

Description

Title of Invention: RESIN MATERIAL SUPPLY DEVICE, RESIN MATERIAL SUPPLY METHOD, RESIN MATERIAL SUPPLY PROGRAM, RESIN MOLDED ARTICLE MANUFACTURING DEVICE, AND RESIN MOLDED ARTICLE MANUFACTURING METHOD

Technical Field

[0001]

The present invention relates to a resin material supply device, a resin material supply method, a resin material supply program, a resin molded article manufacturing device, and a resin molded article manufacturing method.

Background Art

[0002]

PTL 1 discloses a method for manufacturing a resin molded article by sealing a semiconductor substrate with a resin material. At this time, the liquid resin material for sealing is applied onto a release film by a dispenser, and this is disposed in a lower mold of a mold. On the other hand, the semiconductor substrate before resin sealing is disposed on an upper mold of the mold, and the mold is clamped in this state. As a result, a chip and the like mounted on the semiconductor substrate are resin-sealed in a cavity of the lower mold, whereby the resin-sealed substrate is obtained.

Citation List

Patent Literature

[0003]

PTL 1: Japanese Patent Laid-open Publication No. 2022-13023

Summary of Invention

Technical Problem

[0004]

Meanwhile, in PTL 1, the liquid resin material is applied along a prescribed path on the release film by moving the dispenser in the horizontal direction while discharging the liquid resin material from the dispenser. In such a dispenser, the liquid resin material is extruded by an extrusion member to apply the liquid resin material onto the release film. However, when the extrusion member extrudes the liquid resin material by a prescribed length, the liquid resin material remaining in the dispenser may be further discharged due to internal pressure. Therefore, the liquid resin material may be discharged even after the dispenser is stopped, so that there is a possibility that the liquid resin material is excessively applied to one site.

[0005]

The present invention has been made to solve this problem, and aims to provide a resin material supply device, a resin material supply method, a resin material supply program, a resin molded article manufacturing device, and a resin molded article manufacturing method which are capable of suppressing excessive application of a liquid resin material to one site even when the liquid resin material is discharged after an extrusion member is stopped.

Solution to Problem

[0006]

A resin material supply device according to the present invention is a resin supply device for discharging a liquid resin material along a prescribed path on an object and includes: a storage part that stores the resin material and has a discharge part for discharging the resin material; an extrusion member that is disposed in the storage part and extrudes the resin material from the discharge part; a movement mechanism for relatively moving the storage part with respect to the object in an in-plane direction of a

surface of the object; and a control unit for controlling the extrusion member and the movement mechanism, the control unit being configured to discharge the resin material remaining in the storage part while moving the storage part along the path after the extrusion member completes movement by a prescribed extrusion distance.

[0007]

A resin material supply method according to the present invention is a resin supply method for discharging a liquid resin material along a prescribed path on an object using a resin supply device that includes a storage part that stores the resin material and has a discharge part for discharging the resin material, an extrusion member that is disposed in the storage part and extrudes the resin from the discharge part, a movement mechanism for moving the storage part, and a control unit for controlling the extrusion member and the movement mechanism, and includes: a first step of extruding the resin material to apply the resin material to the object until the extrusion member completes movement by a prescribed extrusion distance while moving the storage part along the path; and a second step of performing control to discharge the resin material remaining in the storage part while moving the storage part along the path after the extrusion member completes the movement by the prescribed extrusion distance.

[0008]

A resin material supply program according to the present invention is a resin supply program for discharging a liquid resin material along a prescribed path on an object using a resin supply device that includes a storage part that stores the resin material and has a discharge part for discharging the resin material, an extrusion member that is disposed in the storage part and extrudes the resin material from the discharge part, a movement mechanism for moving the storage part, and a control unit

for controlling the extrusion member and the movement mechanism, and causes the control unit to execute: a first step of extruding the resin material to apply the resin material to the object until the extrusion member completes movement by a prescribed extrusion distance while moving the storage part along the path; and a second step of performing control to discharge the resin material remaining in the storage part while moving the storage part along the path after the extrusion member completes the movement by the prescribed extrusion distance.

[0009]

A resin molded article manufacturing device according to the present invention includes: a resin supply module including the resin material supply device and supplying a liquid resin material onto a film using the resin supply device; and a press module including an upper mold and a lower mold, in which the film supplied with the resin material and a substrate are disposed between the upper mold and the lower mold, and clamping is performed to manufacture a resin molded article in which the substrate is sealed with the resin.

[0010]

A resin molded article manufacturing method according to the present invention is a method for manufacturing a resin molded article using the resin molded article manufacturing device, and includes the steps, executed by the resin material supply device, of: supplying a liquid resin onto a film; disposing the film supplied with the resin material and a substrate between the upper mold and the lower mold; and performing clamping of the upper mold and the lower mold to manufacture the resin molded article in which the substrate is sealed with the resin.

Advantageous Effects of Invention

[0011]

According to the present invention, even when the liquid resin material is discharged after the extrusion member is stopped, the liquid resin material can be suppressed from being excessively applied to one site.

Brief Description of Drawings

[0012]

[Fig. 1] Fig. 1 is a plan view schematically illustrating a resin molding device.

[Fig. 2] Fig. 2 is a cross-sectional view of a dispenser.

[Fig. 3] Fig. 3 is a cross-sectional view illustrating an operation of the dispenser.

[Fig. 4] Fig. 4 is a cross-sectional view illustrating the operation of the dispenser.

[Fig. 5] Fig. 5 is a cross-sectional view of a press module.

[Fig. 6] Fig. 6 is a plan view illustrating an application path of a liquid resin material discharged from the dispenser to a release film.

[Fig. 7] Fig. 7 is a graph showing a relationship between a movement time and a movement distance of the dispenser.

[Fig. 8] Fig. 8 is a graph showing a relationship between a discharge time and a discharge amount of the liquid resin material.

[Fig. 9] Fig. 9 is a block diagram illustrating control of a movement speed of the dispenser.

[Fig. 10] Fig. 10 is a graph showing a relationship between the movement distance of the dispenser and a weight of the discharged liquid resin material.

[Fig. 11] Fig. 11 is a flowchart illustrating a flow of supply of the liquid resin material.

[Fig. 12] Fig. 12 is a plan view illustrating another example of the application

path of the liquid resin material discharged from the dispenser to the release film.

[Fig. 13] Fig. 13 is a flowchart illustrating a flow of supply of the liquid resin material by dripping and draining.

[Fig. 14] Fig. 14 is a plan view illustrating still another example of the application path of the liquid resin material discharged from the dispenser to the release film.

[Fig. 15] Fig. 15 is a plan view illustrating still another example of the application path of the liquid resin material discharged from the dispenser to the release film.

Description of Embodiments

[0013]

Hereinafter, an embodiment of a resin material supply device and a resin molding device including the same according to the present invention will be described with reference to the drawings. Fig. 1 is a schematic plan view of a resin material supply device according to the present embodiment. Note that, in the following description, description may be made according to directions attached to the drawings. However, the present invention is not specified in these directions.

[0014]

<1. Outline of Resin Molding Device>

As illustrated in Fig. 1, the resin molding device according to the present embodiment includes a resin material supply module 2, a plurality of (three in the present embodiment) press modules 3, a substrate module 4, a control unit 5, and a display unit 6. The respective modules 2 to 4 can be attached or detached independently of each other. Note that the number of the press modules 3 in the present embodiment is three, but may be one or two or more.

[0015]

<1-1. Resin Material Supply Module>

The resin material supply module (resin material supply device) 2 includes a resin material supply mechanism 21 that supplies a liquid resin material for resin molding. Here, the liquid resin material includes not only a resin that is liquid at normal temperature (room temperature) but also a molten resin obtained as a solid resin material is melted by heating, and may be a thermoplastic resin material or a thermosetting resin material. The thermosetting resin material is a liquid resin material at normal temperature, but is decreased in viscosity when heated, and is polymerized and cured when further heated. The liquid resin material in the present embodiment is preferably a thermosetting resin material having a relatively high viscosity to such an extent that does not rapidly flow at normal temperature. The viscosity of the liquid resin material is preferably, for example, 100 to 200 Pa·s.

[0016]

As illustrated in Fig. 1, the resin material supply mechanism 21 includes a table 21A on which a release film F is placed, a discharge mechanism 21B that discharges the resin material, and a weight detector 25. The table 21A is provided with a release film supply mechanism 22 that feeds the release film F wound around a reel and cuts and separates the release film F. The separated release film F is sucked and held on an upper surface of the table 21A by a suction mechanism. A frame member 21C is placed on an upper surface of the release film F (see Fig. 2). In the frame member 21C, a space corresponding to a lower mold cavity MC to be described later is formed.

[0017]

As illustrated in Fig. 2, the discharge mechanism 21B includes a dispenser 24. The dispenser 24 includes a cartridge 240 containing the liquid resin material and an

extrusion member 244 for extruding the liquid resin material stored in the cartridge 240. The extrusion member 244 may be a so-called plunger. The cartridge 240 includes an outer cylinder 241 having a cylindrical shape and formed using a hard material such as metal, an inner cylinder 242 having a cylindrical shape, stored in the outer cylinder 241, formed using an elastically deformable material such as plastic, and storing the liquid resin material, and a lid 243 disposed on a surface of the liquid resin material inside the inner cylinder 242.

[0018]

The extrusion member 244 is configured to be moved in the vertical direction by a servo motor 28. There is a case where a gap is provided between the extrusion member 244 and the inner cylinder 242, and the lid 243 provided in the cartridge 240 plays a role of sealing the inner cylinder 242 such that the liquid resin material does not leak. In addition, the lid 243 is movable in an axial direction of the inner cylinder 242 by being pressed by the extrusion member 244. A through hole 245 is formed in a lower portion of the outer cylinder 241, and a lower end portion 249 of the inner cylinder 242 protrudes downward from the through hole 245. Then, a discharge part 246 having a discharge port is provided at the lower end portion 249 of the inner cylinder 242 protruding from the outer cylinder 241. The discharge part 246 may be formed by attaching a tube made of a soft material to the lower end portion 249. When the lid 243 is pressed toward the discharge part 246 by the extrusion member 244, the liquid resin material is discharged from the discharge port of the discharge part 246. In addition, a chuck 247 is provided at the discharge part 246 of the lower end portion 249 of the inner cylinder 242 protruding from the outer cylinder 241. The chuck 247 can press the inner cylinder 242 from the radially outer side, thereby closing the discharge part 246. That is, the discharge of the resin material from the discharge port

can be stopped.

[0019]

When the extrusion member 244 moves downward, the liquid resin material is extruded from the discharge part 246, and a fixed amount of the liquid resin material is applied onto the release film F. Note that the liquid resin material is applied to a path R on the release film F as illustrated in Fig. 6 to be described later. In general, the liquid resin material stored in one cartridge 240 can be applied to a plurality of the paths R. That is, the extrusion member 244 moves downward in the cartridge 240 by a prescribed distance a plurality of times, and the liquid resin material can be applied to one path R by one-time downward movement. Therefore, when the extrusion member 244 moves downward once and the application of the liquid resin material to one path R is completed before the liquid resin material is used up, the liquid resin material remains in the cartridge 240. Therefore, pressure is applied to the remaining liquid resin material by the extrusion member 244, and accordingly, the liquid resin material mainly remaining at the lower end portion 249 of the inner cylinder 242 may be discharged from the discharge part 246 even if the extrusion member 244 does not move downward. Hereinafter, this phenomenon may be referred to as dripping.

[0020]

Thereafter, as illustrated in Fig. 4, when the discharge part 246 of the lower end portion 249 of the inner cylinder 242 is pressed by the chuck 247, the liquid resin material remaining in the vicinity of the lower end portion 249 is extruded and discharged onto the release film F (hereinafter, which may be referred to as draining). Note that discharge amount of the liquid resin material by dripping and draining can be calculated in advance by performing a characteristic test of the dispenser 24 in advance.

[0021]

The dispenser 24 is configured to be freely movable in the vertical direction and the horizontal direction (in-plane direction) on a mounting surface of the release film F by a movement mechanism including a servo motor or the like. More specifically, a flange 2411 protruding radially outward is provided at an upper end portion of the outer cylinder 241 of the cartridge 240, and the cartridge 240 is supported from above by a plurality of locking members 27 being locked to the flange 2411. Then, the cartridge 240 is moved as the locking members 27 are moved in the horizontal direction and the vertical direction by the servo motor. Note that the extrusion member 244 and the chuck 247 are also movable together with the cartridge 240. In addition, in place of the dispenser 24, the table 21A may be configured to be freely movable on the horizontal plane. That is, it is sufficient that the dispenser 24 can move on the horizontal plane relative to the release film F.

[0022]

The resin material supply module 2 includes a resin material storage part 11 that stores a plurality of the cartridges 240. When the liquid resin material is used up in the dispenser 24, the cartridge 240 of the dispenser 24 is replaced with a new cartridge.

[0023]

The weight detector 25 includes a weight sensor (not illustrated) installed below the table 21A. The weight sensor may be a known load sensor, and measures the weight of the table 21A, the weight of the release film F, and the total weight of the liquid resin material supplied onto the release film F per prescribed time (also referred to as unit time). The weight detector 25 detects the weight of the liquid resin material supplied per unit time based on a difference between the total weight at previous measurement and the total weight at current measurement obtained by the weight

sensor.

[0024]

A resin material loader 12 is configured to be movable between the resin material supply module 2 and the press module 3 on a rail. The resin material loader 12 can hold the release film F on which the liquid resin material is supplied from the resin material supply mechanism 21, and can transfer the release film F to the press module 3.

[0025]

<1-2. Press Module>

As illustrated in Fig. 5, the press module 3 includes a press frame in which a lower fixed platen 31 and an upper fixed platen 33 are integrated by a plate-shaped member 32. A movable platen 34 is provided between the lower fixed platen 31 and the upper fixed platen 33. The movable platen 34 is movable up and down along the plate-shaped member 32. A clamping mechanism 35 for moving the movable platen 34 up and down is provided on the lower fixed platen 31. The clamping mechanism 35 includes a pair of ball screws and the like. In addition, the clamping mechanism 35 can also move the movable platen 34 upward to clamp a mold M and move the movable platen 34 downward to open the mold M. A drive source of the clamping mechanism 35 is not particularly limited, but for example, an electric motor such as a servo motor can be used.

[0026]

An upper mold UM and a lower mold LM serving as the mold M are disposed to face each other, and each of these is formed using a metal mold or the like. An upper heater plate 37 incorporating an upper heater 371 is disposed on a lower surface of the upper fixed platen 33, and the upper mold UM is attached beneath the upper

heater plate 37. The upper mold UM is provided with a substrate setting part (not illustrated) on which a substrate S is disposed. Then, the substrate S on which a chip and the like is mounted is attached to the substrate setting part of the upper mold UM. A lower heater plate 36 incorporating a lower heater 361 is disposed on an upper surface of the movable platen 34, and the lower mold LM is provided on the lower heater plate 36. The suction mechanism is provided in the lower mold cavity MC, and the release film F coated with the liquid resin material is held by the suction mechanism.

[0027]

The clamping mechanism 35 clamps the mold M and heats the lower mold LM using the lower heater plate 36. As a result, the liquid resin material in the lower mold cavity MC is cured. That is, the mold M is clamped by the clamping mechanism 35 in a state where a substrate Sa before resin sealing and the release film F are disposed between the upper mold UM and the lower mold LM. As a result, the chip and the like mounted on the substrate Sa before resin sealing (substrate before molding) are resin-sealed in the lower mold cavity MC to become a resin-sealed substrate Sb (resin molded article).

[0028]

<1-3. Substrate Module>

As illustrated in Fig. 1, the substrate module 4 transports the substrate Sa before resin sealing (substrate before molding) on which the chip before resin sealing is mounted, and transports the resin-sealed substrate Sb (resin molded article) after resin sealing. The substrate module 4 includes a substrate loader 41, a first storage part 43 that houses the substrate Sa before resin sealing, a second storage part 44 that houses the resin-sealed substrate Sb, and a substrate delivery unit 45. The substrate delivery

unit 45 moves in the front-rear direction in the substrate module 4, and can deliver the substrate Sa before resin sealing to the substrate loader 41. In addition, the substrate delivery unit 45 can receive the resin-sealed substrate Sb transported from the substrate loader 41. The substrate loader 41 moves in the horizontal direction in the substrate module 4 and each of the press modules 3.

[0029]

<1-4. Control Unit>

The control unit 5 includes a computer such as a PLC that controls an operation of the resin molding device. The control unit 5 includes a storage unit including an HDD, an SSD, or the like, and the storage unit stores a program for executing resin molding in the resin molding device. Then, this program is executed by the CPU of the control unit 5, thereby executing the resin molding including supply of a liquid resin material to be described later. Note that this program can be transmitted to the control unit 5 through a telecommunication line such as a dedicated line or the Internet, and can be provided to the control unit 5 by a storage medium 51 such as a CD-ROM, a DVD-ROM, or a memory card.

[0030]

<1-5. Display Unit>

The display unit 6 displays various states of the resin molding device and performs input for an operation, and includes a known liquid crystal display fixed to a housing of the substrate module 4 in a state visible from the outside, and is controlled to display by the control unit 5. The display unit 6 includes a touch panel that can be operated by pressing a display on a screen with a finger. In addition, the display unit may be configured using a display of an external desktop personal computer, notebook personal computer, tablet terminal, or the like connected via a network.

[0031]

<2. Method for Supplying Resin Material>

Next, a method for supplying a liquid resin material onto the release film F from the dispenser 24 in the resin material supply module 2 will be described. Fig. 6 is a plan view illustrating the path R of the dispenser. The dispenser 24 applies the liquid resin material onto the release film F while being moved in the horizontal direction above the release film F by the above-described movement mechanism. As illustrated in Fig. 6, the dispenser 24 is set to linearly advance from a start point R1 to the right side, the front side, the left side, the front side, and the right side in this order, and stop at an end point R2. However, this path R is an example, and may be a path including a curve.

[0032]

In the present embodiment, as illustrated in Fig. 7, the control unit 5 sets a target movement speed such that the dispenser 24 starts from the start point R1 and arrives at the end point R2 at a time T_g . In addition, as illustrated in Fig. 8, an extrusion speed of the extrusion member 244 is set such that the dispenser 24 starts discharging the liquid resin material from the start point R1 and completes discharging a target weight of the resin material at the end point R2. That is, an extrusion amount (or the extrusion speed) of the extrusion member 244 is set in the control unit 5 such that a fixed amount (hereinafter, referred to as a target discharge amount) of the liquid resin material is discharged per unit time from a time 0 and the discharge of the liquid resin material is completed at the time T_g . As a result, a uniform amount of the liquid resin material can be discharged over the entire length of the path R (the liquid resin material having a uniform line width is applied). Note that Fig. 8 illustrates a relationship between a target time and the discharge amount for the liquid resin material

by one-time movement of the extrusion member 244 corresponding to the application of the liquid resin material to one path R, and does not include the discharge amount of the liquid resin material according to dripping and draining described above.

[0033]

However, since the viscosity and compressibility of the liquid resin material vary depending on a temperature change during discharge, there is a case where the liquid resin material is not uniformly discharged from the discharge part 246 per unit time strictly according to the extrusion of the extrusion member 244. That is, as in a graph illustrated in Fig. 8, there is a possibility that the liquid resin material is not discharged.

[0034]

Therefore, in the present embodiment, the movement speed of the dispenser 24 is controlled as described below such that a substantially uniform amount of the liquid resin material is discharged over the entire length of the path R.

[0035]

Fig. 9 is a block diagram illustrating the control of the movement speed of the dispenser. As illustrated in Fig. 9, when the target movement speed of the dispenser 24 is input, the control unit 5 drives the servo motor of the movement mechanism in accordance with the input, and moves the dispenser 24 in the horizontal direction along the path R. Then, the weight detector 23 detects the weight of the liquid resin material applied to the release film F per unit time (for example, every 0.1 to 0.5 seconds). In a case where there is a difference between the detected discharge amount of the liquid resin material per unit time and the target discharge amount of the liquid resin material per unit time illustrated in Fig. 8, the control unit 5 changes a target value of the movement speed of the dispenser 24 and moves the dispenser 24 by the servo motor

based on a new target value.

[0036]

This point will be described with reference to Fig. 10. Fig. 10 is a graph showing a relationship between a movement distance of the dispenser and the weight of the discharged liquid resin material. For example, when the detected discharge amount of the liquid resin material per unit time is higher than the target discharge amount per unit time (0 to L1 in Fig. 10), control is performed to increase the movement speed of the dispenser 24 (L1 to L2 in Fig. 8). On the other hand, when the detected discharge amount of the liquid resin material per unit time is lower than the target discharge amount per unit time (L3 to L4 in Fig. 8), control is performed to decrease the movement speed of the dispenser 24 (L4 to L5 in Fig. 8). That is, the control unit 5 changes the target value of the movement speed in accordance with the difference between the detected discharge amount of the liquid resin material per unit time and the target discharge amount per unit time. The larger the difference between the detected discharge amount of the liquid resin material per unit time and the target discharge amount per unit time, the larger a change amount of the target value of the movement speed. On the other hand, when the difference between the detected discharge amount of the liquid resin material per unit time and the target discharge amount per unit time is small, the change amount of the target value of the movement speed is also small. In this manner, the control unit 5 controls the servo motor in accordance with the changed target value of the movement speed. As described above, the control unit 5 performs feedback control regarding the movement speed of the dispenser 24 as illustrated in Fig. 9.

[0037]

The above control will be described again with reference to a flowchart

illustrated in Fig. 11. First, the total weight of the liquid resin material to be discharged and a movement time of the extrusion member 244 are set (step S1). Next, a movement speed of the dispenser 24 and a movement distance (path) are set (step S2). That is, the setting illustrated in the graphs of Figs. 7 and 8 is performed. Note that steps S1 and S2 may be reversed.

[0038]

When the setting is completed in this manner, the liquid resin material is discharged while the dispenser 24 is moved from the start point R1 toward the end point R2 (step S3). In this process, the control unit 5 causes the weight detector 25 to detect the weight of the liquid resin material discharged per unit time (step S4). Then, the control unit 5 determines whether there is a difference between a detected discharge amount of the liquid resin material per unit time and a target discharge amount, and when there is a difference (YES in step S5), changes the movement speed of the dispenser 24 as described above (step S7). That is, the target movement speed of the dispenser 24 is newly set.

[0039]

Thereafter, when there is no difference between the detected discharge amount of the liquid resin material per unit time and the target discharge amount (NO in step S5) and the dispenser 24 has moved to the end point R2 (YES in step S6), the process ends. On the other hand, when the dispenser 24 has not moved to the end point R2 (NO in step S6), steps S3 to S7 are repeated. In this manner, the liquid resin material is applied over the entire length of the set path R. Note that the difference between the detected discharge amount of the liquid resin material per unit time and the target discharge amount is determined in step S5. Here, a case where there is no difference can include not only a case where the difference is completely 0 but also a case where a

difference having a slight range is set not to change the target movement speed of the dispenser 24 if the difference falls within this range.

[0040]

Meanwhile, if the liquid resin material is discharged from the discharge part 246 by dripping and draining as described above even after the dispenser 24 stops at the end point R2, there is a possibility that an excessive amount of the liquid resin material is applied to the end point R2. Therefore, hereinafter, control after the dispenser 24 stops at the end point R2 will be described with reference to a flowchart of Fig. 13.

[0041]

Since the discharge amount of the liquid resin material by dripping and draining can be calculated in advance as described above, when determining that the dispenser has arrived at the end point R2 (YES in step S11), the control unit 5 performs discharge of the liquid resin material by dripping while moving the dispenser 24 from the end point R2 toward the start point R1 along the path R as illustrated in Fig. 12 (step S12). Then, when determining that the discharge of the liquid resin material by dripping has been completed (YES in step S13), the control unit 5 closes the chuck 247, and performs discharge of the liquid resin material by draining (step S14). Then, when determining that the discharge of the liquid resin material by draining has been completed (YES in step S15), the control unit 5 stops the movement of the dispenser 24 (step S16), and ends the process. Therefore, during this movement, the liquid resin material is discharged from the dispenser 24 by dripping and draining. During this period, the control unit 5 can perform the control illustrated in steps S3 to S7 of Fig. 11 described above. However, it is also possible to control only the extrusion speed of the extrusion member 244 without performing such feedback control.

[0042]

However, the control unit 5 adjusts the movement speed of the dispenser 24 such that a discharge amount of the liquid resin material applied per unit length on the path R becomes smaller than the target discharge amount described above (for example, 1/2 or less of the target discharge amount). This is because the liquid resin material discharged by dripping and draining is discharged to the path R already coated with the liquid resin material, and the liquid resin material is laminated in two layers. Therefore, in order to make an application amount of the liquid resin material on the path R as uniform as possible, it is necessary to reduce the discharge amount per unit length according to dripping and draining.

[0043]

<3. Features>

(1) Since the viscosity and compressibility of the liquid resin material vary depending on a temperature change during discharge, there is a possibility that the liquid resin material is not uniformly discharged from the discharge part 246 per unit time strictly according to the extrusion of the extrusion member 244. Therefore, in the resin material supply module 2 according to the present embodiment, the discharge amount of the liquid resin material discharged from the dispenser 24 per unit time is detected and compared with the target discharge amount of the resin per unit time. Then, when there is a difference therebetween, the movement speed of the dispenser 24 is corrected.

[0044]

For example, when the detected discharge amount of the liquid resin material is higher than the target discharge amount per unit time, the movement speed of the dispenser 24 is increased to decrease the discharge amount of the liquid resin material per unit length on the path R. On the other hand, when the detected discharge amount

of the liquid resin material is lower than the target discharge amount per unit time, the movement speed of the dispenser 24 is decreased to increase the discharge amount of the liquid resin material per unit length on the path R. As a result, it is possible to suppress variation in the application amount of the liquid resin material over the entire path R.

[0045]

Note that, in addition to the variation in the viscosity and compressibility of the resin material described above, other causes that prevent the liquid resin material from being discharged from the discharge part 246 according to the setting are conceivable. For example, it is conceivable that a set amount of the liquid resin material is not discharged even if the extrusion member 244 is moved at a set speed because the liquid resin material is a compressible fluid having a high viscosity. In addition, it is also conceivable that a set amount of the liquid resin material is not discharged due to deformation of the inner cylinder 242 because there is a possibility that the inner cylinder 242 is deformed when the inner cylinder 242 of the dispenser 24 is formed using elastically deformable plastic. Therefore, the structure of the dispenser 24, the composition of the liquid resin material, and the like may also cause the liquid resin material not to be discharged according to the setting, and thus, various causes are conceivable. Therefore, as in the present embodiment, it is effective to control the application amount of the liquid resin material on the path R by correcting the movement speed of the dispenser 24 based on the discharge amount of the liquid resin material discharged from the dispenser 24 per unit time.

[0046]

(2) As described above, the liquid resin material may be discharged by dripping and draining after the dispenser 24 arrives at the end point R2 of the path R. In this

case, there is a possibility that the liquid resin material is excessively applied to the end point R2. In this regard, the liquid resin material is discharged by dripping and draining while moving the dispenser 24 toward the start point R1 as described above, so that it is possible to suppress the excessive application of the liquid resin material to the end point R2.

[0047]

<4. Modifications>

Although one embodiment of the present invention has been described above, the present invention is not limited thereto, and various modifications can be made without departing from the gist thereof. For example, the following modifications are possible. In addition, the gist of the following modifications can be appropriately combined.

[0048]

(1) In the above embodiment, the discharge amount of the resin material discharged from the dispenser 24 per unit time is detected, and this is compared with the target discharge amount of the resin material per unit time. Then, when there is a difference therebetween, the movement speed of the dispenser 24 is corrected. However, only the control related to the discharge of the liquid resin material by dripping and draining may be performed without performing such feedback control. In this case, as illustrated in Fig. 12, in addition to the control in a case where the extrusion member 244 has completed the movement by the prescribed extrusion distance (the above-described one-time movement) at the same time when the dispenser 24 has arrived at the end point R2, the following control can also be performed.

[0049]

For example, as illustrated in Fig. 14, in a case where the extrusion member

244 completes the movement by the prescribed extrusion distance before the dispenser arrives at the end point R2 (such a point is referred to as R3), it is necessary to discharge the liquid resin material by dripping and draining on a path between the point R3 and the end point R2. In this case, the control unit 5 calculates a distance between the point R3 and the end point R2, and performs control to discharge the liquid resin material by dripping and draining by this distance.

[0050]

For example, since the control unit 5 can detect the discharge amount of the liquid resin material by dripping and draining per unit time, the feedback control described in the above embodiment can be performed by the above distance (between R3 and R2). That is, it is possible to control the movement speed of the dispenser 24 by detecting the discharge amount of the liquid resin material by dripping and draining per unit time and comparing this discharge amount with a target discharge amount per unit time in the case of dripping and draining.

[0051]

(2) As illustrated in Fig. 15, when the distance between the point R3 and the end point R2 is short, the dispenser 24 is moved to the end point R2 and then moved toward the start point R1, and during this movement, the liquid resin material can be discharged by dripping and draining.

[0052]

(3) Since the discharge amount of the liquid resin material by draining is small, for example, it is also possible to perform the above control only for the discharge of the liquid resin material by dripping without performing the control for draining, and to close the chuck 247 to discharge the liquid resin material by draining after the dispenser 24 is stopped.

[0053]

(4) The configuration of the dispenser 24 is not particularly limited as long as the liquid resin material is discharged by extrusion by the extrusion member 244 and the dispenser 24 is movable in the horizontal direction. Therefore, a storage part of the present invention that stores the liquid resin material and discharges the resin material from the discharge part 246 may include one storage part instead of including the outer cylinder 241 and the inner cylinder 242.

[0054]

(5) In the above embodiment, when the liquid resin material discharged from the dispenser is applied to the release film F, the discharge amount of the liquid resin material is detected by the weight sensor (not illustrated) connected to the table 21A supporting the release film F. However, the present invention is not limited thereto, and the discharge amount can be detected (or measured) by another method.

[0055]

(Supplementary Notes)

Supplementary Note 1. A resin material supply device for discharging a liquid resin material along a prescribed path on an object, the resin supply device including:

a storage part that stores the resin material and has a discharge part for discharging the resin material;

an extrusion member that is inserted into the storage part to extrude the resin material from the discharge part;

a movement mechanism for relatively moving the storage part with respect to the object in an in-plane direction of a surface of the object; and

a control unit for controlling the extrusion member and the movement

mechanism,

wherein the control unit is configured to discharge the resin material remaining in the storage part while moving the storage part along the path after the extrusion member completes movement by a prescribed extrusion distance.

[0056]

Supplementary Note 2. The resin material supply device according to Supplementary Note 1, wherein

the control unit is configured to discharge the resin material remaining in the storage part while moving the storage part toward a start point of the path along the path in a case where the storage part has arrived at an end point of the path when the extrusion member has completed the movement by the prescribed extrusion distance.

[0057]

Supplementary Note 3. The resin material supply device according to Supplementary Note 1, wherein

the control unit is configured to discharge the resin material remaining in the storage part on a path from a point where the movement by the prescribed extrusion distance is completed to the end point while moving the storage part from the point to the end point in a case where the storage part has not arrived at the end point of the path when the extrusion member has completed the movement by the prescribed extrusion distance.

[0058]

Supplementary Note 4. The resin supply device according to Supplementary Note 2 or 3, wherein

the control unit corrects a movement speed of the storage part based on a discharge amount of the resin material remaining in the storage part per unit time.

[0059]

Supplementary Note 5. The resin material supply device according to any one of Supplementary Notes 1 to 4, further including a weight detector that supports the object and detects a weight of the resin material discharged from the storage part per unit time.

[0060]

Supplementary Note 6. The resin material supply device according to any one of Supplementary Notes 1 to 5, wherein the resin material remaining in the storage part is discharged from the discharge part by at least one of internal pressure of the storage part and closing of a discharge part of the storage part.

[0061]

Supplementary Note 7. A resin material supply method for discharging a liquid resin material along a prescribed path on an object using a resin material supply device that includes a storage part that stores the resin material and has a discharge part for discharging the resin material, an extrusion member that is disposed in the storage part and extrudes the resin material from the discharge part, a movement mechanism for moving the storage part, and a control unit for controlling the extrusion member and the movement mechanism,

the resin material supply method including:

a first step of extruding the resin material to apply the resin material to the object until the extrusion member completes movement by a prescribed extrusion distance while moving the storage part along the path; and

a second step of performing control to discharge the resin material remaining in the storage part while moving the storage part along the path after the extrusion member completes the movement by the prescribed extrusion distance.

[0062]

Supplementary Note 8. A resin material supply program for discharging a liquid resin material along a prescribed path on an object using a resin material supply device that includes a storage part that stores the resin material and has a discharge part for discharging the resin material, an extrusion member that is disposed in the storage part and extrudes the resin material from the discharge part, a movement mechanism for moving the storage part, and a control unit for controlling the extrusion member and the movement mechanism,

the resin supply program causing the control unit to execute:

a first step of extruding the resin material to apply the resin material to the object until the extrusion member completes movement by a prescribed extrusion distance while moving the storage part along the path; and

a second step of performing control to discharge the resin material remaining in the storage part while moving the storage part along the path after the extrusion member completes the movement by the prescribed extrusion distance.

[0063]

Supplementary Note 9. A resin molded article manufacturing device including:

a resin supply module including the resin material supply device according to any one of Supplementary Notes 1 to 6 and supplying a liquid resin material onto a film using the resin material supply device; and

a press module including an upper mold and a lower mold, wherein

the film supplied with the resin material and a substrate are disposed between the upper mold and the lower mold, and clamping is performed to manufacture a resin molded article in which the substrate is sealed with the resin material.

[0064]

Supplementary Note 10. A resin molded article manufacturing method for manufacturing a resin molded article using the resin molded article manufacturing device according to Supplementary Note 11,

the method including the steps, executed by the resin material supply device, of:

supplying a liquid resin material onto a film;

disposing the film supplied with the resin material and a substrate between the upper mold and the lower mold; and

performing clamping of the upper mold and the lower mold to manufacture the resin molded article in which the substrate is sealed with the resin material.

Reference Signs List

[0065]

24 Dispenser

241 Outer cylinder (storage part)

242 Inner cylinder (storage part)

244 Extrusion member

247 Chuck

25 Weight detector

5 Control unit

Claims

[Claim 1] A resin material supply device for discharging a liquid resin material along a prescribed path on an object, the resin supply device comprising:

a storage part that stores the resin material and has a discharge part for discharging the resin material;

an extrusion member that is inserted into the storage part to extrude the resin material from the discharge part;

a movement mechanism for relatively moving the storage part with respect to the object in an in-plane direction of a surface of the object; and

a control unit for controlling the extrusion member and the movement mechanism,

wherein the control unit is configured to discharge the resin material remaining in the storage part while moving the storage part along the path after the extrusion member completes movement by a prescribed extrusion distance.

[Claim 2] The resin material supply device according to claim 1, wherein

the control unit is configured to discharge the resin material remaining in the storage part while moving the storage part toward a start point of the path along the path in a case where the storage part has arrived at an end point of the path when the extrusion member has completed the movement by the prescribed extrusion distance.

[Claim 3] The resin material supply device according to claim 1, wherein

the control unit is configured to discharge the resin material remaining in the storage part on a path from a point where the movement by the prescribed extrusion distance is completed to the end point while moving the storage part from the point to the end point in a case where the storage part has not arrived at the end point of the path when the extrusion member has completed the movement by the prescribed extrusion

distance.

[Claim 4] The resin material supply device according to claim 2 or 3, wherein the control unit corrects a movement speed of the storage part based on a discharge amount of the resin material remaining in the storage part per unit time.

[Claim 5] The resin material supply device according to claim 4, further comprising a weight detector that supports the object and detects a weight of the resin material discharged from the storage part per unit time.

[Claim 6] The resin material supply device according to claim 1, wherein the resin material remaining in the storage part is discharged from the discharge part by at least one of internal pressure of the storage part and closing of a discharge part of the storage part.

[Claim 7] A resin material supply method for discharging a liquid resin material along a prescribed path on an object using a resin material supply device that includes a storage part that stores the resin material and has a discharge part for discharging the resin material, an extrusion member that is disposed in the storage part and extrudes the resin material from the discharge part, a movement mechanism for moving the storage part, and a control unit for controlling the extrusion member and the movement mechanism,

the resin material supply method comprising:

a first step of extruding the resin material to apply the resin material to the object until the extrusion member completes movement by a prescribed extrusion distance while moving the storage part along the path; and

a second step of performing control to discharge the resin material remaining in the storage part while moving the storage part along the path after the extrusion member completes the movement by the prescribed extrusion distance.

[Claim 8] A resin material supply program for discharging a liquid resin material along a prescribed path on an object using a resin material supply device that includes a storage part that stores the resin material and has a discharge part for discharging the resin material, an extrusion member that is disposed in the storage part and extrudes the resin material from the discharge part, a movement mechanism for moving the storage part, and a control unit for controlling the extrusion member and the movement mechanism,

the resin supply program causing the control unit to execute:

a first step of extruding the resin material to apply the resin material to the object until the extrusion member completes movement by a prescribed extrusion distance while moving the storage part along the path; and

a second step of performing control to discharge the resin material remaining in the storage part while moving the storage part along the path after the extrusion member completes the movement by the prescribed extrusion distance.

[Claim 9] A resin molded article manufacturing device comprising:

a resin supply module including the resin material supply device according to any one of claims 1 to 3 and supplying a liquid resin material onto a film using the resin material supply device; and

a press module including an upper mold and a lower mold, wherein

the film supplied with the resin material and a substrate are disposed between the upper mold and the lower mold, and clamping is performed to manufacture a resin molded article in which the substrate is sealed with the resin material.

[Claim 10] A resin molded article manufacturing method for manufacturing a resin molded article using the resin molded article manufacturing device according to claim 9,

the resin molded article manufacturing method comprising the steps, executed by the resin material supply device, of:

supplying a liquid resin material onto a film;

disposing the film supplied with the resin material and a substrate between the upper mold and the lower mold; and

performing clamping of the upper mold and the lower mold to manufacture the resin molded article in which the substrate is sealed with the resin material.