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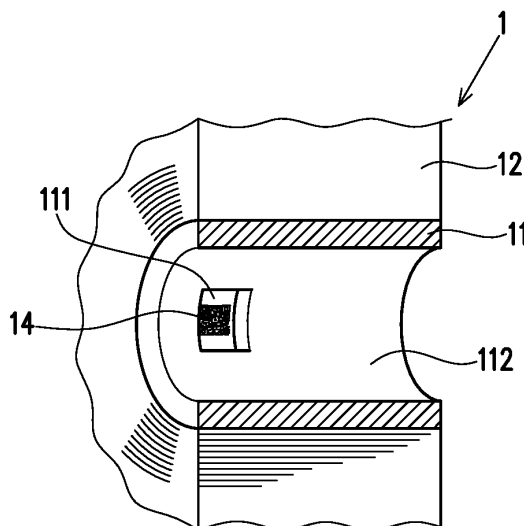
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(54) **SHEET MATERIAL DEPLETION DETECTION MECHANISM, ROLL, AND ROLL PRODUCTION METHOD**

(57) Provided is a sheet material end detection mechanism including: a sheet material information part indicating information on a sheet material wound around a core member in which a light passing part is formed; a reader configured to optically read the sheet material information part; and a detection unit configured to detect that the sheet material is used up, wherein the sheet material information part is held at an end of the sheet ma-

terial wound around the core member at a position corresponding to the light passing part, and the detection unit is configured to detect that the sheet material is present when a read signal of the sheet material information part read by the reader is received and that the sheet material is used up when the read signal disappears, during the withdrawing action to withdraw the sheet material.

Fig . 2B



Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to Japanese Patent Application No. 2015-080167, the disclosure of which is incorporated herein by reference in its entirety.

FIELD

[0002] The present invention relates to a sheet material end detection mechanism used, for example, for a sheet-using device that withdraws a sheet material from a roll body for use, the roll body, and to a method for producing the roll body.

BACKGROUND

[0003] Examples of the sheet-using device include a medicine packaging device that obtains information on the sheet material and operates based on this information. The information on the sheet material is provided in a core member around which the sheet material is wound (see Patent Literature 1, for example).

[0004] Conventionally, in such a medicine packaging device, a configuration for detecting that the sheet material is used up is provided separately from the configuration for obtaining the information on the sheet material. Patent Literature 1 employs a mechanical configuration using a "paper end detection pin". In the case where such a mechanical configuration is separately provided, malfunction may possibly occur due to wear of parts or the like.

CITATION LIST

Patent Literature

[0005] Patent Literature 1: JP 2009-227469 A

SUMMARY

Technical Problem

[0006] It is therefore an object of the present invention to provide a sheet material end detection mechanism, a roll body, and a method for producing the roll body, which enable convenient detection of using up of the sheet material.

Solution to Problem

[0007] The present invention is a sheet material end detection mechanism including: a roll body constituted by winding a sheet material around a tubular core member; a holding unit configured to hold the roll body so as to allow the sheet material to be withdrawn; a sheet material information part provided in the roll body and indi-

cating information on the sheet material; a reader configured to optically read the sheet material information part of the roll body held by the holding unit; and a detection unit configured to detect that the sheet material is used up based on results of the reading by the reader, wherein the core member has a light passing part through which light passes so as to enable the optical reading by the reader from inside to outside, the sheet material information part is held at an end of the sheet material wound around the core member at a position corresponding to the light passing part, and the detection unit is configured to detect that the sheet material is present when a read signal of the sheet material information part read by the reader is received and that the sheet material is used up when the read signal disappears, during the withdrawing action to withdraw the sheet material from the roll body held by the holding unit.

[0008] Further, the present invention is a roll body including: a tubular core member; and a sheet material wound around the core member, wherein the core member has a light passing part through which light passes so as to enable optical reading from inside to outside, and a sheet material information part indicating information on the sheet material is held at an end of the sheet material wound around the core member at a position corresponding to the light passing part.

[0009] Further, the sheet material information part can be directly formed on an inner surface of the sheet material.

[0010] Further, the configuration can be such that the sheet material has a sheet material body and a mounting part attached to a winding start portion of the sheet material body, and the sheet material information part is formed on the mounting part.

[0011] Further, a through hole passing through the core member in an inward-outward direction can be formed in the core member as the light passing part.

[0012] Further, the present invention is a method for producing a roll body by winding a sheet material around a tubular core member, including: a step of winding the sheet material around the core member; and a step of forming, on the sheet material, a sheet material information part indicating information on the sheet material as a step before or after the step of winding the sheet material around the core member, wherein the core member has a light passing part through which light passes so as to enable optical reading from inside to outside, and in the step of forming the sheet material information part on the sheet material, the sheet material information part is formed on the sheet material so that the roll body in which the sheet material information part is held at an end of the sheet material wound around the core member at a position corresponding to the light passing part is obtained.

[0013] Further, the present invention is the method for producing a roll body, wherein the step of forming the sheet material information part on the sheet material is performed as a step before the step of winding the sheet

material around the core member, and in the step of winding the sheet material around the core member, the sheet material is wound around the core member so that the sheet material information part is held at the end of the sheet material wound around the core member at the position corresponding to the light passing part.

[0014] Further, the present invention is the method for producing a roll body, wherein the light passing part is a through hole passing through the core member in an inward-outward direction, the step of forming the sheet material information part on the sheet material is performed as a step after the step of winding the sheet material around the core member, and in the step of forming the sheet material information part on the sheet material, the sheet material information part is formed at the end of the sheet material wound around the core member at the position corresponding to the through hole.

BRIEF DESCRIPTION OF DRAWINGS

[0015]

Fig. 1 is a perspective view simply showing a mechanism for packaging medicine using a roll body according to a first embodiment of the present invention.

Fig. 2A is a perspective view showing the appearance of the roll body according to the first embodiment of the present invention.

Fig. 2B is an enlarged perspective view showing a main part of the radial cross section of the roll body according to the first embodiment of the present invention.

Fig. 2C is a schematic sectional view showing the configuration of the roll body according to the first embodiment of the present invention.

Fig. 3 is a schematic perspective view showing the relationship between the roll body according to the first embodiment of the present invention and a holding unit of a medicine packaging device.

Fig. 4 is a schematic perspective view showing the roll body according to the first embodiment of the present invention when a packaging material is taken away from a core member.

Fig. 5 is a schematic sectional view showing the configuration of a roll body according to a second embodiment of the present invention.

Fig. 6 is a diagram for explaining a modification of the packaging material.

Fig. 7 is a schematic sectional view showing a modification of the core member.

DESCRIPTION OF EMBODIMENTS

[0016] The present invention will be described below mainly with reference to two embodiments.

First embodiment

[0017] Fig. 1 is a view showing peripheral portions of a roll body 1 in a medicine packaging device including a packaging material end detection mechanism. The roll body 1 is constituted by winding a packaging material 12 that is an elongated sheet material around a core member 11. The medicine packaging device that is a sheet-using device is used by withdrawing the packaging material 12 from the roll body 1. The medicine packaging device is used for packaging solid medicine.

[0018] The medicine packaging device includes: a holding unit 2 configured to hold the roll body 1 so as to allow the packaging material 12 to be withdrawn; a hopper 4 configured to put medicine into the packaging material 12 withdrawn from the roll body 1 held by the holding unit 2; a sealing unit 5 configured to seal the medicine put into the packaging material 12 via the hopper 4 within the packaging material 12; and a control unit 7 configured to control the sealing unit 5.

[0019] As shown in Fig. 3, the holding unit 2 has a shaft 21. The shaft 21 is provided rotatably about the axis of the shaft 21. The core member 11 of the roll body 1 is externally fitted to the shaft 21 of the holding unit 2.

[0020] A half folding mechanism 3 is provided between the holding unit 2 and the hopper 4. The half folding mechanism 3 folds the packaging material 12 withdrawn from the roll body 1 in half in the width direction. As shown in Fig. 1, the hopper 4 is inserted into the half-folded portion of the packaging material 12.

[0021] The sealing unit 5 functions as an action unit that acts on the packaging material 12 withdrawn from the roll body 1 held by the holding unit 2. The sealing unit 5 seals medicine within the half-folded packaging material 12 by thermocompression bonding of the packaging material 12. That is, the action of the sealing unit 5 serving as the action unit is exerted onto the packaging material 12 and is sealing of the packaging material 12 by thermocompression bonding.

[0022] Fig. 2A and Fig. 2B are views for explaining the roll body 1, where Fig. 2A is a perspective view showing the appearance of the roll body 1, and Fig. 2B is an enlarged perspective view showing a main part of the radial cross section of the roll body 1. Fig. 2C is a schematic sectional view showing the configuration of the roll body 1. The roll body 1 includes the core member 11 and the packaging material 12 wound around the core member 11.

[0023] The core member 11 is tubular and is cylindrical in this embodiment. The core member 11 of this embodiment is made of resin. However, the material of the core member 11 is not limited to resin. The core member 11 can be formed using various materials as long as it can be formed to have shape retention properties that allow the packaging material 12 to be wound therearound.

[0024] The core member 11 has a light passing part through which light passes so as to enable optical reading by a reader 6, which will be described below, from inside

to outside. In this embodiment, a through window 111 serving as the light passing part is formed in the core member 11. The through window 111 is a through hole passing through the core member 11 in a direction intersecting the axis of the core member 11. In this embodiment, the through window 111 is formed to pass through the core member 11 in the inward-outward direction, that is, in the radial direction of the core member 11. Accordingly, the light passing part can be formed regardless of the material or the like of the core member 11. The through window 111 is, for example, rectangular or square, as viewed in the radial direction. However, the shape of the through window 111 is not limited to the rectangular or square shape, and can be various shapes such as circular and polygonal shapes. As shown in Fig. 2B, the through window 111 is formed in a portion close to one end in the axial direction of the core member 11.

[0025] It is desirable that the through window 111 be formed to be as small as possible as compared with the total area of the inner surface 112 of the core member 11 (see Fig. 2B). The influence of the through window 111 on the packaging material 12 can be reduced by reducing the area of the through window 111. Specifically, the occurrence of recesses in a portion corresponding to the through window 111 in the packaging material 12 wound around the core member 11 can be reduced by the degree of the reduction in area of the through window 111. Therefore, the occurrence of wrinkles or traces of the through window 111 in the packaging material 12 can be reduced.

[0026] However, the through window 111 of this embodiment needs to have a larger area than a packaging material information part 14, which will be described below, as a sheet material information part so that the packaging material information part 14 is not hidden by the core member 11.

[0027] In the roll body 1, the packaging material information part 14 indicating information on the packaging material 12 is formed. Examples of the information on the packaging material 12 include the type of the packaging material 12 (such as material and thickness). Further, examples of the information on the packaging material 12 include information on traceability, such as information on the production lot number and factory of the packaging material 12.

[0028] The packaging material information part 14 is optically readable. The light used for optically reading the packaging material information part 14 is not limited to visible light and may be infrared rays or ultraviolet rays, for example. The packaging material information part 14 is formed by printing.

[0029] The packaging material information part 14 physically (optically or visually) integrates a plurality of elements into one. The packaging material information part 14 indicates the information on the packaging material 12 by the entirety of the packaging material information part 14 (that is, a unit of the plurality of elements). In other words, the packaging material information part

14 cannot indicate the information on the packaging material 12 if a part of the packaging material information part 14 (that is, one or more of the plurality of elements) is missing. The packaging material information part 14 is formed by coding the information on the packaging material 12. In this embodiment, a two-dimensional code ("QR code" which is a registered trademark in Japan) is used as the packaging material information part 14. Accordingly, a general-purpose device can be used as the reader 6, which will be described below.

[0030] The packaging material information part 14 is held at an end of the packaging material 12 wound around the core member 11 at a position corresponding to the through window 111. In other words, the packaging material information part 14 is formed at the end of the packaging material 12 wound around the core member 11 in the portion corresponding to the through window 111. In this embodiment, the packaging material information part 14 is formed directly on the inner surface of the packaging material 12. Since the packaging material information part 14 is formed on the inner surface of the packaging material 12, the packaging material information part 14 is reliably read from the inside of the core member 11, even if the packaging material 12 is not transparent. Further, since the packaging material information part 14 is formed directly on the packaging material 12, the production cost can be reduced as compared with the case where a member for forming the packaging material information part 14 is separately provided.

[0031] As an example, the packaging material 12 is first wound around the core member 11 when producing the roll body 1. Thereafter, the packaging material information part 14 is formed by printing. At this time, the packaging material information part 14 is formed at the end of the packaging material 12 wound around the core member 11 at the position corresponding to the through window 111. In other words, the packaging material information part 14 is formed at the end of the packaging material 12 wound around the core member 11 in the portion corresponding to the through window 111.

[0032] The method for producing the roll body 1 by these steps can facilitate the operation of winding the packaging material 12 around the core member 11. In the case where the packaging material information part 14 is formed on the packaging material 12 in advance and the packaging material 12 is then wound around the core member 11, it is necessary to align the packaging material information part 14 with the through window 111 of the core member 11. In contrast, the method for producing the roll body 1 of this embodiment does not need to align the packaging material information part 14 with the through window 111 of the core member 11 and thus can facilitate the operation of winding the packaging material 12 around the core member 11.

[0033] As another example, the packaging material information part 14 is first formed on the packaging material 12 by printing when producing the roll body 1. Thereafter, the packaging material 12 is wound around the core

member 11 so that the packaging material information part 14 is held at the end of the packaging material 12 wound around the core member 11 at the position corresponding to the through window 111.

[0034] The method for producing the roll body 1 by these steps can facilitate the operation of forming the packaging material information part 14 on the packaging material 12, as compared with the case where the packaging material information part 14 is formed on the inner surface of the packaging material 12 after the packaging material 12 is wound around the core member 11.

[0035] In this way, the step of forming the packaging material information part 14 on the packaging material 12 can be performed as a step before or after the step of winding the packaging material 12 around the core member 11.

[0036] Fig. 3 is a schematic perspective view showing the relationship between the roll body 1 and the holding unit 2. Though not shown in the figure, an engaged part is provided in the core member 11, and an engaging part configured to engage the engaged part of the core member 11 is provided in the shaft 21 of the holding unit 2. When the core member 11 of the roll body 1 is externally fitted to the shaft 21, the engaging part of the shaft 21 engages the engaged part of the core member 11. Accordingly, the core member 11 rotates together with the shaft 21.

[0037] The reader 6 configured to optically read the packaging material information part 14 of the roll body 1 held by the holding unit 2 is provided in the shaft 21 of the holding unit 2. The reader 6 is arranged inside the core member 11 of the roll body 1 held by the holding unit 2 and is provided so as to correspond to the packaging material information part 14 of the roll body 1.

[0038] The reader 6 is connected to a detection unit 8 configured to detect that the packaging material 12 is used up. In this embodiment, the control unit 7 and the detection unit 8 are integrally provided. However, there is no limitation to this configuration, and the control unit 7 and the detection unit 8 can be provided separately from each other.

[0039] The control unit 7 sets the temperature of thermocompression bonding by the sealing unit 5 based on the results of reading by the reader 6. Thereby, thermocompression bonding of the packaging material 12 can be performed at a temperature corresponding to the type of the packaging material 12. Further, the detection unit 8 detects that the packaging material 12 is used up based on the results of reading by the reader 6. Specifically, the detection unit 8 detects that the packaging material 12 is present when a read signal of the packaging material information part 14 read by the reader 6 is received during the withdrawing action to withdraw the packaging material 12 from the roll body 1 held by the holding unit 2. Further, the detection unit 8 is configured to detect that the packaging material 12 is used up when the read signal disappears.

[0040] When the roll body 1 is mounted on the holding

unit 2, the reader 6 reads the packaging material information part 14 of the roll body 1. The control unit 7 sets the temperature of thermocompression bonding by the sealing unit 5 based on the results of reading by the reader 6. The packaging material 12 is withdrawn from the roll body 1 and is folded in half by the half folding mechanism 3 in the case where the half folding mechanism 3 is provided. Medicine is put into the half-folded portion of the packaging material 12 via the hopper 4. The medicine is sealed within the packaging material 12 by the sealing unit 5. At this time, the sealing unit 5 performs thermocompression bonding of the packaging material 12 at the temperature of thermocompression bonding set by the control unit 7. The medicine packaging device repeats the aforementioned operations of putting and sealing of the medicine while withdrawing the packaging material 12 from the roll body 1.

[0041] Fig. 4 is a schematic perspective view showing the packaging material 12 taken away from the core member 11. As the packaging material 12 is withdrawn from the roll body 1, the end of the packaging material 12 wound around the core member 11 is also withdrawn finally. Then, the packaging material information part 14 is displaced from the position corresponding to the through window 111 of the core member 11. Therefore, the reader 6 cannot read the packaging material information part 14 anymore. The detection unit 8 detects that the packaging material 12 is used up by the fact that the reader 6 cannot read the packaging material information part 14.

[0042] Thus, the packaging material end detection mechanism that is a sheet material end detection mechanism is constituted by the roll body 1, the holding unit 2, the packaging material information part 14, the reader 6, and the detection unit 8.

[0043] According to the first embodiment configured as above, the packaging material information part 14 is held at the end of the packaging material 12 wound around the core member 11 at the position corresponding to the through window 111. The reader 6 is provided so as to correspond to the packaging material information part 14. Accordingly, the reader 6 can read the packaging material information part 14 until immediately before the packaging material 12 is used up. Then, the control unit 7 can suitably control the sealing unit 5.

[0044] As the packaging material 12 is withdrawn from the roll body 1, the end of the packaging material 12 wound around the core member 11 is also withdrawn finally. Thus, the packaging material information part 14 is displaced from the position corresponding to the through window 111. Then, the reader 6 cannot read the packaging material information part 14 anymore.

[0045] Based on this point, the detection unit 8 is configured to detect that the packaging material 12 is present when a read signal of the packaging material information part 14 read by the reader 6 is received and that the packaging material 12 is used up when the read signal disappears, during the withdrawing action to withdraw

the packaging material 12 from the roll body 1 held by the holding unit 2. Thus, the detection unit 8 can detect that the packaging material 12 is used up by the fact that the reader 6 cannot read the packaging material information part 14. Accordingly, there is no need to provide a mechanical configuration (such as the "paper end detection pin" according to Patent Literature 1) for detecting that the packaging material 12 is used up. Therefore, parts where malfunction may possibly occur can be reduced, and therefore a packaging material end detection mechanism in which malfunction is less likely to occur can be provided.

Second embodiment

[0046] Next, a second embodiment will be described. The parts that are functionally in common with the first embodiment will be denoted by the same reference numerals in the drawings, and descriptions overlapping with the first embodiment will be omitted in principle.

[0047] Fig. 5 is a schematic sectional view showing the configuration of the roll body 1. In the aforementioned first embodiment, the packaging material information part 14 is directly held at the end of the packaging material 12 wound around the core member 11. In contrast, in the second embodiment, the packaging material information part 14 is indirectly held at the end of the packaging material 12 wound around the core member 11 via a seal 13.

[0048] More specifically, the roll body 1 includes: the core member 11; the packaging material 12 wound around the core member 11; and the seal 13 located between the outer surface of the core member 11 and the inner surface of the packaging material 12 and serving as a forming part used for forming the packaging material information part 14. The seal 13 is attached (by adhesion, sticking, or the like) to the end of the packaging material 12 wound around the core member 11. The packaging material information part 14 is formed on the seal 13 configured as above.

[0049] According to the second embodiment as described above, the seal 13 is attached to the packaging material 12, and the packaging material information part 14 is formed on the seal 13. Accordingly, there is no restriction on the material or the like of the packaging material 12 when forming the packaging material information part 14 on the packaging material 12. As the seal 13, a material or the like capable of reliably forming the packaging material information part 14 can be selected.

[0050] Hereinbefore, the first and second embodiments of the present invention have been described. However, the present invention is not limited to the aforementioned two embodiments, and various modifications can be made without departing from the gist of the present invention.

[0051] The roll body 1 may be constituted by winding the packaging material 12 that has been folded in half in advance around the core member 11. In this case, the half folding mechanism 3 provided between the holding

unit 2 and the hopper 4 in the aforementioned embodiments is not needed.

[0052] As the packaging material information part 14, codes other than the two-dimensional code may be used. As the packaging material information part 14, a barcode (one-dimensional code) may be used, for example.

[0053] Various means can be employed as the packaging material information part 14 as long as it is optically readable. The packaging material information part 14 may include characters, graphics, or symbols as its components. The packaging material information part 14 may include color elements as its components. The packaging material information part 14 may include projections and recesses as its components. Further, the packaging material information part 14 may be constituted by a plurality of elements that are physically (optically or visually) separated from each other.

[0054] As the method for forming the packaging material information part 14, methods other than printing may be used. As the method for forming the packaging material information part 14, various methods that do not fall within the concept of printing such as vapor deposition and etching can be employed as long as the methods allow the packaging material information part 14 that is optically readable to be formed.

[0055] Fig. 6 is a diagram for explaining a modification of the packaging material 12. As shown in Fig. 6, the packaging material 12 may have a packaging material body 12a and a mounting part 12b attached to the winding start portion of the packaging material body 12a and provided separately from the packaging material body. The mounting part 12b is configured to connect the packaging material body 12a to the core member 11 and is a leader tape, for example. The packaging material information part 14 is formed in a portion corresponding to the through window 111 in the mounting part 12b. As the packaging material 12 is withdrawn from the roll body 1, the mounting part 12b is also withdrawn finally, and the packaging material information part 14 formed on the mounting part 12b is displaced from the position corresponding to the through window 111 of the core member 11.

[0056] In the case of such a modification, the packaging material 12 has the packaging material body 12a and the mounting part 12b attached to the winding start portion of the packaging material body 12b, and the packaging material information part 14 is formed on the mounting part 12b. Accordingly, when forming the packaging material information part 14 on the packaging material 12, there is no restriction on the material or the like of the packaging material body 12a. As the mounting part 12b, a material or the like capable of reliably forming the packaging material information part 14 can be selected.

[0057] A fitting member may be fitted in the space of the through window 111 that is a through hole. The fitting member is made of a material through which light passes, thereby enabling optical reading by the reader 6 from inside to outside of the core member 11. In this case, the light passing part is constituted by the through window

111 and the fitting member. In this configuration, the space of the through window 111 is filled with the fitting member, thereby allowing the outer surface of the fitting member and the outer surface of the core member 11 to be substantially flush with each other. Thereby, the occurrence of recesses in the portion of the packaging material 12 wound around the core member 11 corresponding to the through window 111 can be reduced.

[0058] Fig. 7 is a schematic sectional view showing a modification of the core member 11. The through window 111 that is a through hole as provided in the embodiments is not necessarily provided in the core member 11. For example, the core member 11 can be formed by integrally molding a material through which light passes and a material that blocks light, so that a portion 111b formed by the material through which light passes serves as a light passing part that is not a through hole. Further, the entirety of the core member 11 can be formed by molding a material through which light passes, so that a part of the core member 11, specifically, the portion 111b that coincides with the reader 6 when the core member 11 is mounted on the holding unit 2 serves as a light passing part. In this case, portions other than the portion 111b that serves as the light passing part may be coated or uncoated.

[0059] The medicine packaging device may further include a printing unit configured to print information on medicine that is sealed within the packaging material 12 onto the packaging material 12. The medicine packaging device also uses an ink ribbon that is another sheet material than the packaging material 12 of the aforementioned embodiments. The printing unit serves as an action unit that performs an action of "printing" associated with the ink ribbon. In this case, the ink ribbon is wound around another core member than the core member 11 of the aforementioned embodiments, and another roll body than the roll body 1 of the aforementioned embodiments is formed. Then, an ink ribbon end detection mechanism is formed as a sheet material end detection mechanism.

[0060] Finally, the configuration and action of the aforementioned embodiments (including the modifications) will be summarized. The aforementioned embodiments include a packaging material end detection mechanism including: a roll body 1 constituted by winding a packaging material 12 around a tubular core member 11; a holding unit 2 configured to hold the roll body 1 so as to allow the packaging material 12 to be withdrawn; a packaging material information part 14 provided in the roll body 1 and indicating information on the packaging material 12; a reader 6 configured to optically read the packaging material information part 14 of the roll body 1 held by the holding unit 2; and a detection unit 8 configured to detect that the packaging material 12 is used up based on results of the reading by the reader 6, wherein the core member 11 has a light passing part (through hole or through window) 111 or 111b through which light passes so as to enable the optical reading by the reader 6 from

inside to outside, the packaging material information part 14 is held at an end of the packaging material 12 wound around the core member 11 at a position corresponding to the light passing part (through hole or through window) 111 or 111b, and the detection unit 8 is configured to detect that the packaging material 12 is present when a read signal of the packaging material information part 14 read by the reader 6 is received and that the packaging material 12 is used up when the read signal disappears, during the withdrawing action to withdraw the packaging material 12 from the roll body 1 held by the holding unit 2.

[0061] According to the aforementioned configuration, the roll body 1 is constituted by winding the packaging material 12 around the tubular core member 11. The packaging material information part 14 indicating information on the packaging material 12 is formed in the roll body 1. The roll body 1 is held by the holding unit 2 so as to allow the packaging material 12 to be withdrawn. When the roll body 1 is held by the holding unit 2, the packaging material information part 14 of the roll body 1 is optically read by the reader 6. The core member 11 has the light passing part (through hole or through window) 111 or 111b through which light passes so as to enable the optical reading by the reader 6 from inside to outside, and the packaging material information part 14 is held at the end of the packaging material 12 wound around the core member 11 at the position corresponding to the light passing part (through hole or through window) 111 or 111b. Accordingly, the reader 6 can read the packaging material information part 14 until immediately before the packaging material 12 is used up. As the packaging material 12 is withdrawn from the roll body 1, the end of the packaging material 12 wound around the core member 11 is also withdrawn finally. Then, the packaging material information part 14 is displaced from the position corresponding to the light passing part (through hole or through window) 111 or 111b. Therefore, the reader 6 cannot read the packaging material information part 14 anymore. Based on this point, the detection unit 8 is configured to detect that the packaging material 12 is present when a read signal of the packaging material information part 14 read by the reader 6 is received and that the packaging material 12 is used up when the read signal disappears, during the withdrawing action to withdraw the packaging material 12 from the roll body 1 held by the holding unit 2. Thus, the detection unit 8 can detect that the packaging material 12 is used up by the fact that the reader 6 cannot read the packaging material information part 14. Although Patent Literature 1 uses a mechanical configuration of the "paper end detection pin" for the detection, the aforementioned configuration can eliminate the need to provide a mechanical configuration for detecting the using up of the packaging material 12 and can give a packaging material end detection mechanism in which malfunction is less likely to occur.

[0062] Further, the aforementioned embodiments include a roll body 1 including: a tubular core member 11; and a packaging material 12 wound around the core

member 11, wherein the core member 11 has a light passing part (through hole or through window) 111 or 111b through which light passes so as to enable optical reading from inside to outside, and a packaging material information part 14 indicating information on the packaging material 12 is held at an end of the packaging material 12 wound around the core member 11 at a position corresponding to the light passing part (through hole or through window) 111 or 111b.

[0063] According to the aforementioned configuration, the roll body 1 is constituted by winding the packaging material 12 around the tubular core member 11. The packaging material information part 14 indicating information on the packaging material 12 is formed in the roll body 1. The core member 11 has the light passing part (through hole or through window) 111 or 111b through which light passes so as to enable optical reading from inside to outside, and the packaging material information part 14 is held at the end of the packaging material 12 wound around the core member 11 at the position corresponding to the light passing part (through hole or through window) 111 or 111b. Accordingly, the packaging material information part 14 can remain until immediately before the packaging material 12 is used up. Further, as the packaging material 12 is withdrawn from the roll body 1, the end of the packaging material 12 wound around the core member 11 is also withdrawn finally, and the packaging material information part 14 is displaced from the position corresponding to the light passing part (through hole or through window) 111 or 111b. Accordingly, the packaging material information part 14 can be used also for detecting that the packaging material 12 is used up.

[0064] Further, the packaging material information part 14 can be directly formed on an inner surface of the packaging material 12.

[0065] According to the aforementioned configuration, since the packaging material information part 14 is formed on the inner surface of the packaging material 12, the packaging material information part 14 is reliably read from the inside of the core member 11, even if the packaging material 12 is not transparent. Further, since the packaging material information part 14 is directly formed on the packaging material 12, the production cost can be reduced as compared with the case where a member for forming the packaging material information part 14 is separately provided.

[0066] Further, the configuration can be such that the packaging material 12 has a packaging material body 12a and a mounting part 12b attached to a winding start portion of the packaging material body 12a, and the packaging material information part 14 is formed on the mounting part 12b.

[0067] According to the aforementioned configuration, the packaging material 12 has the packaging material body 12a and the mounting part 12b attached to the winding start portion of the packaging material body 12a, and the packaging material information part 14 is formed on

the mounting part 12b. Accordingly, when forming the packaging material information part 14 on the packaging material 12, there is no restriction on the material or the like of the packaging material body 12a. As the mounting part 12b, a material or the like capable of reliably forming the packaging material information part 14 can be selected.

[0068] Further, a through hole passing through the core member 11 in an inward-outward direction can be formed in the core member 11 as the light passing part 111.

[0069] According to the aforementioned configuration, the through hole passing through the core member 11 in the inward-outward direction is formed in the core member 11 as the light passing part 111. Accordingly, the light passing part 111 can be formed regardless of the material or the like of the core member 11.

[0070] Further, the aforementioned embodiments include a method for producing a roll body 1 by winding a packaging material 12 around a tubular core member 11, the method including: a step of winding the packaging material 12 around the core member 11; and a step of forming, on the packaging material 12, a packaging material information part 14 indicating information on the packaging material 12 as a step before or after the step of winding the packaging material 12 around the core member 11, wherein the core member 11 has a light passing part (through hole or through window) 111 or 111b through which light passes so as to enable optical reading from inside to outside, and in the step of forming the packaging material information part 14 on the packaging material 12, the packaging material information part 14 is formed on the packaging material 12 so that the roll body 1 in which the packaging material information part 14 is held at an end of the packaging material 12 wound around the core member 11 at a position corresponding to the light passing part (through hole or through window) 111 or 111b is obtained.

[0071] According to the aforementioned configuration, the tubular core member 11 has the light passing part (through hole or through window) 111 or 111b through which light passes so as to enable optical reading from inside to outside. Further, on the packaging material 12 wound around the core member 11, the packaging material information part 14 indicating information on the packaging material 12 is formed at a position corresponding to the light passing part (through hole or through window) 111 or 111b. Therefore, in the roll body 1 produced by this method, the packaging material information part 14 can be optically read until immediately before the packaging material 12 is used up. Further, as the packaging material 12 is withdrawn from the roll body 1, the packaging material information part 14 is finally displaced from the position corresponding to the light passing part (through hole or through window) 111 or 111b. Then, the packaging material information part 14 cannot be optically read anymore. Thereby, it can be detected that the packaging material 12 is used up.

[0072] Further, the aforementioned embodiments include the method wherein the step of forming the packaging material information part 14 on the packaging material 12 is performed as a step before the step of winding the packaging material 12 around the core member 11, and in the step of winding the packaging material 12 around the core member 11, the packaging material 12 is wound around the core member 11 so that the packaging material information part 14 is held at the end of the packaging material 12 wound around the core member 11 at the position corresponding to the light passing part (through hole or through window) 111 or 111b.

[0073] According to the aforementioned configuration, the tubular core member 11 has the light passing part (through hole or through window) 111 or 111b through which light passes so as to enable optical reading from inside to outside. When producing the roll body 1, the packaging material information part 14 is first formed on the packaging material 12. Thereafter, the packaging material 12 is wound around the core member 11 so that the packaging material information part 14 is held at the end of the packaging material 12 wound around the core member 11 at the position corresponding to the light passing part (through hole or through window) 111 or 111b. Accordingly, as compared with the case where the packaging material information part 14 is formed on the inner surface of the packaging material 12 after the packaging material 12 is wound around the core member 11, the operation of forming the packaging material information part 14 on the packaging material 12 can be facilitated.

[0074] Further, the aforementioned embodiments include the method wherein the light passing part is the through hole 111 passing through the core member 11 in an inward-outward direction, the step of forming the packaging material information part 14 on the packaging material 12 is performed as a step after the step of winding the packaging material 12 around the core member 11, and in the step of forming the packaging material information part 14 on the packaging material 12, the packaging material information part 14 is formed at the end of the packaging material 12 wound around the core member 11 at the position corresponding to the through hole 111.

[0075] According to the aforementioned configuration, the through hole 111 passing through the tubular core member 11 in the inward-outward direction is formed in the tubular core member 11. When producing the roll body 1, the packaging material 12 is first wound around the core member 11. Thereafter, the packaging material information part 14 is formed at the end of the packaging material 12 wound around the core member 11 at the position corresponding to the through hole. Accordingly, the operation of winding the packaging material 12 around the core member 11 can be facilitated. In the case where the packaging material information part 14 is formed on the packaging material 12 in advance and the packaging material 12 is then wound around the core

member 11, there is a need to align the packaging material information part 14 with the through hole 111 of the core member 11. In contrast, the aforementioned configuration can eliminate the need to align the packaging material information part 14 with the through hole 111 of the core member 11 and thus can facilitate the operation of winding the packaging material 12 around the core member 11.

[0076] The aforementioned configuration can eliminate the need to provide a mechanical configuration for detecting the using up of the packaging material 12 and can give a packaging material end detection mechanism in which malfunction is less likely to occur. Therefore, it is possible to conveniently detect that the packaging material 12 is used up without using any mechanical configuration.

REFERENCE SIGNS LIST

[0077]

1	Roll body
11	Core member
111	Light passing part, Through hole, Through window
111b	Light passing part (other than through hole)
12	Sheet material, Packaging material
12a	Sheet material body, Packaging material body
12b	Mounting part
13	Forming part, Seal
14	Sheet material information part, Packaging material information part
2	Holding unit
6	Reader
7	Control unit
8	Detection unit

Claims

1. A sheet material end detection mechanism comprising:

a roll body constituted by winding a sheet material around a tubular core member;
a holding unit configured to hold the roll body so as to allow the sheet material to be withdrawn;
a sheet material information part provided in the roll body and indicating information on the sheet material;

a reader configured to optically read the sheet material information part of the roll body held by the holding unit; and

a detection unit configured to detect that the sheet material is used up based on results of the reading by the reader, wherein the core member has a light passing part through which light passes so as to enable the

- optical reading by the reader from inside to outside,
the sheet material information part is held at an end of the sheet material wound around the core member at a position corresponding to the light passing part, and
the detection unit is configured to detect that the sheet material is present when a read signal of the sheet material information part read by the reader is received and that the sheet material is used up when the read signal disappears, during the withdrawing action to withdraw the sheet material from the roll body held by the holding unit.
2. A roll body comprising:
a tubular core member; and
a sheet material wound around the core member, wherein
the core member has a light passing part through which light passes so as to enable optical reading from inside to outside, and
a sheet material information part indicating information on the sheet material is held at an end of the sheet material wound around the core member at a position corresponding to the light passing part.
3. The roll body according to claim 2, wherein the sheet material information part is directly formed on an inner surface of the sheet material.
4. The roll body according to claim 2, wherein the sheet material has a sheet material body and a mounting part attached to a winding start portion of the sheet material body, and the sheet material information part is formed on the mounting part.
5. The roll body according to claim 2, wherein a through hole passing through the core member in an inward-outward direction is formed in the core member as the light passing part.
6. A method for producing a roll body by winding a sheet material around a tubular core member, comprising:
a step of winding the sheet material around the core member; and
a step of forming, on the sheet material, a sheet material information part indicating information on the sheet material as a step before or after the step of winding the sheet material around the core member, wherein
the core member has a light passing part through which light passes so as to enable optical reading from inside to outside, and
in the step of forming the sheet material information part on the sheet material, the sheet material information part is formed on the sheet material so that the roll body in which the sheet material information part is held at an end of the sheet material wound around the core member at a position corresponding to the light passing part is obtained.
7. The method for producing a roll body according to claim 6, wherein
the step of forming the sheet material information part on the sheet material is performed as a step before the step of winding the sheet material around the core member, and
in the step of winding the sheet material around the core member, the sheet material is wound around the core member so that the sheet material information part is held at the end of the sheet material wound around the core member at the position corresponding to the light passing part.
8. The method for producing a roll body according to claim 6, wherein
the light passing part is a through hole passing through the core member in an inward-outward direction,
the step of forming the sheet material information part on the sheet material is performed as a step after the step of winding the sheet material around the core member, and
in the step of forming the sheet material information part on the sheet material, the sheet material information part is formed at the end of the sheet material wound around the core member at the position corresponding to the through hole.

Fig . 1

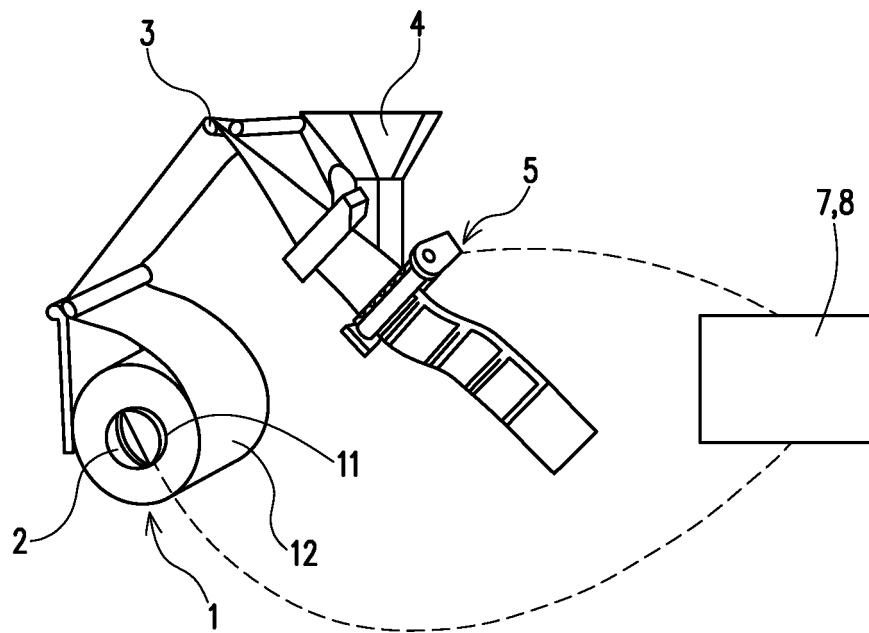


Fig . 2A

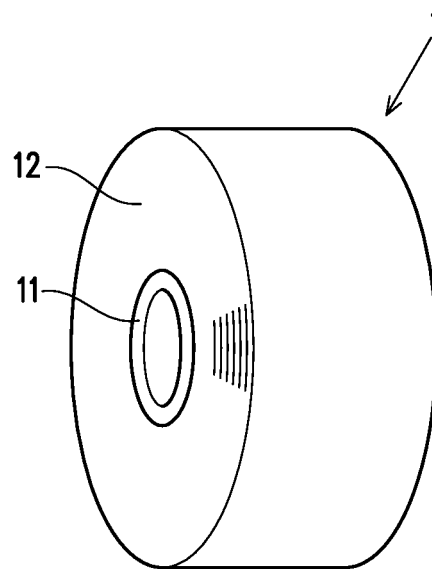


Fig . 2B

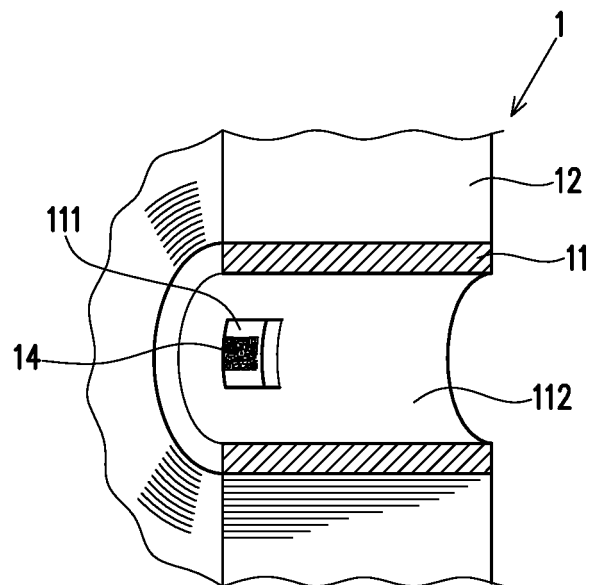


Fig . 2C

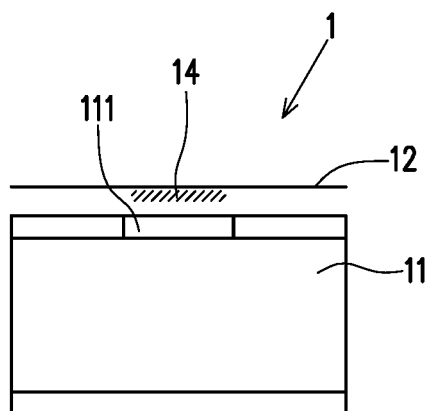


Fig . 3

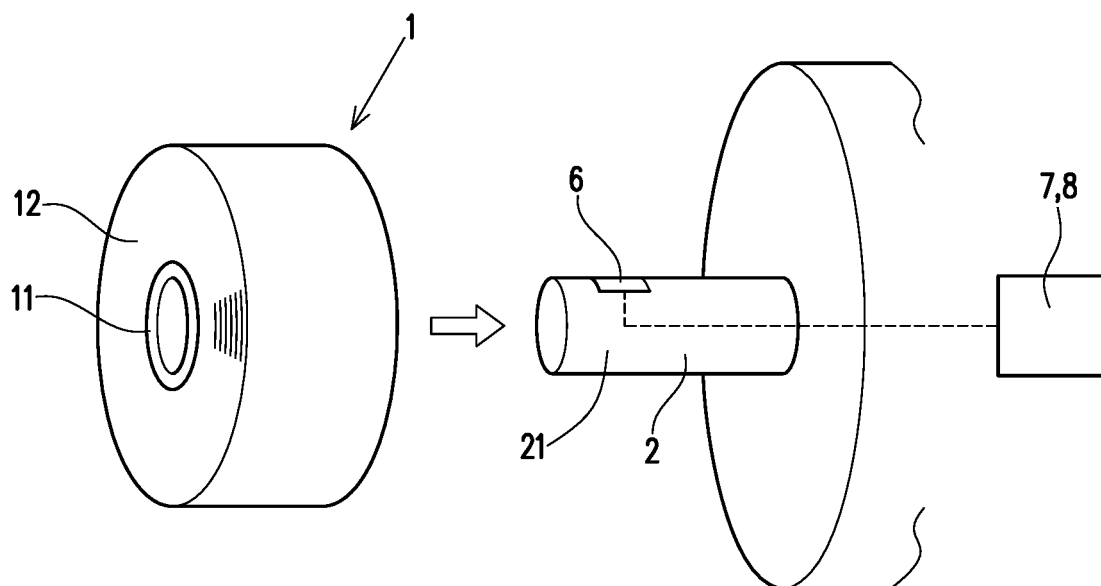


Fig . 4

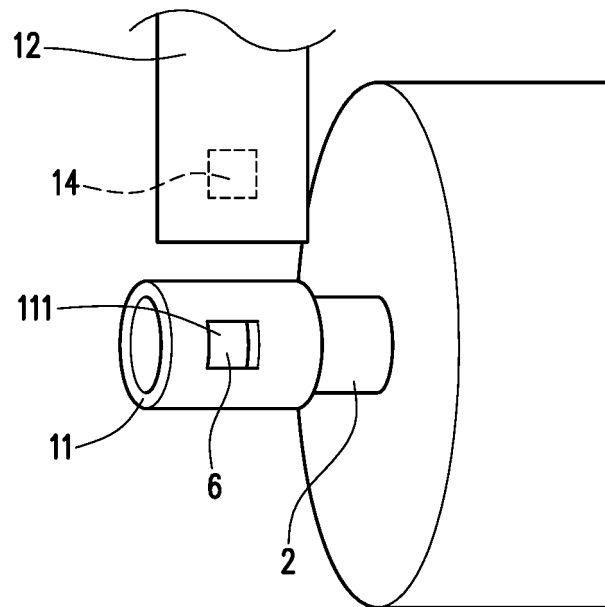


Fig . 5

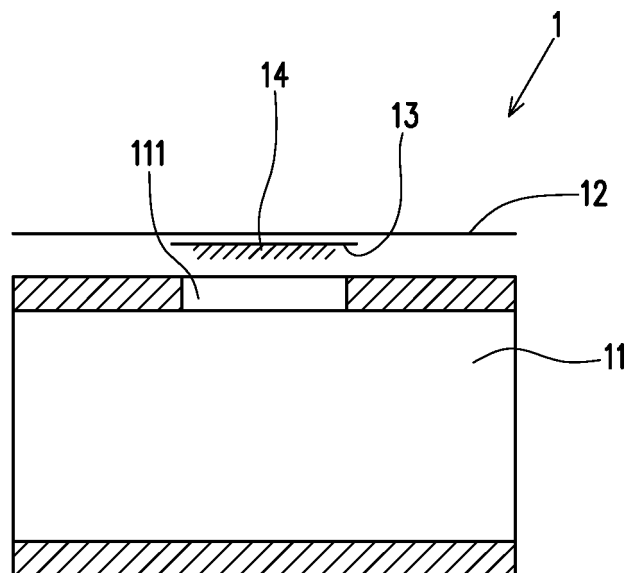


Fig . 6

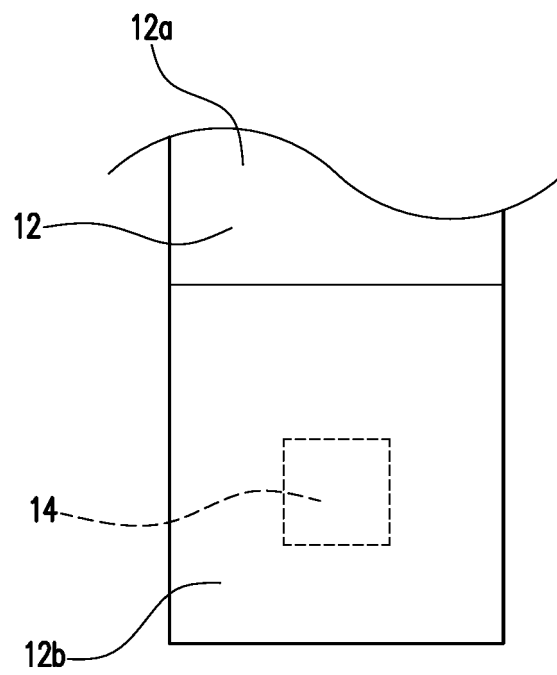
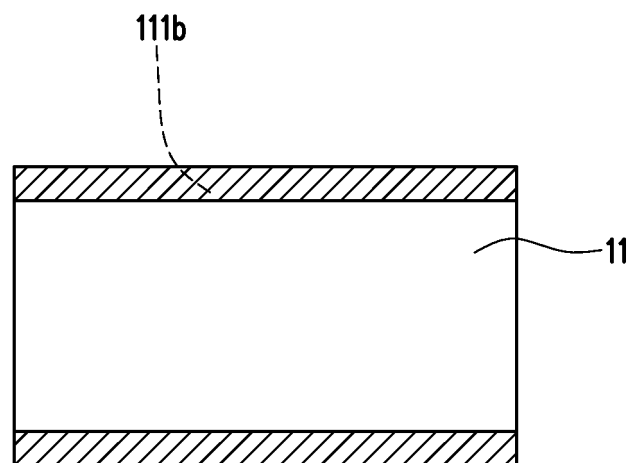


Fig . 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/061353

A. CLASSIFICATION OF SUBJECT MATTER

B65H26/06(2006.01) i, B65B41/00(2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65H26/06, B65B41/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2016

Kokai Jitsuyo Shinan Koho 1971-2016 Toroku Jitsuyo Shinan Koho 1994-2016

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2008-229896 A (Canon Inc.), 02 October 2008 (02.10.2008), paragraphs [0001], [0044] to [0052], [0147]; fig. 4 to 5 & US 2009/0324314 A1 paragraphs [0001], [0089] to [0103]; fig. 4 to 5 & WO 2008/114703 A2 & EP 2079592 A & KR 10-2009-0086270 A & CN 101578181 A & AT 539896 T	1-7 8

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

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Date of the actual completion of the international search
20 April 2016 (20.04.16)Date of mailing of the international search report
10 May 2016 (10.05.16)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/061353

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 122399/1989 (Laid-open No. 62878/1991) (Nippon Tsushinshi Co., Ltd.), 19 June 1991 (19.06.1991), page 2, lines 5 to 17; page 4, line 12 to page 5, line 18; page 8, lines 1 to 6; fig. 1 to 6 (Family: none)	1-7 8
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A	JP 5-301673 A (Sato Corp.), 16 November 1993 (16.11.1993), paragraphs [0036] to [0039]; fig. 5 (Family: none)	1-8

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REFERENCES CITED IN THE DESCRIPTION

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