

DESCRIPTION

TITLE OF INVENTION:

Cutting Apparatus

5 TECHNICAL FIELD

[0001] The present disclosure relates to a cutting apparatus.

BACKGROUND ART

[0002] Conventionally, in a cutting apparatus for manufacturing individual semiconductor device packages by cutting a package substrate, there is a problem that
10 remnants of a package substrate scatter due to a rotation direction of a cutting blade at a time of cutting the package substrate (for example, PTL 1).

CITATION LIST

PATENT LITERATURE

[0003] PTL 1: Japanese Patent Laying-Open No. 2019-192846

15 SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0004] A slide door may be provided on a rear side of the cutting apparatus for the purpose of preventing unwanted substance such as remnants scattered at the time of cutting an object to be cut such as a package substrate from scattering to the outside of
20 the cutting apparatus. The slide door is normally configured to be openable and closable by linearly moving inside the cutting apparatus for repair, cleaning, and the like.

[0005] However, in the conventional cutting apparatus, unwanted substance such as remnants scattered at the time of cutting the object to be cut may be placed on a rail on
25 which the slide door is movable, and the movement of the slide door may be hindered, or unwanted substance such as remnants may be accumulated by opening and closing of the slide door, and the movement of the slide door may be hindered.

SOLUTION TO PROBLEM

[0006] An embodiment disclosed herein can provide a cutting apparatus including a

cutting mechanism configured to be capable of cutting an object to be cut; a scattering mechanism configured to be capable of scattering unwanted substance generated by cutting the object to be cut by the cutting mechanism to a rear side of the cutting mechanism in a first direction; and a slide door structure located on the rear side of the cutting mechanism in the first direction, in which the slide door structure includes a slide door, a rail configured to be capable of linearly moving the slide door in a second direction different from the first direction, a rail cover configured to cover the rail, an unwanted substance removal member configured to be capable of removing the unwanted substance on the rail cover, and a holding member configured to bring at least a part of unwanted substance removal member into contact with an upper surface of the rail cover and configured to hold the unwanted substance removal member.

ADVANTAGEOUS EFFECTS OF INVENTION

[0007] The embodiment disclosed herein can provide a cutting apparatus capable of preventing the movement of a slide door from being hindered by the accumulation of unwanted substance scattered at the time of cutting an object to be cut.

BRIEF DESCRIPTION OF DRAWINGS

[0008] Fig. 1 is a functional block diagram of an example of a cutting apparatus according to an embodiment.

Fig. 2 is a schematic side configuration view of an example of a cutting module of the cutting apparatus according to the embodiment.

Fig. 3 is a schematic perspective view of an example of a spindle to which a fluid supply mechanism is attached.

Fig. 4 is a schematic perspective view of an example of a slide door structure viewed from the inside of the cutting apparatus according to the embodiment.

Fig. 5 is a partial perspective transparent view of the slide door structure illustrated in Fig. 4.

Fig. 6 is a schematic plan view of an example of an object to be cut by a cutting mechanism of the cutting apparatus according to the embodiment.

Fig. 7 is a schematic plan view of a preferred example of an unwanted

substance removal member.

Fig. 8 is a schematic side view of a preferred example of the unwanted substance removal member and a rail cover.

Fig. 9 is a schematic partial side view of a preferred example of the unwanted substance removal member.

Fig. 10 is a schematic perspective view of a slide door structure of a cutting apparatus of a reference example not including a rail cover accommodation member on one side in an X direction.

Fig. 11 is a schematic perspective view of the slide door structure of the cutting apparatus of the reference example illustrated in Fig. 10 in a state where a slide door is opened.

Fig. 12 is a schematic perspective view of an example of a slide door structure of a cutting apparatus according to a second embodiment.

Fig. 13 is a schematic perspective view of the slide door structure of the cutting apparatus according to the second embodiment illustrated in Fig. 12 in a state where a slide door is opened.

DESCRIPTION OF EMBODIMENTS

[0009] Hereinafter, embodiments will be described. In the drawings used for describing the embodiments, the same reference signs represent the same or corresponding parts.

[0010] <Cutting apparatus>

Fig. 1 is a functional block diagram of an example of a cutting apparatus according to an embodiment. As illustrated in Fig. 1, a cutting apparatus 100 according to the embodiment includes a supply module A that allows an object to be cut to be supplied, a cutting module B including a cutting mechanism configured to be capable of cutting the object to be cut, an inspection module C that allows inspection of a product after cutting the object to be cut, a storage module D that allows storage of the product after inspection, and a control unit. The control unit is configured to be capable of controlling each of respective operations and the like of supply module A,

cutting module B, inspection module C, and storage module D. Supply module A, cutting module B, inspection module C, and storage module D are detachable from each other and are exchangeable with each other.

[0011] Supply module A is configured to be capable of supplying an object to be cut such as a package substrate to cutting module B. Cutting module B is configured to be capable of cutting the object to be cut supplied from supply module A. Inspection module C is configured to be capable of inspecting a product singulated by cutting the object to be cut by cutting module B. Storage module D is configured to be capable of storing the product inspected by inspection module C.

[0012] <Detailed configuration of cutting module B>

Fig. 2 is a schematic side configuration view of an example of cutting module B of cutting apparatus 100 according to the embodiment. As illustrated in Fig. 2, cutting module B includes a cutting table 2B configured to be capable of placing an object to be cut W, a movement mechanism 4B configured to be capable of moving cutting table 2B in a Y direction as a first direction, a spindle 6B to which a rotary blade 61B as a cutting mechanism configured to be capable of attaching object to be cut W, a protective cover 10 configured to be capable of covering movement mechanism 4B, an unwanted substance accommodation portion 11 that accommodates remnants S as an example of unwanted substance generated by cutting object to be cut W, an unwanted substance discharge portion 15 that discharges remnants S of object to be cut W having fallen on both sides in X direction as a second direction of a second protective cover 10B (described later) to unwanted substance accommodation portion 11, and a slide door structure 200 on a rear outer side of unwanted substance accommodation portion 11.

[0013] <Cutting table>

A cutting jig 3B configured to be capable of placing object to be cut W is attached to cutting table 2B on an upper side in a Z direction as a third direction. A rotation mechanism 5B configured to be capable of rotating cutting table 2B in a θ direction is attached to cutting table 2B on a lower side in Z direction. Cutting table

2B includes a receiving plate member 13, and receiving plate member 13 is provided with a discharge groove 13M and a discharge end 13a.

[0014] <Movement mechanism>

5 Movement mechanism 4B includes a ball screw mechanism 41 linearly extending in Y direction, a drive source 42 such as a servomotor that drives ball screw mechanism 41, a slider 43 that is coupled to rotation mechanism 5B attached to cutting table 2B and is configured to be reciprocable in Y direction by ball screw mechanism 41, and a fixing base frame 44 configured to be capable of accommodating ball screw mechanism 41. A slide member 14 protruding rearward in Y direction is attached to an upper end of slider 43 in Z direction of slider 43. Movement mechanism 4B is configured to be capable of linearly reciprocating cutting table 2B forward and rearward in Y direction by driving ball screw mechanism 41 with drive source 42, and is configured to be capable of pushing out remnants S staying on an upper surface of second protective cover 10B (described later) to unwanted substance accommodation portion 11 by a tip portion 14a of slide member 14.

[0015] <Spindle>

A fluid supply mechanism 12 is attached to spindle 6B to which rotary blade 61B is attached. Fluid supply mechanism 12 includes a nozzle 121 and a supply pipe 122 that supplies liquid to nozzle 121. Fig. 3 is a schematic perspective view of an example of spindle 6B to which fluid supply mechanism 12 is attached. As illustrated in Fig. 3, nozzle 121 of fluid supply mechanism 12 includes a first nozzle 31 configured to be capable of ejecting liquid such as water for cooling object to be cut W, a second nozzle 32 as a scattering mechanism configured to be capable of ejecting liquid such as water so as to scatter remnants S generated by cutting object to be cut W with rotary blade 61B to a rear side of cutting mechanism 100 in Y direction, and a third nozzle 33 configured to be capable of ejecting liquid such as water for cooling rotary blade 61B. Fluid supply mechanism 12 is attached to a front side of rotary blade 61B of spindle 6B in Y direction.

[0016] <Protective cover>

Protective cover 10 illustrated in Fig. 2 is provided between cutting table 2B and movement mechanism 4B, and is configured to be stretchable while covering at least an upper side of movement mechanism 4B. Protective cover 10 includes a first protective cover 10A provided on the front side of cutting table 2B in Y direction and a second protective cover 10B provided on a rear side of cutting table 2B in Y direction.

[0017] First protective cover 10A is provided between a front wall 44a of fixing base frame 44 and slider 43, and is configured to cover ball screw mechanism 41 located on the front side of cutting table 2B in Y direction. First protective cover 10A includes a first bellows element 10A1 that covers an upper side of ball screw mechanism 41 and a plurality of first cover elements 10A2 that is provided on an upper surface of first bellows element 10A1 and covers the upper side of ball screw mechanism 41. Each of the plurality of first cover elements 10A2 can have, for example, a rectangular flat plate shape in a plan view. In two first cover elements 10A2 adjacent to each other, first cover element 10A2 located on the rear side of cutting table 2B in Y direction overlaps first cover element 10A2 located on the front side of cutting table 2B in Y direction. These first cover elements 10A2 are slidable relative to each other by the movement of cutting table 2B. First protective cover 10A is configured to contract when cutting table 2B moves forward in Y direction and to stretch when cutting table 2B moves rearward in Y direction.

[0018] Second protective cover 10B is provided between a rear wall 44b of fixing base frame 44 and slider 43, and is configured to cover ball screw mechanism 41 located on the rear side of cutting table 2B in Y direction. Second protective cover 10B includes a second bellows element 10B1 that covers at least the upper side of ball screw mechanism 41, and a plurality of second cover elements 10B2 that is provided on an upper surface of second bellows element 10B1 and covers the upper side of ball screw mechanism 41. Each of the plurality of second cover elements 10B2 can have, for example, a rectangular flat plate shape in a plan view. In two second cover elements 10B2 adjacent to each other, second cover element 10B2 located on the rear side of cutting table 2B in Y direction overlaps second cover element 10B2 located on the

front side of cutting table 2B in Y direction. These second cover elements 10B2 are slidable relative to each other by the movement of cutting table 2B. Second protective cover 10B is configured to stretch when cutting table 2B moves forward in Y direction and is configured to contract when cutting table 2B moves rearward in Y direction.

5 [0019] <Unwanted substance accommodation portion>

Unwanted substance accommodation portion 11 is provided between rotary blade 61B as a cutting mechanism and slide door structure 200. Unwanted substance accommodation portion 11 configured to be capable of accommodating remnants S of object to be cut W pushed out by tip portion 14a of slide member 14 and remnants S of
10 object to be cut W scattered rearward in Y direction by second nozzle 32 of fluid supply mechanism 12 attached to spindle 6B.

[0020] <Unwanted substance discharge portion>

A fluid spray mechanism 16 is attached to the front side of unwanted substance discharge portion 15. Fluid spray mechanism 16 includes a spray nozzle 161 provided
15 inside unwanted substance discharge portion 15 and a supply pipe 162 that supplies liquid such as water to spray nozzle 161. Fluid spray mechanism 16 is configured to be capable of discharging remnants S of object to be cut W having fallen on both sides of second protective cover 10B in X direction to unwanted substance accommodation portion 11 by spraying liquid such as water from cutting table 2B of unwanted
20 substance discharge portion 15 toward unwanted substance accommodation portion 11.

[0021] <Slide door structure>

Slide door structure 200 is located on the rear side of rotary blade 61B and unwanted substance accommodation portion 11 in Y direction. Slide door structure 200 includes a slide door 20 that is configured to be linearly reciprocable in X
25 direction, a rail 23 that is located on the front side of slide door 20 in Y direction, configured to be capable of linearly reciprocating slide door 20 in X direction, and has a protruding center, a roller 25 that is located on the front side of slide door 20 in Y direction and has a concave center, a connection member 24 that connects slide door 20 and roller 25, a bottom member 26 having a bottom surface extending in X direction on

the lower side of slide door 20 in Z direction, and a rail cover 21 configured to cover rail 23. Rail cover 21 has upper surface 21a that covers the upper side of rail 23 in Z direction and a side surface 21b that covers the front side of rail 23 in Y direction.

[0022] Rail 23 is configured to linearly extend in X direction on a bottom surface of bottom member 26. Roller 25 is located on rail 23, and movement of roller 25 on rail 23 allows slide door 20 to linearly reciprocate in X direction.

[0023] Rail cover 21 includes upper surface 21a located on the upper side of rail 23 in Z direction so as to cover rail 23 with a space from rail 23, and side surface 21b located on the front side of rail 23 in Y direction so as to face rail 23 with a space from rail 23.

[0024] Fig. 4 is a schematic perspective view of an example of slide door structure 200 viewed from the inside of cutting apparatus 100 according to the embodiment. Fig. 5 is a partial perspective view of slide door structure 200 illustrated in Fig. 4. As illustrated in Figs. 4 and 5, slide door structure 200 includes an unwanted substance removal member 28 configured to be capable of removing unwanted substance on rail cover 21, and a holding member 27 configured to bring at least a part of unwanted substance removal member 28 into contact with upper surface 21a of rail cover 21 and to hold unwanted substance removal member 28. In the present embodiment, holding member 27 is a rail cover accommodation member configured to be capable of accommodating rail cover 21, and unwanted substance removal member 28 is configured to close at least a part of a gap between rail cover 21 and a rail cover accommodation portion which is an example of holding member 27. Holding member 27 is installed on the upper side of upper surface 21a of rail cover 21 accommodated at an end of slide door structure 200 with a space from rail cover 21. Accordingly, holding member 27 is configured to be capable of accommodating rail cover 21 attached to slide door 20 when slide door 20 is moved in X direction to open slide door 20. An upper end which is one end of unwanted substance removal member 28 on the upper side in Z direction is fixed to holding member 27, and a lower end which is the other end of unwanted substance removal member 28 on the lower side in Z direction is released. As illustrated in Fig. 5, a part of rail 23 is accommodated in holding

member 27.

[0025] <Mechanism of action of cutting apparatus>

Fig. 6 is a schematic plan view of an example of object to be cut W cut by a cutting mechanism of cutting apparatus 100 according to the embodiment. For example, object to be cut W illustrated in Fig. 6 is cut by rotary blade 61B as the cutting mechanism illustrated in Fig. 3, and a plurality of products P and remnants S of products P are produced. Here, remnants S are scattered rearward in Y direction of rotary blade 61B by the liquid ejected from second nozzle 32 as the scattering mechanism illustrated in Fig. 3. At this time, remnants S are indirectly accommodated in unwanted substance accommodation portion 11 via second protective cover 10B illustrated in Fig. 2, or directly accommodated in unwanted substance accommodation portion 11.

[0026] However, in some cases, some of remnants S scattered rearward in Y direction of rotary blade 61B is not accommodated in unwanted substance accommodation portion 11, and is accumulated on rail cover 21 of slide door structure 200 illustrated in Fig. 2. When slide door 20 is opened in a state where remnants S are accumulated on rail cover 21, remnants S accumulated on rail cover 21 are also accommodated in holding member 27 together with rail cover 21. When remnants S as unwanted substance are accumulated on holding member 27, the movement of slide door 20 is hindered. At least some of remnants S accumulated inside holding member 27 may collapse and fall onto rail 23 inside holding member 27. In this case, when slide door 20 is once closed and then opened again, the movement of slide door 20 may be hindered by remnants S located on rail 23 inside holding member 27.

[0027] Cutting apparatus 100 according to the embodiment includes unwanted substance removal member 28 held by holding member 27 such that at least a part of unwanted substance removal member 28 is in contact with upper surface 21a of rail cover 21. Therefore, even if slide door 20 is opened with remnants S accumulated on rail cover 21, unwanted substance removal member 28 can prevent remnants S accumulated on rail cover 21 from entering the inside of holding member 27.

Therefore, as compared with a conventional cutting apparatus, cutting apparatus 100 according to the embodiment can suppress the movement of the slide door from being hindered by the accumulation of the remnants scattered at the time of cutting the object to be cut.

5 [0028] Fig. 7 is a schematic plan view of a preferred example of unwanted substance removal member 28. As illustrated in Fig. 7, unwanted substance removal member 28 is configured to extend in a direction inclined so as to spread from the rear side to the front side in Y direction. In this case, when slide door 20 is opened and rail cover 21 is accommodated in holding member 27, remnants S accumulated on rail cover 21 can
10 be moved in the direction of the arrow illustrated in Fig. 7 by unwanted substance removal member 28 and accommodated in unwanted substance accommodation portion 11.

[0029] Fig. 8 is a schematic side view of a preferred example of unwanted substance removal member 28 and rail cover 21. As illustrated in Fig. 8, the upper surface of
15 rail cover 21 and/or unwanted substance removal member 28 is configured to extend so as to be inclined downward in Z direction with respect to Y direction toward unwanted substance accommodation portion 11 (that is, to be inclined from slide door 20 downward in the inside of cutting apparatus 100). In this case, when rail cover 21 is accommodated in holding member 27, remnants S accumulated on rail cover 21 can be
20 moved in the direction of the arrow illustrated in Fig. 7 by unwanted substance removal member 28 and accommodated in unwanted substance accommodation portion 11.

[0030] The material of unwanted substance removal member 28 is not limited as long as unwanted substance removal member 28 can block remnants S on rail cover 21 when slide door 20 is opened and prevent remnants S from entering the opposite side
25 separated by unwanted substance removal member 28 (in the present embodiment, since holding member 27 is a rail cover accommodation member, the side on which slide door 20 moves when slide door 20 is opened among the spaces partitioned by unwanted substance removal member 28). Fig. 9 is a schematic partial side view of a preferred example of unwanted substance removal member 28. As illustrated in Fig.

9, it is preferable that unwanted substance removal member 28 is disposed so as to be in contact with upper surface 21a of rail cover 21, and that the lower end in the downward direction in Z direction of unwanted substance removal member 28 is configured to be oriented in X direction by rail cover 21 so as to face remnants S accumulated on rail cover 21. In this case, since the lower end of unwanted substance removal member 28 can be made difficult to face holding member 27 by rail cover 21, it is possible to further suppress the entry of remnants S accumulated on rail cover 21 to the inside of holding member 27. In order to have such a configuration, unwanted substance removal member 28 is preferably configured of a flexible material or an elastic material, and rubber and/or a brush may be exemplified as such a material, and in particular, a brush is preferable.

[0031] <Second embodiment>

In a second embodiment, a case will be described where holding member 27 is not a rail cover accommodation member is configured to be capable of accommodating rail cover 21. Fig. 10 is a schematic perspective view of a slide door structure of a cutting apparatus of a reference example not including a rail cover accommodation member on one side in an X direction (the right side in Fig. 10). In the cutting apparatus of the reference example illustrated in Fig. 10, due to the above-described reason, remnants S as an example of the unwanted substance may be accumulated on rail cover 21. When slide door 20 illustrated in Fig. 10 is opened in a state where remnants S are accumulated on rail cover 21, for example, as illustrated in the schematic perspective view of Fig. 11, remnants S accumulated on rail cover 21 may fall onto rail 23 in an advancing direction of slide door 20. In this case, the movement of slide door 20 may be hindered by remnants S located on rail 23 in an advancing direction of rail cover 21.

[0032] Therefore, for example, as illustrated in a schematic perspective view of Fig. 12, the cutting apparatus according to the second embodiment includes holding member 27 such as a fixing bracket that does not allow accommodation of rail cover 21 but allows unwanted substance removal member 28 to be held. In the cutting

apparatus according to the second embodiment, even when remnants S as an example of the unwanted substance are accumulated on rail cover 21, for example, as illustrated in a schematic perspective view of Fig. 13, remnants S accumulated on rail cover 21 can be blocked by unwanted substance removal member 28 fixed and held by holding member 27 and accommodated in unwanted substance accommodation portion 11.

Holding member 27 according to the second embodiment has a surface extending rearward in Y direction above holding member 27 in order to fix unwanted substance removal member 28, and a gap through which rail cover 21 can pass is provided below the surface extending rearward in Y direction. In the second embodiment, holding member 27 has a surface extending in X direction in which a side on the front side in Y direction of the surface extending rearward in Y direction and a part of a side are joined, and a lower end of the surface extending in X direction is fixed to a part of slide door structure 200.

[0033] In the cutting apparatus according to the second embodiment, from the viewpoint of preventing unwanted substance such as remnants accumulated on rail cover 21 from falling onto rail 23 located in the advancing direction of slide door 20 (the direction in which the slide door opens) when slide door 20 is opened, holding member 27 is preferably provided above rail cover 21 and near the side of the position (slide start position) where slide door 20 starts to slide when slide door 20 is opened.

[0034] In the cutting apparatus according to the second embodiment, a part or the whole of the lower end of unwanted substance removal member 28 is preferably disposed so as to be in contact with upper surface 21a of rail cover 21. In this case, when slide door 20 is opened, the unwanted substance such as remnants S accumulated on rail cover 21 can be prevented from passing through unwanted substance removal member 28 in the advancing direction of slide door 20.

[0035] <Supplementary note>

(Disclosure 1)

Disclosure 1 is a cutting apparatus including a cutting mechanism configured to be capable of cutting an object to be cut; a scattering mechanism configured to be

capable of scattering unwanted substance generated by cutting the object to be cut by the cutting mechanism to a rear side of the cutting mechanism in a first direction; and a slide door structure located on the rear side of the cutting mechanism in the first direction, in which the slide door structure includes a slide door, a rail configured to be capable of linearly moving the slide door in a second direction different from the first direction, a rail cover configured to cover the rail, an unwanted substance removal member configured to be capable of removing the unwanted substance on the rail cover, and a holding member configured to bring at least a part of the unwanted substance removal member into contact with an upper surface of the rail cover and configured to hold the unwanted substance removal member. [0036] (Disclosure 2)

Disclosure 2 is the cutting apparatus according to disclosure 1, in which the holding member is a rail cover accommodation member configured to be capable of accommodating the rail cover, and the unwanted substance removal member configured to close at least a part of a gap between the rail cover and the rail cover accommodation member. [0037] (Disclosure 3)

Disclosure 3 is the cutting apparatus according to disclosure 1 or 2, further including a roller located on a front side of the slide door in the first direction, and a connection member that connects the slide door and the roller, in which the roller is located on the rail, and the slide door is movable by movement of the roller on the rail. [0038] (Disclosure 4)

Disclosure 4 is the cutting apparatus according to any one of disclosures 1 to 3, in which one end of the unwanted substance removal member is fixed to the holding member, and another end of the unwanted substance removal member is released. [0039] (Disclosure 5)

Disclosure 5 is the cutting apparatus according to disclosure 4, in which the other end of the unwanted substance removal member is directed in the second direction by the rail cover.

[0040] (Disclosure 6)

Disclosure 6 is the cutting apparatus according to disclosure 4 or 5, in which the unwanted substance removal member is configured to extend in a direction inclined with respect to the first direction.

5 [0041] (Disclosure 7)

Disclosure 7 is the cutting apparatus according to any one of disclosures 1 to 6, further including an unwanted substance accommodation portion between the cutting mechanism and the slide door structure.

[0042] (Disclosure 8)

10 Disclosure 8 is the cutting apparatus according to disclosure 7, in which an upper surface of the cover extends so as to be inclined with respect to the first direction toward the unwanted substance accommodation portion.

[0043] (Disclosure 9)

15 Disclosure 9 is the cutting apparatus according to disclosure 7 or 8, in which the unwanted substance removal member extends so as to be inclined with respect to the first direction toward the unwanted substance accommodation portion.

[0044] (Disclosure 10)

Disclosure 10 is the cutting apparatus according to any one of disclosures 1 to 9, in which the unwanted substance removal member is a brush.

20 [0045] Although the embodiments have been described above, it is also planned from the beginning to appropriately combine the configurations of the above embodiments.

[0046] It should be understood that the embodiments disclosed herein are illustrative in all respects and not restrictive. The scope of the present invention is defined by not the above description, but the claims, and it is intended that all modifications within the
25 meaning and scope equivalent to the claims are included in the present invention.

REFERENCE SIGNS LIST

[0047] 2B: cutting table, 3B: cutting jig, 4B: movement mechanism, 5B: rotation mechanism, 6B: spindle, 10: protective cover, 10A: first protective cover, 10A1: first bellows element 10A2: first cover element, 10B: second protective cover, 10B1: second

bellows element, 10B2: second cover element, 11: unwanted substance accommodation portion, 12: fluid supply mechanism, 13: receiving plate member, 13a: discharge end, 13M: discharge groove, 14: slide member, 14a: tip portion, 15: unwanted substance discharge portion, 16: fluid spray mechanism, 20: slide door, 21: rail cover, 21a: upper surface, 21b: side surface, 23: rail, 24: connection member, 25: roller, 26: bottom member, 27: holding member, 28: unwanted substance removal member, 31: first nozzle, 32: second nozzle, 33: third nozzle, 41: ball screw mechanism, 42: drive source, 43: slider, 44: fixing base frame, 121: nozzle, 122: supply pipe, 161: spray nozzle, 162: supply pipe, 61B: rotary blade, 100: cutting apparatus, 200: slide door structure.

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CLAIMS

[Claim 1] A cutting apparatus comprising:

a cutting mechanism configured to be capable of cutting an object to be cut;

5 a scattering mechanism configured to be capable of scattering unwanted substance generated by cutting the object to be cut by the cutting mechanism to a rear side of the cutting mechanism in a first direction; and

a slide door structure located on the rear side of the cutting mechanism in the first direction, wherein

10 the slide door structure includes

a slide door,

a rail configured to be capable of linearly moving the slide door in a second direction different from the first direction,

a rail cover configured to cover the rail,

15 an unwanted substance removal member configured to be capable of removing the unwanted substance on the rail cover, and

a holding member configured to bring at least a part of unwanted substance removal member into contact with an upper surface of the rail cover and configured to hold the unwanted substance removal member.

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[Claim 2] The cutting apparatus according to claim 1, wherein

the holding member is a rail cover accommodation member configured to be capable of accommodating the rail cover, and

25 the unwanted substance removal member is configured to close at least a part of a gap between the rail cover and the rail cover accommodation member.

[Claim 3] The cutting apparatus according to claim 1 or 2, further comprising:

a roller located on a front side of the slide door in the first direction; and

a connection member that connects the slide door and the roller, wherein

the roller is located on the rail, and
the slide door is movable by movement of the roller on the rail.

5 [Claim 4] The cutting apparatus according to any one of claims 1 to 3,
wherein
one end of the unwanted substance removal member is fixed to the holding
member, and
another end of the unwanted substance removal member is released.

10 [Claim 5] The cutting apparatus according to claim 4, wherein the other end
of the unwanted substance removal member is directed in the second direction by the
rail cover.

15 [Claim 6] The cutting apparatus according to claim 4 or 5, wherein the
unwanted substance removal member is configured to extend in a direction inclined
with respect to the first direction.

20 [Claim 7] The cutting apparatus according to any one of claims 1 to 6, further
comprising an unwanted substance accommodation portion between the cutting
mechanism and the slide door structure.

25 [Claim 8] The cutting apparatus according to claim 7, wherein an upper
surface of the cover extends so as to be inclined with respect to the first direction
toward the unwanted substance accommodation portion.

[Claim 9] The cutting apparatus according to claim 7 or 8, wherein the
unwanted substance removal member extends so as to be inclined with respect to the
first direction toward the unwanted substance accommodation portion.

[Claim 10] The cutting apparatus according to any one of claims 1 to 9, wherein the unwanted substance removal member is a brush.