axis direction, and to pick up the semiconductor packages sucked
20 on the sucking plate of the drying device and load the semiconductor packages in the loading grooves in the first arrangement table or the second arrangement table, wherein the arrangement table picker simultaneously picks up the

semiconductor packages sucked on the sucking plate or divides the semiconductor packages into two parts and sequentially picks up the two parts, and sequentially loads the two parts on the first arrangement table and the second arrangement table.

5 **[10]** And the arrangement table picker or the sucking plate may comprise first sucking ports and second sucking ports alternately disposed, a first pneumatic line configured to communicate with the first sucking ports, a second pneumatic line configured to communicate with the second sucking ports and be
10 separated from the first pneumatic line and a vacuum unit configured to selectively apply vacuum pressure to the first pneumatic line and the second pneumatic line.

[11] And the mold surfaces of the semiconductor packages may be tested by the first vision unit in a state in which the
15 semiconductor packages may be picked up by the arrangement table picker, and the tested semiconductor packages may be transferred in the loading grooves in the first arrangement table or the second arrangement table, and ball surfaces or lead surfaces of the semiconductor packages loaded in the first arrangement table
20 or the second arrangement table may be tested by the second vision unit.

[12] And ball surfaces or lead surfaces of the semiconductor packages sucked on the sucking plate may be tested

by the first vision unit in a state in which the sucking plate of the drying device may be rotated by 180° with respect to the Y-axis on the XY plane, and after the sucking plate may be rotated again by 180° with respect to the Y-axis on the XY plane, the tested semiconductor packages may be picked up by the arrangement table picker and mold surfaces of the semiconductor packages may be tested by the first vision unit.

[13] And the arrangement table picker may comprise a guide frame mounted along an axis and an arrangement table picker driving unit coupled to a top surface of the guide frame to be detachable from the guide frame, and configured to move the arrangement table picker, wherein one side of the drying device may be coupled to a first transfer rail engaged with a lower portion of the guide frame and another side of the drying device may be coupled to a second transfer rail to prevent an interference or a collision between the arrangement table picker driving unit and a drying device driving unit.

[14] And a first sucking part on which sucking ports sucking the semiconductor packages may be arranged in a matrix in the X-axis direction and the Y-axis direction may be formed on the top surface of the sucking plate, and a vacuum-blocking unit may be formed on the bottom surface of the sucking plate to block the second pneumatic line or the second distribution member.

[15] And the first sucking part may comprise first sucking ports and second sucking ports alternately disposed and a vacuum unit configured to communicate with the first sucking ports and the second sucking ports to selectively apply vacuum pressure to the first sucking ports and the second sucking ports, wherein the vacuum unit applies vacuum pressure to the first distribution member via the first pneumatic line.

[16] And the vacuum-blocking unit may be a locking member or a plate type blocking member.

[17] And the drying device may comprise a movement frame mounted to be movable along an axis and to which the sucking plate may be rotatably coupled, a heater mounted in the sucking plate, and configured to dry the semiconductor packages sucked on the sucking plate by heating the semiconductor packages and a blower configured to remove moisture on the top surface of the sucking plate or the top or side surfaces of the semiconductor package by blowing a gas onto the semiconductor packages sucked on the sucking plate.

[18] And the first vision unit may be an upwardly directed vision unit configured to test the top or bottom surfaces of the semiconductor packages, and disposed below the semiconductor packages to test the semiconductor packages in an up-direction, and the second vision unit may be a downwardly directed vision

unit configured to test the other top or bottom surfaces of the semiconductor package, and disposed above the semiconductor packages loaded in the arrangement table to test the semiconductor packages in a down-direction.

5 **[19]** And the sorting device may comprise at least one sorting picker configured to individually pick up the semiconductor packages loaded in the first arrangement table or the second arrangement table, and sequentially sort out and transfer the semiconductor packages based on the results of
10 testing the semiconductor packages, a tray which have a plurality of loading grooves in which the semiconductor packages picked up by the sorting picker and sorted out based on the results of testing the semiconductor packages may be stored and configured to be movable in a predetermined direction.

15 **[20]** And the semiconductor packages loaded in the first arrangement table and the second arrangement table may be picked up by the sorting picker, one surface of each of the semiconductor packages may be tested by the first vision unit, and the semiconductor packages may be sorted out based on a
20 testing result of the surface of each of the semiconductor packages and may be stored on the tray.

[21] And the semiconductor packages or a test jig may be loaded in at least two loading grooves among loading grooves in

the tray, the first vision unit may be moved to, images of the semiconductor packages or an image of the test jig may be photographed by the first vision unit in a state in which the sorting picker picks up the semiconductor packages or the test
5 jig, and location values of the loading grooves in the tray may be precisely calculated by comparing previously input pitch information with an actual moving distance.

[22] And the sorting device may comprise a tray including a plurality of loading grooves in which the semiconductor packages
10 may be sorted out based on the results of testing the semiconductor packages and may be stored and a tray picker configured to pick up and discharge the tray, and a tray picker driving unit and the arrangement table picker driving unit may be mounted on the same guide frame.

[23] The semiconductor strip sawing apparatus of the present invention may comprise a sawing device configured to provide a semiconductor strip, saw the semiconductor strip on a
15 chuck table into on a plurality of semiconductor packages, and clean top surfaces of the plurality of semiconductor packages with cleaning water, a unit picker configured to simultaneously
20 suck plurality of semiconductor packages sawn by the sawing device and the top surfaces of which may be cleaned, and to transfer the sucked semiconductor packages to a drying device via

a cleaning device, the cleaning device configured to clean bottom surfaces of the semiconductor packages in a state in which the semiconductor packages may be sucked by the unit picker, the drying device including a sucking part configured to suck the semiconductor packages cleaned by the cleaning device and transferred by the unit picker, wherein the sucking plate may be movable on an XY plane in an X-axis direction or a Y-axis direction and may be rotatable with respect to an Y-axis on the XY plane, a first vision unit disposed in a movement path of the sucking plate of the drying device, and configured to be movable within the XY plane in a predetermined direction perpendicular to a moving direction of the sucking plate and to test the semiconductor packages, an arrangement table picker configured to pick up the semiconductor packages sucked on the sucking plate, and to be movable in the X-axis direction or the Y-axis direction, an arrangement table configured to be movable in the Y-axis direction, wherein the arrangement table comprises, a first loading unit on which loading grooves in which the semiconductor packages sucked on the sucking plate may be loaded and non-groove portions in which the semiconductor packages may be not loaded may be formed to be intersected one another in the X-axis direction and the Y-axis direction and a second loading unit formed to be symmetrical with respect to the first loading unit,

a second vision unit configured to test the semiconductor packages loaded in the loading grooves in the arrangement table and a sorting device configured to transfer the semiconductor packages in the X-axis direction and sort out and store the semiconductor packages based on results of testing the semiconductor packages, and a rotation function of the drying device may be performed to flip the semiconductor packages upside-down according to a method of storing the semiconductor package, and when the rotation function of the drying device may be performed, the semiconductor packages sucked on the sucking plate and dried may be moved relative to the Z-axis direction to be loaded in the loading grooves in the arrangement table in a state in which the sucking plate of the drying device may be rotated by 180° with respect to the Y-axis on the XY plane, and when the rotation function of the drying device may be not performed, the semiconductor packages sucked on the sucking plate and dried may be picked up by the arrangement table picker and loaded in the loading grooves in the arrangement table.

20 Advantageous Effects

[24] A drying device according to an embodiment of the present invention may be used simply for a drying purpose,

rotated if needed, and used for a vision test and a flipping purpose.

[25] According to an embodiment of the present invention, both a ball up type apparatus and a ball down type apparatus can
5 be changed by simply changing constituent elements. Thus, the present invention may be operated to be switched to various types to apparatus according to a method of storing semiconductor packages or as occasion demands.

[26] When a drying device according to an embodiment of the
10 present invention is used simply for a drying purpose, the structure of the drying device may be partially modified to provide air pressure applied via a pneumatic line uniformly, efficiently and intensively. And a flipping function may be performed to load semiconductor packages such that the
15 semiconductor packages are turned upside-down by transferring the semiconductor packages in loading grooves in an arrangement table by rotating the drying device in a state in which the semiconductor packages are sucked on a top surface and a bottom surface of a sucking plate of the drying device and then flipping
20 the semiconductor packages.

[27] According to an embodiment of the present invention, a ball down type semiconductor strip sawing device capable of receiving a semiconductor strip in a ball up state and

discharging semiconductor packages in a ball down state may be switched to a ball up type semiconductor strip sawing apparatus by simply installing an arrangement table picker.

[28] Also, in a semiconductor strip sawing apparatus
5 according to an embodiment of the present invention, a sucking plate driving unit that may be rotated and linearly transferred may be mounted at a location that is different from locations at which an arrangement table picker driving unit and a tray picker driving unit are mounted, thereby preventing interference between
10 these driving units.

[29] Also, since a drying device is mounted to be movable, semiconductor packages may be dried while the drying device is moved and an additional time is not needed to perform a drying process, thereby reducing a process time.

[30] Also, dried semiconductor packages may be flipped
15 upside-down by rotating a sucking plate and be then loaded in an arrangement table. Thus, an additional process need not be performed to flip the semiconductor packages upside-down and the semiconductor packages may be controlled to be rotated during
20 movement, thereby saving a time needed to flip the semiconductor packages upside-down.

[31] Also, mold surfaces, ball surfaces, or lead surfaces of semiconductor packages may be performed and a tray alignment

test may be conducted using a first vision unit. That is, various tests may be conducted using only one vision unit.

[32] Also, according to an embodiment of the present invention, both a top surface test and a bottom surface test may
5 be performed on semiconductor packages.

[33] Furthermore, since testing may be performed using the first vision unit while vertically moving the first vision unit, testing may be conducted by selectively moving the position of the first vision unit according to the specifications of a
10 semiconductor packages or strips. Accordingly, a total package processing speed per hour of equipment may be improved.

Description of the Drawings

[34] FIG. 1 is a plan view of a semiconductor strip sawing
15 device according to an embodiment of the present invention;

[35] FIG. 2 is a diagram illustrating a process of assembling a drying device and a semiconductor package test unit of a semiconductor strip sawing apparatus according to an embodiment of the present invention;

20 [36] FIG. 3 illustrates a state in which a drying device of a semiconductor strip sawing apparatus according to an embodiment of the present invention is operated while being mounted in a semiconductor package test unit;

[37] FIG. 4 is a plan view of a semiconductor strip sawing device according to another embodiment of the present invention;

[38] FIG. 5 illustrates a drying device and an arrangement table picker included in a semiconductor package test unit of a semiconductor strip sawing apparatus according to an embodiment of the present invention;

[39] FIG. 6 is a plan view of a semiconductor strip sawing device according to another embodiment of the present invention;

[40] FIG. 7 illustrates an sucking plate of a semiconductor strip sawing apparatus according to an embodiment of the present invention; and

[41] FIG. 8 illustrates a sucking plate of a semiconductor strip sawing apparatus according to another embodiment of the present invention.

Mode of the invention

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[42] Hereinafter, exemplary embodiments of the present invention will be described below in more detail with reference to the accompanying drawings. The present invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these

embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the present invention to those skilled in the art. Further, the present invention is only defined by scopes of claims. Like reference
5 numerals refer to like elements throughout.

[43] FIG. 1 is a plan view of a semiconductor strip sawing apparatus 1000 according to an embodiment of the present invention. In general, the semiconductor strip sawing apparatus 1000 may be classified as a ball down type or a ball up type
10 according to a form in which tested semiconductor packages that are to be discharged are loaded in a tray. Since a subsequent process or a strip storage method may vary according to a semiconductor manufacturer, the semiconductor packages may be finally loaded in the tray in a ball up state or a ball down
15 state. Although a semiconductor strip may be provided in the ball up state or the ball down state, it will be assumed in the embodiment of FIG. 1 that a semiconductor strip that is to be sawn is provided in the ball up state.

[44] The semiconductor strip sawing apparatus 1000
20 according to an embodiment of the present invention may include an on-loading part 100 provided in a state in which a semiconductor strip S is loaded in a magazine M; a pusher 110 or a drawer 220 for drawing the semiconductor strip S from the

magazine M to the outside of the on-loading part 100; an inlet rail 210 on which the semiconductor strip S drawn by the pusher 110 or the drawer 220 is placed; a strip picker 230 for sucking the semiconductor strip S placed on the inlet rail 210 and
5 transferring the semiconductor strip S to a chuck table 250 such that a mold surface of the semiconductor strip faces downward; a sawing device 200 for receiving the semiconductor strip S from the strip picker 230, sawing the semiconductor strip S on the chuck table 250 into a plurality of semiconductor packages, and
10 cleaning top surfaces of the semiconductor packages with a cleaning water; a unit picker 270 for sucking all of the semiconductor packages sawn from the semiconductor strip S by the sawing device 200 and the top surfaces of which are cleaned at a time, and transferring the sucked semiconductor package to a
15 drying device 300 via a cleaning device 280; the cleaning device 280 for cleaning bottom surfaces of the semiconductor packages in a state in which the semiconductor packages are sucked by the unit picker 270; and a sucking plate 310 for sucking the semiconductor packages cleaned by the cleaning device 280 and
20 transferred via the unit picker 270; the drying device 300 that is movable on an XY plane in an X-axis direction or a Y-axis direction and is rotatable with respect to an Y-axis on the XY plane according to a method of storing the semiconductor packages

or as occasion demands; a first vision unit 410 disposed in the movement path of the sucking plate 310 of the drying device 300 and configured to test the semiconductor packages while moving within the XY plane in a predetermined direction perpendicular to a direction in which the sucking plate 310 is moved; a first arrangement table 430a and a second arrangement table 430b in which loading grooves 431a and 431b in which the semiconductor packages are loaded and non-groove portions in which the semiconductor packages are not loaded are alternately formed in the X-axis direction and the Y-axis direction, and which are capable of independently transferring semiconductor packages, which are sucked by the sucking plate 310 and transferred and loaded in the loading grooves 431a and 431b, in the Y-axis direction; a second vision unit 420 for testing the semiconductor packages loaded in the loading grooves 431a and 431b in the first arrangement table 430a and the second arrangement table 430b; and a sorting device 500 for transferring the semiconductor packages in the X-axis direction and sorting out and storing the semiconductor packages, based on results of testing the semiconductor packages.

[45] The semiconductor strip S to be sawn may be provided from the on-loading part 100. The semiconductor strip S may be a long tetragonal material in which a plurality of semiconductor

packages are arranged in a matrix in the X-axis direction and the Y-axis direction, and may be provided to the sawing device 200 such that a lengthwise direction of the semiconductor strip S is parallel to the X-axis direction.

5 **[46]** A plurality of semiconductor strips that are to be sawn may be provided to the on-loading part 100 in a state in which they are placed in the magazine M. When the pusher 110 of the on-loading part 100 sequentially pushes out the semiconductor strips toward the sawing device 200, the semiconductor strips
10 pushed in the X-axis direction are placed on the inlet rail 210 of the sawing device 200 configured to guide the semiconductor strips, and the drawer 220 capable of drawing a semiconductor strip in the X-axis direction transfers the semiconductor strips to a location where the strip picker 230 may pick up the
15 semiconductor strips that are to be sawn by holding front ends of the semiconductor strips.

[47] The strip picker 230 may be mounted on a guide frame 240, which includes driving units and is mounted in the X-axis direction, to transfer the semiconductor strip S in the X-axis
20 direction.

[48] The strip picker 230 that picks up the semiconductor strips to be sawn delivers the semiconductor strip S to the chuck table 250.

[49] The chuck table 250 may be configured to be moved to an any location on the XY plane and to be rotated with respect to a Z-axis. A semiconductor strip sucked on the chuck table 250 may be sawn into separate semiconductor packages by at least one
5 cutter 260. In the embodiment of FIG. 1, the at least one cutter 260 is illustrated as including two cutting blades. Also, in the embodiment of FIG. 1, one chuck table 250 is illustrated but two or more chuck tables 250 may be used to improve an unit per hour (UPH), etc.

10 **[50]** The semiconductor strip sucked on the chuck table 250 may be sawn into separate semiconductor packages while the at least one cutter 260 is displaced relative to the chuck table 250, and the semiconductor packages sawn from the semiconductor strip may be simultaneously picked up by the unit picker 270 to be
15 transferred.

[51] The unit picker 270 may pick up the semiconductor packages by sucking them, transfer the semiconductor packages to the cleaning device 280 and the drying device 300 (which will be described below) to perform a cleaning process and a drying
20 process. The cleaning device 280 may include a plurality of nozzles 281 via which cleaning water or compressed air is sprayed. The plurality of nozzles 281 may be disposed in a width direction of the unit picker 270.

[52] The plurality of semiconductor packages picked up by the unit picker 270 and cleaned by the cleaning device 280 may be sucked on the drying device 300 of a semiconductor package test unit 400.

5 **[53]** As described above, a semiconductor strip sawing apparatus may be classified as a ball down type (defined as a state in a ball surface or a lead surface faces downward and a mold surface faces upward) or a ball up type (defined as a state in a ball surface or a lead surface faces upward and a mold
10 surface faces downward) according to a form in which discharged semiconductor packages are loaded in a tray. A semiconductor strip that is to be sawn may be provided in a ball up state or a ball down state. In embodiments set forth herein (including the embodiment of FIG. 1), it is assumed for convenience of
15 explanation that a semiconductor strip that is to be sawn is provided in the ball up state.

[54] Thus, it means that when a semiconductor strip is provided in the ball up state is sawn, cleaned, dried, tested, and discharged, semiconductor package should be flipped (rotated)
20 by 180° at least once while the semiconductor package is sawn, cleaned, dried, and discharged so that the semiconductor packages may be discharged in the ball down state.

[55] In detail, in the embodiment of FIG. 1, the semiconductor strip sawing apparatus 1000 configured to receive a semiconductor strip that is in the ball up state and to discharge semiconductor packages in the ball down state is provided.

5 [56] The semiconductor strip sawing apparatus 1000 of FIG. 1 according to the present embodiment may flip semiconductor packages using the drying device 300, which is configured to dry cleaned semiconductor packages, without any flipper.

10 [57] In detail, semiconductor packages may be flipped upside-down by rotating the sucking plate 310 of the drying device 300 by 180° with respect to the Y-axis on the XY plane, and moving dried semiconductor packages sucked on the sucking plate 310 relative to the Z-axis to be transferred into the loading grooves 431a in the first arrangement table 430a or the
15 loading grooves 431b in the second arrangement table 430b.

[58] In general, a heat wire may be embedded in the drying device 300 to perform a drying process, and the drying device 300 of the semiconductor strip sawing apparatus 1000 according to an embodiment of the present invention may further have a flipping
20 function and a transferring function.

[59] The semiconductor package test unit 400 includes the drying device 300 including an electric heater (not shown) for drying cleaned semiconductor packages. Semiconductor packages

sawn from a semiconductor strip by the sawing device 200 are transferred to the drying device 300 by the unit picker 270.

[60] The semiconductor packages transferred to the drying device 300 may be dried by the electric heater included in the drying device 300 or the like.

[61] The semiconductor package test unit 400 may conduct a semiconductor package test by photographing images of a top surface (a mold surface) and a bottom surface (a ball surface or a lead surface) of a semiconductor package that is sawn (from a semiconductor strip) and that is cleaned.

[62] A semiconductor package top surface test of testing a top surface of a semiconductor package may be a marking test performed on a molding material of the semiconductor package, and a semiconductor package bottom surface test may be a test of determining the distances between balls or lead wires of a semiconductor package or determining whether a defect such as a short circuit occurs.

[63] A top surface and a bottom surface of a semiconductor package that is cleaned and dried may be tested based on images of the top and bottom surfaces of the semiconductor package that are photographed by a vision unit.

[64] The semiconductor package test unit 400 that is included in the semiconductor strip sawing apparatus 1000

according to an embodiment of the present invention and that tests a semiconductor package on which a sawing process, a cleaning process, and a drying process are performed by photographing images of top and bottom surfaces of the semiconductor package includes the first vision unit 410 for photographing up-looking images of the top and bottom surfaces of the semiconductor package and the second vision unit 420 for photographing down-looking images of the top and bottom surfaces of the semiconductor package. Otherwise, the first vision unit 410 may be configured to capture an image of one of the top surface and the bottom surface of the semiconductor package, and the second vision unit 420 may be configured to capture an image of the other surface.

[65] Also, as illustrated in FIG. 1, the first vision unit 410 may be mounted to be transferred in the semiconductor package test unit 400 in the Y-axis direction, and the second vision unit 420 may be mounted to be transferred in the semiconductor package test unit 400 in the X-axis direction.

[66] Each of the first and second vision units 410 and 420 may be mounted in a vision driving unit each disposed in the X-axis direction or the Y-axis direction so that a particular vision unit may be transferred in the X-axis direction or the Y-axis direction.

[67] However, since a semiconductor package sucked on the drying device 300 or the like is disposed on the XY plane, when the first and second vision units 410 and 420 are mounted to be transferred in the Y-axis direction (or the X-axis direction),
5 either the drying device 300 picking up or sucking semiconductor packages that are targets to be photographed or an arrangement table (which will be described below) may be mounted to be transferred in the X-axis direction (or the Y-axis direction).

[68] Also, the semiconductor package test unit 400 of the
10 semiconductor strip sawing apparatus 1000 according to an embodiment of the present invention may include at least one arrangement table that may be transferred to be parallel to the Y-axis direction and rotated with respect to the Z-axis.

[69] In the embodiment of FIG. 1, semiconductor packages
15 sucked on the drying device 300 and the up-looking images of which are captured are transferred and loaded in the at least one arrangement table, and down-looking images thereof may be captured by the second vision unit 420 in a state in which the semiconductor packages are loaded in the at least one arrangement
20 table.

[70] If a flipping (rotating) process is not performed on semiconductor packages while the semiconductor packages are

cleaned, dried, and photographed, a method of loading the semiconductor packages cannot be changed.

[71] Thus, in the embodiment of FIG. 1, semiconductor packages transferred by the unit picker 270 and sucked on a sucking part of the drying device 300 may be flipped by rotating the drying device 300, transferred in the X-axis direction, and loaded in the at least one arrangement table.

[72] A first sucking part and a second sucking part sucking semiconductor packages are disposed on a top surface and a bottom surface of the sucking plate 310 of the drying device 300, respectively. Semiconductor packages transferred by the unit picker 270 may be sequentially distributed to and sucked on the first sucking part and the second sucking part.

[73] In this case, some of the semiconductor packages transferred by the unit picker 270 may be sucked on the first sucking part, and the other semiconductor packages sucked by the unit picker 270 may be sequentially distributed to and sucked on the second sucking part by rotating the sucking plate 310 with respect to the Y-axis. The unit picker 270 may include first sucking ports and second sucking ports that are alternately disposed, a first pneumatic line that communicates with the first sucking ports, a second pneumatic line that communicates with the second sucking ports and is separated from the first pneumatic

line, and a vacuum unit for selectively applying vacuum pressure (suction pressure or negative pressure) to the first pneumatic line and the second pneumatic line.

[74] Specifically, the unit picker 270 may have a sucking
5 plate structure illustrated in FIG. 8(d) as will be described below.

[75] Some of semiconductor packages picked up by the unit
picker 270 are sucked on the first sucking part disposed on the
drying device 300, and the other semiconductor packages picked up
10 by the unit picker 270 may be sucked on the second sucking part
disposed on the drying device 300 after the drying device 300 is
rotated.

[76] The drying device 300 may include a movement frame 320
mounted to be movable along an axis and to which the sucking
15 plate 310 is coupled to be rotatable, the electric heater mounted
in the sucking plate 310 to heat semiconductor packages placed on
the sucking ports so as to dry the semiconductor packages, and a
blower (not shown) for removing moisture remaining on a top
surface of the sucking plate 310 or top or side surfaces of
20 semiconductor packages by blowing a gas onto the semiconductor
packages sucked on the sucking plate 310.

[77] Since it may take a long time to dry semiconductor
packages using only the electric heater, the blower may be

mounted on and/or below(mounted downwardly and/or upwardly) the drying device 300 to remove moisture on the semiconductor packages sucked on the top and bottom surfaces of the sucking plate 310, thereby minimizing a drying time.

5 **[78]** The blower may be mounted on, below, or both on and below the drying device 300 when the drying device 300 has a rotatable structure, and may be mounted on a surface (top surface) of the drying device 300 on which semiconductor packages are sucked when the drying device 300 cannot be rotated.

10 **[79]** A method of sequentially distributing and supplying a plurality of semiconductor packages transferred by the unit picker 270 to the first sucking part and the second sucking part of the sucking plate 310 will be described below.

15 **[80]** A semiconductor package may be placed and sucked on the drying device 300 and be flipped, and then an image of one of a top surface and a bottom surface of the semiconductor package may be photographed by the first vision unit 410 and an image of the other surface may be photographed by the second vision unit 420 in a state in which the semiconductor package is loaded on
20 the at least one arrangement table.

[81] That is, in the embodiment of FIG. 1, semiconductor packages are placed on the drying device 300 in a state in which mold surfaces thereof are sucked on the drying device 300, images

of ball surfaces or lead surfaces of the semiconductor packages are captured by the first vision unit 410, and the semiconductor packages are loaded and sucked in the at least one arrangement table in a state in which the ball surfaces thereof face downward.

5 Thus, the mold surfaces of the semiconductor packages may be tested by the second vision unit 420 when the semiconductor packages are loaded in the at least one arrangement table.

[82] Also, in the embodiment of FIG. 1, a semiconductor strip is provided in the ball up state from the on-loading part 10 100, and loaded in the at least one arrangement table in the ball down state by the drying device 300 of the semiconductor package test unit 400. Thus, the semiconductor strip may be loaded in a discharging tray (which will be described below) in the ball down state.

15 [83] Accordingly, the semiconductor strip sawing apparatus 1000 of FIG. 1 may be a ball down type semiconductor strip sawing apparatus configured to saw a semiconductor strip that is in the ball up state into several semiconductor packages and to discharge the semiconductor packages in the ball down state.

20 [84] A structure and operations of the drying device 300 in the embodiment of FIG. 1 will be described below.

[85] The semiconductor package test unit 400 of the semiconductor strip sawing apparatus 1000 illustrated in FIG. 1

according to an embodiment of the present invention includes the first arrangement table 430a and the second arrangement table 430b.

[86] When the first arrangement table 430a and the second arrangement table 430b are not used and two loading regions are formed in one arrangement table, subsequent processes (a test performed by the second vision unit 420, loading of semiconductor packages in a tray, etc.) cannot be performed until remaining semiconductor packages are loaded in the second loading region even after semiconductor packages are loaded in the first loading region. To solve this problem, in the present embodiment, the semiconductor package test unit 400 includes the two arrangement tables 430a and 430b configured to be independently operated in order to improve the unit per hour (UPH) of equipment.

[87] In the embodiment of FIG. 1, sucking parts (the first sucking part and the second sucking part disposed opposite to each other) may be formed on the top and bottom surfaces of the sucking plate 310 of the drying device 300. Semiconductor packages picked up by the unit picker 270 may be distributed to and sucked on the first sucking part and the second sucking part. Semiconductor packages sucked on the first sucking part are loaded in one of the first arrangement table 430a and the second arrangement table 430b when the sucking plate 310 is rotated.

The other semiconductor packages sucked on the second sucking part may be loaded in the other arrangement table 430a or 430b.

5 **[88]** Due to the structure described above, a plurality of semiconductor packages picked up by the unit picker 270 are distributed when the first sucking part and second sucking part of the sucking plate 310 of the drying device 300 are located at upward positions, and provided in the first arrangement table 430a and the second arrangement table 430b in a state in which the first sucking part and the second sucking part are rotated in
10 a downward direction.

[89] Transfer trajectories of the sucking plate 310 and the first and second arrangement tables 430a and 430b may be set to have different heights so that interference may be prevented during rotation of the sucking plate 310 or when semiconductor
15 packages are transferred by the sucking plate 310 and the first and second arrangement tables 430a and 430b. Semiconductor packages may be transferred through movement relative to the Z-axis direction, e.g., by moving the first or second arrangement table 430a or 430b upward.

20 **[90]** The structures and operations of the drying device 300 and the arrangement tables 430a and 430b are as disclosed in Korean Laid-open Patent Publication Nos. 2005-0058555 and 2007-

0006639, filed in the name of the applicant of the present invention.

[91] As described above, the first vision unit 410 may capture images of top or bottom surfaces of semiconductor packages sucked on the first and second sucking parts of the sucking plate 310 of the drying device 300 in a state in which the first sucking part and the second sucking part are rotated in a downward direction. In the embodiment of FIG. 1, semiconductor packages are provided in the ball up state and thus the first vision unit 410 may capture images of bottom surfaces (ball surfaces or lead surfaces) of the semiconductor packages sucked on the first sucking part and the second sucking part.

[92] In the embodiment of FIG. 1, the semiconductor package test unit 400 includes the first arrangement table 430a and the second arrangement table 430b that are transferred in a predetermined direction parallel to the Y-axis direction and that are rotatable with respect to the Z-axis. The first arrangement table 430a and the second arrangement table 430b may be mounted in a first arrangement table driving unit 610 and a second arrangement table driving unit 620 mounted in the Y-axis direction, respectively, so that first arrangement table 430a and the second arrangement table 430b may be transferred in the Y-axis direction.

[93] Images of top surfaces (mold surfaces) of semiconductor packages loaded in the first arrangement table 430a and the second arrangement table 430b that are independently transferred by the first arrangement table driving unit 610 and the second arrangement table driving unit 620 in the Y-axis direction may be captured by the second vision unit 420 mounted in a vision driving unit 425 disposed in the X-axis direction.

[94] Thus, ball surfaces or lead surfaces of the semiconductor packages sucked on the sucking plate 310 may be tested by the first vision unit 410 in a state in which the sucking plate 310 of the drying device 300 is rotated by 180° with respect to the Y-axis on the XY plane. Semiconductor packages, the ball surfaces or the lead surfaces of which have been tested may be loaded in the loading grooves 431a in the first arrangement table 430a or the loading grooves 431b in the second arrangement table 430b. Then, mold surfaces of the semiconductor packages loaded on the first arrangement table 430a or the second arrangement table 430b may be tested by the second vision unit 420.

[95] In the semiconductor package test unit 400 of the semiconductor strip sawing apparatus 1000 of FIG. 1, cleaned semiconductor packages are sequentially provided from the unit picker 270 picking up the cleaned semiconductor packages, placed,

and sucked on the first and second sucking parts rotated to face upward by using the sucking plate 310 including the first sucking part and the second sucking part that face each other. Then, when the sucking plate 310 is rotated to cause the first and second sucking parts to face downward, images of bottom surfaces (ball surfaces or lead surfaces) of the semiconductor packages are captured by the first vision unit 410 and images of top surfaces (mold surfaces) of the semiconductor packages are captured by the second vision unit 420 in a state in which the semiconductor packages are placed in the first and second arrangement tables 430a and 430b, thereby completing processes of drying and testing the semiconductor packages.

[96] The semiconductor packages that are loaded in the first arrangement table 430a and the second arrangement table 430b and images of which are captured by the second vision unit 420 are selectively picked up by a pair of sorting pickers 560 and 580 mounted to be transferred in the X-axis direction, based on results of testing the semiconductor packages, and are then discharged via a first discharging tray 510 or a second discharging tray 530 of the sorting device 500.

[97] Although not shown, the sorting device 500 includes at least one sorting picker configured to individually pick up the semiconductor packages loaded in the first arrangement table 430a

or the second arrangement table 430b, and sequentially sort out and transfer the semiconductor packages based on the test results; a plurality of loading grooves in which the semiconductor packages picked up by the at least one sorting
5 picker are sorted out based on the test results and are then stored; and a discharging tray to be transferred in one direction.

[98] The semiconductor packages loaded in the first arrangement table 430a and the second arrangement table 430b may be picked up by the at least one sorting picker, one surface of
10 each of the semiconductor packages may be tested by the first vision unit 410, and then the semiconductor packages may be sorted out and transferred to the first or second discharging tray 510 or 530 based on a test result.

[99] Also, a 3-point test may be conducted by loading the
15 semiconductor packages or a test jig in at least two loading grooves among loading grooves in a tray, moving the semiconductor packages or the test jig to the first vision unit 410 in a state in which the semiconductor packages or the test jig are pick by the at least one sorting picker, photographing images of the
20 semiconductor packages or an image of the test jig using the first vision unit 410, and comparing input pitch information with an actual moving distance to precisely determine location values of the loading grooves in the tray.

[100] The 3-point test may be efficiently conducted to determine an align state of the tray by loading the semiconductor packages or the test jig in loading grooves in three corners among the four corners of the tray, picking up the semiconductor packages or the test jig, and testing the semiconductor packages of the test jig. The align state of the tray may be determined by precisely obtaining location values of the tray based on input information regarding the tray, the number of the loading grooves, pitch information, etc.

[101] A plurality of pickup units 561 may be formed in the sorting picker 560 in a line in the X-axis direction and a plurality of pickup units 581 may be formed in the sorting picker 580 in a line in the X-axis direction so as to pick up a plurality of semiconductor packages together.

[102] The pickup units 561 and 581 may be configured to be independently driven.

[103] In the embodiment of FIG. 1, the first sorting picker 560 and the second sorting picker 580 may be disposed to be transferred in parallel to each other. The first sorting picker 560 and the second sorting picker 580 may be mounted in a first sorting picker driving unit 650 and a second sorting picker driving unit 660, respectively, to be transferred in the X-axis direction.

[104] In the embodiment of FIG. 1, the lengthwise directions of the arrangement tables 430a and 430b are equal to the Y-axis direction when semiconductor packages are provided to the arrangement tables 430a and 430b from the sucking plate 310.

5 However, since the pickup units 561 are disposed on the first sorting picker 560 in a line in the X-axis direction and the pickup units 581 are disposed in the second sorting picker 580 in a line in the X-axis direction, the arrangement tables 430a and 430b may be rotated such that the lengthwise directions thereof
10 are equal to the X-axis direction before the semiconductor packages placed in the arrangement tables 430a and 430b are picked up by the sorting pickers 560 and 580. Accordingly, an area occupied by the semiconductor strip sawing apparatus 1000 may be minimized.

15 **[105]** Thus, the semiconductor strip sawing apparatus 1000 illustrated in FIG. 1 is capable of sawing a semiconductor strip provided in the ball up state into semiconductor packages, cleaning, drying, photographing, and testing the semiconductor packages, and discharging the semiconductor packages in the ball
20 down state.

[106] The sorting device 500 may include the first discharging tray 510 and the second discharging tray 530

configured to store normal semiconductors and defective semiconductors, respectively.

[107] The first discharging tray 510 and the second discharging tray 530 may be configured to store and discharge normal semiconductors and defective semiconductors, respectively. The sorting device 500 may further include a tray picker 570 configured to discharge the first and second discharging trays 510 and 530 and supply new trays when all of semiconductor packages are loaded in the first and second discharging trays 510 and 530.

[108] FIG. 2 is a diagram illustrating a process of assembling the drying device 300 and the semiconductor package test unit 400 of the semiconductor strip sawing apparatus 1000 of FIG. 1 according to an embodiment of the present invention. FIG. 3 illustrates a state in which the drying device 300 of the semiconductor strip sawing apparatus 1000 according to an embodiment of the present invention is operated while being mounted in the semiconductor package test unit 400.

[109] The sorting device 500 of the semiconductor strip sawing apparatus 1000 of FIG. 1 may include the tray picker 570 for transferring a tray in which normal semiconductors are loaded or a tray in which defective semiconductors are loaded. The tray

picker 570 may be transferred in the X-axis direction by a tray picker driving unit 575 disposed on a guide frame 670.

[110] Although both the tray picker 570 and the drying device 300 are transferred in the X-axis direction, they are
5 configured to be driven independently.

[111] Thus, when a plate driving unit 330 for transferring the sucking plate 310 of drying device 300 and the tray picker driving unit 575 are disposed on the same guide frame, interference may occur between the plate driving unit 330 and the
10 tray picker driving unit 575. Therefore, the plate driving unit 330 and the tray picker driving unit 575 may be mounted at different locations to have different heights.

[112] As described above, the drying device 300 may have functions of rotating and transferring the sucking plate 310.

15 **[113]** As illustrated in FIGS. 2 and 3, the sucking plate 310 is configured to make a reciprocating motion in the X-axis direction due to the plate driving unit 330 disposed at a side of the drying device 300.

[114] As illustrated in FIG. 2, the plate driving unit 330
20 may include a motor (not shown), a ball screw 331, a ball screw nut 333, etc., but is not limited thereto.

[115] A first transfer rail 360 may be mounted at one side of the drying device 300, and the plate driving unit 330 disposed

at another side of the drying device 300 may be accommodated in a second transfer rail 340 to guide a driving and transferring process.

[116] The first transfer rail 360 may be mounted at the bottom of the guide frame 670 via a mounting member 370 or the like.

[117] The reason why the first transfer rail 360 is mounted at the bottom of the guide frame 670 is to minimize interference between elements and prevent an interference between an arrangement table picker 460 (see FIG. 4) that may be additionally mounted in the ball up type semiconductor strip sawing apparatus 1000 (which will be described below) and a unit of driving the arrangement table picker 460, since the tray picker driving unit 575 is mounted on the guide frame 670 to drive the tray picker 570 and the guide frame 670 is configured to guide transfer of the tray picker 570 as described above, as will be described in detail.

[118] The drying device 300 may be moved forward and backward by the plate driving unit 330 in the X-axis direction, and is rotatable while being moved since the drying device 300 includes a rotating driving unit 350.

[119] The drying device 300 may include the movement frame 320 supporting the sucking plate 310 to be rotatable. Since the

rotatable driving unit 350 is disposed at a side of the movement frame 320, the sucking plate 310 may be rotated independently from transferring of the drying device 300 in the X-axis direction.

5 **[120]** As described above, the sucking plate 310 may be transferred in the X-axis direction, and at the same time be rotatably driven during transferring of semiconductor packages to the arrangement tables 430a and 430b.

10 **[121]** The structures and operations of the drying device 300 and the arrangement tables 430a and 430b are disclosed in Korean Laid-open Patent Publication Nos. 2005-0058555 and 2007-0006639 in detail and are thus not described herein.

15 **[122]** FIG. 4 is a plan view of a semiconductor strip sawing apparatus 1000 according to another embodiment of the present invention. FIG. 5 is a perspective view of a drying device 300 and an arrangement table picker 460 included in a semiconductor package test unit 400 of the semiconductor strip sawing apparatus 1000 of FIG. 4 according to an embodiment of the present invention. The structures and operations of elements of the
20 semiconductor strip sawing apparatus 1000 that are the same as those in FIGS. 1 to 3 are not described again here.

[123] The embodiment of FIG. 1 provides the semiconductor strip sawing apparatus 1000 capable of sawing, cleaning, drying,

and testing a semiconductor strip provided in the ball up state and discharging semiconductor packages in the ball down state. However, the embodiment of FIG. 1 is applicable to a reversed case. Also, in the embodiment of FIG. 1, a semiconductor strip
5 may be sawn into separate semiconductor packages and the semiconductor packages may be flipped at least once.

[124] In contrast, the embodiment of FIG. 4 provides the semiconductor strip sawing apparatus 1000 that does not perform a flipping process. Thus, a semiconductor strip may be provided in
10 the ball up state (or the ball down state) and sawn into semiconductor packages, and the semiconductor packages may be discharged in the ball up state (or the ball down state).

[125] Accordingly, since the drying device 300 of the semiconductor strip sawing apparatus 1000 illustrated in FIG 4
15 need not a flipping function, semiconductor packages transferred by a unit picker 270 may be sucked on the drying device 300 and be then dried.

[126] In the case of the semiconductor strip sawing apparatus 1000 of FIG. 4, top and bottom surfaces of the dried
20 semiconductor packages should be also tested.

[127] Although in the embodiment of FIG. 1, images of semiconductor packages are captured by the first vision unit 410 in a state in which the sucking plate 310 on which the

semiconductor packages are sucked is flipped, and the drying device 300 is moved in the X-axis direction to transfer the semiconductor packages toward the at least one arrangement table. However, the semiconductor strip sawing apparatus 1000 of FIG. 4 may additionally include the arrangement table picker 460 to transfer semiconductor packages to arrangement tables 430a and 430b.

[128] The arrangement table picker 460 may be configured to be moved in the X-axis direction, pick up semiconductor packages sucked on the sucking plate 310 of the drying device 300, and load the semiconductor packages in loading grooves 431a in the first arrangement table 430a or loading grooves 431b in the second arrangement table 430b. The arrangement table picker 460 may simultaneously pick up all of the semiconductor packages sucked on the sucking plate 310 or divide the semiconductor packages into two parts and sequentially pick up the two parts, and then divide the semiconductor packages into two parts and sequentially load the parts to the first arrangement table 430a and the second arrangement table 430b.

[129] The arrangement table picker 460 or the sucking plate 310 may include first sucking ports and second sucking ports that are alternately disposed, a first communication line that communicates with the first sucking ports, a second communication

line that communicates with the second sucking ports and is separated from the first communication line, and a vacuum unit for selectively applying vacuum pressure to the first communication line and the second communication line. Here, the first and second communication lines may be understood as flow channels that connect the sucking ports in a distribution channel 314 of a distribution member 313 (see FIG. 8). In this case, since semiconductor packages are sucked only on one surface (e.g., a top surface) of the sucking plate 310, another surface (e.g., a bottom surface) of the sucking plate 310 may be blocked by a blocking member 317 of FIG. 8 or a locking member 317' such as a bolt so that air pressure applied from both pneumatic channels may be applied only to a distribution channel on a sucking member, thereby minimizing a loss in air pressure.

[130] For example, a vacuum unit mounted to provide air pressure to the sucking ports may provide air pressure via a first pneumatic line, and air pressure distributed by a first distribution member may be changed to a vacuum by using the first communication line that communicates with the first sucking ports. As described above, vacuum pressure may be selectively applied to the first sucking ports or the second sucking ports if needed.

[131] Specifically, the arrangement table picker 460 or the sucking plate 310 may have a sucking plate structure illustrated in FIG. 8(d), similar to the unit picker 270 of FIG. 1.

[132] The semiconductor package test unit 400 of the semiconductor strip sawing apparatus 1000 illustrated in FIG. 4 may further include at least one arrangement table mounted to be transferred in the Y-axis direction, and the arrangement table picker 460 for picking up semiconductor packages dried by the drying device 300 and transferring the semiconductor packages to the at least one arrangement table. Images of top or bottom surfaces of the semiconductor packages picked up by the arrangement table picker 460 may be captured by the first vision unit 410 and then the semiconductor packages may be loaded in the arrangement table 430a or 430b.

[133] In the embodiment of FIG. 4, in a whole process of sawing a semiconductor strip, a process of flipping semiconductor packages is not performed and thus both top and bottom surfaces of the semiconductor packages may be tested by the first vision unit 410 during transfer of the dried semiconductor packages.

[134] In the embodiment of FIG. 4, after a semiconductor strip provided in the ball up state is sawn into semiconductor packages and dried, mold surfaces of the semiconductor packages may be tested by the first vision unit 410 in a state in which

the semiconductor packages sucked on the drying device 300 in the ball up state are picked up by the arrangement table picker 460, the tested semiconductor packages may be transferred in the loading grooves 431a in the first arrangement table 430a or the loading grooves 431b in the second arrangement table 430b, and then ball surfaces or lead surfaces of the semiconductor packages loaded in the first arrangement table 430a or the second arrangement table 430b may be tested by the second vision unit 420.

10 **[135]** Otherwise, the ball surfaces or the lead surfaces of the semiconductor packages sucked on the sucking plate 310 may be tested by the first vision unit 410 in a state in which the sucking plate 310 of the drying device 300 is rotated by 180° with respect to the Y-axis on an XY plane, the sucking plate 310 may be rotated again by 180° with respect to the Y-axis on the XY plane, the tested semiconductor packages may be picked up by the arrangement table picker 460, and the mold surfaces of the semiconductor packages may be tested by the first vision unit 410 in a state in which the tested semiconductor packages are picked up by the arrangement table picker 460.

20 **[136]** In the present embodiment, the drying device 300 performs only a drying function without flipping the

semiconductor packages, and the semiconductor packages are loaded in a final tray in the ball up state.

[137] To this end, in the embodiment of FIG. 4, the drying device 300 is not involved in transferring the semiconductor packages to the at least one arrangement table and thus additionally includes the arrangement table picker 460.

[138] The arrangement table picker 460 may be mounted to be movable in the X-axis direction to transfer the semiconductor packages to the first arrangement table 430a and the second arrangement table 430b.

[139] The arrangement table picker 460 may include the guide frame 670 mounted along an axis direction, and an arrangement table picker driving unit 465 coupled to a top surface of the guide frame 670 to be detachable from the guide frame 670 and configured to move the arrangement table picker 460. One side of the drying device 300 may be coupled to a first transfer rail 360 engaged with a lower portion of the guide frame 670, and another side of the drying device 300 may be coupled to a second transfer rail 340, thereby preventing interference or a collision between the arrangement table picker driving unit 465 and a plate driving unit 330.

[140] The arrangement table picker driving unit 465 configured to drive the arrangement table picker 460 in the X-

axis direction may be mounted on the guide frame 670 on which the tray picker driving unit 575 configured to drive the tray picker 570 is mounted.

[141] Specifically, a method of installing a ball screw, a motor, and the like in the guide frame 670 may be used.

[142] The arrangement table picker 460 transfers semiconductor packages from the sucking plate 310 to the first arrangement table 430a and the second arrangement table 430b. Thus, a range of transfer of the semiconductor packages performed by the arrangement table picker 460 does not overlap with a range of transfer of the semiconductor packages performed by the tray picker 570. Accordingly, the arrangement table picker driving unit 465 and the tray picker driving unit 575 may be mounted the guide frame 670 to independently drive the arrangement table picker driving unit 465 and the tray picker driving unit 575.

[143] Thus, when a semiconductor strip sawing apparatus capable of receiving a semiconductor strip provided in the ball up state and discharging semiconductor packages in the ball down state is switched to a ball up type semiconductor strip sawing apparatus capable of receiving a semiconductor strip provided in the ball up state and discharging semiconductor packages in the ball up state, according to the type of the semiconductor strip or a user's demand, the arrangement table picker 460 (and the

arrangement table picker driving unit 465) may be mounted on the guide frame 670 and the drying device 300 may be used simply for a drying purpose.

[144] If a space between the drying device 300 and the arrangement table picker 460 is sufficient not to cause interference to occur therebetween even after the arrangement table picker 460 is mounted, a ball down semiconductor strip sawing apparatus capable of sawing a semiconductor strip that is in the ball up state into separate semiconductor packages and discharging the semiconductor packages in the ball down state without detaching or separating the arrangement table picker 460 may be used.

[145] That is, in an embodiment of the present invention, the plate driving unit 330 that drives the drying device 300 is disposed on a front of the apparatus, and the arrangement table picker driving unit 465 is disposed in the guide frame 670, thereby preventing interference between the drying device 300 and the arrangement table picker 460. Thus, when a semiconductor strip sawing apparatus is switched to another type of semiconductor strip sawing apparatus, an inconvenient replacement work, such as a process of detaching or separating particular members, need not be performed.

[146] Although not shown, the arrangement table picker driving unit 465 may be disposed on a top surface or an upper portion of the apparatus rather than in the guide frame 670. Also, the drying device 300 may be disposed on a lower end portion of the arrangement table picker 460 so that the drying device 300 and the arrangement table picker 460 may be driven without interfering with each other.

[147] Processes that are to performed after semiconductor packages are transferred from the drying device 300 to the at least one arrangement table by the arrangement table picker 460 are the same as those performed by the semiconductor strip sawing apparatus 1000 of FIG. 1 and are thus not redundantly described here.

[148] FIG. 6 is a plan view of a semiconductor strip sawing device 1000 according to another embodiment of the present invention. The structures and operations of elements of the semiconductor strip sawing apparatus 1000 of FIG. 6 that are the same as those of FIGS. 1 to 5 are not described again here.

[149] Top or bottom surfaces of semiconductor packages placed on one of a first sucking part and a second sucking part of a drying device 300 may be tested by photographing images thereof using a first vision unit 410 in a state in which the first or second sucking part is rotated to face downward.

[150] Unlike the previous embodiments of FIGS. 1 and 4, in the embodiment of FIG. 6, a plurality of semiconductor packages that are picked up by a unit picker 270 and are cleaned may be distributed to and placed on the first sucking part and the second sucking part of the sucking plate 310, and top and bottom surfaces of the semiconductor packages may be tested by the first vision unit 410 while being dried on the sucking plate 310. Then, the semiconductor packages placed on the first sucking part and the second sucking part of the sucking plate 310 may be transferred to a first arrangement table 430a and a second arrangement table 430b using an arrangement table picker 460. Then, the top and bottom surfaces of the semiconductor packages may be tested again by photographing images thereof using the first vision unit 410 in a state in which the semiconductor packages placed in the first arrangement table 430a and the second arrangement table 430b are picked up by a first sorting picker 560 and a second sorting picker 580.

[151] That is, in the embodiment of FIG. 6, a semiconductor strip that is in the ball up state is sawn into semiconductor packages, the semiconductor packages are placed in the ball up state on the drying device 300 such that mold surfaces thereof are sucked on the drying device 300, a half of the semiconductor packages and the other semiconductor packages are loaded on a top

surface and a bottom surface of the sucking plate 310, respectively, images of ball surfaces of the semiconductor packages are photographed by the first vision unit 410 while the sucking plate 310 is flipped to secure a sufficient dry time, and
5 then the sucking plate 310 is flipped again to test ball surfaces of the other semiconductor packages. In this case, the first and second sucking parts are rotated by 180° twice, i.e., by 360° , to return to the original state in which the semiconductor packages are first sucked on the sucking plate 310. More specifically,
10 while the unit picker 270 places some semiconductor packages on the first sucking part of the sucking plate 310 and the other semiconductor packages on the second sucking part of the flipped sucking plate 310, images of the ball surfaces of the semiconductor packages placed on the first sucking part may be
15 photographed by the first vision unit 410, thereby securing a sufficient drying time for these semiconductor packages. After the other semiconductor packages are placed on the second sucking part, the sucking plate 310 is flipped again to dry the other semiconductor packages while photographing images of the ball
20 surfaces of the other semiconductor packages using the first vision unit 410. While the images of the ball surfaces of the other semiconductor packages sucked on the second sucking part are captured, the semiconductor packages sucked on the first

sucking part may be picked up by the arrangement table picker 460 and transferred to the first arrangement table 430a or the second arrangement table 430b.

[152] The first vision unit 410 configured to be transferred
5 in the Y-axis direction may be transferred to working areas of the sorting pickers 560 and 580 so as to perform a bottom surface test (a ball or lead surface test) or a top surface test (a mold surface test or a marking test) on the semiconductor packages picked up by the sorting pickers 560 and 580 or perform a 3-point
10 alignment test of a tray using the sorting pickers 560 and 580.

[153] In this case, the 3-point alignment test of a tray using the sorting pickers 560 and 580 is conducted by loading package-shaped jigs (or packages) in at least three loading grooves among loading grooves (preferably, corners) of the tray,
15 moving to the first vision unit 410, and photographing images of the jigs after the jigs are picked up by the sorting pickers 560 and 580.

[154] Offset values (X, Y, θ) of the at least three loading grooves and a center value of the tray may be calculated by
20 photographing images of the jigs a plurality of times, and location values of the loading grooves formed in a matrix may be precisely calculated based on input information regarding the tray, the number of the loading grooves, and pitch information.

However, the 3-point alignment test of a tray is not limited to the at least three loading grooves and test areas are not limited to the corners of the tray.

5 **[155]** A range of movement of a driving unit 415 mounted to move the first vision unit 410 in the Y-axis direction may be secured to intersect ranges of movement of the sorting pickers 560 and 580 or the arrangement table picker 460 in the X-axis direction.

10 **[156]** In conclusion, the above-described effects may be achieved when the range of movement of the first vision unit 410 in the Y-axis direction intersects the ranges of movement of the sorting pickers 560 and 580 or the range of movement of the arrangement table picker 460 in the X-axis direction on an XY plane.

15 **[157]** When a plurality of sorting pickers (e.g., the two sorting pickers 560 and 580) are configured to be movable in parallel in the X-axis direction, the range of movement of the first vision unit 410 in the Y-axis direction may be set such that the ranges of movement of the plurality of sorting pickers
20 in the X-axis direction intersect on the XY plane, as in the semiconductor strip sawing apparatuses 1000 illustrated in FIGS. 1, 4 and 6.

[158] As described above, testing of top and bottom surfaces of semiconductor packages performed using the first vision unit 410 in a state in which the semiconductor packages are pick up may be performed not only when the sorting pickers 560 and 580 load the semiconductor packages in a tray but also when the arrangement table picker 460 is transferred to load the semiconductor packages in the arrangement tables 430a and 430b.

[159] Although in the embodiment of FIG. 6, two sorting pickers, i.e., the sorting pickers 560 and 580, are used, the number of sorting pickers may be set to be less than or greater than '2'.

[160] In the embodiment of FIG. 6, both the top and bottom surfaces of the semiconductor packages may be tested without using the second vision unit 420, unlike in the previous embodiments.

[161] Also, the top or bottom surfaces of the semiconductor packages are tested by the first vision unit 410 while the semiconductor packages are dried, thereby minimizing waste of a process time. Since a plurality of picker units included in each of the sorting pickers 560 and 580 may be independently driven, the bottom or top surfaces of the semiconductor packages may be tested by the first vision unit 410 in a state in which the semiconductor packages are picked up by the sorting pickers 560

and 580 and the semiconductor packages may be directly sorted out and placed in discharging trays 510 and 530, based on a test result.

5 **[162]** FIG. 7 illustrates a sucking plate 310 included in a semiconductor package test unit 400 of a semiconductor strip sawing apparatus 1000 according to an embodiment of the present invention. In detail, FIG. 7(a) is a cross-sectional view of the sucking plate 310 of the semiconductor strip sawing apparatus 1000 illustrated in FIG. 1 or 6. FIG. 7(b) is a plan view of one
10 sucking member 311a included in the sucking plate 310 of FIG. 7(a). FIG. 7(c) is a plan view of another sucking member 311b included in the sucking plate 310 of FIG. 7(a).

15 **[163]** The sucking plate 310 of FIG. 7 may include a base member 315 at a center, the base member 315, a distribution member configured to distribute air pressure to the outside, and the sucking members 311a and 311b disposed at an external side of the distribution member, to which the air pressure distributed by the distribution member is applied, and including a plurality of sucking ports.

20 **[164]** In the embodiment of FIG. 1 or 6, the sucking plate 310 supplies some of a plurality of semiconductor packages, which are picked up by the unit picker 270 and are cleaned, to a first sucking part 311as which is a surface of the sucking plate 310 on

which semiconductor packages are sucked, and is rotated to supply the other semiconductor packages to a second sucking part 311bs which is a surface of the sucking plate 310 on which semiconductor packages are sucked.

5 **[165]** Specifically, the sucking plate 310 may include the base member 315 including a first pneumatic line 3153a and a second pneumatic line 3153b for selectively applying air pressure to a top surface and a bottom surface of the sucking plate 310, a first distribution member 313a that communicates with the top
10 surface of the sucking plate 310 and the first pneumatic line 3153a of the base member 315 to distribute air pressure, and a second distribution member 313b that communicates with the bottom surface of the sucking plate 310 and the second pneumatic line 3153b of the base member 315 to distribute air pressure.

15 **[166]** Semiconductor packages placed on the first and second sucking parts 311as and 311bs may be sucked and fixed on the first and second sucking parts 311as and 311bs due to suction pressure applied from sucking ports 312a of the first sucking part 311as and sucking ports 312b of the second sucking part
20 311bs. The sucking plate 310 may have a structure in which the sucking member 311a including the sucking part 311as and the sucking member 311b including the sucking part 311bs are disposed

on parallel side surfaces of the sucking plate 310 facing each other.

[167] The base member 315 may be disposed at the center of the sucking plate 310. In the base member 315, a shaft hole 3151
5 into which a rotation shaft is inserted to rotate the sucking plate 310 by the rotatable driving unit 350 (see FIG. 2) is formed, and a pair of the pneumatic lines 3153a and 3153b are disposed to be in parallel with the shaft hole 3151 and be symmetrical with respect to the shaft hole 3151.

10 **[168]** The pneumatic lines 3153a and 3153b communicate with a distribution channel 314a of the distribution member 313a and a distribution channel 314b of the distribution member 313b configured to distribute air pressure, respectively. The distribution channels 314a and 314b may communicate with the
15 sucking ports 312a and 312b of the sucking members 311a and 311b, respectively.

[169] The base member 315 may include a communication channel 3154 and a communication channel 3155 that communicate with the distribution channels 314a and 314b of the distribution
20 members 313a and 313b.

[170] The communication channels 3154 and 3155 that branch off from the respective pneumatic lines 3153a and 3153b may communicate with the distribution channels 314a and 314b of the

distribution members 313a and 313b, respectively, when a sucking part or a sucking member is disposed on both two surfaces of the sucking plate 310 facing each other.

[171] In this case, it may be considered to configure the communication channels 3154 and 3155 to be symmetrical with respect to the pneumatic lines 3153a and 3153b, respectively. However, in the base member 315 of the sucking plate 310 of FIG. 7, communication channels 3154b and 3155b are formed from one pneumatic line 3153b toward the two sucking parts 311as and 311bs, respectively.

[172] That is, a communication channel 3155a is formed from the first pneumatic line 3153a only toward the first sucking member 311a, whereas the communication channels 3154b and 3155b are formed from the second pneumatic line 3153b toward both the first sucking member 311a and the second sucking member 311b.

[173] In the embodiment of FIG. 7, the communication channel 3155b formed toward the first sucking member 311a among the two communication channels 3154b and 3155b branching off from the second pneumatic line 3153b is blocked by the first distribution member 313a and air pressure cannot be thus applied thereto via the pneumatic line 3153b.

[174] As illustrated in FIG. 7, advantages achieved when communication channels are set to be asymmetrical in the base

member 315 of the sucking plate 310 will be described with reference to FIG. 8 below.

[175] The first and second sucking parts 311as and 311bs on which the sucking ports 312a or 312b that suck the semiconductor packages and non-sucking parts that do not suck the semiconductor packages are formed to be intersected one another in the X-axis direction and the Y-axis direction may be disposed on top and bottom surfaces of the sucking plate 310. The first distribution member 313a may communicate with the sucking ports 312a formed on the first sucking part 311as, and the second distribution member 313b may communicate with the sucking ports 312b formed on the second sucking part 311bs.

[176] Semiconductor packages picked up by the unit picker 270 are arranged in a lattice form such that the semiconductor packages are disposed adjacent to one another in up, down, left, and right directions in a state in which the semiconductor packages are sawn. The semiconductor packages picked up by the unit picker 270 are divided and distributed to the first sucking part 311as and the second sucking part 311bs as the sucking plate 310 is rotated. Thus, the location of sucking ports included in the first and second sucking members 311a and 311b may be different.

[177] Specifically, a plurality of sucking ports may be disposed on each of the sucking members 311a and 311b illustrated in FIG. 7(b) and (c). Although the sucking ports are formed either in a lattice pattern, they may be continuously formed only in a diagonal direction not to be adjacent to one another in the up and down directions or the left and right directions or in a check pattern. Suction pressure may be distributed and applied to the sucking ports 312a and 312b of the sucking members 311a and 311b via a distribution channel of a distribution member between the base member 315 and the sucking members 311a and 311b.

[178] FIG. 8 illustrates a sucking plate 310 included in a semiconductor package test unit 400 of a semiconductor strip sawing apparatus 1000 according to another embodiment of the present invention.

[179] FIG. 8(a) is a plan view of one sucking member 311 of a sucking plate 300 of the semiconductor strip sawing apparatus 1000. FIG. 8(b) is a plan view of another sucking member 311 of the sucking plate 300 of the semiconductor strip sawing apparatus 1000. FIG. 8(c) is a cross-sectional view of the sucking plate 310 including the sucking member 311 of FIG. 8(a) on only one side surface thereof. FIG. 8(d) is a cross-sectional view of the sucking plate 310 including the sucking member 311 of FIG. 8(b) on only one side surface thereof.

[180] A sucking part 311s on which sucking ports sucking semiconductor packages are arranged in a matrix in the X-axis direction and the Y-axis direction is formed on a top surface of the sucking plate 310 of a drying device 300 of the semiconductor strip sawing apparatus 100 according to an embodiment of the present invention, and a vacuum block unit for blocking the second pneumatic line 3153b or the second distribution member 313b may be formed on a bottom surface of the sucking plate 310.

[181] As described above with reference to FIG. 7, the reason why communication channels that each connect one of symmetrical pneumatic lines of the base member 315 of the sucking plate 310 and one of distribution channels are formed to be asymmetrical is to cause air pressure applied to both pneumatic lines to be focused on a distribution channel below one sucking member 311 when the sucking plate 310 of FIG. 8 is not flipped and performs only a drying function similar to the sucking plate 310 of FIG. 4 and when the sucking part 311s may be formed by mounting the sucking member 311 on only one side surface of the sucking plate 310.

[182] By focusing the air pressure on one distribution channel, a loss in the air pressure may be minimized when using the sucking plate 310 of the semiconductor strip sawing apparatus 1000 of FIG. 4 that should simultaneously suck and fix

semiconductor packages sawn in a dense lattice pattern and supplied from the unit picker 120.

[183] Thus, when the sucking plate 310 of the semiconductor strip sawing apparatus 1000 need not be flipped and thus only one sucking member need to be formed on the sucking plate 310, a sucking member may be mounted above a distribution channel to which more communication channels are connected among pneumatic channels and an installation surface of a sucking member opposite to the mounted sucking member may be blocked by the blocking member 317 or the like as illustrated in FIG. 8(c), thereby causing air pressure applied from both the pneumatic channels to be intensively or more uniformly applied to the distribution channel below the sucking member.

[184] The sucking plate 310 of the semiconductor strip sawing apparatus 1000 of FIG. 1 is configured to transfer semiconductor packages to the arrangement tables 430a and 430b using the first sucking part and the second sucking part. However, when the sucking plate 310 uses only one sucking part, i.e., when all of semiconductor packages picked up by the sucking part of the sucking plate 310 are transferred to the arrangement tables 430a and 430b by placing them on the unit picker 270, the loading grooves 431a and 431b in the respective arrangement tables 430a and 430b may be formed either in a lattice pattern

such that these grooves are disposed to be adjacent to one another only in a diagonal direction or in a check pattern (e.g., a gull-type pneumatic channel pattern) as illustrated in FIG. 1, 4, 6, or 7 rather than a dense lattice pattern. Thus, in order to load semiconductor packages in the loading grooves 431a and 431b in the respective arrangement tables 430a and 430b, the sucking plate 310 may be flipped, suction pressure of sucking ports disposed either in a lattice pattern to be adjacent to one another only in the diagonal direction or in the check pattern (the gull-type pneumatic channel pattern) to correspond to the locations of the loading grooves 431a and 431b in the respective arrangement tables 430a and 430b may be removed, and the semiconductor packages may be loaded from the sucking plate 310 to desired loading grooves 431a and 431b in the respective arrangement tables 430a and 430b.

[185] In particular, a method of forming distribution channels distributing air pressure in a zigzag pattern not to be intersected one another, which is disclosed in Korean Patent No. 10-0604098, may be used to provide air pressure to one sucking member 311 either in the lattice pattern or the check pattern described above or to cancel the application of the air pressure.

[186] In this case, only one sucking part may be formed on the sucking plate 310, a sucking member may be disposed in a

predetermined direction in which more communication channels are formed in pneumatic channels when the base member 315 is used, and a sucking member opposite to the sucking member or a installation surface of a distribution member may be blocked by a vacuum blocking unit such as the blocking member 317 of FIG. 8(c) or the locking member 317' of FIG. 8(d).

[187] When this method is used, semiconductor packages, which are sucked by selectively applying suction pressure to suction ports connected to the respective pneumatic lines and arranged in a lattice form or a check pattern to be adjacent to a sucking member only in a diagonal direction or canceling the applied suction pressure, may be selectively loaded in the arrangement table 430 using air pressure applied from two pneumatic lines.

[188] In the embodiments of FIG. 8(b) and (d), the sucking member 311 includes first sucking ports and second sucking ports that are alternately disposed, and a plurality of separated distribution channels 314 that are arranged in a zigzag pattern or a gull-type pattern and that each communicate with one of the first sucking ports and the second sucking ports. When adjacent distribution channels 314 are set to communicate with different pneumatic lines, some of sucked semiconductor packages may be first loaded in a first arrangement table and the other

semiconductor packages may be then loaded in a second arrangement table.

[189] A sucking part or a sucking member of a sucking plate of a semiconductor strip sawing apparatus according to an embodiment of the present invention includes first sucking ports and second sucking ports that are alternately disposed, and a vacuum unit that communicates with the first sucking ports and the second sucking ports. The vacuum unit may cause vacuum pressure to be applied to a first distribution member via a first pneumatic line. Accordingly, semiconductor packages may be selectively loaded in arrangement tables.

[190] While the present invention has been described with reference to the particular illustrative embodiments, it is not to be restricted by the embodiments but only by the appended claims. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present invention.

What is claimed is:

1. A semiconductor strip sawing apparatus comprising:

an on-loading part configured to provide a semiconductor package in a state in which the semiconductor package is placed
5 in a magazine;

a pusher or a drawer configured to draw the semiconductor package from the magazine to the outside of the on-loading part;

an inlet rail on which the semiconductor package drawn from the pusher or the drawer is placed;

10 a strip picker configured to suck the semiconductor package placed on the inlet rail, and transfer the semiconductor package to a chuck table in a state in which a mold surface of the semiconductor package faces downward;

a sawing device configured to receive the semiconductor
15 package from the strip picker, saw the semiconductor package on the chuck table into a plurality of semiconductor packages, and clean top surfaces of the plurality of semiconductor package with cleaning water;

a unit picker configured to simultaneously suck the
20 plurality of semiconductor packages sawn by the sawing device and the top surfaces of which are cleaned, and to transfer the sucked semiconductor packages to a drying device via a cleaning device;

the cleaning device configured to clean bottom surfaces of the semiconductor packages in a state in which the semiconductor packages are sucked by the unit picker;

the drying device including a sucking plate configured to
5 suck the semiconductor packages cleaned by the cleaning device and transferred by the unit picker, wherein the sucking plate is movable on an XY plane in an X-axis direction or a Y-axis direction and is rotatable with respect to a Y-axis on the XY plane if needed;

10 a first vision unit disposed in a movement path of the sucking plate of the drying device, and configured to be moved within the XY plane in a predetermined direction perpendicular to a moving direction of the sucking plate and to test the semiconductor packages;

15 a first arrangement table and a second arrangement table in which loading grooves in which the semiconductor packages sucked on the sucking plate are loaded and non-groove portions in which the semiconductor packages are not loaded are alternately formed in the X-axis direction and the Y-axis direction, and configured
20 to transfer and load the semiconductor packages sucked on the sucking plate in the loading grooves and to be independently transferred in the Y-axis direction;

a second vision unit configured to test the semiconductor package loaded in the loading grooves in the first arrangement table and the second arrangement table; and

a sorting device configured to transfer the semiconductor
5 packages in the X-axis direction, and sort out and store the semiconductor packages based on results of testing the semiconductor packages.

2. The semiconductor strip sawing apparatus according to
10 claim 1, wherein the sucking plate of the drying device is rotated by 180° with respect to the Y-axis on the XY plane to flip the semiconductor packages, which are sucked on the sucking plate and dried, upside-down by moving the semiconductor packages relative to a Z-axis direction to be transferred into the loading
15 grooves in the first arrangement table or the second arrangement table.

3. The semiconductor strip sawing apparatus according to claim 2, wherein the sucking plate comprises:

20 a base member including a first pneumatic line and a second pneumatic line for selectively applying air pressure to a top surface and a bottom surface of the sucking plate;

a first distribution member configured to communicate with a top surface of the sucking plate, and including a distribution channel that communicates with the first pneumatic line of the base member to distribute air pressure; and

5 a second distribution member configured to communicate with a bottom surface of the sucking plate, and including a distribution channel that communicates with the second pneumatic line of the base member to distribute air pressure.

10 4. The semiconductor strip sawing apparatus according to claim 3, wherein a first sucking part and a second sucking part are disposed on the top surface and the bottom surface of the sucking plate, respectively, wherein sucking ports that suck the semiconductor packages and non-sucking parts that do not suck the
15 semiconductor packages are formed on each of the first and second sucking parts to be intersected one another in the X-axis and the Y-axis direction, and

the first distribution member communicates with the sucking ports formed on the first sucking part, and the second
20 distribution member communicates with the sucking ports formed on the second sucking part.

5. The semiconductor strip sawing apparatus according to claim 4, wherein some of the semiconductor packages sucked by the unit picker are loaded on the first sucking part, and the other semiconductor packages sucked by the unit picker are sequentially distributed and loaded on the second sucking part by rotating the sucking plate with respect to the Y-axis, and

the unit picker comprises:

first sucking ports and second sucking ports that are alternately disposed;

10 a first pneumatic line configured to communicate with the first sucking ports;

a second pneumatic line configured to communicate with the second sucking ports and to be separated from the first pneumatic line; and

15 a vacuum unit configured to selectively apply vacuum pressure to the first pneumatic line and the second pneumatic line.

6. The semiconductor strip sawing apparatus according to claim 4, in order to blow a gas onto the semiconductor packages sucked on the first sucking part and the second sucking part to remove moisture on the semiconductor packages, further comprising:

a downward blower mounted toward the first sucking part; and
an upward blower mounted toward the second sucking part.

7. The semiconductor strip sawing apparatus according to
claim 2, wherein ball surfaces or lead surfaces of the
semiconductor packages sucked on the sucking plate are tested by
the first vision unit in a state in which the sucking plate of
the drying device is rotated by 180° with respect to the Y-axis
on the XY plane, and

the tested semiconductor packages are transferred into the
loading grooves in the first arrangement table or the second
arrangement table, and mold surfaces of the semiconductor
packages loaded in the first arrangement table or the second
arrangement table are tested by the second vision unit.

8. The semiconductor strip sawing apparatus according to
claim 1, further comprising an arrangement table picker
configured to be movable in the X-axis direction or the Y-axis
direction, and to pick up the semiconductor packages sucked on
the sucking plate of the drying device and load the semiconductor
packages in the loading grooves in the first arrangement table or
the second arrangement table,

wherein the arrangement table picker simultaneously picks up the semiconductor packages sucked on the sucking plate or divides the semiconductor packages into two parts and sequentially picks up the two parts, and sequentially loads the two parts on the first arrangement table and the second arrangement table.

9. The semiconductor strip sawing apparatus according to claim 8, wherein the arrangement table picker or the sucking plate comprises:

10 first sucking ports and second sucking ports alternately disposed;

a first pneumatic line configured to communicate with the first sucking ports;

15 a second pneumatic line configured to communicate with the second sucking ports and be separated from the first pneumatic line; and

a vacuum unit configured to selectively apply vacuum pressure to the first pneumatic line and the second pneumatic line.

20 10. The semiconductor strip sawing apparatus according to claim 8, wherein the mold surfaces of the semiconductor packages are tested by the first vision unit in a state in which the

semiconductor packages are picked up by the arrangement table picker, and

the tested semiconductor packages are transferred in the loading grooves in the first arrangement table or the second arrangement table, and ball surfaces or lead surfaces of the semiconductor packages loaded in the first arrangement table or the second arrangement table are tested by the second vision unit.

11. The semiconductor strip sawing apparatus according to claim 8, wherein ball surfaces or lead surfaces of the semiconductor packages sucked on the sucking plate are tested by the first vision unit in a state in which the sucking plate of the drying device is rotated by 180° with respect to the Y-axis on the XY plane, and

after the sucking plate is rotated again by 180° with respect to the Y-axis on the XY plane, the tested semiconductor packages are picked up by the arrangement table picker and mold surfaces of the semiconductor packages are tested by the first vision unit.

12. The semiconductor strip sawing apparatus according to claim 8, wherein the arrangement table picker comprises:

a guide frame mounted along an axis; and

an arrangement table picker driving unit coupled to a top surface of the guide frame to be detachable from the guide frame, and configured to move the arrangement table picker,

wherein one side of the drying device is coupled to a first transfer rail engaged with a lower portion of the guide frame and another side of the drying device is coupled to a second transfer rail to prevent an interference or a collision between the arrangement table picker driving unit and a drying device driving unit.

13. The semiconductor strip sawing apparatus according to claim 3, wherein a first sucking part on which sucking ports sucking the semiconductor packages are arranged in a matrix in the X-axis direction and the Y-axis direction is formed on the top surface of the sucking plate, and

a vacuum-blocking unit is formed on the bottom surface of the sucking plate to block the second pneumatic line or the second distribution member.

14. The semiconductor strip sawing apparatus according to claim 13, wherein the first sucking part comprises:

first sucking ports and second sucking ports alternately disposed; and

a vacuum unit configured to communicate with the first sucking ports and the second sucking ports to selectively apply vacuum pressure to the first sucking ports and the second sucking ports,

5 wherein the vacuum unit applies vacuum pressure to the first distribution member via the first pneumatic line.

15. The semiconductor strip sawing apparatus according to claim 13, wherein the vacuum-blocking unit is a locking member or
10 a plate type blocking member.

16. The semiconductor strip sawing apparatus according to claim 1, wherein the drying device comprises:

15 a movement frame mounted to be movable along an axis and to which the sucking plate is rotatably coupled;

 a heater mounted in the sucking plate, and configured to dry the semiconductor packages sucked on the sucking plate by heating the semiconductor packages; and

20 a blower configured to remove moisture on the top surface of the sucking plate or the top or side surfaces of the semiconductor package by blowing a gas onto the semiconductor packages sucked on the sucking plate.

17. The semiconductor strip sawing apparatus according to claim 1, wherein the first vision unit is an upwardly directed vision unit configured to test the top or bottom surfaces of the semiconductor packages, and disposed below the semiconductor packages to test the semiconductor packages in an up-direction, and

the second vision unit is a downwardly directed vision unit configured to test the other top or bottom surfaces of the semiconductor package, and disposed above the semiconductor packages loaded in the arrangement table to test the semiconductor packages in a down-direction.

18. The semiconductor strip sawing apparatus according to claim 1, wherein the sorting device comprises:

at least one sorting picker configured to individually pick up the semiconductor packages loaded in the first arrangement table or the second arrangement table, and sequentially sort out and transfer the semiconductor packages based on the results of testing the semiconductor packages;

a tray which have a plurality of loading grooves in which the semiconductor packages picked up by the sorting picker and sorted out based on the results of testing the semiconductor packages are stored; and

configured to be movable in a predetermined direction.

19. The semiconductor strip sawing apparatus according to claim 18, wherein the semiconductor packages loaded in the first arrangement table and the second arrangement table are picked up by the sorting picker, one surface of each of the semiconductor packages is tested by the first vision unit, and the semiconductor packages are sorted out based on a testing result of the surface of each of the semiconductor packages and are stored on the tray.

20. The semiconductor strip sawing apparatus according to claim 18, wherein the semiconductor packages or a test jig is loaded in at least two loading grooves among loading grooves in the tray, the first vision unit is moved to, images of the semiconductor packages or an image of the test jig is photographed by the first vision unit in a state in which the sorting picker picks up the semiconductor packages or the test jig, and location values of the loading grooves in the tray are precisely calculated by comparing previously input pitch information with an actual moving distance.

21. The semiconductor strip sawing apparatus according to claim 12, wherein the sorting device comprises:

a tray including a plurality of loading grooves in which the semiconductor packages are sorted out based on the results of testing the semiconductor packages and are stored; and

a tray picker configured to pick up and discharge the tray, wherein a tray picker driving unit and the arrangement table picker driving unit are mounted on the same guide frame.

22. A semiconductor strip sawing apparatus comprising:

a sawing device configured to provide a semiconductor strip, saw the semiconductor strip on a chuck table into on a plurality of semiconductor packages, and clean top surfaces of the plurality of semiconductor packages with cleaning water;

a unit picker configured to simultaneously suck plurality of semiconductor packages sawn by the sawing device and the top surfaces of which are cleaned, and to transfer the sucked semiconductor packages to a drying device via a cleaning device;

the cleaning device configured to clean bottom surfaces of the semiconductor packages in a state in which the semiconductor packages are sucked by the unit picker;

the drying device including a sucking part configured to suck the semiconductor packages cleaned by the cleaning device

and transferred by the unit picker, wherein the sucking plate is movable on an XY plane in an X-axis direction or a Y-axis direction and is rotatable with respect to an Y-axis on the XY plane;

5 a first vision unit disposed in a movement path of the sucking plate of the drying device, and configured to be movable within the XY plane in a predetermined direction perpendicular to a moving direction of the sucking plate and to test the semiconductor packages;

10 an arrangement table picker configured to pick up the semiconductor packages sucked on the sucking plate, and to be movable in the X-axis direction or the Y-axis direction;

 an arrangement table configured to be movable in the Y-axis direction, wherein the arrangement table comprises;

15 a first loading unit on which loading grooves in which the semiconductor packages sucked on the sucking plate are loaded and non-groove portions in which the semiconductor packages are not loaded are formed to be intersected one another in the X-axis direction and the Y-axis direction; and

20 a second loading unit formed to be symmetrical with respect to the first loading unit;

a second vision unit configured to test the semiconductor packages loaded in the loading grooves in the arrangement table; and

a sorting device configured to transfer the semiconductor packages in the X-axis direction and sort out and store the semiconductor packages based on results of testing the semiconductor packages,

wherein a rotation function of the drying device is performed to flip the semiconductor packages upside-down according to a method of storing the semiconductor package,

wherein when the rotation function of the drying device is performed, the semiconductor packages sucked on the sucking plate and dried are moved relative to the Z-axis direction to be loaded in the loading grooves in the arrangement table in a state in which the sucking plate of the drying device is rotated by 180° with respect to the Y-axis on the XY plane, and

when the rotation function of the drying device is not performed, the semiconductor packages sucked on the sucking plate and dried are picked up by the arrangement table picker and loaded in the loading grooves in the arrangement table.