

DESCRIPTION

TITLE OF INVENTION: CUTTING APPARATUS AND METHOD FOR MANUFACTURING CUT ARTICLE

5 Technical Field

[0001] The present invention relates to technology for a cutting apparatus and a method for manufacturing a cut article.

Related Art

[0002] Patent Document 1 discloses a machining apparatus including a support base that
10 supports a chuck table holding a workpiece, a machining feed means that reciprocates the support base, a machining means that cuts the workpiece, a water case that receives machining chips, and a two-fluid jet nozzle that is fixed to the support base and jets fluid. In the machining apparatus described in Patent Document 1, machining chips in the water case can be flushed and removed by the fluid jetted from the two-fluid jet nozzle that moves integrally with the support base.

15 Citation List

Patent Documents

[0003]

Patent Document 1: Japanese Patent Application Laid-Open (JP-A) No. 2006-218551.

20 SUMMARY OF INVENTION

Technical Problem

[0004] Here, in an apparatus such as that described in Patent Document 1, it is assumed that an inclination is provided at the bottom of the water case to promote discharge of scrap material that has fallen into the water case. In the case of the bottom of the water case being inclined in this
25 manner, the distance between the two-fluid jet nozzle and the bottom of the water case changes in

accordance with the movement of the support base. For this reason, there is a possibility that fluid cannot be effectively jetted onto the scrap material, and the scrap material cannot be flushed.

[0005] The present invention has been made in view of the above circumstances, and a problem to be solved is to provide a cutting apparatus and a method for manufacturing a cut article capable of more reliably discharging scrap material.

Solution to Problem

[0006] The problem to be solved by the present invention is as described above. To solve this problem, a cutting apparatus according to the present invention includes a processing table movable along a linear moving direction; a cutting mechanism that cuts a cutting target placed on the processing table; a receiving member disposed below the processing table and capable of receiving scrap material generated by the cutting target being cut by the cutting mechanism at an inclined portion inclined along the moving direction; a movable nozzle movable in the moving direction accompanying movement of the processing table and ejecting fluid onto the inclined portion; and a position adjustment mechanism capable of adjusting an up-down position of the movable nozzle accompanying movement of the movable nozzle in the moving direction.

[0007] Further, a method for manufacturing a cut article according to the present invention is a method for manufacturing a cut article using the cutting apparatus, and includes a step of placing the cutting target on the processing table; and a step of cutting the cutting target by relatively moving the cutting mechanism and the processing table.

Effects of Invention

[0008] According to the present invention, scrap material may be more reliably discharged.

BRIEF DESCRIPTION OF DRAWINGS

[0009]

[FIG. 1] is a schematic plan view showing an overall configuration of a cutting apparatus

according to an embodiment.

[FIG. 2] is a plan view showing a configuration of a cutting module.

[FIG. 3] is a cross-sectional view taken along line S1-S1.

[FIG. 4] is a plan view showing a lower portion of the cutting module.

5 [FIG. 5] is a cross-sectional view taken along line S2-S2.

[FIG. 6] is a perspective view showing a removal mechanism fixed to a cover member.

[FIG. 7] (a) is a front view showing a removal mechanism. (b) is a left side view showing a removal mechanism.

[FIG. 8] is a left side view showing a state in which the removal mechanism moves rearward.

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DESCRIPTION OF EMBODIMENTS

[0010] In the following description, the directions indicated by arrows U, D, L, R, F, and Ba shown in the drawings are defined as an upward direction, a downward direction, a left direction, a right direction, a forward direction, and a rearward direction, respectively. Further, a rotation direction about a rotation axis in the up-down direction is defined as a θ direction.

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[0011] <Configuration of cutting apparatus 100 according to first embodiment>

First, a configuration of a cutting apparatus 100 according to a first embodiment will be described.

In the present embodiment, for example, a configuration of the cutting apparatus 100 will be described in a case where a sealed substrate W, in which a substrate having semiconductor chips

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fixed thereto is resin-sealed, is used as a cutting target by the cutting apparatus 100.

[0012] As the sealed substrate W, for example, a BGA (Ball grid array) package substrate, a CSP (Chip size package) package substrate, an LED (Light emitting diode) package substrate, or the like is used. Further, as the cutting target, not only the sealed substrate W but also a sealed lead frame in which a lead frame having semiconductor chips fixed thereto is resin-sealed may be

used. Further, as the cutting target, a wiring substrate in which electronic elements or electronic components are not fixed and single-layer or multiple-layer wiring is provided may be used.

[0013] A cutting apparatus 100 shown in FIG. 1 is a processing apparatus that singulates a sealed substrate W, which is a cutting target, into multiple cut articles (products P) by cutting the sealed substrate W. The cutting apparatus 100 includes, as components, a substrate supply module A, a cutting module B, and a storage module C. Each component is attachable to and detachable from, and exchangeable with, other components.

[0014] <Substrate supply module A>

The substrate supply module A is mainly provided with a substrate supply mechanism 1 and a control portion CTL.

[0015] The sealed substrate W, which is the cutting target, is carried out from the substrate supply mechanism 1 and transferred to the cutting module B by a transfer mechanism (not shown). The sealed substrate W transferred to the cutting module B is placed on a cutting table 15 described later.

[0016] The control portion CTL controls operations of each part of the cutting apparatus 100. By controlling each part of the cutting apparatus 100 by the control portion CTL, carrying in of the sealed substrate W, cutting of the sealed substrate W, inspection of the products P, carrying out of the products P, and the like may be performed. The control portion CTL may also be provided in a module other than the substrate supply module A. Further, the control portion CTL may also be provided by being divided into multiple parts. For example, it is also possible to provide a control portion CTL in each module and control each part by linking the control portions CTL with each other.

[0017] <Cutting module B>

The cutting module B shown in FIG. 1 is mainly provided with a moving mechanism 13, a cutting table 15, a rotation mechanism 17, and a spindle portion 23.

[0018] In the present embodiment, a twin cut table type cutting apparatus 100 having two cutting tables 15 is illustrated. The cutting table 15 is movable in the front-rear direction by the moving mechanism 13 and is rotatable in the θ direction by the rotation mechanism 17.

[0019] Further, in the present embodiment, a twin spindle configuration cutting apparatus 100 having two spindle portions 23 is illustrated. The two spindle portions 23 are movable in the left-right direction and the up-down direction independently of each other.

[0020] In the cutting module B, with the sealed substrate W held on the cutting table 15, the sealed substrate W may be cut and singulated by relatively moving the cutting table 15 and the two spindle portions 23. A blade 23a is attached to the spindle portion 23. The blade 23a cuts the sealed substrate W held on the cutting table 15 by rotating in a plane including the front-rear direction and the up-down direction. At this time, the sealed substrate W may also be cut while jetting cutting water toward the blade 23a from a cutting nozzle 23b (see FIG. 3) described later.

[0021] <Storage module C>

The storage module C is mainly provided with an inspection table 2 and a tray 3.

[0022] An assembly including multiple products P singulated by cutting the sealed substrate W is placed on the inspection table 2. The multiple products P are inspected by an inspection camera (not shown) and sorted into non-defective products and defective products. The sorted non-defective products are housed in the tray 3. The sorted defective products are housed in a separately prepared tray (not shown) and excluded from the products P. In the storage module C, inspection of the products P is not necessarily required.

[0023] <Details of cutting module B>

Next, a specific configuration of the cutting module B will be described with reference to FIG. 2 to FIG. 7. In FIG. 4, the illustration of members provided at an upper portion of the cutting module B (a second receiving member 14, the cutting table 15, a rear cover member 18, a front cover member 19, an upper cover member 20, and the like described later) is appropriately omitted,

and a lower portion of the cutting module B is illustrated. Further, since the apparatus configurations of the left and right cutting tables 15 are substantially the same, the apparatus configuration of the left cutting table 15 will be mainly described in detail below.

[0024] The cutting module B mainly includes a first receiving member 11, a housing portion 12, a moving mechanism 13, a second receiving member 14, the cutting table 15, a rotation mechanism 17, a rear cover member 18, a front cover member 19, an upper cover member 20, a cleaning nozzle 22, and a spindle portion 23.

[0025] The first receiving member 11 shown in FIG. 2 to FIG. 5 is a member that receives scrap material E generated when cutting the sealed substrate W. The first receiving member 11 is one embodiment of the receiving member of the present application. The first receiving member 11 is formed in a box shape opened toward an upper side and a rear side. The first receiving member 11 may receive the scrap material E that has fallen from the cutting table 15, the second receiving member 14, and the like described later. The first receiving member 11 mainly includes a protrusion portion 11a, an opening portion 11b, an inclined groove portion 11c, and a side portion 11d.

[0026] The protrusion portion 11a shown in FIG. 3 to FIG. 5 is a portion formed such that a bottom surface of the first receiving member 11 rises upward. The protrusion portion 11a is formed as a pair on left and right sides so as to correspond to the cutting table 15. The protrusion portion 11a is formed to extend in the front-rear direction.

[0027] The opening portion 11b shown in FIG. 4 and FIG. 5 is a portion formed to penetrate the bottom surface of the first receiving member 11 in the up-down direction. The opening portion 11b is formed on an upper surface of the protrusion portion 11a. The opening portion 11b is formed to extend in the front-rear direction across both front and rear end portions of the protrusion portion 11a.

[0028] The inclined groove portion 11c shown in FIG. 3 to FIG. 5 is a portion formed such that a bottom surface of the first receiving member 11 inclines downward toward the rear. The inclined groove portion 11c is one embodiment of the inclined portion of the present application. The inclined groove portion 11c is formed on both left and right sides of the protrusion portion 11a. Specifically, the inclined groove portion 11c is formed at a total of three locations: between the left and right protrusion portions 11a, and between the left and right protrusion portions 11a and the side portion 11d described later. The inclined groove portion 11c is formed to extend along the front-rear direction. An upper surface of the inclined groove portion 11c is formed to incline downward toward the rear.

[0029] The side portion 11d is a portion that forms a side surface of the first receiving member 11. The side portion 11d is formed to surround the protrusion portion 11a, the opening portion 11b, and the inclined groove portion 11c from both left and right sides and from the front. The side portion 11d is formed to have an appropriate width in the up-down direction.

[0030] The housing portion 12 is a portion that collects the scrap material E discharged from the first receiving member 11. The housing portion 12 is formed in a box shape with an upper side opened. The housing portion 12 is disposed at a rear end portion of the first receiving member 11. In the present embodiment, for convenience, FIG. 3 and other figures illustrate a configuration in which the housing portion 12 and the first receiving member 11 are integrally formed, however, it is also possible to configure the first receiving member 11 and the housing portion 12 as separate members, and to configure the housing portion 12 to be detachable from the first receiving member 11.

[0031] The moving mechanism 13 shown in FIG. 3 to FIG. 6 is configured to move the cutting table 15 forward and backward. The moving mechanism 13 mainly includes a moving member 13a, a linking portion 13b, a nut 13c, a screw shaft 13d, and a cover member 13e.

[0032] The moving member 13a is a member that supports the cutting table 15 and is movable forward and backward. The moving member 13a is formed in, for example, a cylindrical shape. The moving member 13a is disposed above the protrusion portion 11a.

[0033] The linking portion 13b shown in FIG. 3 to FIG. 5 is a portion that links the moving member 13a and the nut 13c. The linking portion 13b is formed in an elongated shape (for example, a cylindrical shape) extending in the up-down direction. The linking portion 13b is disposed to span from below to above the first receiving member 11 through the opening portion 11b. An upper end portion of the linking portion 13b is fixed to the moving member 13a.

[0034] The nut 13c and the screw shaft 13d constitute a ball screw mechanism. The screw shaft 13d is disposed below the opening portion 11b. The screw shaft 13d is disposed with a longitudinal direction oriented in a horizontal direction (front-rear direction). The screw shaft 13d is rotatable by a driving force from a driving source (not shown) such as a motor. The nut 13c is fitted to the screw shaft 13d. A large number of balls (not shown) are interposed between the nut 13c and the screw shaft 13d. A lower end portion of the linking portion 13b is fixed to an upper portion of the nut 13c. Rotation of the nut 13c around the screw shaft 13d is prevented.

[0035] The cover member 13e shown in FIG. 6 covers the moving member 13a from a lateral side. The cover member 13e is formed by combining multiple plate-shaped members. Specifically, the cover member 13e is configured to surround the moving member 13a from front, rear, left, and right by a pair of plate-shaped members in the front-rear direction and a pair of plate-shaped members in the left-right direction. The cover member 13e is fixed to the moving member 13a by an appropriate method. In figures other than FIG. 6, illustration of the cover member 13e is omitted.

[0036] In the moving mechanism 13, when the screw shaft 13d rotates, the nut 13c fitted to the screw shaft 13d linearly moves in a direction (either one of the front-rear direction) corresponding to the rotation direction of the screw shaft 13d. When the nut 13c moves, the moving member

13a linked to the nut 13c through the linking portion 13b also linearly moves together with the nut 13c.

[0037] The second receiving member 14 shown in FIG. 2 and FIG. 3 is a member that receives the scrap material E generated when cutting the sealed substrate W. The second receiving member 14 is formed in a box shape opened toward an upper side and a rear side. The second receiving member 14 is fixed to an upper portion of the moving member 13a. The second receiving member 14 may receive the scrap material E that has fallen from the cutting table 15.

[0038] The cutting table 15 is a portion on which the sealed substrate W, which is the cutting target, is placed. The cutting table 15 is one embodiment of the processing table of the present application. The cutting table 15 is disposed above the first receiving member 11 and the second receiving member 14. The cutting table 15 is supported by the moving member 13a through a rotation mechanism 17 described later.

[0039] The rotation mechanism 17 is configured to rotate the cutting table 15 in a θ direction. The rotation mechanism 17 is interposed between the moving member 13a and the cutting table 15. The rotation mechanism 17 may rotate the cutting table 15 by a driving force from a driving source (not shown) such as a motor.

[0040] The rear cover member 18 shown in FIG. 3 and FIG. 5 covers the opening portion 11b from above at a rear side of the moving member 13a. The rear cover member 18 is disposed at an upper portion of the protrusion portion 11a. The rear cover member 18 is formed in a bellows shape and is configured to be extendable and contractable in the front-rear direction. A front portion of the rear cover member 18 is linked to the moving member 13a. Accordingly, the rear cover member 18 extends and contracts in the front-rear direction along with the movement of the moving member 13a in the front-rear direction.

[0041] The front cover member 19 shown in FIG. 2, FIG. 3, and FIG. 5 covers the opening portion 11b from above at a front side of the moving member 13a. The front cover member 19

is disposed at an upper portion of the protrusion portion 11a. The front cover member 19 is formed in a bellows shape and is configured to be extendable and contractable in the front-rear direction. A rear portion of the front cover member 19 is linked to the moving member 13a. Accordingly, the front cover member 19 extends and contracts in the front-rear direction along with the movement of the moving member 13a in the front-rear direction.

[0042] The upper cover member 20 covers the rear cover member 18 from above. The upper cover member 20 mainly includes multiple plate-shaped members 20a and a linking portion 20b.

[0043] The multiple plate-shaped members 20a are formed in a rectangular plate shape. The multiple plate-shaped members 20a are disposed so as to be aligned in the front-rear direction above the upper cover member 20. The multiple plate-shaped members 20a are disposed such that at least a portion thereof overlaps in the up-down direction with respect to the plate-shaped members 20a adjacent in the front-rear direction. The adjacent plate-shaped members 20a are linked to each other so as to be relatively movable. The multiple plate-shaped members 20a are disposed so as to span both front and rear end portions of the rear cover member 18. A rear end portion of the plate-shaped member 20a disposed at the most rear side is disposed so as to overlap with the housing portion 12 in the up-down direction.

[0044] The linking portion 20b links the plate-shaped member 20a and the second receiving member 14. The linking portion 20b is fixed to a bottom surface of a rear end portion of the second receiving member 14. The linking portion 20b is linked to the plate-shaped member 20a disposed at the most front side. Accordingly, the multiple plate-shaped members 20a extend and contract in the front-rear direction along with the movement of the second receiving member 14 (moving member 13a) in the front-rear direction.

[0045] The cleaning nozzle 22 shown in FIG. 2 to FIG. 4 ejects cleaning water toward the inclined groove portion 11c. The cleaning nozzle 22 is disposed above a front portion of the inclined groove portion 11c and directed toward the rear side. The cleaning nozzle 22 may eject

cleaning water from a tip (rear end). The cleaning water ejected from the cleaning nozzle 22 may flush the scrap material E in the inclined groove portion 11c and wash away dirt such as machining chips.

[0046] The spindle portion 23 shown in FIG. 2 and FIG. 3 is configured to cut the sealed substrate W that is the cutting target. The spindle portion 23 is one embodiment of the cutting mechanism of the present application. A blade 23a that rotates in a plane including the front-rear direction and the up-down direction is attached to the spindle portion 23. Further, a cutting nozzle 23b configured to supply cutting water when cutting the sealed substrate W is provided in the vicinity of the spindle portion 23. The cutting nozzle 23b may move integrally with the spindle portion 23.

[0047] A removal mechanism 26 shown in FIG. 2 and FIG. 3 is configured to discharge the scrap material E of the first receiving member 11 (inclined groove portion 11c) to the housing portion 12. The removal mechanism 26 is provided on both left and right sides of the moving member 13a, respectively.

[0048] Since the configuration of the removal mechanism 26 provided on the left and right sides of the moving member 13a is bilaterally symmetrical, the following description focuses on the removal mechanism 26 disposed on the left side of the moving member 13a. Further, for convenience, since the removal mechanism 26 is illustrated in a simplified manner in figures other than FIG. 6 and FIG. 7, the configuration of the removal mechanism 26 is described below using FIG. 6 and FIG. 7.

[0049] As shown in FIG. 6 and FIG. 7, the removal mechanism 26 mainly includes a position adjustment mechanism 30 and a movable nozzle 40.

[0050] The position adjustment mechanism 30 supports the movable nozzle 40 and adjusts the up-down position of the movable nozzle 40. The position adjustment mechanism 30 mainly

includes a shaft 31, a fixed portion 32, a lifting block 33, a linear bush 34, a bracket 35, and a roller 36.

[0051] The shaft 31 is configured to guide the lifting block 33 up and down. The shaft 31 is formed in a substantially cylindrical shape. An upper portion of the shaft 31 is formed in a flat plate shape so as to facilitate fixing of the fixed portion 32. The shaft 31 is disposed with an axis directed in the up-down direction. Two shafts 31 are provided so as to be aligned in the front-rear direction. The two shafts 31 are disposed parallel to each other. In figures other than FIG. 6 and FIG. 7, only one shaft 31 is illustrated for simplification.

[0052] The fixed portion 32 is configured to fix the shaft 31 to the cover member 13e. The fixed portion 32 is formed in a rod shape. The fixed portion 32 is disposed with an axis directed in the left-right direction. Two fixed portions 32 are provided for one shaft 31. One end portion (left end portion) of the fixed portion 32 is fixed to the upper portion of the shaft 31. The other end portion (right end portion) of the fixed portion 32 is fixed to the left side surface of the cover member 13e. Thereby, the fixed portion 32 may fix the shaft 31 to the left side surface of the cover member 13e.

[0053] The lifting block 33 is configured to support the movable nozzle 40 so as to be capable of moving up and down. The lifting block 33 is one embodiment of the lifting portion of the present application. The lifting block 33 is formed in an appropriate shape capable of mounting the bracket 35, the movable nozzle 40, and the like.

[0054] The linear bush 34 shown in FIG. 7 is configured to smoothly move the lifting block 33 up and down along the shaft 31. The linear bush 34 is formed in a substantially cylindrical shape. The linear bush 34 is provided with balls and the like configured to reduce resistance with the shaft 31. The linear bush 34 is fixed in each of two through holes (not shown) that penetrate the lifting block 33 in the up-down direction. The shaft 31 is inserted into each of the two linear bushes 34. Thereby, the lifting block 33 may move up and down along the shaft 31. Further,

by inserting the two shafts 31 into the lifting block 33, the lifting block 33 may be prevented from rotating around the axis of the shaft 31.

[0055] The bracket 35 shown in FIG. 6 and FIG. 7 is configured to support the roller 36. The bracket 35 is formed in a substantially rectangular plate shape. The bracket 35 is disposed with the longitudinal direction directed in the up-down direction. An upper portion of the bracket 35 is fixed to the left side surface of the lifting block 33. Thereby, the bracket 35 is disposed so as to extend downward from the lifting block 33.

[0056] The roller 36 is a portion that contacts the inclined groove portion 11c of the first receiving member 11. The roller 36 is one embodiment of a contact portion of the present application. The roller 36 is formed in a substantially cylindrical shape. The roller 36 is disposed with an axis serving as a center of rotation directed in the left-right direction. The roller 36 is supported at a lower portion of the bracket 35 so as to be rotatable.

[0057] The movable nozzle 40 ejects cleaning water toward the inclined groove portion 11c while moving together with the moving member 13a. The movable nozzle 40 is configured by a two-fluid nozzle capable of mixing and ejecting two types of fluids (for example, air and cleaning water). The movable nozzle 40 is fixed to the lifting block 33 via the connection portion 41. The movable nozzle 40 is disposed with a tip directed toward the rear lower side. The movable nozzle 40 may eject fluid from the tip toward the rear lower side. The fluid ejected from the movable nozzle 40 is supplied to the movable nozzle 40 via a flow path formed inside the connection portion 41 and the lifting block 33, as well as a hose and the like not shown.

[0058] In the removal mechanism 26 configured as described above, the lifting block 33 descends along the shaft 31 by its own weight. Further, the descent of the lifting block 33 is restricted by the roller 36 contacting the inclined groove portion 11c.

[0059] The removal mechanism 26 is provided on both left and right sides of the moving member 13a, and thereby is disposed so as to correspond to each of the three inclined groove portions 11c as shown in FIG. 2.

[0060] <Discharge of scrap material E>

5 Hereinafter, with reference to FIG. 3 and FIG. 8, a manner in which the scrap material E that has fallen into the inclined groove portion 11c is discharged in the cutting apparatus 100 configured as described above will be described.

[0061] When cutting the sealed substrate W, the moving member 13a may be moved back and forth by rotating the screw shaft 13d of the moving mechanism 13, and as a result, the cutting table
10 15 may be moved in the front-rear direction. By combining the movement of the cutting table 15 in the front-rear direction by the moving mechanism 13, the rotation of the cutting table 15 in the θ direction by the rotation mechanism 17, and the movement of the spindle portion 23 in the left-right direction and the up-down direction, the sealed substrate W disposed on the cutting table 15 may be cut and singulated by the blade 23a.

15 **[0062]** The scrap material E and machining chips generated by cutting the sealed substrate W may fall from the cutting table 15 to the inclined groove portion 11c of the first receiving member 11. In the cutting apparatus 100, when cutting the sealed substrate W, cleaning water is ejected continuously or intermittently from the cleaning nozzle 22. By this cleaning water, the scrap material E and machining chips that have fallen into the inclined groove portion 11c may be
20 flushed toward the housing portion 12.

[0063] Furthermore, in the present embodiment, the scrap material E and the like that have fallen into the inclined groove portion 11c may be more reliably discharged to the housing portion 12 by the removal mechanism 26. Specifically, as shown in FIG. 3, fluid is ejected toward the rear lower side from the movable nozzle 40 of the removal mechanism 26 provided on the side of the
25 moving member 13a. In this manner, in addition to the cleaning water ejected from the cleaning

nozzle 22, the scrap material E and the like that have fallen into the inclined groove portion 11c may be more reliably flushed toward the housing portion 12 by the fluid ejected from the movable nozzle 40.

[0064] Further, for example, when the moving member 13a moves rearward, as shown in FIG. 8, the removal mechanism 26 also moves rearward together with the moving member 13a. At this time, the roller 36 in contact with the inclined groove portion 11c descends while rolling on the inclined groove portion 11c. Thus, the lifting block 33 descends so as to follow the inclined groove portion 11c.

[0065] Further, although illustration is omitted, when the moving member 13a moves forward, the roller 36 ascends while rolling on the inclined groove portion 11c, and thus the lifting block 33 ascends so as to follow the inclined groove portion 11c.

[0066] In this manner, since the lifting block 33 ascends and descends following the inclined groove portion 11c, the up-down position of the movable nozzle 40 may be adjusted. Particularly in the present embodiment, the up-down position of the movable nozzle 40 may be adjusted so that the distance between the movable nozzle 40 and the inclined groove portion 11c becomes constant regardless of the movement of the moving member 13a. Thus, the water pressure of the fluid jetted onto the inclined groove portion 11c may be maintained substantially constant, and the scrap material E and the like that have fallen into the inclined groove portion 11c may be effectively flushed.

[0067] The first embodiment of the present invention has been described above, but the present invention is not limited to the above embodiment, and appropriate modifications are possible within the scope of the technical idea of the invention described in the claims.

[0068] For example, the configuration (shape, arrangement, number, and the like) of each part of the cutting apparatus 100 described in the present embodiment is not particularly limited, and may be arbitrarily changed.

[0069] Further, the configuration of the position adjustment mechanism 30 shown in the present embodiment is an example, and the present invention is not limited thereto.

[0070] Specifically, in the present embodiment, an example in which the lifting block 33 (movable nozzle 40) descends by its own weight has been shown, but the present invention is not limited thereto. For example, a configuration in which the lifting block 33 is pushed downward by a spring or the like is also possible. This makes it easier for the roller 36 to follow the inclined groove portion 11c.

[0071] Further, in the present embodiment, an example in which the movable nozzle 40 is raised and lowered along the inclined groove portion 11c by bringing the roller 36 into contact with the inclined groove portion 11c has been shown, but the present invention is not limited thereto. For example, it is also possible to raise and lower the movable nozzle 40 by bringing the roller 36 into contact with a guide member such as a separately provided rail, instead of the inclined groove portion 11c.

[0072] Further, it is also possible to raise and lower the lifting block 33 using the power of an appropriate drive source. For example, a configuration in which the lifting block 33 is raised and lowered by the power of a motor, a cylinder, or the like is possible. In this case, it is desirable to control the movable nozzle 40 to an appropriate height by controlling the up-down position of the lifting block 33 according to the front-rear position of the cutting table 15.

[0073] Further, in the present embodiment, an example in which the up-down position of the movable nozzle 40 is adjusted so that the distance between the movable nozzle 40 and the inclined groove portion 11c becomes constant has been shown, but the present invention is not limited thereto. That is, the distance between the movable nozzle 40 and the inclined groove portion 11c does not necessarily have to be constant. For example, it is also possible to adjust the up-down position of the movable nozzle 40 so that the distance between the movable nozzle 40 and the inclined groove portion 11c becomes smaller as the movable nozzle 40 moves rearward (toward

the housing portion 12 side). This makes it possible to increase the water pressure of the fluid jetted onto the scrap material E toward the downstream side (rear side) of the inclined groove portion 11c where a large amount of scrap material E exists, and the scrap material E may be discharged more reliably.

5 **[0074]** Further, in the present embodiment, an example in which the roller 36 is brought into contact with the inclined groove portion 11c has been shown, but the present invention is not limited thereto, and any member may be brought into contact with the inclined groove portion 11c. In this case, from the viewpoint of suppressing damage to the member or suppressing resistance, it is preferable to use a low-friction material having relatively small friction with the inclined
10 groove portion 11c.

[0075] Further, in the present embodiment, an example in which the removal mechanism 26 is fixed to the cover member 13e has been shown, but the present invention is not limited thereto, and it is also possible to provide the removal mechanism 26 on other members that move along with the movement of the cutting table 15. For example, it is also possible to provide the removal
15 mechanism 26 on the moving member 13a, the second receiving member 14, the linking portion 13b, or the like.

[0076] Further, in the present embodiment, an example in which the lifting block 33 is guided up and down using two shafts 31 has been shown, but the present invention is not limited thereto, and the number of shafts 31 may be changed arbitrarily. When only one shaft 31 is used, it is
20 desirable to provide a mechanism configured to prevent the lifting block 33 from rotating around the axis of the shaft 31. For example, it is possible to form splines on the shaft 31 and the lifting block 33 (linear bush 34) to prevent the rotation of the lifting block 33.

[0077] <Supplementary Notes>

A cutting apparatus 100 according to a first aspect of the disclosure includes:

25 a cutting table 15 (processing table) movable along a linear moving direction;

a spindle portion 23 (cutting mechanism) that cuts a sealed substrate W (cutting target) placed on the cutting table 15; and

a first receiving member 11 (receiving member) disposed below the cutting table 15 and capable of receiving scrap material E generated by cutting the sealed substrate W with the spindle portion

5 23 at an inclined groove portion 11c (inclined portion) inclined along the moving direction;

a movable nozzle 40 movable in the moving direction accompanying movement of the cutting table 15 and ejecting fluid onto the inclined groove portion 11c; and

a position adjustment mechanism 30 capable of adjusting an up-down position of the movable nozzle 40 accompanying movement of the movable nozzle 40 in the moving direction.

10 According to the cutting apparatus 100 of the first aspect of the disclosure, the scrap material E may be discharged more reliably. That is, fluid is ejected by the removal mechanism 26 moving together with the cutting table 15, and the scrap material E that has fallen into the inclined groove portion 11c may be discharged. Further, since the up-down position of the movable nozzle 40 may be adjusted along with the movement of the cutting table 15, the water pressure of the fluid
15 ejected onto the inclined groove portion 11c (scrap material E) may be adjusted. As a result, the scrap material E (the scrap material E that has accumulated or adhered to the inclined groove portion 11c) that is unable to be completely discharged by cleaning water from the cleaning nozzle 22 may be more reliably discharged from the inclined groove portion 11c.

[0078] In the cutting apparatus 100 of the second aspect according to the first aspect,

20 the position adjustment mechanism 30 adjusts an up-down position of the movable nozzle 40 such that a distance between the movable nozzle 40 and the inclined groove portion 11c becomes constant.

According to the cutting apparatus 100 of the second aspect of the disclosure, by maintaining the distance between the movable nozzle 40 and the inclined groove portion 11c constant, the water

25 pressure of the fluid jetted to the inclined groove portion 11c may be maintained substantially

constant, and the scrap material E that has fallen into the inclined groove portion 11c may be effectively flushed.

[0079] The cutting apparatus 100 of the third aspect according to the first or second aspect further includes

5 a housing portion 12 disposed on one side of the first receiving member 11 in the moving direction and capable of housing the scrap material E, and

the inclined groove portion 11c is inclined downward toward the housing portion 12.

According to the cutting apparatus 100 of the third aspect of the disclosure, discharge of the scrap material E may be promoted by the fluid flowing on the inclined groove portion 11c toward the
10 housing portion 12.

[0080] In the cutting apparatus 100 of the fourth aspect according to any one of the first to third aspects,

the position adjustment mechanism 30 includes

a lifting block 33 (lifting portion) that supports the movable nozzle 40 and is capable of moving
15 up and down, and

a roller 36 (contact portion) provided on the lifting block 33 and in contact with the inclined groove portion 11c.

According to the cutting apparatus 100 of the fourth aspect of the disclosure, the up-down position of the movable nozzle 40 may be adjusted to follow the inclined groove portion 11c by a simple
20 configuration.

[0081] In the cutting apparatus 100 of the fifth aspect according to the fourth aspect, the contact portion is constituted by a rotatable roller 36.

According to the cutting apparatus 100 of the fifth aspect of the disclosure, the inclined groove portion 11c and the contact portion (roller 36) may be brought into smooth contact with each other,

and breakage, damage, and the like of the inclined groove portion 11c and the contact portion (roller 36) may be suppressed.

[0082] The cutting apparatus 100 of the sixth aspect according to the fourth or fifth aspect includes

- 5 a shaft 31 that guides the lifting block 33 up and down.

According to the cutting apparatus 100 of the sixth aspect of the disclosure, the lifting block 33 may be raised and lowered along a certain direction.

[0083] A method for manufacturing a cut article of the seventh aspect of the disclosure is

a method for manufacturing a cut article using the cutting apparatus 100 according to any one of

- 10 the first to sixth aspects, and the method includes:

a step of placing the sealed substrate W on the cutting table 15; and

a step of cutting the sealed substrate W by relatively moving the spindle portion 23 and the cutting table 15.

According to the method for manufacturing a cut article of the seventh aspect of the disclosure,

- 15 the scrap material E may be discharged more reliably.

Reference Signs List

[0084]

11 First receiving member

11c Inclined groove portion

- 20 12 Housing portion

15 Cutting table

23 Spindle portion

30 Position adjustment mechanism

31 Shaft

- 25 33 Lifting block

36 Roller

40 Movable nozzle

100 Cutting apparatus

5

CLAIMS

[Claim 1]

A cutting apparatus comprising:

a processing table movable along a linear moving direction;

5 a cutting mechanism that cuts a cutting target placed on the processing table;

a receiving member disposed below the processing table and capable of receiving scrap material generated by the cutting target being cut by the cutting mechanism at an inclined portion inclined along the moving direction;

10 a movable nozzle movable in the moving direction accompanying movement of the processing table and ejecting fluid onto the inclined portion; and

a position adjustment mechanism capable of adjusting an up-down position of the movable nozzle accompanying movement of the movable nozzle in the moving direction.

[Claim 2]

15 The cutting apparatus according to claim 1, wherein the position adjustment mechanism adjusts an up-down position of the movable nozzle such that a distance between the movable nozzle and the inclined portion becomes constant.

[Claim 3]

20 The cutting apparatus according to claim 1 or claim 2, further comprising a housing portion disposed on one side of the receiving member in the moving direction and capable of housing the scrap material,

wherein the inclined portion is inclined downward toward the housing portion.

[Claim 4]

The cutting apparatus according to any one of claim 1 to claim 3, wherein the position adjustment mechanism comprises:

a lifting portion that supports the movable nozzle and is capable of moving up and down;
and

a contact portion provided on the lifting portion and contacting the inclined portion.

[Claim 5]

5 The cutting apparatus according to claim 4, wherein the contact portion is constituted by a rotatable roller.

[Claim 6]

The cutting apparatus according to claim 4 or claim 5, further comprising a shaft that guides the lifting portion up and down.

10 [Claim 7]

A method for manufacturing a cut article using the cutting apparatus according to any one of claim 1 to claim 6, the method comprising:

a step of placing the cutting target on the processing table; and

15 a step of cutting the cutting target by relatively moving the cutting mechanism and the processing table.