

DESCRIPTION

TITLE OF THE INVENTION: RESIN-MOLDING DEVICE AND METHOD FOR PRODUCING RESIN MOLDED ARTICLE

TECHNICAL FIELD

[0001]

The present invention relates to a resin-molding device and a method for producing a resin molded article.

BACKGROUND ART

[0002]

In recent years, it has been desired to reduce a thickness of a semiconductor package, and in resin supply, in-plane uniformity of a resin supply amount has been required so that the package thickness is uniform over a wide area without variation. Thus, for example, Patent Document 1 describes a technique in which a release film is disposed on a table, then a liquid resin is supplied onto the release film, and the liquid resin is imaged by a camera (see Fig. 3, etc.). Patent Document 2 describes a technique of disposing a release film on a movement table, then supplying a granular resin onto the release film, and observing the resin (see paragraphs 0048 and 0049, Fig. 1, etc.). In any of the techniques of Patent Documents, in-plane uniformity of a resin material is identified by observing the resin material stacked on the release film.

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0003]

Patent Document 1: Japanese Patent No. 6,218,891

Patent Document 2: Japanese Patent Laid-open Publication No. 2020-82534

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0004]

Meanwhile, although not explicitly described in each of the above publications, in the prior art, a camera is disposed above the resin material, and an illumination is also disposed above the resin material. Thus, an illumination direction of the illumination is inclined with respect to an imaging direction. As a result, a shadow is formed on the resin material to cause light and dark, which may cause erroneous recognition of the in-plane uniformity.

[0005]

The present invention has been made to solve this problem, and an object of the present invention is to provide a resin-molding device and a method for producing a resin molded article capable of detecting occurrence of variation in thickness in one resin molded article.

MEANS FOR SOLVING THE PROBLEM

[0006]

A resin-molding device according to the present invention is provided with a table that is at least partially translucent, an illumination unit capable of illuminating the table from below, a resin material supply unit configured to supply a resin material onto the table, an imaging unit capable of imaging the resin material, supplied onto the table, from above, and a resin-molding unit configured to perform resin molding using the resin material supplied onto the table.

[0007]

A method for producing a resin molded article according to the present invention includes a step of supplying a resin material onto a table that is at least partially translucent, a step of imaging the supplied resin material from above in a state

where the table is illuminated from below, and a step of performing resin molding using the resin material supplied onto the table.

ADVANTAGES OF THE INVENTION

[0008]

According to the present invention, it is possible to detect occurrence of variation in thickness in one resin molded article.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

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

Fig. 2 is a plan view of a movement table.

Fig. 3 is a cross-sectional view of the movement table.

Fig. 4 is a view for explaining an operation of a release film supply unit.

Fig. 5 is a cross-sectional view for explaining a resin material container.

Fig. 6 is a cross-sectional view schematically showing a resin material supply unit.

Fig. 7 is a view for explaining an imaging state by an imaging unit.

Fig. 8 is a view showing an example of a recess in a state where a resin material is supplied.

Fig. 9 is a flowchart showing a partial operation procedure in the resin-molding device.

Fig. 10 is a flowchart showing a procedure of analysis processing executed in step S230 of Fig. 9.

Fig. 11 is a view for explaining a region included in image data indicating a recess.

Fig. 12 is a view showing an example of analysis data.

Fig. 13 is a cross-sectional view for explaining irradiation of the resin material with light.

Fig. 14 is a photograph of the resin material imaged by the resin-molding device to which the present invention is applied.

Fig. 15 is a photograph of the resin material imaged by a conventional resin-molding device.

EMBODIMENTS OF THE INVENTION

[0010]

Hereinafter, an embodiment of a resin-molding device according to the present invention will be described in detail with reference to the drawings. Each drawing may be schematically drawn by appropriately omitting or exaggerating an object for easy understanding.

[0011]

<1. Configuration of resin-molding device>

Fig. 1 is a schematic plan view of a resin-molding device 100 according to the present embodiment. The resin-molding device 100 is configured to perform resin sealing on a substrate W to which electronic elements such as a semiconductor chip, a resistance element, and a capacitor element are connected to manufacture a resin molded article. In the resin-molding device 100, a component mounting surface of the substrate W on which an electronic component is mounted is resin-sealed.

[0012]

Examples of the substrate W used here include a semiconductor substrate such as a silicon wafer, a lead frame, a printed wiring board, a metal substrate, a resin substrate, a glass substrate, and a ceramic substrate. The substrate W may be a carrier used for FOWLP (Fan Out Wafer Level Packaging) and FOPLP (Fan Out Panel Level

Packaging). In the substrate W, wiring may be already applied, or no wiring may be applied.

[0013]

As shown in Fig. 1, the resin-molding device 100 includes a substrate supply/storage module A (hereinafter, also simply referred to as “module A”), two resin molding modules B (hereinafter, also simply referred to as “module B”), a resin material supply module C (hereinafter, also simply referred to as “module c”), and a first control unit 14. As the first control unit, for example, a PLC (Programmable Logic Controller), a PC (Personal Computer), or the like can be used. The first control unit 14 includes a CPU (Central Processing Unit), a RAM (Random Access Memory), a ROM (Read Only Memory), and the like, and is configured to control each of the modules A to C in accordance with information processing. Hereinafter, each of the modules A to C will be described in detail. Each module is detachable and replaceable with another module. In the resin-molding device 100, each of the modules A to C can be increased or decreased.

[0014]

<1-1. Module A>

The module A is a module that supplies the substrate W before sealing and stores the sealed substrate W, and includes a substrate supply unit 1, a substrate storage unit 2, a substrate placing unit 3, and a substrate transport mechanism 4. The substrate supply unit 1 is configured to supply the substrate W before sealing onto the substrate placing unit 3. The substrate storage unit 2 is configured to store the sealed substrate W (resin molded article). The substrate placing unit 3 is configured to move in an arrow Y direction between a position corresponding to the substrate supply unit 1 and a position corresponding to the substrate storage unit 2. The substrate transport

mechanism 4 is configured to move in an arrow X direction and the arrow Y direction across the module A and the module B, and for example, the substrate transport mechanism 4 holds the substrate W before sealing on the substrate placing unit 3 in the module A and transports the substrate W to the module B. Alternatively, the sealed substrate W manufactured by the module B is placed on the substrate placing unit 3 of the module A.

[0015]

<1-2. Module B>

Each of the modules B is a module that molds a resin material, and includes a compression molding unit 5 that manufactures the sealed substrate W (resin molded article) by compression molding. In this compression molding, for example, a black granular resin material P is used. The compression molding unit 5 includes an upper mold 52, a lower mold 51 facing the upper mold 52, and a mold clamping mechanism 53. The upper mold 52 is configured to hold the substrate W on a lower surface. On the other hand, the lower mold 51 includes a bottom surface member and a side surface member for forming a concave cavity 51C. That is, the bottom surface member constitutes a bottom surface of the cavity 51C, and the side surface member constitutes a side surface of the cavity 51C. As will be described later, the resin material P provided in the module C is disposed in the cavity 51C. The mold clamping mechanism 53 is configured to clamp the upper mold 52 and the lower mold 51 in which the resin material P is disposed.

[0016]

<1-3. Module C>

The module C is a module for supplying a resin material. As shown in Fig. 1, the module C includes a movement table 6, a resin material container 7, a resin material

supply unit 8, a release film supply unit 9, an imaging unit 300, and a resin material conveyance mechanism 90. Furthermore, the module C is provided with a HDD (Hard Disc Drive) 200 and a second control unit 150. The second control unit 150 corresponds to a controller of the present invention. Hereinafter, each configuration will be described in detail.

[0017]

<1-3-1. Movement table>

Fig. 2 is a plan view of the movement table, and Fig. 3 is a cross-sectional view of Fig. 2. As shown in Fig. 1, the movement table 6 is configured to move in the arrow X direction and the arrow Y direction in the module C. As shown in Figs. 2 and 3, a recess 61 is formed on an upper surface of the movement table 6, and a light guide plate 62 is disposed in the recess 61. An LED module 63 as an illumination unit is disposed on a side end surface of the light guide plate 62, and light emitted from the LED module 63 enters the light guide plate 62 and diffuses in the light guide plate 62, so that the upper surface of the light guide plate 62 emits light. As the light guide plate 62, a known plate formed of an acrylic resin or the like can be appropriately used, and a reflection film or a diffusion film can be provided as necessary.

[0018]

On the upper surface of the movement table 6, a suction port (not shown) is formed around the light guide plate 62, and is configured to hold a release film 73 described below by suction.

[0019]

<1-3-2. Release film supply unit>

Fig. 4 is a side view for explaining an operation of the release film supply unit. As shown in Fig. 4(a), a release film supply unit 9 for disposing the release film 73 on

the upper surface of the movement table 6 is provided on one end side of the movement table 6. The release film supply unit 9 includes a roll 91 around which the release film 73 is wound, a feeding unit 92 that feeds the release film 73 from the roll 91 and places the release film on the movement table 6, and a cutting unit 93 that cuts the release film 73.

[0020]

As shown in Fig. 4(b), the feeding unit 92 is configured to grip an end of the release film 73 wound around the roll 91 and to feed the release film 73 by being away from the roll 91. At this time, the feeding unit 92 moves from one end to the other end above the movement table 6. As a result, the release film 73 is disposed on the movement table 6. The release film 73 on the movement table 6 is sucked by the suction port described above and held on the movement table 6. As shown in Fig. 4(c), in the release film 73, the end on the roll 91 side is cut by the cutting unit 93. Thus, the sheet-like release film 73 is disposed on the movement table 6.

[0021]

<1-3-3. Resin material container>

Next, the resin material container 7 will be described. As shown in Fig. 5(a), the resin material container 7 includes a frame-shaped member 72 and a movement mechanism (not shown) that moves the frame-shaped member. The frame-shaped member 72 is formed in a rectangular shape, and is disposed on the movement table 6 on which the release film 73 is disposed by the movement mechanism. As a result, a recess 71 to which the resin material is supplied is formed. That is, the release film 73 constitutes a bottom surface of the recess 71, and the frame-shaped member 72 constitutes a side surface of the recess 71. The recess 71 has a space corresponding to the size of the cavity 51C of the lower mold 51 of the module B.

[0022]

<1-3-4. Resin material supply unit>

Next, the resin material supply unit 8 will be described. Fig. 6 is a cross-sectional view schematically showing the resin material supply unit. The resin material supply unit 8 is configured to supply a resin material P having a preset weight to the recess 71 of the frame-shaped member 72, and includes a storage unit 11, a conveyance path 12, a vibration unit 13, and a weighing unit 16. The storage unit 11 temporarily stores the granular resin material P, and supplies the resin material P to the conveyance path 12. The resin material supplied to the conveyance path 12 is discharged from a discharge port 121 at the end, and is supplied to the recess 71 of the frame-shaped member 72. At this time, the conveyance path 12 is vibrated by the vibration unit 13, whereby the resin material P is conveyed to the discharge port side.

[0023]

The weighing unit 16 is configured to measure the weight of the resin material P in the resin material supply unit 8. The first control unit 14 controls the vibration unit 13 so that a supply amount of the resin material P to the resin material container 7 becomes a target value based on a weighing result by the weighing unit 16.

[0024]

The resin material P falling from the discharge port 121 of the resin material supply unit 8 is evenly spread in the recess 71 as the movement table 6 relatively moves with respect to the discharge port of the resin material supply unit 8.

[0025]

<1-3-5. Imaging unit>

Fig. 7 is a view for explaining an imaging state by the imaging unit. As shown in Fig. 7, the imaging unit 300 is configured to image the resin material P

supplied to the recess 71 of the frame-shaped member 72 from above and generate image data. For example, the imaging unit 300 images the resin material P in the recess 71 in a state where the movement table 6 is located below the imaging unit 300. The imaging unit 300 includes, for example, a camera module including an image sensor such as a CCD (Charge Coupled Device) image sensor or a CMOS (Complementary Metal Oxide Semiconductor) image sensor. At the time of this photographing, light is emitted from below the resin material P through the release film 73 by the light guide plate 62 described above.

[0026]

The HDD 200 described above is configured to store the image data generated by the imaging unit 300. The HDD 200 may be replaced with another storage medium such as a solid state drive.

[0027]

The second control unit 150 includes a CPU, a RAM, a ROM, and the like, and is configured to control the imaging unit 300 and the like according to information processing. Various controls by the first control unit 14 and the second control unit 150 will be described in detail later.

[0028]

<1-3-6. Resin material conveyance mechanism>

As shown in Fig. 1, the resin material conveyance mechanism 90 is configured to move in the arrow X direction and the arrow Y direction in the module C and the module B. As shown in Fig. 5(b), the resin material conveyance mechanism 90 spaces away the frame-shaped member 72 containing the resin material P and the release film 73 from the movement table 6. Then, these are conveyed to the lower mold 51 of the module B, and the resin material P is supplied to the cavity 51C of the lower mold 51.

[0029]

<2. Suppression of variation in thickness of resin molded article>

Next, a method for suppressing the thickness of the resin molded article in the module C configured as described above will be described.

[0030]

In recent years, thinning of a semiconductor package (an example of a resin molded article) has progressed, and for example, a product having a thickness of 0.38 mm or 0.43 mm is required in the market. On the other hand, depending on a quality of a molding process, the thickness may vary in one resin molded article. In a resin molded article having a small thickness, a slight variation in thickness greatly affects the quality of the resin molded article. The variation in thickness in one resin molded article is not a variation in thickness when comparing thicknesses of a plurality of resin molded articles, but a variation in thickness in a plane of one resin molded article, and means a variation in thickness in a plurality of portions in the resin molded article.

[0031]

For example, when the resin material P is not evenly supplied to the recess 71 of the frame-shaped member 72, such a problem becomes remarkable. That is, when resin molding is performed in a state where the resin material P is insufficient in a partial region of the recess 71, the thickness of the completed resin molded article varies in each region.

[0032]

Fig. 8 is a view showing an example of the recess 71 in a state where the resin material P is supplied. As shown in Fig. 8, the recess 71 includes a region T30 and a region T40. Although the resin material P is sufficiently supplied in the region T30, the resin material P is insufficient in the region T40. In the region where the resin

material P is insufficient, the bottom surface of the recess 71 is exposed. The color of the bottom surface of the recess 71 is closer to white than the resin material P.

[0033]

In the resin-molding device 100, before resin molding is performed, the imaging unit 300 images the resin material P supplied to the frame-shaped member 72. The second control unit 150 analyzes the image data generated by the imaging unit 300, and controls the resin material supply unit 8 based on the analysis result. In the resin-molding device 100, since the resin material supply unit 8 is controlled based on the analysis result of the supply state of the resin material P in the recess 71, the supply state of the resin material P in the recess 71 is improved. As a result, according to the resin-molding device 100, it is possible to suppress a situation in which resin molded articles having varying thicknesses in one resin molded article are manufactured. Hereinafter, the operation of the resin-molding device 100 will be described in detail.

[0034]

<3. Operation example of resin-molding device>

Fig. 9 is a flowchart showing a partial operation procedure in the resin-molding device 100. The processing shown in the flowchart is executed in a state where the recess 71 of the frame-shaped member 72 is located below the discharge port 121 of the resin material supply unit 8. The processing shown in the flowchart on the left side is executed by the first control unit 14, and the processing shown in the flowchart on the right side is executed by the second control unit 150.

[0035]

Referring to the left side of Fig. 9, the first control unit 14 controls the resin material supply unit 8 to discharge the resin material P toward the recess 71 (step S100). The first control unit 14 determines whether or not the discharge of the resin material P

has been completed (step S110). When it is determined that the discharge of the resin material P has not been completed (NO in step S110), the first control unit 14 continuously executes necessary processing during the discharge of the resin material P. For example, the first control unit 14 moves the movement table 6 so that the resin material P is evenly supplied to the recess 71.

[0036]

On the other hand, when it is determined that the discharge of the resin material P has been completed (YES in step S110), the first control unit 14 transmits a signal (imaging instruction signal) instructing imaging by the imaging unit 300 to the second control unit 150 (S120).

[0037]

Referring to the right side of Fig. 9, the second control unit 150 determines whether or not the imaging instruction signal has been received from the first control unit 14 (step S200). When it is determined that the imaging instruction signal has not been received (NO in step S200), the second control unit 150 waits until the imaging instruction signal is received.

[0038]

On the other hand, when it is determined that the imaging instruction signal has been received (YES in step S200), the second control unit 150 controls the imaging unit 300 to image the resin material P in the recess 71 from above and generate image data (step S210). The second control unit 150 controls the imaging unit 300 to store the image data generated by the imaging unit 300 in the HDD 200 (step S220). The second control unit 150 executes image data analysis processing (step S230).

[0039]

Fig. 10 is a flowchart showing a procedure of the analysis processing executed

in step S230 of Fig. 9. Referring to Fig. 10, the second control unit 150 reads the image data stored in the HDD 200 (step S300). The second control unit 150 performs gradation processing and binarization processing on the read image data (step S310).

[0040]

In the gradation processing, each pixel of the image data is classified into 256 stages [0 (dark) - 255 (bright)]. For example, “255” is assigned to a white pixel, and “0” is assigned to a black pixel. In the binarization processing, each pixel of the image data is classified into “white” or “black”. For example, a pixel whose value assigned by the gradation processing is equal to or more than a threshold X1 (for example, 200) is classified as “white”, and a pixel whose value assigned by the gradation processing is less than the threshold X1 is classified as “black”.

[0041]

Fig. 11 is a view for explaining a region included in the image data indicating the recess 71. As shown in Fig. 11, the image data includes regions T1 to T18.

[0042]

Referring again to Fig. 10, the second control unit 150 calculates numerical data corresponding to each of the regions T1 to T18 included in the image data (step S320). In the present embodiment, this numerical data is the number of pixels classified as “white” in each region. That is, in step S320, the number of pixels classified as “white” in each of the regions T1 to T18 is calculated. The large number of pixels classified as “white” indicates that the resin material P is not evenly supplied, and a range where a surface of the recess 71 is exposed is wide.

[0043]

The second control unit 150 compares each numerical data calculated in step S320 with a threshold X2 (for example, 10), and determines whether or not a problem

occurs in each of the regions T1 to T18 (step S330). For example, the second control unit 150 determines that a region where the numerical data exceeds the threshold X2 is “bad (NG)”, and determines that a region where the numerical data is equal to or less than the threshold X2 is “good (OK)”. That is, in step S320, it is determined whether or not the resin material P is insufficient in each region of the recess 71 corresponding to each of the regions T1 to T18 (whether or not the number of “white” pixels is larger than the threshold X2). The second control unit 150 generates analysis data based on the comparison result in step S330 (step S340).

[0044]

Fig. 12 is a view showing an example of the analysis data. As shown in Fig. 12, the analysis data D1 includes a determination result related to OK/NG in each region of the image data and the number of pixels classified as “white” in each region of the image data.

[0045]

Referring again to the right side of Fig. 9, when the image analysis is ended in step S230, the second control unit 150 transmits the analysis data D1 to the first control unit 14 (step S240).

[0046]

Referring again to the left side of Fig. 9, the first control unit 14 determines whether or not the analysis data D1 has been received from the second control unit 150 (step S130). When it is determined that the analysis data D1 has not been received (NO in step S130), the first control unit 14 waits until the analysis data D1 is received.

[0047]

On the other hand, when it is determined that the analysis data D1 has been received (YES in step S130), the first control unit 14 determines whether there is no

problem in the state of the resin material P in the recess 71 based on the analysis data D1 (step S140). For example, when any of the regions T1 to T18 is determined to be “NG”, the first control unit 14 determines that there is a problem in the state of the resin material P in the recess 71 (NG), and when none of the regions T1 to T18 is determined to be “NG”, the first control unit 14 determines that there is no problem in the state of the resin material P in the recess 71 (OK).

[0048]

When it is determined that there is no problem in the state of the resin material P in the recess 71 (OK in step S140), the first control unit 14 controls each component to proceed to a process of performing resin molding (step S150). That is, even when controlling the resin material supply unit 8 next time, the first control unit 14 maintains an operating state of the resin material supply unit 8 without particularly changing the operating state of the resin material supply unit 8.

[0049]

On the other hand, when it is determined that there is a problem in the state of the resin material P in the recess 71 (NG in step S140), the first control unit 14 executes processing in a case where it is determined as NG (step S160). That is, when controlling the resin material supply unit 8 next time, the first control unit 14 changes the control content, stores the change content, and stops the resin-molding device 100. For example, when controlling the resin material supply unit 8 next time, the first control unit 14 controls the resin material supply unit 8 so that the insufficiency of the resin material P is resolved in the region (T1 to T18) where it is determined that the resin material P is insufficient. More specifically, the first control unit 14 decreases the amount of the resin material P supplied to the region where the resin material P is not insufficient, and increases the amount of the resin material P supplied to the region

where the resin material P is insufficient. As a result, the resin material P is evenly supplied in the recess 71.

[0050]

<4. Features>

According to the resin-molding device 100 according to the present embodiment, the following effects can be obtained.

[0051]

In the module C, as described above, the resin material P is irradiated with light from below the movement table 6, and imaged from above by the imaging unit 300. Thus, for example, as shown in Fig. 13, at a portion where the resin material P is not densely stacked and a gap is generated (a thin portion where a predetermined thickness cannot be formed), light from the light guide plate 62 is transmitted, and this can be imaged by the imaging unit 300. Fig. 14 is an example of an imaged image, and a white portion is a portion through which light is transmitted (the thickness of the resin material P is approximately 1.0 mm). That is, it is considered that the resin material P is not densely stacked at this white portion, and a void is formed inside.

[0052]

On the other hand, for example, when light is emitted obliquely from above the movement table 6 and imaging is performed by the imaging unit 300, an image as shown in Fig. 15 is obtained. The same resin material P is imaged in Figs. 14 and 15. In Fig. 15, a central portion (broken line portion) of the resin material seems to be densely stacked; however, in Fig. 14, it can be seen that a white portion is generated at this portion and a gap is formed inside. For example, even in a portion where overlap of the granular resin material P is thin, when light is emitted obliquely from above, it can be seen that the resin material P is densely stacked by a shadow of the resin material

P. Therefore, when imaging is performed by illumination from above, even if the resin material P is not densely stacked, this may be erroneously recognized, and it may be recognized that the resin material P is densely stacked. On the other hand, when light is emitted from below the movement table 6 as in the present embodiment, it is possible to accurately detect a portion where the resin material P is not densely stacked, and to prevent erroneous recognition.

[0053]

When light is emitted from below the resin material P as described above, there is an advantage that it is easy to visually observe regardless of inspection by a camera.

[0054]

<5. Modifications>

Although one embodiment of the present invention has been described above, the present invention is not limited to the above embodiment, and various modifications that do not depart from the gist of the invention can be made. For example, the following modifications are possible. The gist of the following modifications can be combined as appropriate.

[0055]

(1) The configuration of the movement table 6 is not particularly limited, and various aspects are possible as long as light can be emitted from below the resin material P. For example, in the above embodiment, light is emitted using the light guide plate 62; however, if a material having translucency is disposed on the movement table 6 and a light source (illumination unit) is disposed below the material, the resin material P can be irradiated with light from below. In this case, the type of the light source is not particularly limited, and for example, organic EL, inorganic EL, or the like can be used in addition to the LED. In addition, the arrangement range of the material

having translucency on the movement table 6 can be appropriately changed according to the size of the recess 71 of the frame-shaped member 72 or the imaging range.

[0056]

The wavelength of light from the light source may be changed according to the type of resin material to be used. That is, since light may be absorbed depending on the type of the resin material, the wavelength of light can be selected according to the type of the resin material so that light can sufficiently pass through a portion of the resin material that is not dense.

[0057]

(2) In the above embodiment, the granular resin material P is used; however, the present invention can also be applied to a liquid resin such as a paste resin. Even such a resin material can be identified because light is transmitted through the portion where the resin material is not densely stacked.

[0058]

(3) Although a resin-molding unit of the present invention corresponds to the module B described in the above embodiment, the configuration of the module B is an example, and various aspects are possible. That is, the configuration is not particularly limited as long as the resin molding is performed using the resin material supplied onto the movement table 6.

[0059]

(4) In the above embodiment, after the discharge of the resin material P is completed, imaging is performed by the imaging unit 300. However, the imaging timing by the imaging unit 300 is not limited thereto. For example, the imaging unit 300 may be disposed near the discharge port of the resin material supply unit 8, and the imaging unit 300 may constantly capture a moving image of the recess 71 during supply

of the resin material P by the resin material supply unit 8. In this case, the second control unit 150 may determine whether or not there is a problem in the state of the resin material P in the recess 71 in real time based on moving image data being captured, and change the control content of the resin material supply unit 8 in real time.

[0060]

(5) In the above embodiment, the image analysis is performed through the gradation processing and the binarization processing. However, the technique used for image analysis is not limited thereto. For example, the region where the resin material P is insufficient may be detected in the recess 71 based on the result of unevenness measurement based on a 3D image of the recess 71, or the region where the resin material P is insufficient may be detected in the recess 71 by using pattern matching, a statistical method, AI (Artificial Intelligence), or the like.

[0061]

(6) In the above embodiment, when it is determined that there is a problem in the state of the resin material P in the recess 71 (NG in step S140 of Fig. 9), from the next time, the first control unit 14 reduces the amount of the resin material P to be supplied to the region where the resin material P is not sufficient and increases the amount of the resin material P to be supplied to the region where the resin material P is insufficient. However, the control content by the first control unit 14 from the next time is not limited thereto. For example, the first control unit 14 may further decrease the amount of the resin material P supplied to a region having fewer pixels classified as “white” and further increase the amount of the resin material P supplied to a region having more pixels classified as “white” with reference to the analysis data D1.

[0062]

(7) In the above embodiment, the resin-molding device 100 is controlled by the

first control unit 14 and the second control unit 150. However, the control performed by the first control unit 14 and the second control unit 150 may be configured by a common control unit, and may be realized by, for example, one computer or three or more computers.

[0063]

(8) In the above embodiment, the resin-molding device 100 includes the HDD 200. However, the resin-molding device 100 does not necessarily include the HDD 200. The HDD 200 may exist, for example, on a cloud server. In this case, the second control unit 150 accesses the cloud server via a communication unit (not shown).

DESCRIPTION OF REFERENCE SIGNS

[0064]

- 6: Movement table: (table)
- 63: LED module (illumination unit)
- 73: Release film
- 9: Release film supply unit
- 100: Resin-molding device
- 150: Second control unit (controller)
- 300: Imaging unit

CLAIMS

1. A resin-molding device comprising:
 - a table that is at least partially translucent;
 - an illumination unit configured to illuminate the table from below;
 - a resin material supply unit configured to supply a resin material onto the table;
 - an imaging unit configured to image the resin material, supplied onto the table, from above; and
 - a resin-molding unit configured to perform resin molding using the resin material supplied onto the table.
2. The resin-molding device according to claim 1, wherein
 - the table includes a light guide plate having translucency, and
 - the illumination unit is configured to emit light from a side end surface of the light guide plate.
3. The resin-molding device according to claim 1 or 2, further comprising a release film supply unit configured to supply a release film onto the table,
 - wherein the resin material is supplied onto the release film disposed on the table.
4. The resin-molding device according to any one of claims 1 to 3, further comprising a controller configured to analyze image data generated by imaging by the imaging unit and to control the resin material supply unit based on an analysis result.
5. The resin-molding device according to claim 4, wherein the controller is

configured to analyze the image data by performing gradation processing and binarization processing on the image data.

6. A method for producing a resin molded article comprising:
supplying a resin material onto a table that is at least partially translucent;
imaging the supplied resin material from above in a state where the table is illuminated from below; and
performing resin molding using the resin material supplied onto the table.
7. The method for producing a resin molded article according to claim 6, further comprising disposing a release film on the table prior to supplying the resin material, wherein the resin material is supplied onto the release film.
8. The method for producing a resin molded article according to claim 5 or 6, further comprising analyzing image data generated by the imaging and controlling the supply of the resin material based on an analysis result.