

RESIN MOLDING APPARATUS AND MANUFACTURING METHOD OF RESIN MOLDED PRODUCT

TECHNICAL FIELD

5 [0001] The present invention relates to a resin molding apparatus and a method of manufacturing a resin molded product.

BACKGROUND ART

[0002] JP 2006-286744A (hereinafter called as “Patent Document 1”) discloses a
10 semiconductor mounting substrate. In this semiconductor mounting substrate, an underfill is filled between the substrate and a semiconductor chip. An inspection pattern is formed on the substrate, and if the underfill is appropriately filled, the inspection pattern is hidden by the underfill. On the other hand, if the underfill is not appropriately filled, the inspection pattern is exposed. Accordingly, with this semiconductor mounting
15 substrate, the quality of underfill formation can be determined, by shooting an image of the semiconductor mounting substrate and analyzing the shot image (see Patent Document 1).

[0003] In recent years, semiconductor packages (example of resin molded product) have become thinner, and there is demand in the market for products having a thickness of
20 0.38mm or 0.43mm, for example. On the other hand, depending on the quality of the molding process, there may be a variation in thickness within individual resin molded products. With a thin resin molded product, a slight variation in thickness greatly affects the quality of the resin molded product. In Patent Document 1, means for solving such a problem is not disclosed.

25 [0004] The present invention has been made to solve such a problem, and an object thereof is to provide a resin molding apparatus and the like capable of suppressing the occurrence of a variation in thickness within individual resin molded products.

SUMMARY OF THE INVENTION

[0005] A resin molding apparatus according to an aspect of the present invention is configured to manufacture a resin molded product. The resin molding apparatus includes a supply mechanism, an image capturing unit, and a control unit. The supply mechanism is configured to supply a resin material. The image capturing unit is configured to capture an image of the supplied resin material from above and generate image data. The control unit is configured to analyze the image data and control the supply mechanism based on an analysis result.

[0006] Also, a method of manufacturing a resin molded product according to another aspect of the present invention is a method of manufacturing a resin molded product using the resin molding apparatus. This manufacturing method of a resin molded product includes a step of supplying a resin material, a step of capturing an image of the supplied resin material from above and generating image data, a step of analyzing the image data and controlling the supply mechanism based on an analysis result, a step of disposing the supplied resin material on a lower mold, and a step of performing resin molding by clamping an upper mold and the lower mold.

[0007] According to the present invention, a resin molding apparatus and the like capable of suppressing the occurrence of a variation in thickness within individual resin molded products can be provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a plan view schematically showing a resin molding apparatus.

FIG. 2 is a cross-sectional view schematically showing a resin material supply mechanism.

FIG. 3 is a diagram for illustrating an image capturing state of an image capturing unit.

FIG. 4 is a diagram showing an example of a recessed part in a state where a resin material has been supplied.

FIG. 5 is a flowchart showing some of the operating procedures of the resin molding apparatus.

5 FIG. 6 is a flowchart showing the procedure of analysis processing that is executed in step S230 of FIG 5.

FIG. 7 is a diagram for describing regions included in image data showing a recessed part.

FIG. 8 shows an example of analysis data.

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EMBODIMENTS OF THE INVENTION

[0009] Hereinafter, an embodiment according to one aspect of the present invention (hereinafter, also referred to as "the present embodiment") will be described in detail using the drawings. Note that the same reference signs are given to portions that are the same or equivalent in the drawings, the description thereof will not be repeated. Also, the diagrams are schematically drawn with objects being omitted or exaggerated as appropriate, in order to facilitate understanding.

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[0010] 1. Configuration of resin molding apparatus

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FIG. 1 is a plan view schematically showing a resin molding apparatus 100 according to the present embodiment. The resin molding apparatus 100 is configured to manufacture a resin molded product by performing resin sealing on a substrate W on which electronic components such as semiconductor chips are mounted. In the resin molding apparatus 100, a component mounting surface of the substrate W on which the electronic components are mounted is resin sealed.

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[0011] Examples of the substrate W include semiconductor substrates such as a silicon wafer, lead frames, printed circuit boards, metal substrates, resin substrates, glass

substrates and ceramic substrates. The substrate W may be a carrier that is used in FOWLP (Fan Out Wafer Level Packaging) or FOPLP (Fan Out Panel Level Packaging).

The substrate W may have already undergone wiring or may not have undergone wiring.

[0012] As shown in FIG. 1, the resin molding apparatus 100 includes a substrate

5 supply/housing module A (hereinafter, also referred to simply as "module A"), two resin molding modules B (hereinafter, also referred to simply as "modules B"), a resin material supply module C (hereinafter, also referred to simply as "module C"), and a PLC (Programable Logic Controller) 14. Each of the modules A to C is detachably mountable to and replaceable by other modules. Also, in the resin molding apparatus

10 100, each of the modules A to C can be increased or decreased in number.

[0013] The PLC 14 includes a CPU (Central Processing Unit), a RAM (Random Access Memory) and a ROM (Read Only Memory), and is configured to control each of the modules A to C according to information processing.

[0014] The module A includes a substrate supply unit 1, a substrate housing unit 2, a

15 substrate placement unit 3, and a substrate conveyance mechanism 4. The substrate supply unit 1 is configured to supply a pre-sealing substrate W to the substrate placement unit 3. The substrate housing unit 2 is configured to house a sealed substrate W (resin molded product). The substrate placement unit 3 is configured to move in an arrow Y

20 direction between a position corresponding to the substrate supply unit 1 and a position corresponding to the substrate housing unit 2. The substrate conveyance mechanism 4 is configured to move in an arrow X direction and the arrow Y direction in the module A and the modules B. The substrate conveyance mechanism 4 holds the pre-sealing substrate W that is on the substrate placement unit 3 and conveys the pre-sealing substrate W to the modules B, and places the sealed substrate W on the substrate placement unit 3, 25 for example.

[0015] Each module B includes a compression molding unit 5. The compression molding unit 5 is configured to manufacture the sealed substrate W (resin molded

product) by compression molding. In this compression molding, a granular resin material P is used. The color of the resin material P is black, for example. The compression molding unit 5 includes an upper mold 52 (first mold), a lower mold 51(second mold) opposing 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. The lower mold 51 includes a bottom member and a side member. The bottom member constitutes the bottom surface of a cavity 51C, and the side member constitutes the side surface of the cavity 51C. That is, the recessed concave cavity 51C is formed by the bottom member and the side member. The resin material P is disposed in the cavity 51C. The mold clamping mechanism 53 is configured to clamp the upper mold 52 and the lower mold 51.

[0016] The module C includes a moving table 6, a resin material housing unit 7, a resin material supply mechanism 8, a mold release film supply unit (not shown), an image capturing unit 300, and a resin material conveyance mechanism 9. The moving table 6 is configured to move in the arrow X direction and the arrow Y direction in the module C. The resin material housing unit 7 includes a mold release film 73 and a frame member 72 (see FIGS. 2 and 3). The resin material is supplied to the resin material housing unit 7. The mold release film 73 constitutes the bottom surface of the resin material housing unit 7, and the frame member 72 constitutes the side surface of the resin material housing unit 7. A space (recessed part 71) corresponding to the size of the cavity 51C of the lower mold 51 is formed in the frame member 72. The resin material housing unit 7 is placed on the moving table 6.

[0017] The resin material supply mechanism 8 is configured to supply the resin material P to the resin material housing unit 7 from above the resin material housing unit 7. The resin material P dropping from a discharge port of the resin material supply mechanism 8 is spread uniformly in the recessed part 71 of the resin material housing unit 7, by moving the moving table 6 relative to the discharge port of the resin material supply

mechanism 8.

[0018] FIG. 2 is a cross-sectional view schematically showing the resin material supply mechanism 8. The resin material supply mechanism 8 is configured to supply resin material P of a weight set in advance to the resin material housing unit 7.

5 [0019] As shown in FIG. 2, the resin material supply mechanism 8 includes a storage unit 11, a conveyance path 12, a vibration unit 13, and a weighing unit 16. The storage unit 11 is configured to temporarily store the granular resin material P. The conveyance path 12 is a conveyance path of the resin material P flowing from the storage unit 11. The vibration unit 13 is configured to convey the resin material P to the discharge port
10 side by vibrating the conveyance path 12. The weighing unit 16 is configured to measure the weight of the resin material P that is in the resin material supply mechanism 8. The PLC 14 controls the vibration unit 13 such that the supply amount of resin material P to the resin material housing unit 7 achieves a target value, based on the measurement result of the weighing unit 16.

15 [0020] Referring again to FIG. 1, the image capturing unit 300 is configured to capture an image of the resin material P supplied to the resin material housing unit 7 from above and generate image data.

[0021] FIG. 3 is a diagram for illustrating an image capturing state of the image capturing unit 300. As shown in FIG. 3, the image capturing unit 300 captures an image
20 of the resin material P that is in the recessed part 71 of the resin material housing unit 7, in a state where the moving table 6 is located below the image capturing unit 300, for example. The image capturing unit 300 is constituted by 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, for example.

25 [0022] Referring again to FIG. 1, the resin material conveyance mechanism 9 is configured to move in the arrow X direction and the arrow Y direction in the modules C and B. The resin material conveyance mechanism 9 is configured to convey the resin

material housing unit 7 housing the resin material P to the lower mold 51 and supply the resin material P to the cavity 51C of the lower mold 51.

[0023] The resin molding apparatus 100 further includes an HDD (Hard Disk Drive) 200 and a control unit 150. The HDD 200 is configured to store image data generated by the image capturing unit 300. Note that the HDD 200 may be replaced by other storage media such as a solid-state drive.

[0024] The control unit 150 includes a CPU, a RAM and a ROM, and is configured to control the image capturing unit 300 and the like according to information processing. Various controls by the control unit 150 and the PLC 14 will be described in detail later.

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[0025] 2. Suppression of variation in thickness of resin molded product

In recent years, semiconductor packages (example of resin molded product) have become thinner, and there is demand in the market for products having a thickness of 0.38 mm or 0.43 mm, for example. On the other hand, depending on the quality of the molding process, there may be a variation in thickness within individual resin molded products. In a thin resin molded product, a slight variation in thickness greatly affects the quality of the resin molded product. The variation in thickness within individual resin molded products referred to here is not a variation in thickness when comparing the thicknesses of a plurality of resin molded products but a variation in thickness within the surface of one resin molded product, and refers to a variation in thickness of a plurality of portions within that resin molded product.

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[0026] For example, such a problem becomes marked when the resin material P is not uniformly supplied to the recessed part 71 of the resin material housing unit 7. That is, when resin molding is performed in a state where the resin material P is insufficient in a partial area of the recessed part 71, a variation occurs in the thickness of each area of the final resin molded product.

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[0027] FIG. 4 is a diagram showing an example of the recessed part 71 in a state where

the resin material P has been supplied. As shown in FIG. 4, the recessed part 71 includes a region T30 and a region T40. Sufficient resin material P is supplied in the region T30, but 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 recessed part 71 is exposed. The color of the bottom surface of the recessed part 71 is closer to white than the resin material P.

[0028] In the resin molding apparatus 100 according to the present embodiment, an image of the resin material P supplied to the resin material housing unit 7 is captured by the image capturing unit 300 before resin molding is performed. The control unit 150 analyzes the image data generated by the image capturing unit 300 and controls the resin material supply mechanism 8 based on the analysis result. In the resin molding apparatus 100, the resin material supply mechanism 8 is controlled based on the result of analyzing the supply state of the resin material P in the recessed part 71, and thus the supply state of the resin material P in the recessed part 71 is improved. As a result, according to the resin molding apparatus 100, it is possible to suppress a situation where resin molded products are manufactured in which there is a variation in thickness within individual resin molded products. Hereinafter, operations of the resin molding apparatus 100 will be described in detail.

[0029] 3. Operations of resin molding apparatus

FIG. 5 is a flowchart showing some of the operating procedures in the resin molding apparatus 100. The processing shown in this flowchart is executed in a state where the resin material housing unit 7 is located below the discharge port of the resin material supply mechanism 8. The processing shown in the flowchart on the left side is executed by the PLC 14, and the processing shown in the flowchart on the right side is executed by the control unit 150.

[0030] Referring to the left side of FIG. 5, the PLC 14 controls the resin material supply mechanism 8 to discharge the resin material P toward the resin material housing unit 7 (step S100). The PLC 14 determines whether discharge of the resin material P has been completed (step S110). When it is determined that discharge of the resin material P has not been completed (NO in step S110), the PLC 14 continues to execute the necessary processing during discharge of the resin material P. For example, the PLC 14 moves the moving table 6 such that the resin material P is supplied uniformly to the recessed part 71 of the resin material housing unit 7.

[0031] On the other hand, when it is determined that discharge of the resin material P has been completed (YES in step S110), the PLC 14 transmits a signal (image capture instruction signal) instructing image capture by the image capturing unit 300 to the control unit 150 (S120).

[0032] Referring to the right side of FIG. 5, the control unit 150 determines whether the image capture instruction signal has been received from the PLC 14 (step S200). When it is determined that the image capture instruction signal has not been received (NO in step S200), the control unit 150 waits until the image capture instruction signal is received.

[0033] On the other hand, when it is determined that the image capture instruction signal has been received (YES in step S200), the control unit 150 controls the image capturing unit 300 to capture an image of the resin material P that is in the recessed part 71 of the resin material housing unit 7 from above and generate image data (step S210). The control unit 150 controls the image capturing unit 300 to save the image data generated by the image capturing unit 300 to the HDD 200 (step S220). The control unit 150 executes processing for analyzing the image data (step S230).

[0034] FIG. 6 is a flowchart showing the procedure of analysis processing that is executed in step S230 of FIG. 5. Referring to FIG. 6, the control unit 150 loads image data that is saved in the HDD 200 (step S300). The control unit 150 performs gradation processing and binarization processing on the loaded image data (step S310).

[0035] In the gradation processing, each pixel of the image data is classified as one of 256 gradations (0 (dark) to 255 (light)). For example, a white pixel is allocated "255", and a black pixel is allocated "0". In the binarization processing, each pixel of the image data is classified as "white" or "black". For example, pixels allocated a value by the gradation processing that is greater than or equal to a threshold value X1 (e.g., 200) are classified as "white", and pixels allocated a value by the gradation processing that is less than the threshold value X1 are classified as "black".

[0036] FIG. 7 is a diagram for describing regions included in image data showing the recessed part 71. As shown in FIG. 7, regions T1 to T18 are included in the image data.

[0037] Referring again to FIG. 6, the 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. A large number of pixels being classified as "white" means that a large area of the resin material housing unit 7 is exposed due to the resin material P having not been supplied uniformly.

[0038] The control unit 150 compares the respective numerical data calculated in step S320 with a threshold value X2 (e.g., 10) and determines for each of the regions T1 to T18 whether a problem has occurred (step S330). The control unit 150 determines that a region where the numerical data exceeds the threshold value X2 is "no good" (NG), and determines that a region where the numerical data is less than or equal to the threshold value X2 is "good" (OK). That is, in step S330, it is determined whether a shortage of the resin material P (whether the number of "white" pixels is greater than the threshold value X2) has occurred for each region of the resin material housing unit 7 corresponding to each of the regions T1 to T18. The control unit 150 generates analysis data based on the result of the comparison in step S330 (step S340).

[0039] FIG. 8 is a diagram showing an example of analysis data. As shown in FIG. 8,

analysis data D1 includes the determination result relating 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.

5 [0040] Referring again to the right side of FIG. 5, when image analysis has been completed in step S230, the control unit 150 transmits the analysis data D1 to the PLC 14 (step S240).

[0041] Referring again to the left side of FIG. 5, the PLC 14 determines whether the analysis data D1 has been received from the control unit 150 (step S130). When it is determined that the analysis data D1 has not been received (NO in step S130), the PLC
10 14 waits until the analysis data D1 is received.

[0042] On the other hand, when it is determined that the analysis data D1 has been received (YES in step S130), the PLC 14 determines whether there is a problem with the state of the resin material P in the resin material housing unit 7 based on the analysis data D1 (step S140). The PLC 14 determines that there is a problem (NG) with the state of
15 the resin material P in the resin material housing unit 7 if any of the regions T1 to T18 are determined to be "NG", and determines that there is no problem (OK) with the state of the resin material P in the resin material housing unit 7 if none of the regions T1 to T18 are determined to be "NG", for example.

[0043] When it is determined that there is no problem with the state of the resin material
20 P in the resin material housing unit 7 (OK in step S140), the PLC 14 controls the constituent elements to transition to a process for performing resin molding (step S150). That is, the PLC 14 maintains the operating state of the resin material supply mechanism 8 without particularly changing the operating state of the resin material supply mechanism 8, when next controlling the resin material supply mechanism 8.

25 [0044] On the other hand, when it is determined that there is a problem with the state of the resin material P in the resin material housing unit 7 (NG in step S140), the PLC 14 executes processing for when NG is determined (step S160). That is, the PLC 14

changes the control content for when the resin material supply mechanism 8 is next controlled and stores the changed content, along with stopping the resin molding apparatus 100. The PLC 14 controls the resin material supply mechanism 8 such that the shortage of the resin material P is eliminated in regions (T1 to T18) where it was determined that a shortage of the resin material P has occurred, when next controlling the resin material supply mechanism 8, for example. More specifically, the PLC 14 reduces the amount of resin material P that is supplied to regions where a shortage of the resin material P has not occurred, and increases the amount of resin material P that is supplied to regions where a shortage of the resin material P has occurred. The resin material P is thereby uniformly supplied in the recessed part 71 of the resin material housing unit 7.

[0045] 4. Features

As described above, the resin molding apparatus 100 according to the present embodiment is configured to manufacture a resin molded product. The resin molding apparatus 100 includes the resin material supply mechanism 8, the image capturing unit 300 and the control unit 150. The resin material supply mechanism 8 is configured to supply the resin material P. The image capturing unit 300 is configured to capture an image of the supplied resin material P and generate image data. The control unit 150 is configured to analyze the image data and control the resin material supply mechanism 8 based on the analysis result.

[0046] In the resin molding apparatus 100, an image of the supplied resin material P is captured by the image capturing unit 300. The control unit 150 analyzes the image data generated by the image capturing unit 300 and controls the resin material supply mechanism 8 based on the analysis result. In the resin molding apparatus 100, the resin material supply mechanism 8 is controlled based on the analysis result of the supply state of the resin material P, and thus the supply state of the resin material P is improved. As

a result, according to the resin molding apparatus 100, it is possible to suppress a situation in which resin molded products are manufactured in which there is a variation in thickness within individual resin molded products.

5 [0047] 5. Other embodiments

The concept of the above embodiment is not limited to the embodiment described above. Hereinafter, examples of other embodiments to which the concept of the above embodiment is applicable will be described.

[0048] In the above embodiment, the threshold value X1 that is used when classifying
10 each pixel as "white" or "black" in the binarization processing is common to each of the regions T1 to T18. However, the threshold value X1 may differ for each region. Since the regions closer to the center of the image data are more important, the threshold value X1 that is used in the central regions T9 and T10 may be set to V1, the threshold value X1 used in the relatively central regions T8 and T11 may be set to a value of 1.1 times
15 V1, and the threshold value X1 that is used in the surrounding regions T1 to T7 and T12 to T18 may be set to a value of 1.2 times V1, for example. A shortage of the resin material P can thereby be more strictly detected in relation to regions that are more greatly affected by a shortage of the resin material P. The reason why the regions closer to the center of the image data are more important will be additionally described. The granular
20 resin material P supplied to the resin material housing unit 7 is conveyed to and disposed in the lower mold 51 of the mold. Thereafter, the resin material P is melted by the heat of the mold, and resin molding is performed by clamping the upper mold 52 and the lower mold 51. At this time, the resin material P flows so as spread outward, and thus a shortage of the resin material P in the central regions is more likely to result in molding
25 failure. For such reasons, the regions closer to the center of the image data are more important.

[0049] In the above embodiment, the threshold value X2 with which numerical data is

compared is common to each of the regions T1 to T18. However, the threshold value X2 with which numerical data is compared may differ for each region. Since the regions closer to the center are more important, the threshold value X2 that is used in the central regions T9 and T10 may be set to V2, the threshold value X2 that is used in the relatively central regions T8 and T11 may be set to a value of 1.5 times V2, and the threshold value X2 that is used in the surrounding regions T1 to T7 and T12 to T18 may be set to a value of two times V2. For example, the image data may include a first region and a second region, the numerical data corresponding to the first region may be compared with a first threshold value (e.g., V2), and the numerical data corresponding to the second region may be compared with a second threshold value (e.g., a value of 1.5 times V2). That is, the image data may be divided into a plurality of regions, a threshold value may be set for respective numerical data corresponding to those regions, and the numerical data may be compared with the respective threshold value. A shortage of the resin material P can thereby be more strictly detected in relation to regions that are more greatly affected by a shortage of the resin material P.

[0050] Also, in the above embodiment, image capture by the image capturing unit 300 is performed after discharge of the resin material P has been completed. However, the timing of image capturing by the image capturing unit 300 is not limited thereto. For example, the image capturing unit 300 may be disposed in a vicinity of the discharge port of the resin material supply mechanism 8, and the image capturing unit 300 may constantly capture moving images of the recessed part 71 during supply of the resin material P by the resin material supply mechanism 8. In this case, the control unit 150 may determine in real time whether there is a problem with the state of the resin material P in the resin material housing unit 7 based on the moving image data obtained during image capture, and the control content of the resin material supply mechanism 8 may be changed in real time.

[0051] Also, in the above embodiment, when the numerical data does not exceed the

threshold value X2 in any of the regions T1 to T18, the control content of the resin material supply mechanism 8 is not changed. However, the conditions under which the control content of the resin material supply mechanism 8 is changed is not limited thereto. For example, as long as there are pixels classified as "white" in the binarization processing, the control content of the resin material supply mechanism 8 may be changed to eliminate such pixels. Note that, similarly in this case, the resin molding apparatus 100 is not forcibly stopped, as long as the numerical data does not exceed the threshold value X2 in any of the regions T1 to T18.

[0052] Also, in the above embodiment, image analysis is performed through gradation processing and binarization processing. However, the technology that is used in image analysis is not limited thereto. For example, regions where the resin material P is insufficient in the recessed part 71 may be detected, based on the result of unevenness measurement that is based on 3D images of the recessed part 71, or regions where the resin material P is sufficient in the recessed part 71 may be detected by using pattern matching, a statistical technique, AI (Artificial Intelligence) or the like.

[0053] Also, in the above embodiment, when it is determined that there is a problem with the state of the resin material P in the resin material housing unit 7 (NG in step S140 of FIG. 5), the PLC 14 reduces the amount of resin material P that is supplied to regions where a shortage of the resin material P has not occurred and increases the amount of resin material P supplied to regions where a shortage of the resin material P has occurred from the next time. However, the control content of the PLC 14 from the next time is not limited thereto. For example, the PLC 14 may reduce the amount of resin material P that is supplied in regions where there are fewer pixels classified as "white", and increase the amount of resin material P that is supplied in regions where there are more pixels classified as "white", with reference to the analysis data D1.

[0054] Also, in the above embodiment, control of the resin molding apparatus 100 is performed by the PLC 14 and the control unit 150. However, control performed by the

PLC 14 and the control unit 15 may be realized by one computer or may be realized by three or more computers, for example.

[0055] Also, in the above embodiment, the resin molding apparatus 100 includes the HDD 200. However, the resin molding apparatus 100 need not necessarily include the
5 HDD 200. The HDD 200 may be provided on a cloud server, for example. In this case, the control unit 150 accesses the cloud server via an unillustrated communication unit.

[0056] Embodiments of the present invention have been illustratively described above. That is, a detailed description and appended drawings have been disclosed for the purpose of illustrative description. Therefore, the constituent elements illustrated in the detailed
10 description and appended drawings may include constituent elements that are not required in order to solve the problem. Accordingly, even though these nonessential constituent elements are illustrated in the detailed description and the appended drawings, these nonessential constituent elements should not be immediately recognized as being essential.

[0057] Also, the above embodiments are in all respects merely illustrative examples of the present invention. Various improvements and changes can be made to the above embodiments within the scope of the present invention. That is, in implementing the present invention, specific configurations can be appropriately employed according to the embodiment.

LIST OF REFERENCE NUMERALS

[0058]	1	Substrate supply unit
	2	Substrate housing unit
	3	Substrate placement unit
25	4	Substrate conveyance mechanism
	5	Compression molding unit
	6	Moving table

	7	Resin material housing unit		
	8	Resin material supply mechanism		
	9	Resin material conveyance mechanism		
	11	Storage unit	12	Conveyance path
5	13	Vibration unit	14	PLC
	16	Weighing unit		
	51	Lower mold	51C	Cavity
	52	Upper mold		
	53	Mold clamping mechanism		
10	71	Recessed part		
	72	Frame member		
	73	Mold release film		
	100	Resin molding apparatus		
	150	Control unit		
15	200	HDD		
	300	Image capturing unit		
	A	Substrate supply/housing module		
	B	Resin molding module		
	C	Resin material supply module		
20	D1	Analysis data		
	P	Resin material		
	T1-T18, T30, T40		Region	
	X1, X2	Threshold value		

WHAT IS CLAIMED IS:

1. A resin molding apparatus configured to manufacture a resin molded product, comprising:
 - 5 a supply mechanism configured to supply a resin material;
an image capturing unit configured to capture an image of the supplied resin material from above and generate image data; and
a control unit configured to analyze the image data and control the supply mechanism based on an analysis result,
 - 10 wherein the image data includes a plurality of regions, and
the control unit is configured to analyze the image data, through generating numerical data corresponding to each of the regions based on the image data, and compare respective numerical data with a threshold value,
wherein the plurality of regions include a first region and a second region
 - 15 different from the first region,
the threshold value includes a first threshold value and a second threshold value different from the first threshold value,
the numerical data corresponding to the first region is compared with the first threshold value, and
 - 20 the numerical data corresponding to the second region is compared with the second threshold value.
2. The resin molding apparatus according to claim 1, wherein the control unit is configured to analyze the image data, through performing gradation processing and
- 25 binarization processing on the image data.
3. The resin molding apparatus according to claim 1 or 2, wherein the control unit

is configured to analyze the image data, through generating numerical data based on the image data and comparing the numerical data with a threshold value.

4. The resin molding apparatus according to claim 1 or 3, wherein the control unit is configured to determine whether a shortage of the resin material has occurred for each region to which the resin material corresponding to each of the plurality of regions is supplied, through comparison of the respective numerical data with the threshold value, and to control the supply mechanism such that the shortage is eliminated in regions where it is determined that the shortage has occurred.

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5. The resin molding apparatus according to any one of claims 1 to 4, wherein the control unit is configured to control the supply mechanism to maintain an operating state if the analysis result satisfies a predetermined condition, and to control the supply mechanism to change the operating state if the analysis result does not satisfy the predetermined condition.

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6. The resin molding apparatus according to any one of claims 1 to 5, further comprising:

a mold including an upper mold and a lower mold opposing the upper mold; and

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a mold clamping mechanism configured to clamp the mold.

7. A method of manufacturing a resin molded product using the resin molding apparatus according to any one of claims 1 to 5, the method comprising the steps of:

supplying the resin material;

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capturing the image of the supplied resin material from above and generating image data;

analyzing the image data and controlling the supply mechanism based on the

analysis result;

disposing the supplied resin material on a lower mold; and
performing resin molding by clamping an upper mold and the lower mold.

- 5 8. A method of manufacturing a resin molded product using the resin molding apparatus according to claim 6, the method comprising the steps of:

supplying the resin material;

capturing the image of the supplied resin material from above and generating image data;

- 10 analyzing the image data and controlling the supply mechanism based on the analysis result;

disposing the supplied resin material on the lower mold; and
performing resin molding by clamping the upper mold and the lower mold.