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UNPACKED CONTENT MANUFACTURING
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DENKI**, Fukuoka (JP)(21) Appl. No.: **13/669,616**(22) Filed: **Nov. 6, 2012**(30) **Foreign Application Priority Data**

Nov. 8, 2011 (JP) 2011-244423

(57) **ABSTRACT**

An unpacking device unpacks a package and takes out contents. The package includes a primary package formed by packing the contents with a primary packing material and a secondary package formed by packing the primary package with a secondary packing material. The secondary packing material of the secondary package has an incision. The unpacking device includes a robot, and a control unit for controlling the robot such that the robot takes out the primary package through the incision of the secondary packing material and then takes out the contents from the primary package.

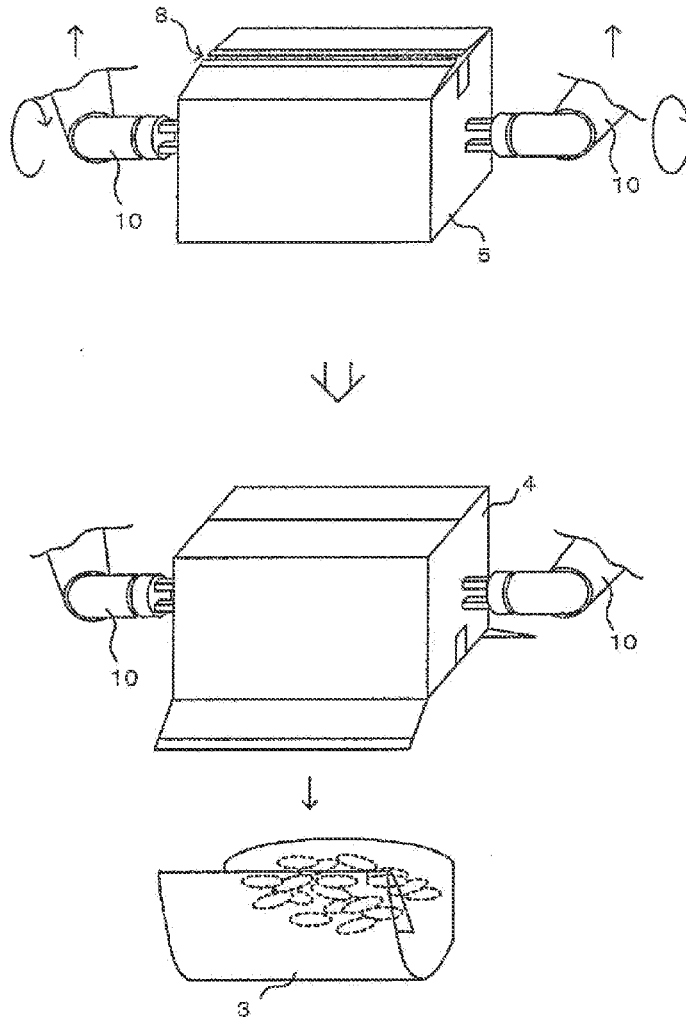


FIG. 1

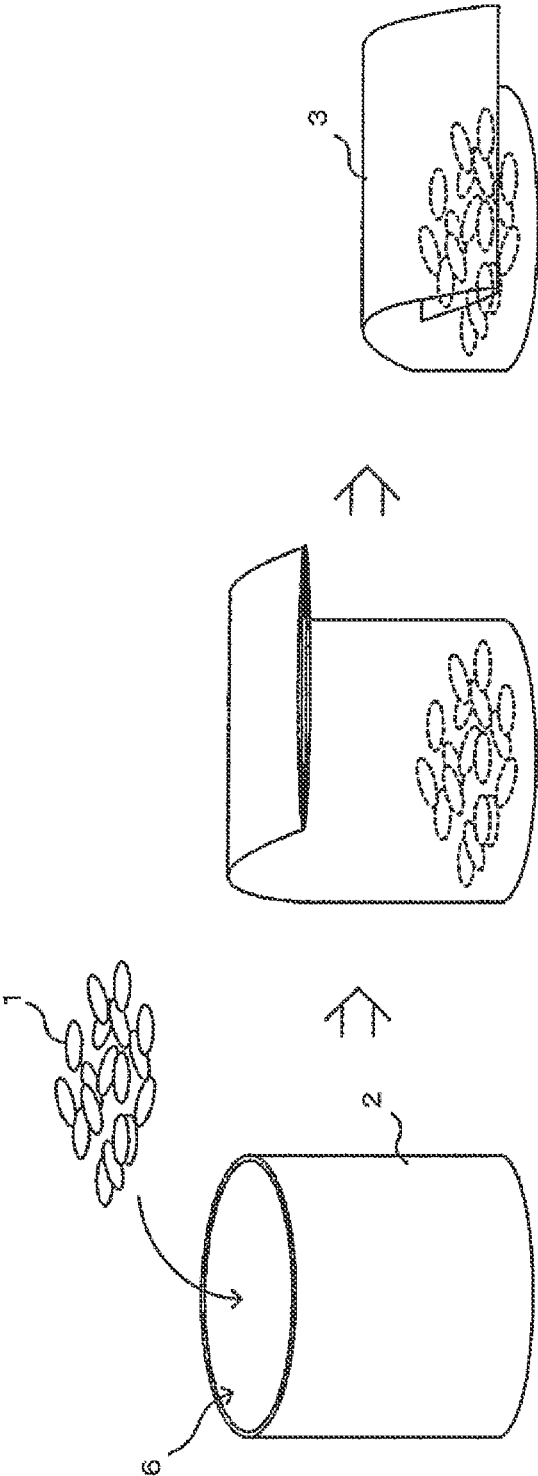


FIG. 2

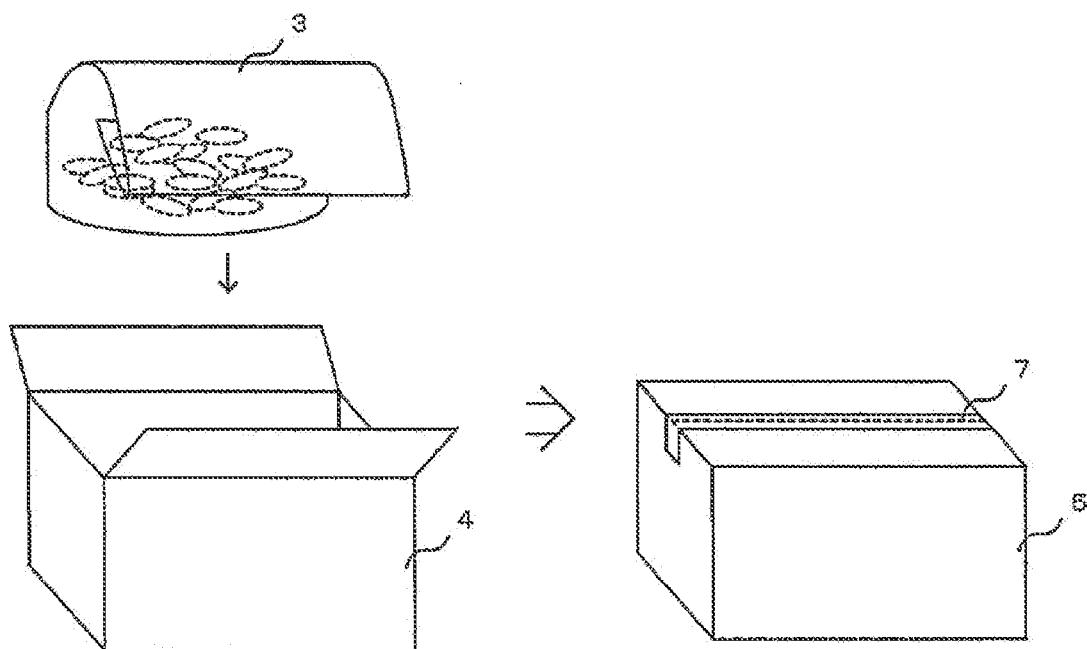


FIG. 3

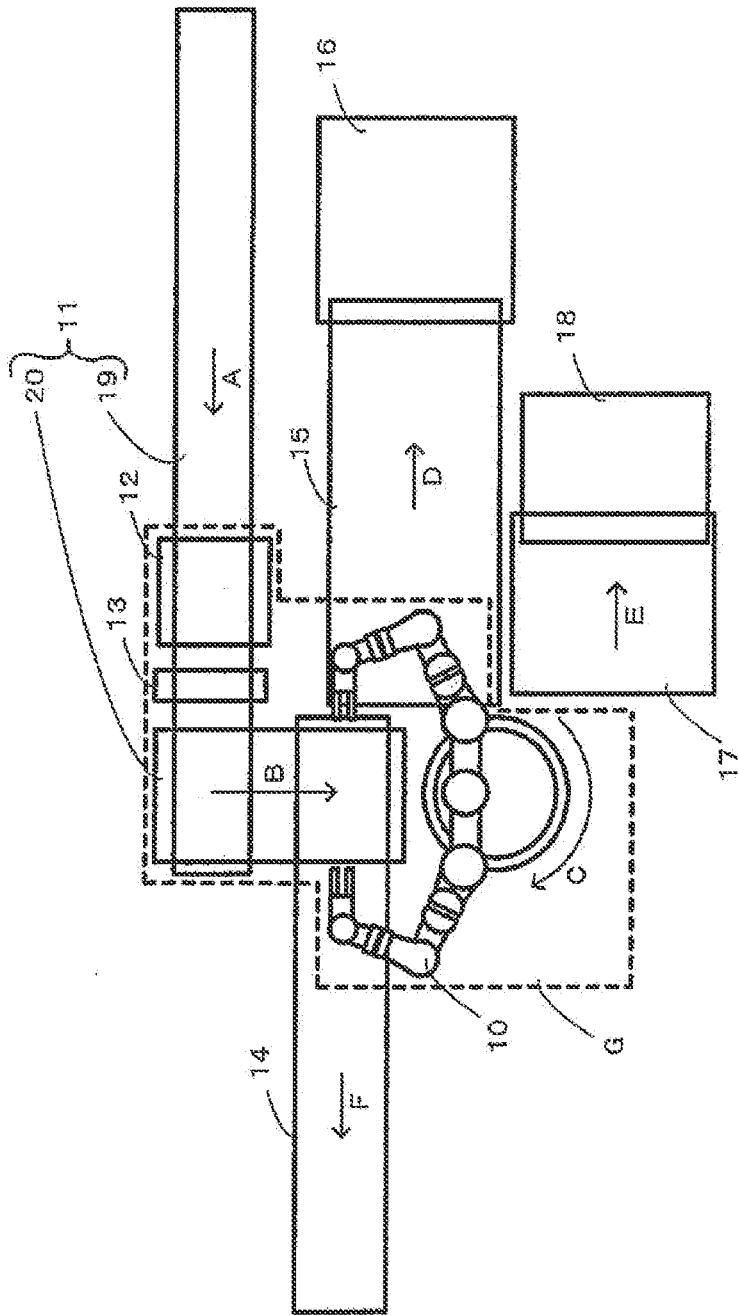


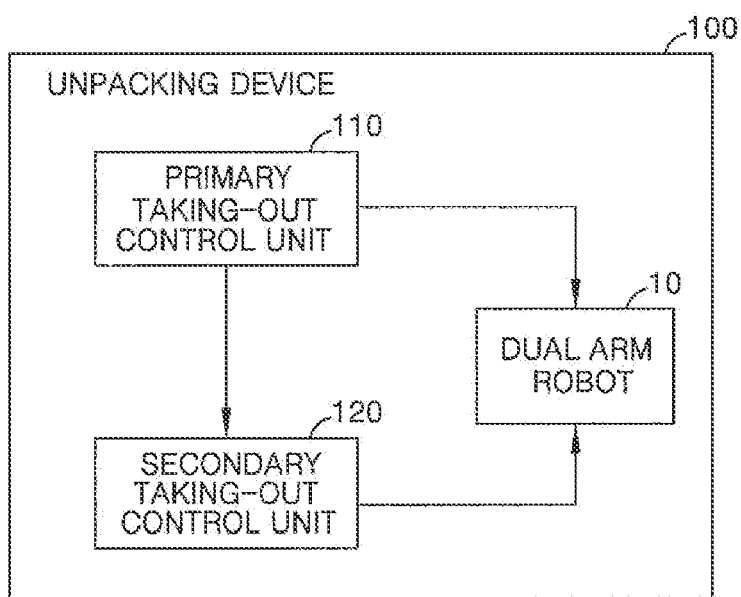
FIG. 4

FIG. 5

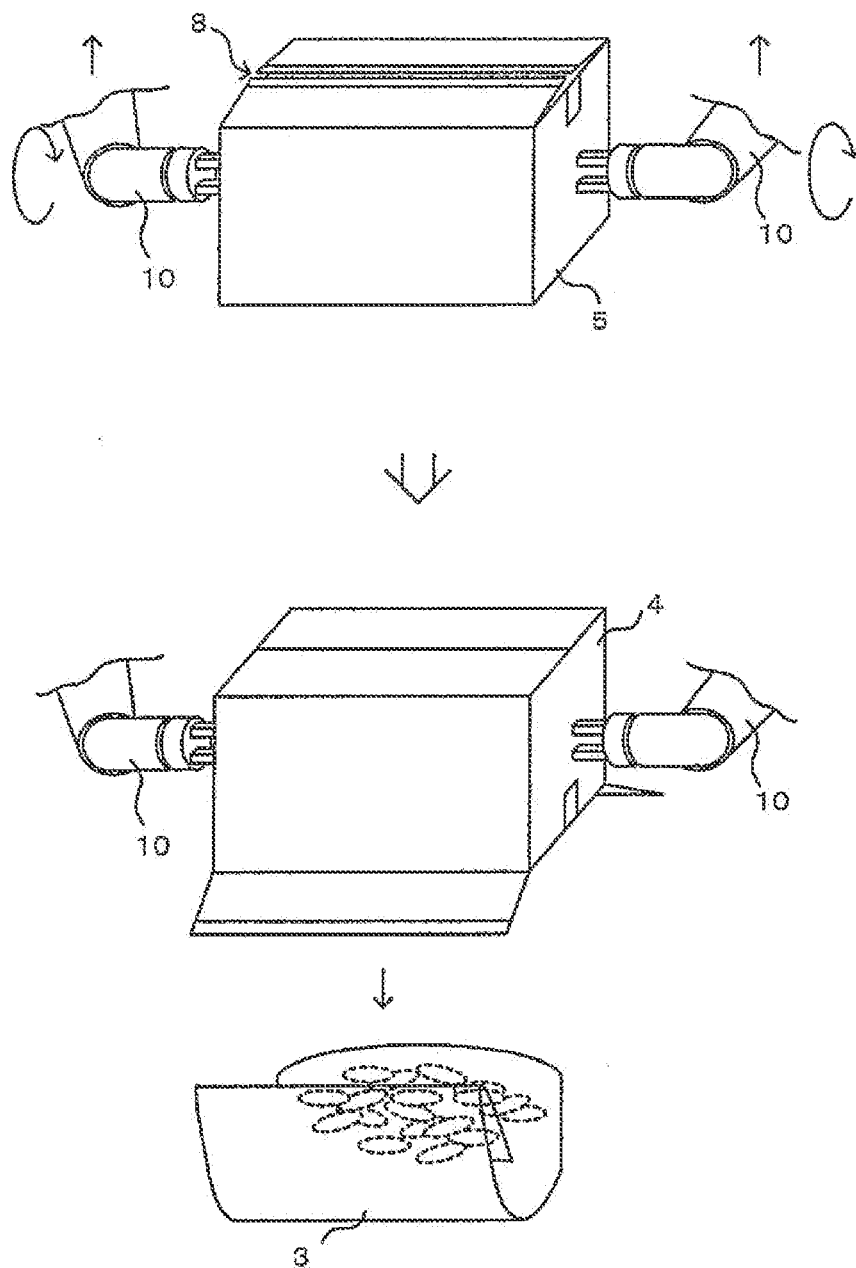


FIG. 6

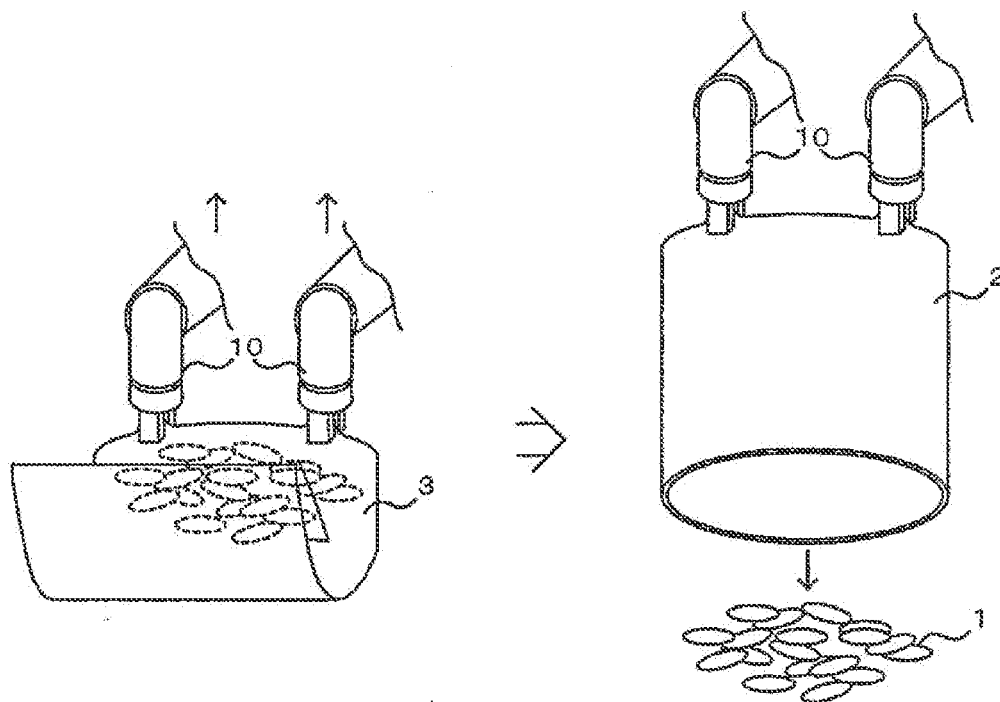


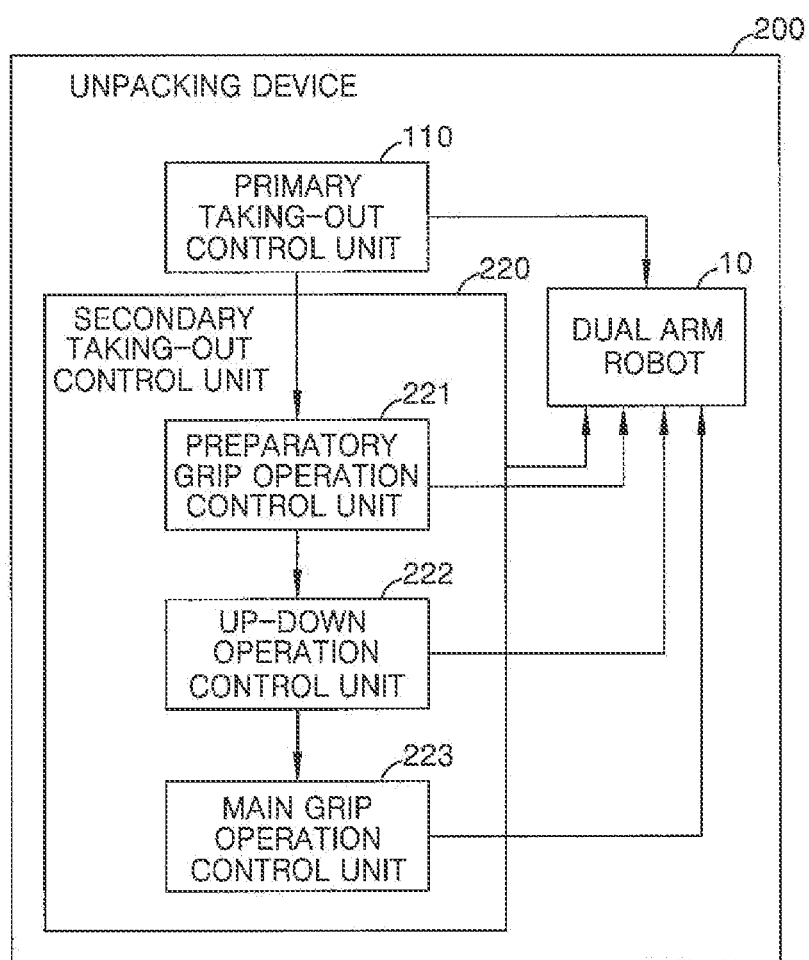
FIG. 7

FIG. 8

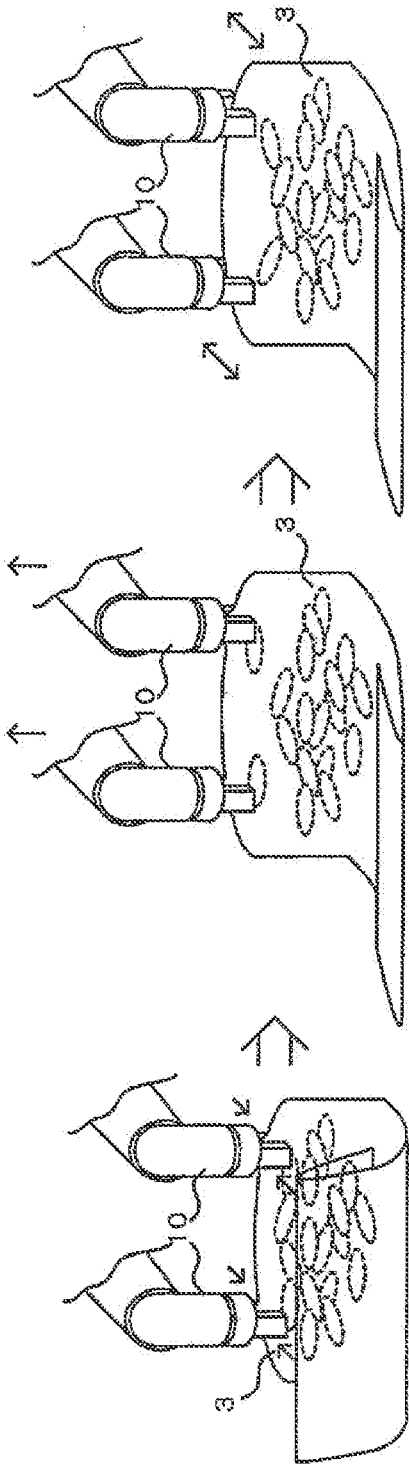


FIG. 9

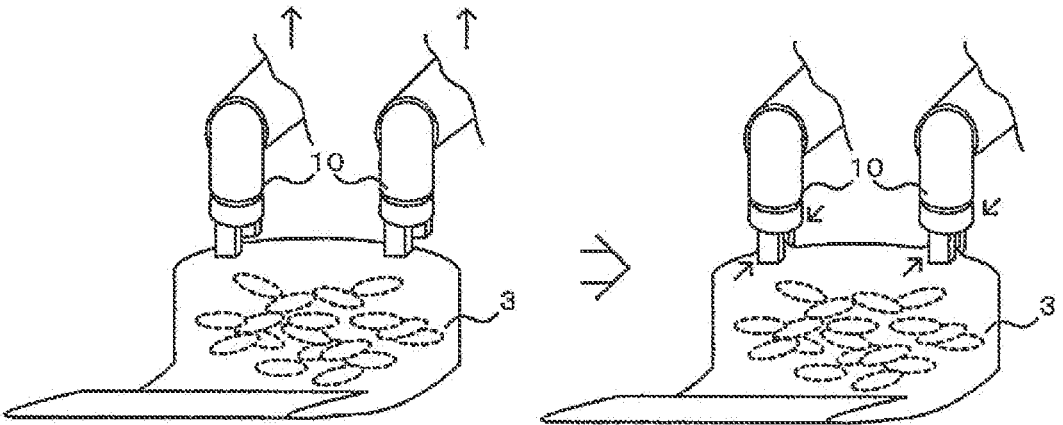


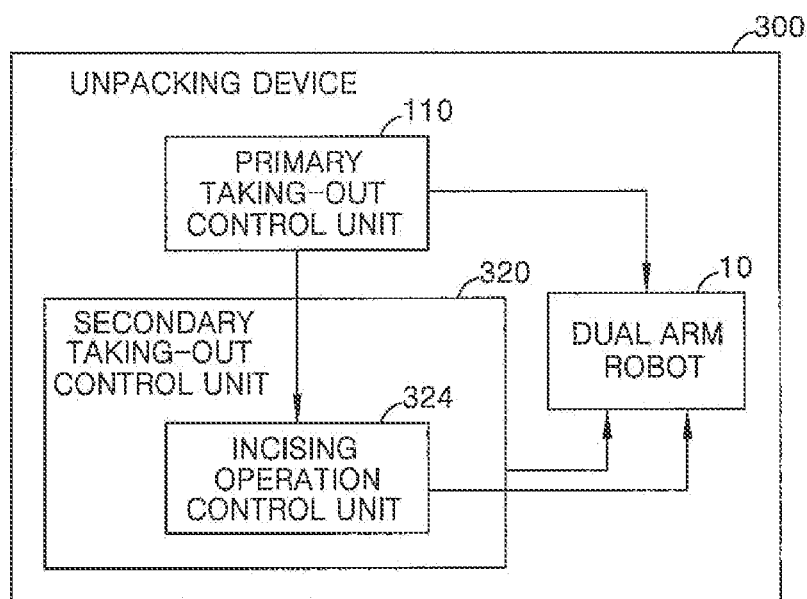
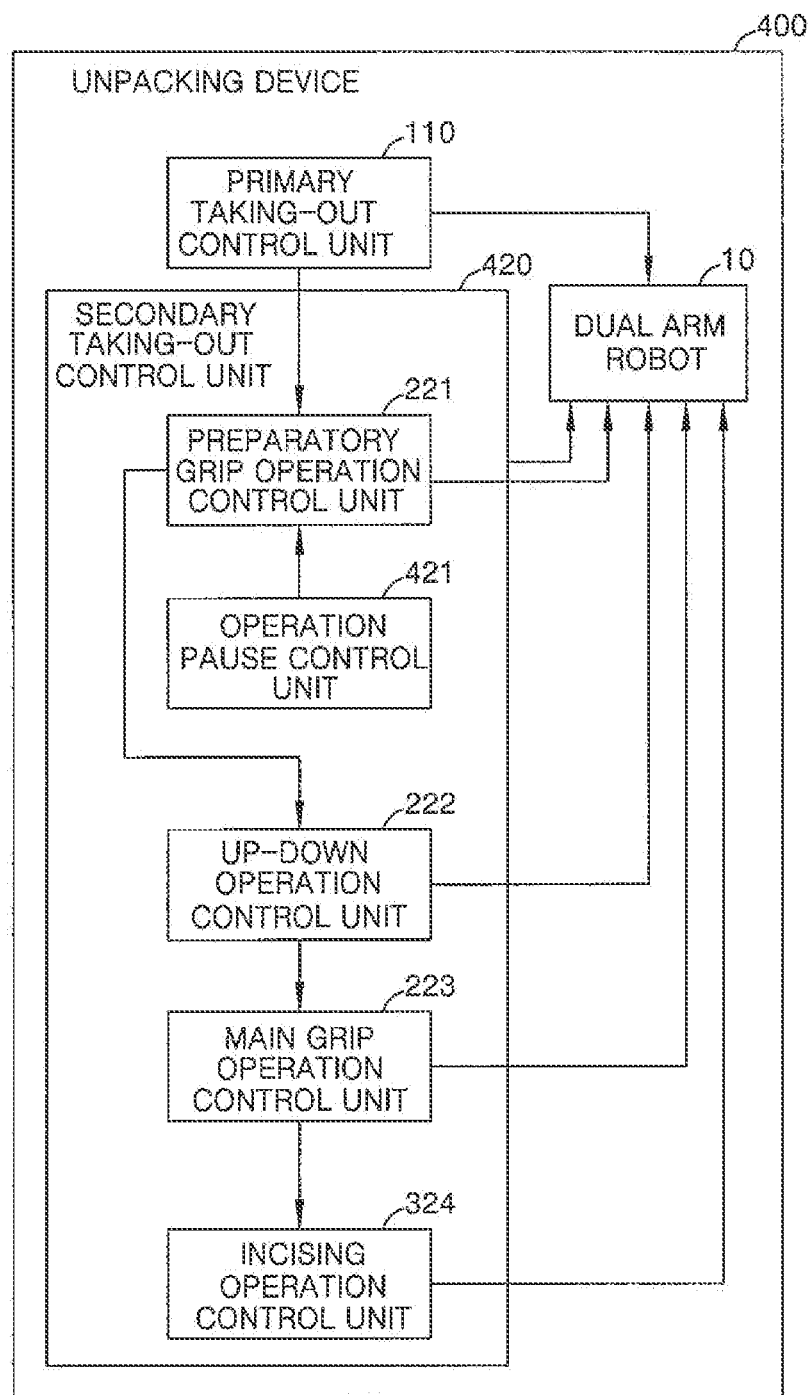
FIG. 10

FIG. 11

UNPACKING DEVICE AND METHOD, AND UNPACKED CONTENT MANUFACTURING METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present disclosure contains subject matter related to that disclosed in Japanese Priority Patent Application No. 2011-244423 filed with the Japan Patent Office on Nov. 8, 2011, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an unpacking device and unpacking method for unpacking a package and taking out contents, and an article unpacked by the unpacking device and unpacking method; and, more particularly, to a technology for restraining scraps of a packing material from being mixed in contents when a package is unpacked.

[0004] 2. Description of the Related Art

[0005] A material put into a production line is usually received in a packed state. A packed material is manually unpacked by a worker and is put into a production line. Most of unpacking works are repeatedly performed and are automated in many cases.

[0006] Unpacking devices for taking out contents by cutting a packing material with an edged tool are disclosed in Japanese Patent Application Publication Nos. 2002-002638 and 2002-249116. In the unpacking device of JP2002-002638A, contents (old newspapers) are cut simultaneously with cutting a packing material. In the unpacking device of JP2002-249116A, the upper wall of a box is cut out with a slanting cutter.

SUMMARY OF THE INVENTION

[0007] In accordance with an aspect of the embodiment, there is provided an unpacking device including: a robot; and a control unit configured to control the robot such that the robot takes out a primary package through an incision of a secondary packing material of a secondary package and then takes out content from the primary package. The primary package is formed by packing the content with a primary packing material, and the secondary package is formed by packing the primary package with the secondary packing material.

[0008] In accordance with another aspect of the embodiment, there is provided an unpacked content manufacturing method or an unpacking method for unpacking a package and taking out contents including: forming an incision in a secondary packing material of a secondary package; taking out a primary package through the incision of the secondary packing material; and taking out content from the primary package through the use of a robot. The primary package is formed by packing the content with a primary packing material, and the secondary package is formed by packing the primary package with the secondary packing material

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The objects and features of the embodiments will become apparent from the following description of embodiments, given in conjunction with the accompanying drawings, in which:

[0010] FIGS. 1 and 2 are views schematically showing a packing process of a foodstuff;

[0011] FIG. 3 is a plan view showing a process layout according to an embodiment of the present invention;

[0012] FIG. 4 is a block diagram schematically showing an unpacking device according to the embodiment;

[0013] FIG. 5 is a view for explaining the function of a primary taking-out control unit;

[0014] FIG. 6 is a view for explaining the function of a secondary taking-out control unit;

[0015] FIG. 7 is a block diagram schematically showing an unpacking device according to a first modified example of the embodiment;

[0016] FIG. 8 is a view for explaining the function of a preparatory grip operation control unit;

[0017] FIG. 9 is a view for explaining the functions of an up-down operation control unit and a main grip operation control unit;

[0018] FIG. 10 is a block diagram schematically showing an unpacking device according to a second modified example of the embodiment; and

[0019] FIG. 11 is a block diagram schematically showing an unpacking device according to a third modified example of the embodiment.

DESCRIPTION OF THE EMBODIMENTS

[0020] There is provided an unpacking device for taking out a plastic bag from a package formed of an incised cardboard box, lifting up the plastic bag and taking out contents from the plastic bag through the use of an articulated robot.

[0021] In the present embodiment, it is supposed that a foodstuff as a material is put into a snack food production line. A packing state available when a foodstuff is received will be described herein below.

[0022] FIGS. 1 and 2 are views schematically showing a packing process of a foodstuff. As shown in FIG. 1, a foodstuff 1 as contents (see the left view in FIG. 1) is contained in a plastic bag 2 as a primary packing material (see the central view in FIG. 1). A taking-out mouth (bag opening) 6 is folded to form a primary package 3 (see the right view in FIG. 1). As shown in FIG. 2, the primary package 3 is packed into a cardboard box 4 as a secondary packing material (see the left view in FIG. 2), thereby forming a secondary package 5 (see the right view in FIG. 2). In this regard, the primary packing material is a flexible bag like the plastic bag 2 and has the taking-out mouth 6. The secondary packing material is a container like the cardboard box 4, the shape of which is kept unchanged unless a certain level of external force is applied thereto. In the present embodiment, an incision enough to take out the primary package 3 therethrough can be formed in the secondary package 5 by cutting the secondary packing material itself or the packing tape 7 adhering to the secondary packing material through the use of an edged tool.

[0023] FIG. 3 is a plan view showing a process layout according to the present embodiment. Referring to FIG. 3, there are shown a dual arm robot 10, a package conveying unit 11, a packing material cutting unit 12, a scrap removal unit 13, a content unloading conveyor 14, a cardboard unloading conveyor 15, a cardboard storage device 16, a plastic bag recovery device 17 and a plastic bag storage box 18.

[0024] The dual arm robot 10 is an articulated robot having fifteen axes in total and is provided with two seven-axes articulated robots which are mounted to a common shaft rotating in a substantially horizontal direction. Then, geomet-

ric terms such as “horizontal” in the present disclosure do not require the strict mathematical sense. It is intended to allow an error during implementation. The package conveying unit 11 conveys the secondary package 5 at least from the packing material cutting unit 12 to the operation region of the dual arm robot 10. The package conveying unit 11 includes a package loading conveyor 19 and a cross feed device 20.

[0025] The package loading conveyor 19 conveys the secondary package 5 from an upstream-side unloading station to the start point of the cross feed device 20 (see an arrow A in FIG. 3).

[0026] The packing material cutting unit 12 is a cutting device installed in a conveying route along which the secondary package 5 is conveyed by the package loading conveyor 19. The packing material cutting unit 12 forms an incision in the cardboard box 4 of the secondary package 5 using an edged tool or the like. In this connection, the packing material cutting unit 12 forms an incision in the portion of the cardboard box 4 other than the lower surface thereof. Preferably, the packing material may be cut by the packing material cutting unit 12 in any location other than the location where the primary package 3 is taken out by the dual arm robot 10 and the location where the foodstuff 1 is taken out by the dual arm robot 10. Alternatively, an incision may be formed on the lower surface of the cardboard box 4 by the packing material cutting unit 12, and then the secondary package 5 may be rotated so that the incision can lie at the lateral side or the upper side.

[0027] The scrap removal unit 13 is a cleaning device installed between the packing material cutting unit 12 and the cross feed device 20. The scrap removal unit 13 removes the scraps generated in the packing material cutting process from the secondary package 5 by blowing the scraps away with a compressed air or by sucking the scraps. The scraps are removed by the scrap removal unit 13 in a location between the packing material cutting unit 12 and the operation region of the dual arm robot 10. Preferably, the scraps may be removed by the scrap removal unit 13 in any location other than the location where the primary package 3 is taken out by the dual arm robot 10 and the location where the foodstuff 1 is taken out by the dual arm robot 10.

[0028] The cross feed device 20 conveys the secondary package 5 by parallel-moving the secondary package 5 from the end point of the package loading conveyor 19 to the start point of the content unloading conveyor 14 (see an arrow B in FIG. 3).

[0029] FIG. 4 is a block diagram schematically showing an unpacking device 100 according to the present embodiment. As shown in FIG. 4, the unpacking device 100 includes the dual arm robot 10, a primary taking-out control unit 110 and a secondary taking-out control unit 120. In the present embodiment, the primary taking-out control unit 110 and the secondary taking-out control unit 120 serve as a control unit.

[0030] The primary taking-out control unit 110 and the secondary taking-out control unit 120 control the dual arm robot 10 to unpack a package and take out contents.

[0031] FIG. 5 is a view for explaining the function of the primary taking-out control unit 110. As shown in FIG. 5, the primary taking-out control unit 110 controls the dual arm robot 10 to take out the primary package 3 through the incision 8 formed by the packing material cutting unit 12. More specifically, the primary taking-out control unit 110 first controls the dual arm robot 10 to hold the cardboard box 4 of the

secondary package 5 at the start point of the content unloading conveyor 14 and can lift up the secondary package 5 (see the upper view in FIG. 5).

[0032] Next, the primary taking-out control unit 110 controls the dual arm robot 10 to rotate the secondary package 5 to have the incision 8 face downward so that the primary package 3 can be taken out through the incision 8 onto the content unloading conveyor 14 under the own weight of the primary package 3 (see the lower view in FIG. 5). For example, if the incision 8 is formed at the upper side of the cardboard box 4, the primary taking-out control unit 110 controls the dual arm robot 10 to rotate the secondary package 5 by 180 degrees. Moreover, the primary taking-out control unit 110 controls the dual arm robot 10 to rotate (see an arrow C in FIG. 3) while holding the cardboard box 4 and carry the cardboard box 4 onto the cardboard unloading conveyor 15.

[0033] After the cardboard box 4 is carried by the dual arm robot 10, the cardboard unloading conveyor 15 conveys the cardboard box 4 to the cardboard storage device 16 (see an arrow D in FIG. 3). The cardboard storage device 16 stores the cardboard box 4 conveyed by the cardboard unloading conveyor 15.

[0034] FIG. 6 is a view for explaining the function of the secondary taking-out control unit 120. As shown in FIG. 6, the secondary taking-out control unit 120 controls the dual arm robot 10 to come back to the content unloading conveyor 14 and take out the foodstuff 1 from the primary package 3. More specifically, the secondary taking-out control unit 120 controls the dual arm robot 10 to grip the plastic bag 2 of the primary package 3 (see the left view in FIG. 6) and lift up the plastic bag 2 so that the foodstuff 1 can be taken out through the taking-out mouth 6 onto the content unloading conveyor 14 under the own weight of the foodstuff (see the right view in FIG. 6).

[0035] In this regard, when the dual arm robot 10 grips the plastic bag 2 of the primary package 3, the secondary taking-out control unit 120 confirms the gripping position through the use of a sensor (not shown). After the foodstuff 1 is taken out onto the content unloading conveyor 14, the secondary taking-out control unit 120 controls the dual arm robot 10 to rotate (see an arrow C in FIG. 3) while gripping the plastic bag 2 and carry the plastic bag 2 onto the plastic bag recovery device 17.

[0036] When lifting up the plastic bag 2, the dual arm robot 10 may operate at a relatively low speed until the foodstuff 1 comes out from the plastic bag 2, so that the plastic bag should not be torn by an operation impact. After the foodstuff 1 comes out from the plastic bag 2, the dual arm robot 10 may operate at a relatively high speed. In this connection, the secondary taking-out control unit 120 can use the sensitivity of a servo motor of the dual arm robot 10 to detect whether the foodstuff 1 has come out from the plastic bag 2. Instead of detecting whether the foodstuff 1 has come out from the plastic bag 2, the secondary taking-out control unit 120 may control the dual arm robot 10 to operate by a specified distance at a relatively low speed, and then the secondary taking-out control unit 120 may control the dual arm robot 10 to operate at a relatively high speed. In this regard, it is preferred that the specified distance be substantially equal to the length of the plastic bag 2.

[0037] The plastic bag recovery device 17 sends the plastic bag 2 to the plastic bag storage box 18 (see an arrow E in FIG. 3). The plastic bag storage box 18 stores the plastic bag 2 sent from the plastic bag recovery device 17. After the foodstuff 1

is taken out by the dual arm robot **10**, the content unloading conveyor **14** conveys the foodstuff **1** to the next station (see an arrow **F** in FIG. **3**).

[0038] In order to take out the contents (the foodstuff **1**) from the secondary package **5** using the conventional unpacking devices disclosed in JP2002-002638A and JP2002-249116A, the secondary packing material (the cardboard box **4**) and the primary packing material (the plastic bag **2**) are simultaneously cut with an edged tool. In that case, however, it is highly likely that the scraps of the secondary packing material (the cardboard box **4**) and the primary packing material (the plastic bag **2**) are mixed in the contents.

[0039] On the other hand, with the unpacking device **100** and the unpacking method according to the present embodiment, the primary package **3** is first taken out from the secondary package **5** and then the contents (the foodstuff **1**) are taken out without having to form an incision in the primary packing material (the plastic bag **2**). This makes it difficult for the scraps of the primary packing material (plastic bag **2**) and the secondary packing material (the cardboard box **4**) to be mixed in the contents (foodstuff **1**). With the unpacking device **100** according to the present embodiment, the location where the incision is formed in the secondary packing material (the cardboard box **4**) differs from the location where the primary package **3** is taken out and the location where the contents (the foodstuff **1**) are taken out. This makes it particularly difficult for the scraps of the secondary packing material (the cardboard box **4**) to be mixed in the contents (the foodstuff **1**).

FIRST MODIFIED EXAMPLE

[0040] In a first modified example of the above-described embodiment, description will be made on an instance where an operation for creating a grip margin is added to the unpacking device **100** of the above-described embodiment.

[0041] In this regard, the term “operation for creating a grip margin” means a preparatory grip operation of gripping a specified portion of the plastic bag **2**, lifting up the plastic bag **2** and releasing the plastic bag **2**.

[0042] FIG. **7** is a block diagram schematically showing an unpacking device **200** according to the first modified example. As shown in FIG. **7**, the unpacking device **200** includes the dual arm robot **10**, the primary taking-out control unit **110** and a secondary taking-out control unit **220**. In the first modified example, the primary taking-out control unit **110** and the secondary taking-out control unit **220** serve as a control unit. The same components as those of the above-described embodiment will be designated by like reference symbols and redundant description thereof will be omitted.

[0043] Just like the secondary taking-out control unit **120** of the unpacking device **100** of the above-described embodiment, the secondary taking-out control unit **220** controls the dual arm robot **10** to take out the foodstuff **1** from the primary package **3**. The secondary taking-out control unit **220** differs from the secondary taking-out control unit **120** in that the secondary taking-out control unit **220** has an operation for creating a grip margin. The secondary taking-out control unit **220** includes a preparatory grip operation control unit **221**, an up-down operation control unit **222** and a main grip operation control unit **223**.

[0044] FIG. **8** is a view for explaining the function of the preparatory grip operation control unit **221**. The preparatory grip operation control unit **221** controls the dual arm robot **10** to grip a specified portion of the plastic bag **2** of the primary

package **3** (see the left view in FIG. **8**), lift up the primary package **3** by a specified displacement amount (see the central view in FIG. **8**) and release the primary package **3** (see the right view in FIG. **8**), prior to taking out the foodstuff **1** from the taking-out mouth **6**.

[0045] FIG. **9** is a view for explaining the functions of the up-down operation control unit **222** and the main grip operation control unit **223**. The up-down operation control unit **222** operates the dual arm robot **10** to move upward or downward in a state that the dual arm robot **10** has released the primary package **3** under the control of the preparatory grip operation control unit **221**. Thus the up-down operation control unit **222** shifts the position where the dual arm robot **10** grips the primary package **3** in a main grip operation (see the left view in FIG. **9**). In the first modified example, the up-down operation control unit **222** operates the dual arm robot **10** to move upward by about 30 cm to 50 cm. The main grip operation control unit **223** causes the dual arm robot **10** to grip a specified portion of the primary package **3** or the vicinity of the specified portion (see the right view in FIG. **9**).

[0046] In the control performed by the up-down operation control unit **222**, the distance of upward movement or downward movement of the dual arm robot **10** and the number of the preparatory grip operations may be set by a user. For example, a screen for setting the position of the grip margin and the number of the preparatory grip operations may be displayed on a touch panel so as to receive the selection of “high”, “middle” and “low” options and the number of the preparatory grip operations inputted by a user. Since the movement distance of the dual arm robot **10** controlled by the up-down operation control unit **222** may be zero, the secondary taking-out control unit **220** may be configured not to include the up-down operation control unit **222**.

[0047] As described above, with the unpacking device **200** according to the first modified example, the dual arm robot performs the operation of creating the grip margin, whereby the amount of the contents (the foodstuff **1**) gripped during the main grip operation can be made smaller than the amount of the contents (the foodstuff **1**) gripped during the preparatory grip operation. This makes it difficult for the contents (the foodstuff **1**) to remain within the primary packing material (the plastic bag **2**) when the dual arm robot of the unpacking device **200** grips the primary packing material (the plastic bag **2**) and takes out the contents (the foodstuff **1**) without forming an incision in the primary packing material (the plastic bag **2**).

SECOND MODIFIED EXAMPLE

[0048] In a second modified example of the above-described embodiment, description will be made on an unpacking device in which an articulated robot takes out a sealed plastic bag from a package formed of an incised cardboard box, grips the plastic bag, makes an incision in the plastic bag and takes out contents through the incision.

[0049] In the second modified example, just like the above-described embodiment, it is supposed that a foodstuff as a material is put into a snack food production line. The second modified example differs from the above-described embodiment in terms of the foodstuff packing state. In the above-described embodiment, a foodstuff **1** as contents is contained in the plastic bag **2** as the primary packing material. The primary package **3** is formed by folding the taking-out mouth **6**. In the second modified example, a primary package **23** (not shown) is formed by putting a foodstuff **1** as contents into a

plastic bag **22** (not shown) as a primary packing material in a sealed state. As in the above-described embodiment, a secondary package **25** (not shown) is formed by packing the primary package **23** with a cardboard box **4** as a secondary packing material.

[0050] The foodstuff packing state is substantially the same as the foodstuff packing state available in the embodiment shown in FIGS. **1** and **2**. The plastic bag **22** of the second modified example corresponds to the plastic bag **2** of the above-described embodiment. The plastic bag **22** of the second modified example differs from the plastic bag **2** of the above-described embodiment in that the mouth of the plastic bag **22** is closed by thermal welding. The primary package **23** of the second modified example corresponds to the primary package **3** of the above-described embodiment. While the contents are not sealed in the primary package **3** of the above-described embodiment, the contents are kept sealed in the primary package **23** of the second modified example. The secondary package **25** of the second modified example corresponds to the secondary package **5** of the above-described embodiment. While the primary package **23** is packed by the secondary package **25** of the second modified example, the primary package **3** is packed by the secondary package **5** of the above-described embodiment.

[0051] FIG. **10** is a block diagram schematically showing an unpacking device **300** according to the second modified example. As shown in FIG. **10**, the unpacking device **300** includes the dual arm robot **10**, the primary taking-out control unit **110** and a secondary taking-out control unit **320**. In the second modified example, the primary taking-out control unit **110** and the secondary taking-out control unit **320** serve as a control unit. The same components as those of the above-described embodiment will be designated by like reference symbols and redundant description thereof will be omitted.

[0052] Just like the secondary taking-out control unit **120** of the unpacking device **100** of the above-described embodiment, the secondary taking-out control unit **320** controls the dual arm robot **10** to take out the foodstuff **1** from the primary package **23**. The secondary taking-out control unit **320** differs from the secondary taking-out control unit **120** in that the secondary taking-out control unit **320** controls the dual arm robot **10** to perform an incising operation for making an incision in the plastic bag. The secondary taking-out control unit **320** includes an incising operation control unit **324**.

[0053] The incising operation control unit **324** controls the dual arm robot **10** to perform an incising operation in which the plastic bag **22** of the primary package **23** is gripped by one robot arm of the dual arm robot **10** and is incised by the other robot arm of the dual arm robot **10**.

[0054] As described above, with the unpacking device **300** according to the second modified example, the dual arm robot **10** first takes out the primary package **23** from the secondary package **25**, then makes an incision in the primary packing material (the plastic bag **2**) and then takes out the contents (the foodstuff **1**) from the incision. This makes it difficult for the scraps of the primary packing material (the plastic bag **22**) and the secondary packing material (the cardboard box **4**) to be mixed in the contents (the foodstuff).

[0055] For example, if the contents are not so good for a human body, it is undesirable to manually perform an unpacking operation. The unpacking device **300** according to the second modified example is very useful in this situation. In case where the contents are not so good for a human body, the primary package **23** is formed by, e.g., putting the contents

into the primary packing material (the plastic bag **22**) in a sealed state as in the second modified example. For example, the secondary package **25** is formed by packing the primary package **23** with a secondary packing material stronger than the cardboard box **4**. The secondary packing material stronger than the cardboard box **4** refers to a container, e.g., a drum can, which is not readily deformed even if a considerable external force is applied thereto. In case of a strong container such as a drum can or the like, however, it is difficult to form an incision by the cutting operation as applied to the cardboard box. For that reason, instead of the packing material cutting unit **12**, a lid opening device for opening a lid of a container needs to be employed in the process layout of the above-described embodiment.

THIRD MODIFIED EXAMPLE

[0056] In a third modified example of the above-described embodiment, description will be made on an instance where an operation for creating a cutting margin is added to the unpacking device **300** of the second modified example. In this regard, the term "operation for creating a cutting margin" means a preparatory grip operation of gripping a specified portion of the plastic bag **2**, lifting up the plastic bag **2** and releasing the plastic bag **2**, just like the grip margin creating operation of the first modified example.

[0057] FIG. **11** is a block diagram schematically showing an unpacking device **400** according to the third modified example. As shown in FIG. **11**, the unpacking device **400** includes a dual arm robot **10**, a primary taking-out control unit **110** and a secondary taking-out control unit **420**. In the third modified example, the primary taking-out control unit **110** and the secondary taking-out control unit **420** serve as a control unit. The same components as those of the above-described embodiment, the first modified example and the second modified example will be designated by like reference symbols and redundant description thereof will be omitted.

[0058] Just like the secondary taking-out control unit **320** of the unpacking device **300** of the second modified example, the secondary taking-out control unit **420** controls the dual arm robot **10** so that the dual arm robot **10** can take out the foodstuff **1** from the primary package **23**. The secondary taking-out control unit **420** differs from the secondary taking-out control unit **320** in that the secondary taking-out control unit **420** has an operation for creating a cutting margin. The secondary taking-out control unit **420** includes a preparatory grip operation control unit **221**, an operation pause control unit **421**, an up-down operation control unit **222**, a main grip operation control unit **223** and an incising operation control unit **324**.

[0059] The operation pause control unit **421** controls the dual arm robot **10** so that the dual arm robot **10** can cease to operate for a specified time while gripping a specified portion of the plastic bag **22** under the control of the preparatory grip operation control unit **221**. In the third modified example, the specified time is approximately several seconds or several tens of seconds.

[0060] The pause control for pausing the operation of the dual arm robot **10** for the specified time under the control of the operation pause control unit **421** is performed in anticipation of an effect that the contents having a relatively small particle size, such as flour or the like, are dropped downward so as to increase the cutting margin. The pause control may be applied to the first modified example. If the particle size of the contents is larger than a specified size, it is difficult to expect

the pause control effect. This means that the operation pause control unit **421** is not an essential element.

[0061] As described above, with the unpacking device **400** according to the third modified example, the dual arm robot **10** performs the operation for creating the cutting margin. This makes it possible to restrain the contents (the foodstuff **1**) from scattering when an incision is formed in the primary packing material (the plastic bag **22**).

[0062] The unpacking devices **100**, **200**, **300** and **400** described above are capable of unpacking a package formed of a previously-incised cardboard box **4**. If the package conveying unit **11**, the packing material cutting unit **12** and the scrap removal unit **13** are added to the respective unpacking devices, it becomes possible to realize an unpacking device capable of unpacking a package formed of a cardboard box **4** having no incision (which corresponds to the area indicated by a broken line G in FIG. 3).

[0063] The present invention can find its application in all kinds of unpacking devices for unpacking a package and taking out contents. With the present invention, it is possible to perform an unpacking operation so that the scraps of a packing material should not be mixed in the contents. Therefore, the present invention is very high in industrial applicability.

[0064] While the invention has been shown and described with respect to the embodiments, it will be understood by those skilled in the art that various changes and modification may be made without departing from the scope of the invention as defined in the following claims.

What is claimed is:

1. An unpacking device comprising:
a robot; and
a control unit configured to control the robot such that the robot takes out a primary package through an incision of a secondary packing material of a secondary package and then takes out content from the primary package, wherein the primary package is formed by packing the content with a primary packing material, and the secondary package is formed by packing the primary package with the secondary packing material.
2. The device of claim 1, wherein the control unit is configured to control the robot such that the robot takes out the primary package through the incision of the secondary packing material by own weight of the primary package.
3. The device of claim 1, wherein the primary packing material is a flexible bag, and the control unit is configured to control the robot such that the robot grips the primary packing material of the primary package, lifts up the primary packing material and takes out the content from the bag by own weight of the content.
4. The device of claim 3, wherein the control unit is configured to control the robot such that, prior to taking out the content, the robot performs a preparatory grip operation of gripping a specified portion of the primary packing material of the primary package, lifting up the primary package by a specified displacement amount and releasing the primary package and a main grip operation of gripping the specified portion or the vicinity of the specified portion.
5. The device of claim 4, wherein the control unit is configured to control the robot such that the robot performs an up-down operation between the preparatory grip operation and the main grip operation and, in the up-down operation, the robot is moved upward or downward in a state that the robot has released the primary package in the preparatory grip

operation so that the position where the robot grips the primary package in the main grip operation is shifted.

6. The device of claim 1, wherein the primary packing material is a flexible bag, the content is sealed within the primary packing material of the primary package, and the control unit is configured to control the robot such that the robot grips the primary packing material of the primary package, forms an incision in the primary packing material and takes out the content through the incision formed in the primary packing material using the own weight of the content.

7. The device of claim 6, wherein the control unit is configured to control the robot such that, prior to forming the incision in the primary packing material, the robot performs a preparatory grip operation of gripping a specified portion of the primary packing material of the primary package, lifting up the primary package by a specified displacement amount and releasing the primary package and a main grip operation of gripping the specified portion or the vicinity of the specified portion.

8. The device of claim 7, wherein the control unit is configured to control the robot such that the robot performs an up-down operation between the preparatory grip operation and the main grip operation and, in the up-down operation, the robot is moved upward or downward in a state that the robot has released the primary package in the preparatory grip operation so that the position where the robot grips the primary package in the main grip operation is shifted.

9. The device of claim 7, wherein the control unit is configured to control the robot such that the robot ceases to operate for a specified time while gripping the specified portion of the primary packing material in the preparatory grip operation.

10. The device of claim 1, further comprising:
a packing material cutting unit for forming the incision in the secondary packing material by cutting the secondary packing material of the secondary package in a location other than a location where the primary package is taken out by the robot and other than a location where the content is taken out by the robot;
a conveying unit for conveying the secondary package from the packing material cutting unit to an operation region of the robot; and
a scrap removal unit for removing scraps generated during the cutting operation from the secondary package in a location between the packing material cutting unit and the operation region of the robot, other than the location where the primary package is taken out by the robot and other than the location where the content is taken out by the robot.

11. An unpacked content manufacturing method, comprising:
forming an incision in a secondary packing material of a secondary package;
taking out a primary package through the incision of the secondary packing material; and
taking out content from the primary package through the use of a robot,
wherein the primary package is formed by packing the content with a primary packing material, and a secondary package is formed by packing the primary package with the secondary packing material.
12. An unpacking method for unpacking a package and taking out contents, comprising:

forming an incision in a secondary packing material of a secondary package;
taking out a primary package through the incision of the secondary packing material; and
taking out content from the primary package through the use of a robot
wherein the primary package is formed by packing the content with a primary packing material, and a secondary package is formed by packing the primary package with the secondary packing material.

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