Specification

Title of Invention: CLEANING APPARATUS, RESIN MOLDING APPARATUS, AND METHOD FOR MANUFACTURING RESIN MOLDED PRODUCT

Technical Field

[0001]

The present invention relates to a cleaning apparatus, a resin molding apparatus, and a method for manufacturing a resin molded product.

Background Art

[0002]

Conventionally, as shown in Patent Document 1, as a configuration for supplying a resin material and a mold release film to a cavity in a lower die, a material holding frame that includes a through hole as seen in plan view has been used.

[0003]

This material holding frame holds the release film by suction so as to cover its lower surface, including the through hole, thus forming a resin material accommodating unit that accommodates the resin material. The resin material is then stored in this resin material accommodating unit, and the resin material is supplied to the cavity of the lower die together with the mold release film.

Prior Art Literature

Patent Literature

[0004]

Patent Literature 1: JP 2015-233039 A

Summary of Invention

Problem to be Solved by the Invention

[0005]

It is necessary to clean the material holding frame each time the resin material is supplied to the cavity of the lower die, but Patent Document 1 does not disclose the specific configuration of the cleaning mechanism. In addition, no consideration is given at all to the dust generated when cleaning the material holding frame.

[0006]

Therefore, the present invention was made to solve the above problems, and its main object is to clean the material holding frame for conveying resin material and to efficiently collect dust generated by the cleaning.

Solution to the Problem

[0007]

That is, a cleaning apparatus according to the present invention is a cleaning apparatus that cleans a material holding frame for conveying resin material, characterized in comprising: a stage on which the material holding frame is placed; a first cleaning body provided to the stage that cleans an inner circumferential surface of the material holding frame that is placed on the stage; and a dust collection opening provided to the stage that collects dust generated by cleaning the material holding frame.

Effect of the Invention

[0008]

The present invention, configured like this, is able to clean the material holding frame for conveying resin material and to efficiently collect dust generated by the cleaning.

Brief Description of the Drawings

[0009]

FIG 1: A schematic plan view of a resin molding apparatus according to an embodiment of the present invention.

FIG 2: This schematically shows the material holding frame of the same embodiment, (a) in plan view, (b) in a cross-sectional view along line A - A, and (c) in a cross-sectional view along line A - A in a state wherein the resin material is held.

FIG 3: A schematic cross-sectional view showing a state before the material holding frame is placed on the cleaning apparatus according to the same embodiment.

FIG 4: A schematic plan view showing a state before the material holding frame is placed on the cleaning apparatus according to the same embodiment.

FIG 5: Cross-sectional views showing, in a cleaning apparatus of the same embodiment, (a) a state in which a first cleaning body is lowered and (b) a state in which the first cleaning body is raised.

FIG 6: A flow diagram schematically showing the cleaning operation of the cleaning apparatus of the same embodiment.

FIG 7: A flow diagram schematically showing the cleaning operation of the cleaning apparatus of a variation embodiment.

Modes for Carrying out the Invention

[0010]

Next, the technology according to the present invention will be described in more detail with reference to examples. However, the present invention is not limited to the technology described below.

[0011]

A cleaning apparatus according to a first technology of the present invention is a cleaning apparatus that cleans a material holding frame for conveying resin material, characterized in comprising: a stage on which the material holding frame is placed; a first cleaning body provided to the stage that cleans an inner circumferential surface of the material holding frame that is placed on the stage; and a dust collection opening provided to the stage that collects dust generated by cleaning the material holding frame.

[0012]

This cleaning apparatus is such that the stage on which the material holding frame is placed is provided with a first cleaning body for cleaning the inner circumferential surface of the material holding frame, and a dust collection opening for collecting dust generated by cleaning the material holding frame, so that the material holding frame for conveying the resin material can be cleaned and the dust generated by cleaning can be efficiently collected.

[0013]

A cleaning apparatus of a second technology according to the present invention is preferably one wherein, in addition to the configuration of the above-mentioned first technology, the first cleaning body is located on an inner side of the material holding frame placed on the stage and moves up and down relative to the material holding frame.

This configuration simplifies the configuration for cleaning the inner circumferential surface of the material holding frame.

[0014]

A cleaning apparatus of a third technology according to the present invention is preferably one wherein, in addition to the configuration of the above-mentioned first or second technology, the dust collection opening is located on an inner side of the material holding frame placed on the stage and draws air in a downward direction to collect dust.

This configuration allows for efficient dust collection of the dust generated by cleaning the inner circumferential surface of the material holding frame.

[0015]

A cleaning apparatus of a fourth technology according to the present invention is preferably one wherein, in addition to the configuration of the above-mentioned third technology, the first cleaning body is provided to an inner side of the dust collection opening and moves up and down relative to the material holding frame.

This configuration makes it difficult for dust generated by cleaning the inner circumferential surface of the material holding frame to leak outside, allowing for efficient dust collection. In addition, the first cleaning body and the dust collection opening can be installed in a single location, which allows the footprint of the stage to be reduced.

[0016]

A cleaning apparatus of a fifth technology according to the present invention is preferably one wherein, in addition to the configuration of the above-mentioned third or fourth technology, a cover body that is arranged on the upper surface of the material holding frame placed on the stage is further comprised and wherein the cover body forms a flow path between itself and the upper surface of the material holding frame for drawing air from an outside.

In this configuration, a flow path is formed between the cover body and the upper surface of the material holding frame, and the dust collection operation by the dust collection opening can increase the flow velocity of the air suctioned from this flow path. As a result, the upper surface of the material holding frame can be cleaned.

[0017]

A cleaning apparatus of a sixth technology according to the present invention is preferably one wherein, in addition to the configuration of the above-mentioned fifth technology, the material holding frame has a rectangular frame shape in plan view, and the cover body is rectangular in plan view, has convex portions that contact the corner portions of the material holding frame, and forms a flow path between itself and the upper surface at the four edge portions of the material holding frame.

With this configuration, the upper surface of the four edge portions of the material holding frame can be cleaned because flow paths for air suction are formed at the four edge portions.

[0018]

A cleaning apparatus of a seventh technology according to the present invention is preferably one further comprising a second cleaning body provided to the stage that cleans a lower surface of the material holding frame that is conveyed to the stage.

With this configuration, the lower surface of the material holding frame can be cleaned during the conveyance of the material holding frame to the stage.

[0019]

A cleaning apparatus of a eighth technology according to the present invention is preferably one wherein the second cleaning body is provided to be movable up and down with respect to the stage, and is raised when the material holding frame is conveyed to the stage to clean the lower surface of the material holding frame.

With this configuration, the lower surface of the material holding frame can be cleaned during the conveying of the material holding frame to the stage, and then the second cleaning body can be lowered to prevent the second cleaning body from getting in the way when the material holding frame is placed on the stage.

[0020]

A resin molding apparatus of a ninth technology according to the present invention is one characterized in comprising a resin molding module that includes a pair of molding dies, a resin material supply module that supplies resin material to the resin molding module, and the cleaning apparatus according to any one of the first to the eighth technology as mentioned above.

This resin molding apparatus can improve the quality of resin molded products because it can clean the material holding frame for conveying resin materials and efficiently collect dust generated by the cleaning.

[0021]

A method for manufacturing a resin molded product of a tenth technology according to the present invention is one characterized in being a method for manufacturing a resin molded product using a resin molding apparatus according to the above-mentioned ninth technology, comprising supplying an object-to-be-molded and resin material to the molding dies; performing resin molding on the object-to-be-molded, and removing the resin molded product that has been resin molded from the molding dies.

This method for manufacturing a resin molded product can improve the quality of resin molded products because it is able to clean the material holding frame for conveying resin materials and efficiently collect dust generated by the cleaning.

[0022]

First Embodiment of the Present Invention

A first embodiment of the resin molding apparatus of the present invention is described below with reference to the drawings. All figures shown below are schematically depicted with omissions or exaggerations for the sake of clarity. The same components are given the same reference numerals and descriptions will be omitted when appropriate.

[0023]

1. Basic Configuration of the Resin Molding Apparatus 100

The resin molding apparatus 100 in the present embodiment manufactures a resin molded product P by resin sealing an electronic component (not shown) fixed to a substrate W, which is the object-to-be-molded, via resin molding that

makes use of a thermosetting resin material J.

[0024]

Examples of the substrate W include a metal substrate, a resin substrate, a glass substrate, a ceramic substrate, a circuit board, a semiconductor substrate, a lead frame, a silicon wafer, and a glass wafer. Electronic components can include, for example, semiconductor chips, resistor elements, capacitor elements, and other electronic elements, or at least one of these electronic elements in a state of having been resin sealed. Furthermore, the resin material J may be, for example, liquid resin, granule-shaped resin, sheet resin, tablet resin, or particle-shaped resin. The resin material J may be a material having thermoplastic properties.

[0025]

As shown in FIG 1, this resin molding apparatus 100 has as its components a substrate supply and storage module A, a resin molding module B, and a resin material supply module C, respectively. Each component (each module A to C) is removable and interchangeable with respect to each other component.

[0026]

The substrate supply and storage module A has an unfinished substrate supply unit 1 that supplies unfinished substrates W that have not yet been molded and a finished substrate storage unit 2 that stores finished substrates W that have already been molded (resin molded products P).

[0027]

The resin molding module B performs compression molding of resin material J onto the substrate W. The resin molding module B includes an upper die 3, which is a molding die that holds the substrate W, a lower die 4, which is a molding die with a cavity 4C, and a mold clamping mechanism 5 that clamps the upper die 3 and the lower die 4. The resin molding module B, by clamping the upper die 3 and the lower die 4, resin seals the electronic components fixed to the substrate W via resin molding using resin material J.

[0028]

Here, the substrate supply and storage module A and the resin molding module B are equipped with a substrate conveyance mechanism 6 that conveys unfinished substrates W and resin molded products P.

[0029]

The substrate conveyance mechanism 6 moves on a rail (not shown) that extends over the substrate supply and storage module A and the resin molding module B. The substrate conveyance mechanism 6 is configured to be movable in at least the X direction and the Y direction in the substrate supply and storage module A and the resin molding module B.

[0030]

The substrate conveyance mechanism 6 conveys unfinished substrates W from the substrate supply and storage module A to the resin molding module B, and the unfinished substrates W are supplied to the molding dies 3, 4 in the resin molding module B. After resin molding of the unfinished substrate W, the substrate conveyance mechanism 6 receives the resin molded product P from the molding dies 3, 4 in the resin molding module B and conveys it to substrate supply and storage module A.

[0031]

The resin material supply module C has a resin material supply unit 21 that supplies, for example, granule-shaped resin to the material holding frame 10 for conveying the resin material J. The resin material supply unit 21 has a resin discharge unit 211 that discharges granule-shaped resin at its tip portion. Besides supplying granule-shaped resin, the resin material supply module C may also supply other forms of resin material J, such as liquid resin, sheet resin, tablet resin, and particle-shaped resin.

[0032]

As shown in FIG 2, the material holding frame 10 of the present embodiment is a frame member having an opening portion 101 corresponding to cavity 4C of lower die 4 in plan view. The material holding frame 10 of the present embodiment has a rectangular frame shape with a rectangular opening portion 101 in plan view. The lower surface 10c of the material holding frame 10 is provided with a suction holding unit 102 for holding the release film F by suction. The material holding frame 10 holds the release film F on the lower surface 10c, so that the lower opening is in a state of being blocked by the release film F and, together with the release film F, a resin material housing unit 10x is formed. The resin material supply module C of the present embodiment has a film cutting unit 22 that cuts the release film F, and a film holding unit 23 that holds the cut release

film F to the material holding frame 10.

[0033]

Here, the resin material supply module C and the resin molding module B are provided with a material holding frame 10 and a resin material conveyance mechanism 7 that transfers resin material J.

[0034]

The resin material conveyance mechanism 7 moves on a rail (not shown) that extends over the resin material supply module C and the resin molding module B. The resin material conveyance mechanism 7 is configured to be movable in at least the X direction and the Y direction in the resin material supply module C and the resin molding module B.

[0035]

The resin material conveyance mechanism 7 conveys the material holding frame 10 to which resin material J is supplied within the resin material supply module C, from the resin material supply module C to the resin molding module B. Then, the resin material conveyance mechanism 7 supplies the release film F and resin material J to the molding dies 3, 4 in the resin molding module B. After resin molding of the unfinished substrate W, the resin material conveyance mechanism 7 collects the used release film F from the molding dies 3, 4 in the resin molding module B. The resin material conveyance mechanism 7 may also dispose of used release film F in a disposal unit (not shown) in the resin material supply module C.

[0036]

2. Configuration of the cleaning apparatus 30

The resin material supply module C of the present embodiment is equipped with a cleaning apparatus 30 that cleans the material holding frame 10, which is a frame member for conveying resin material J. The cleaning apparatus 30 cleans the material holding frame 10 after the resin material J and the release film F are conveyed.

[0037]

Specifically, as shown in FIG 1 and FIGs 3 - 5, the cleaning apparatus 30 has a stage 31 on which the material holding frame 10 is placed, a first cleaning body 32 that cleans the inner circumferential surface 10a of the material holding

frame 10 placed on the stage 31, a dust collection opening 33 that collects dust generated by the cleaning of the material holding frame 10, a cover body 34 that is placed on the upper surface 10b of the material holding frame 10 placed on the stage 31, and a second cleaning body 35 that cleans the lower surface 10c of the material holding frame 10 conveyed on the stage 31.

[0038]

As shown in FIGs 3 - 5, stage 31 has a placing surface 31a on its upper surface on which the material holding frame 10 is placed. Also connected to stage 31 is dust collection piping 311 to which a dust collector (not shown) is connected. An internal space 31S is formed within the stage 31, which connects the dust collection piping 311 and the dust collection opening 33.

[0039]

The first cleaning body 32 is provided to the stage 31 and moves up and down with respect to the material holding frame 10 placed on the stage 31 to clean the inner circumferential surface 10a of the material holding frame 10.

[0040]

Specifically, the first cleaning body 32 is positioned so as to be inside the material holding frame 10 that is placed on the stage 31. In other words, the first cleaning body 32 is provided on an inner side of the placing surface 31a on which the material holding frame 10 is placed on the stage 31.

[0041]

The first cleaning body 32 is made of a brush or brushes and is configured to move up and down using an actuator such as an air cylinder or motor (not shown). The first cleaning body 32 is provided to correspond with the four edge portions of the inner circumferential surface 10a of the material holding frame 10. As shown in FIG 4, in plan view, the first cleaning body 32 of the present embodiment has a rectangular shape corresponding to the inner circumferential surface 10a. The four edge portions of the inner circumferential surface 10a of the material holding frame 10 are cleaned all at once by the moving of the first cleaning body 32 up and down.

[0042]

The dust collection opening 33 is provided to the stage 31 and draws air in a downward direction to collect dust. Specifically, the dust collection opening 33 is positioned so as to be on an inner side of the material holding frame 10 that is

placed on the stage 31. In other words, the dust collection opening 33 is provided on an inner side of the placing surface 31a with respect to the material holding frame 10 on the stage 31.

[0043]

The size of the opening of the dust collection opening 33 of the present embodiment is larger than the size of the opening of the opening portion 101 of the material holding frame 10, so that in a state wherein the material holding frame 10 is placed on the stage 31, the entire inner side of the material holding frame 10 becomes the dust collection opening 33.

[0044]

The dust collection opening 33 in the present embodiment is rectangular in plan view. The first cleaning body 32 is provided on an inner side of the dust collection opening 33 and is configured to move up and down with respect to the material holding frame 10 through said dust collection opening 33. In other words, the four edge portions forming the dust collection opening 33 surround the first cleaning body 32 in plan view.

[0045]

As shown in FIGs 3 - 5, the cover body 34 covers the upper opening of the material holding frame 10 and forms a flow path 10R between it and the upper surface 10b of the material holding frame 10 for suction of air from outside.

[0046]

As shown in FIG 4, the cover body 34 has a rectangular shape corresponding to the material holding frame 10 in plan view, has four contact portions 341 that contact the four corner portions of the material holding frame 10, and forms a flow path 10R between the upper surface 10b at the four edge portions of the material holding frame 10. Moreover, the contact portion 341 protrudes in the downward direction from the lower surface of the cover body 34 (see FIG 3).

[0047]

The cover body 34 is, for example, conveyed by the resin material conveyance mechanism 7 to the material holding frame 10 placed on the stage 31, and is placed on the upper surface 10b of the material holding frame 10.

[0048]

The cover body 34 covers the upper opening of the material holding frame

10 to form the flow path 10R, so that when air is sucked from the dust collection opening 33, the air passes over the upper surface 10b of the material holding frame 10 with increased flow velocity. As a result, dust adhering to the upper surface 10b of the material holding frame 10 is collected in the dust collection opening 33. Covering the upper opening of the material holding frame 10 with the cover body 34 prevents dust generated when the inner circumferential surface 10a of the material holding frame 10 is cleaned by the first cleaning body 32 from being dispersed outside.

[0049]

As shown in FIG 3 to FIG 5, the second cleaning body 35 is provided on the stage 31 and cleans the lower surface 10c of the material holding frame 10 that is conveyed to the stage 31. This second cleaning body 35 is provided on the conveying-in side with respect to the first cleaning body 32. The second cleaning body 35 of the present embodiment has roughly a straight line shape in plan view.

[0050]

As shown in FIG 4, the length of the second cleaning body 35 orthogonal to the conveyance direction is longer than the length of the material holding frame 10 being conveyed orthogonal to the conveyance direction. As a result, the second cleaning body 35 is configured so as to clean the entire lower surface 10c of the material holding frame 10 simply by conveying the material holding frame 10 in the conveyance direction.

[0051]

The second cleaning body 35 is movable up and down with respect to the stage 31, and is raised when the material holding frame 10 is conveyed to the stage 31 to clean the lower surface 10c of the material holding frame 10.

[0052]

The second cleaning body 35 is, for example, made of a brush or brushes and is configured to move up and down using an actuator such as an air cylinder or motor (not shown). The raised second cleaning body 35 comes into contact with the lower surface 10c of the material holding frame 10, and while in this state of contact, the material holding frame 10 moves relative to the second cleaning body 35 as it is conveyed, thereby cleaning the lower surface 10c of the material holding frame 10.

[0053]

The stage 31 is formed with an opening portion 36 for moving the second cleaning body 35 up and down, and this opening portion 36 also communicates with the internal space 31S of the stage 31. In other words, the opening portion 36 also functions as a dust collection opening.

[0054]

3. Cleaning Operation of the Material Holding Frame 10

Next, the cleaning operation of the material holding frame 10 by the cleaning apparatus 30 in the present embodiment will be described with reference to FIGs 3, 5, and 6.

[0055]

First, the used material holding frame 10, after the resin material J is conveyed to the lower die 4, is conveyed to the stage 31 by the resin material conveyance mechanism 7. At this time, as shown in FIG 3 and FIG 6(a), the second cleaning body 35 of the cleaning apparatus 30 is raised and awaiting use. As shown in FIG 6(b), when the material holding frame 10 is conveyed and reaches the second cleaning body 35, the lower surface 10c of the material holding frame 10 being conveyed moves while in contact with the second cleaning body 35. The lower surface 10c of the material holding frame 10 is thereby cleaned by the second cleaning body 35. The dust generated at this time is collected into the dust collection opening 33 and the opening portion 36.

[0056]

Then, as shown in FIG 5 and FIG 6(c), when the entire lower surface 10c of the material holding frame 10 has passed the second cleaning body 35, the second cleaning body 35 descends into the opening portion 36 and retreats into the interior of the stage 31. Furthermore, the resin material conveyance mechanism 7 places the material holding frame 10 on the placing surface 31 a of the stage 31. Furthermore, as shown in FIG 5 and FIG 6(d), the resin material conveyance mechanism 7 places a cover body 34 on the upper surface 10b of the material holding frame 10 placed on the stage 31. By placing the cover body 34 on the upper surface 10b of the material holding frame 10, air is sucked through the flow path 10R, and the upper surface 10b of the material holding frame 10 is cleaned. As shown in FIG 5, and FIGs 6(e) and (f), the first cleaning body 32 is moved up and

down multiple times relative to the material holding frame 10, whereby the inner circumferential surface 10a of the material holding frame 10 is cleaned. The dust generated at this time is collected into the dust collection opening 33.

[0057]

This completes the cleaning of the inner circumferential surface 10a, the upper surface 10b, and the lower surface 10c of the material holding frame 10 (see FIG 6(g)). The cleaned material holding frame 10, having been conveyed by the resin material conveyance mechanism 7, holds the release film F for the next resin molding, and the resin material J is contained therein.

[0058]

4. Resin Molding Operation of the Resin Molding Apparatus 100

Next, an example of the operation of the resin molding apparatus 100 will be described with reference to FIG 1 and FIG 6. The operations described below are performed, for example, by a control device CTL in the substrate supply and storage module A, which controls each part of the resin molding apparatus 100. The control device CTL is a dedicated or general-purpose computer with a CPU, internal memory, input/output interface, AD converter, etc.

[0059]

(1) Unfinished Substrate Supply Process

In the substrate supply and storage module A, the substrate conveyance mechanism 6 receives an unfinished substrate W from the unfinished substrate supply unit 1 and conveys it to the resin molding module B. The unfinished substrate W is then passed to the opened upper die 3. The substrate conveyance mechanism 6 then returns to the predetermined standby position.

[0060]

(2) Resin Material Supply Process

In the resin material supply module C, the resin material supply unit 21 supplies resin material J onto the release film F held in the material holding frame 10. The resin material conveyance mechanism 7 then conveys the material holding frame 10 to the resin molding module B to supply resin material J together with the release film F to the cavity 4C of the opened lower die 4. The resin material conveyance mechanism 7 then returns to the predetermined standby position.

[0061]

Here, as shown in FIG 6, the resin material conveyance mechanism 7 conveys the material holding frame 10 after supplying resin material J to the cleaning apparatus 30. The cleaning apparatus 30 then cleans the inner circumferential surface 10a, the upper surface 10b, and the lower surface 10c of the material holding frame 10.

[0062]

(3) Resin Molding Process

After the process described above, in the resin molding module B, the upper die 3 and the lower die 4 are clamped by the mold clamping mechanism 5 with a predetermined clamping pressure, and then heat is applied to them. After a predetermined amount of time has elapsed, the lower die 4 is lowered by the mold clamping mechanism 5, and the upper die 3 and the lower die 4 are opened.

[0063]

(4) Finished Substrate Removal Process

In the finished substrate removal process, the substrate conveyance mechanism 6 is moved to receive the resin molded product P from the upper die 3 that has been opened. The substrate conveyance mechanism 6, having received the resin molded product P, is moved to the substrate supply and storage module A, and the resin molded product P is received into the finished substrate storage unit 2 from the substrate conveyance mechanism 6 and then stored.

[0064]

(5) Used Release Film Collection Process

In the used release film collection process, the resin material conveyance mechanism 7 is moved to collect the used release film F from the opened lower die 4. The resin material conveyance mechanism 7, which has collected the used release film F, is moved to the resin material supply module C, and the used release film F is disposed of in a disposal unit.

[0065]

5. Effect of the Present Embodiment

According to the resin molding apparatus 100 of the present embodiment, the stage 31 on which the material holding frame 10 is placed is provided with a first cleaning body 32 for cleaning the inner circumferential surface 10a of the material holding frame 10, and a dust collection opening 33 for collecting dust

generated by cleaning the material holding frame 10, so that the material holding frame 10 for conveying the resin material J can be cleaned and the dust generated by cleaning can be efficiently collected. This result in an improvement of the quality of the resin molded product P.

[0066]

In addition, the dust collection opening 33 is located in an inner side of the material holding frame 10 that is placed on the stage 31, and collects dust by sucking air in a downward direction, so that dust generated by cleaning the inner circumferential surface 10a of the material holding frame 10 can be efficiently collected.

[0067]

Furthermore, since the first cleaning body 32 is provided on an inner side of the dust collection opening 33, dust generated by cleaning the inner circumferential surface 10a of the material holding frame 10 is less likely to leak to the outside, and the dust can be collected efficiently. Furthermore, the first cleaning body 32 and the dust collection opening 33 can be provided in a single location, and the footprint of the stage 31 can be reduced.

[0068]

In particular, in the present embodiment, the inner circumferential surface 10a, the upper surface 10b, and the lower surface 10c of the material holding frame 10 are cleaned, which prevents foreign matter from entering the next resin molding process and improves the quality of the resin molded product P.

[0069]

In the present embodiment, the second cleaning body 35 contacts and cleans the lower surface 10c of the material holding frame 10 during the process of conveying the material holding frame 10 to the stage 31, so the process of conveying the material holding frame 10 to the stage 31 and the cleaning process of the lower surface 10c of the material holding frame 10 can be performed simultaneously. Therefore, the lower surface 10c of the material holding frame 10 can be cleaned without increasing the time necessary for cleaning the material holding frame 10.

[0070]

6. Variation Embodiments

The present invention is not limited to the aforementioned embodiments.

[0071]

For example, the above embodiment has a configuration with a second cleaning body 35; however, as shown in FIG 7, a configuration without a second cleaning body 35 is also possible. FIG 7 shows the cleaning operation in a configuration without the second cleaning body 35, which is the same as the cleaning operation in the previous embodiment except that there is no cleaning process for the lower surface 10c of the material holding frame 10.

[0072]

In the above embodiment, the second cleaning body 35 is vertically movable upon and down with respect to the stage 31, but it is also possible for the second cleaning body 35 to be fixed in place. Moreover, it is also possible for the second cleaning body 35 to be provided separately from the stage 31.

[0073]

In addition to a configuration in which the first cleaning body 32 is movable up and down inside the dust collection opening 33, the space of the dust collection opening 33 and the space in which the first cleaning body 32 moves up and down can be provided separately.

[0074]

Furthermore, the first cleaning body 32 of the above embodiment is a single piece with a rectangular cleaning section in plan view corresponding to the four edge portions of the inner circumferential surface 10a of the material holding frame 10, but it can also be configured with four cleaning units corresponding to each of the four edge portions.

[0075]

In the above embodiment, there was just one second cleaning body 35 provided on the stage 31, but a plurality of second cleaning body 35 can be provided along the conveyance direction.

[0076]

It is also possible for the dust collection opening 33 to be located on the outside of the material holding frame 10 placed on the stage 31. Moreover, it is possible for the dust collection opening 33 to be provided both outside and inside the material holding frame 10 placed on the stage 31.

[0077]

In addition to the configuration wherein the first cleaning body 32 moves vertically with respect to the material holding frame 10, it may be configured to move horizontally or diagonally with respect to the material holding frame 10.

[0078]

In addition, when cleaning the lower surface 10c of the material holding frame 10 with the second cleaning body 35, it is also possible for the material holding frame 10 to be moved back and forth multiple times against the second cleaning body 35.

[0079]

In the above embodiment, one resin molding module B is connected between the substrate supply and storage module A and the resin material supply module C, but a configuration with two or more resin molding modules B connected is also possible. Moreover, it is also possible for it to be a single module together with the substrate supply and storage module A and the resin material supply module C, with the resin molding module B connected to that module. The film cutting unit can be separated from the resin material supply module C to be its own module. Furthermore, it is also possible for the resin molding apparatus does to not be modularized into each module as in the previous embodiment.

[0080]

Needless to say, the present invention is not limited to the aforementioned embodiments, and various other variations are possible without departing from the intent of the invention.

Industrial Applicability

[0081]

According to the present invention, it is possible to clean the material holding frame for conveying resin material and to efficiently collect dust generated by the cleaning.

Explanation of Reference Numerals

[0082]

100: resin molding apparatus

W: object-to-be-molded

P: resin molded product

J: resin material

B: resin molding module

3, 4: molding dies

C: resin material supply module

10: material holding frame

10a: inner circumferential surface of the material holding frame

10b: upper surface of the material holding frame

10c: lower surface of the material holding frame

10R: flow path

30: cleaning apparatus

31: stage

32: first cleaning body

33: dust collection opening

34: cover body

341: contact portion

35: second cleaning body