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(71) Applicant: **Fujitsu Frontech Limited**
Inagi-shi, Tokyo 206-8555 (JP)

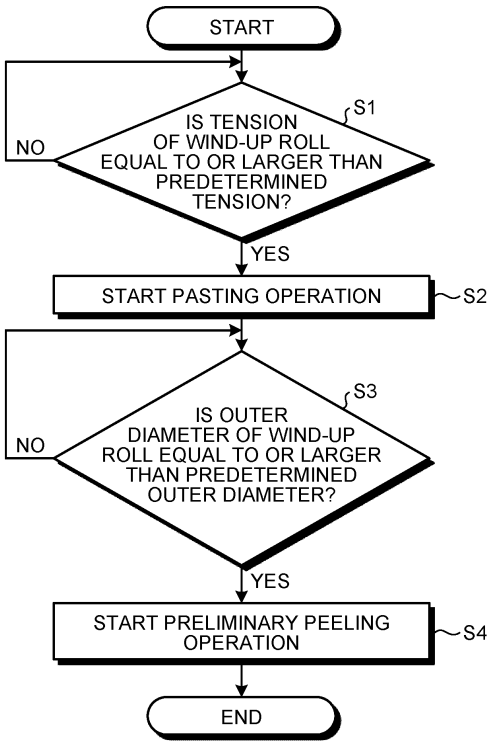
(72) Inventors:
- **TAKAMURA, Ryotaro**
Inagi-shi, Tokyo 206-8555 (JP)
- **OHKI, Seiichi**
Inagi-shi, Tokyo 206-8555 (JP)

(74) Representative: **Haseltine Lake Kempner LLP**
Bürkleinstrasse 10
80538 München (DE)

(54) **LABEL-AFFIXING DEVICE, METHOD FOR CONTROLLING LABEL-AFFIXING DEVICE, AND PROGRAM**

(57) A label pasting apparatus includes a feeding mechanism that includes; a supply roll around which a sheet, which includes a base material and a label that is provided on the base material by means of an adhesive agent, is wound, and a wind-up roll around which the base material, included in the sheet supplied from the supply roll, is wound, a printing unit that performs printing on the label, a peeling member that peels off the label from the base material included in the sheet that has been fed by the feeding mechanism, a pasting mechanism that pastes the label, whose front end of the sheet in a feeding direction has been peeled off from the base material, on a cylindrical body along an outer circumferential surface, a detection unit for detecting an outer diameter of the wind-up roll, around which the base material has been wound, and a control unit that controls the feeding mechanism. The control unit controls the feeding mechanism such that the feeding mechanism starts, when it is detected by the detection unit that the outer diameter of the wind-up roll becomes equal to or larger than a predetermined outer diameter, a preliminary peeling operation for peeling off the front end of the label from the base material and returning the label to the base material by feeding the sheet backward, and peels off the front end of the label from the base material after the preliminary peeling operation.

FIG.8



EP 4 455 038 A1

Description

Field

[0001] The present invention relates to a label pasting apparatus, a method of controlling the label pasting apparatus, and a program for controlling the label pasting apparatus.

Background

[0002] For example, there is a known label pasting apparatus that pastes a label, which has been peeled off from a base material included in a sheet, on an outer circumferential surface of a cylindrical body of a test tube, such as a blood collection tube. As this type of the label pasting apparatus, there is a label pasting apparatus that peels off a part of the front end of a label from a base material included in a sheet, and that peels off the label from the base material while pasting the label on the cylindrical body starting from the front end of the label along the outer circumferential surface of the cylindrical body.

[0003] In the label pasting apparatus, when the front end of the label has been peeled off from the base material, the front end of the label tends to be pulled in the direction in which the base material is fed, a variation is produced in the orientation of the front end portion of the label. As a result of this, accuracy of the position of the label to be pasted on the outer circumferential surface of the cylindrical body, is decreased in accordance with the orientation of the front end portion of the label. In the case where the front end portion of the label is not appropriately peeled off from the base material, for example, the front end portion of the label comes into collision with the outer circumferential surface of the cylindrical body, and there may possibly occur poor pasting as a result of the label being pasted on the cylindrical body while the front end portion of the label is folded, or the like.

[0004] This phenomenon is particularly conspicuous in the case of a low temperature environment, in which adhesive force of an adhesive agent applied to the label increases, or in a case of the use of a label, to which an adhesive agent having large adhesive force is applied. Furthermore, in the case where a roll sheet, such as a roll of paper, in which a sheet is wound is used, the diameter on the center side of the roll sheet in the radial direction is smaller than the diameter on the outer circumferential side, a curling tendency is likely to be generated in the sheet, and thus, the orientation of the front end portion of the label is likely to be unstable due to the curling tendency.

[0005] As a result of this, the label pasting apparatus performs a preliminary peeling operation for peeling off the front end of the label from the base material and returning the label to the base material by feeding the sheet in the backward direction, and after the preliminary operation, the label pasting apparatus peels off the front end of the label from the base material. As a result of this, it is possible to enhance the stability of the orientation of the front end portion of the label, which has been peeled off from the base material, and it is also possible to enhance the reliability of the pasting operation for the label with respect to the outer circumferential surface of the cylindrical body.

Citation List

Patent Literature

[0006] Patent Literature 1: International Publication Pamphlet No. WO 2020/261445

Summary

Technical Problem

[0007] However, it takes time for the label pasting apparatus to perform the above described preliminary peeling operation, so that there is a problem in that pasting efficiency of the label is decreased as a result of the preliminary peeling operation being performed on all of the labels, which are included in the roll sheet.

[0008] Accordingly, the disclosed technology has been conceived in light of the circumstances described above, and an object thereof is to provide a label pasting apparatus that is able to start a preliminary peeling operation when poor pasting of a label is likely to occur, and that is able to enhance the pasting efficiency of the label, a method of controlling the label pasting apparatus, and a program for controlling the label pasting apparatus.

Solution to Problem

[0009] To solve the above problem and attain the object, a label pasting apparatus disclosed in this application, according to an aspect, includes: a feeding mechanism that includes a supply roll around which a sheet, which includes a base material and a label that is provided on the base material by means of an adhesive agent, is wound, and a wind-up roll around which the base material, which is included in the sheet that is supplied from the supply roll, is wound; a printing unit that performs printing on the label; a peeling member that peels off the label from the base material included in the sheet that has been fed by the feeding mechanism; a pasting mechanism that pastes the label, whose front end of the sheet in a feeding direction has been peeled off from the base material, on a cylindrical body along an outer circumferential surface; a detection unit for detecting an outer diameter of the wind-up roll, around which the base material has been wound; and a control unit that controls the feeding mechanism, wherein the control unit controls the feeding mechanism such that the feeding mechanism starts, when it is detected by the detection unit that the outer diameter of the wind-up roll becomes equal to or larger than a predetermined outer diameter, a preliminary peeling operation for peeling off the front end

of the label from the base material and returning the label to the base material by feeding the sheet backward, and peels off the front end of the label from the base material after the preliminary peeling operation.

Advantageous Effects of Invention

[0010] According to an aspect of an embodiment of the label pasting apparatus, it is possible to start a preliminary peeling operation when poor pasting of a label is likely to occur, and thus, it is able to enhance the pasting efficiency of the label.

Brief Description of Drawings

[0011]

FIG. 1 is a perspective view illustrating an external appearance of a blood collection tube preparation apparatus according to an embodiment.
FIG. 2 is a perspective view illustrating an inner part of the blood collection tube preparation apparatus according to the embodiment.
FIG. 3 is a longitudinal sectional view for explaining the inner part of the blood collection tube preparation apparatus according to the embodiment.
FIG. 4 is a schematic view illustrating a relevant part of a label pasting apparatus according to the embodiment.
FIG. 5 is a plan view illustrating a sheet that is used in the label pasting apparatus according to the embodiment.
FIG. 6 is a schematic view for explaining a rotary encoder used for a wind-up roll according to the embodiment.
FIG. 7A is a schematic view illustrating a state in which a front end of a label has been peeled off in the label pasting apparatus according to the embodiment.
FIG. 7B is a schematic view illustrating a state in which a front end of a label has been peeled off in the label pasting apparatus according to the embodiment.
FIG. 8 is a flowchart for explaining control of a preliminary peeling operation according to the embodiment.
FIG. 9 is a diagram illustrating a change in tension of a backing sheet occurring in accordance with a change in an outer diameter of the wind-up roll.

Description of Embodiments

[0012] Preferred embodiments of a label pasting apparatus, a method of controlling the label pasting apparatus, and a program for controlling the label pasting apparatus disclosed in the present application, will be described in detail below with reference to the accompanying drawings. Furthermore, the label pasting apparatus, the method of controlling the label pasting apparatus, and the program for controlling the label pasting apparatus disclosed in the present application are not limited by the embodiments described below.

[Embodiment]

[0013] FIG. 1 is a perspective view illustrating an external appearance of a blood collection tube preparation apparatus according to an embodiment. FIG. 2 is a perspective view illustrating an inner part of the blood collection tube preparation apparatus according to the embodiment. As illustrated in FIG. 1 and FIG. 2, a blood collection tube preparation apparatus 1 includes a housing that has a top face cover CV1, a side face cover CV2, and a front face cover CV3, and is constituted such that each of parts included in the inner part is able to be opened and closed. The front face cover CV3 is provided with an operation panel 5 that is used to operate a blood collection tube supply apparatus 2 and a label pasting apparatus 3, both of which will be described later. In FIG. 1 and FIG. 2, a depth direction of the blood collection tube preparation apparatus 1 is indicated by an X direction, a width direction of the blood collection tube preparation apparatus 1 is indicated by a Y direction, and a height direction of the blood collection tube preparation apparatus 1 is indicated by a Z direction. In also FIG. 3 and the subsequent drawings, in the same manner as in FIG. 1 and FIG. 2, each of the X, Y, and Z directions is indicated.

[0014] FIG. 3 is a longitudinal sectional view for explaining an inner part of the blood collection tube preparation apparatus 1 according to the embodiment. As illustrated in FIG. 3, the blood collection tube preparation apparatus 1 includes a blood collection tube supply apparatus 2, and the label pasting apparatus 3 that pastes a label on a blood collection tube 4, which has been supplied from the blood collection tube supply apparatus 2. The blood collection tube supply apparatus 2 includes a plurality of accommodating units 6A and 6B in each of which the blood collection tube 4 is accommodated, a feeding unit 7 that feeds the blood collection tube 4 from each of the accommodating units 6A and 6B, and a conveyance unit 8 that conveys the blood collection tube 4, which has been fed from the feeding unit 7.

[0015] The plurality of accommodating units 6A and the plurality of accommodating units 6B are arranged side by side in the X direction. In each of the accommodating units 6A and in each of the accommodating unit 6B, for example, the blood collection tubes 4, which have different sizes, are accommodated. In each of the accommodating units 6A and 6B, the plurality of blood collection tubes 4 are arranged along the Z direction such that the length direction of the blood collection tubes 4 is oriented in a lateral direction. The feeding unit 7 is arranged in a lower part of the accommodating units 6A and 6B, and feeds the blood collection tubes 4 from the inside of the respective accommodating units 6A and 6B. The conveyance unit 8 includes a conveyance member 9 that

moves forward and backward along the X direction, and supplies the blood collection tubes 4 to the label pasting apparatus 3 by conveying each of the blood collection tubes 4 from the feeding unit 7 by using the conveyance member 9.

(Configuration of label pasting apparatus)

[0016] As illustrated in FIG. 3, the label pasting apparatus 3 includes a sheet supply mechanism 16 that functions as a feeding mechanism, and that feeds a sheet 10, which includes a label 12 that is provided on a backing sheet 11 that will be described later and that functions as a base material by way on an adhesive agent (adhesive layer) 13, and a printing unit 17 that performs printing on the label 12. Furthermore, the label pasting apparatus 3 includes a peeling member 18 that peels off the label 12 from the sheet 10 that has been fed by the sheet supply mechanism 16, and a pasting mechanism 19 that pastes the label 12, in which a front end 12a of the label 12 in the feeding direction (X direction) of the sheet 10 has been peeled off from the backing sheet 11 by a predetermined amount of reference peeling, along the outer circumferential surface of each of the blood collection tubes 4 each of which is constituted as a cylindrical body.

[0017] FIG. 4 is a schematic view illustrating a relevant part of the label pasting apparatus 3 according to the embodiment. Furthermore, as illustrated in FIG. 4, the label pasting apparatus 3 includes a control unit 21 that controls each of the sheet supply mechanism 16, the printing unit 17, and the pasting mechanism 19. The control unit 21 includes a control circuit board (not illustrated) on which, for example, a central processing unit (CPU), a storage device, an input-output device, a communication interface, a media interface, and the like are provided, and the sheet supply mechanism 16, the printing unit 17, and the pasting mechanism 19 are electrically connected with each other. The control unit 21 according to the embodiment controls each of the sheet supply mechanism 16, the printing unit 17, and the pasting mechanism 19; however, it may also possible to independently use a control unit that controls the sheet supply mechanism 16, and another control unit that controls the printing unit 17 and the pasting mechanism 19.

(Control of sheet supply mechanism performed by control unit)

[0018] Then, the control unit 21 included in the label pasting apparatus 3 controls the sheet supply mechanism 16 such that the sheet supply mechanism 16 performs a preliminary peeling operation for peeling off the front end 12a of the label 12 in an X1 direction by a predetermined amount of preliminary peeling and returning all of the labels 12 to the backing sheet 11 by feeding the sheet 10 backward in an X2 direction by the sheet supply mechanism 16. The control unit 21 controls the sheet supply mechanism 16 such that the sheet supply mechanism 16 starts the preliminary peeling operation at a predetermined timing at which tension of the backing sheet 11 of the sheet 10, fed by the sheet supply mechanism 16, is equal to or less than a predetermined threshold. The timing, at which the preliminary peeling operation is to be started, will be described later. Furthermore, the control unit 21 controls the sheet supply mechanism 16 such that the sheet supply mechanism 16 peels off the front end 12a of the label 12 by the predetermined amount of the reference peeling after the preliminary peeling operation.

(Configuration of sheet)

[0019] FIG. 5 is a plan view illustrating the sheet 10 that is used in the label pasting apparatus 3 according to the embodiment. The sheet 10 includes the backing sheet 11, and the labels 12 that are provided on the backing sheet 11 by way of the adhesive agent 13. As illustrated in FIG. 5, the plurality of labels 12 are arranged along the longitudinal direction of the backing sheet 11 at predetermined intervals. A length L of the label 12, provided on the backing sheet 11 in the longitudinal direction, is formed to be about, for example, 30 [mm] to 35 [mm]. A width W of the label 12, provided on the backing sheet 11 in the short direction, is formed to be about, for example, 50 [mm].

[0020] As the sheet 10, a roll sheet, around which the backing sheet 11 is wound in such a manner that the labels 12, which are provided on the backing sheet 11, face toward the outer circumferential side, is used. Furthermore, the sheet 10 is not limited to the roll sheet, but a sheet, what is called a fanfold sheet, that is folded alternately in the longitudinal direction of the sheet 10 in a bellow folding shape may be used. Furthermore, as the sheet 10 using a radio frequency identifier (RFID), the sheet 10, in which a RF tag is provided on the label 12, may also be used.

(Configuration of sheet supply mechanism)

[0021] As illustrated in FIG. 3 and FIG. 4, the sheet supply mechanism 16 includes a supply roll 23 that is the above described roll sheet, a plurality of guide rollers 24 and a plurality of guide plates 25 that guide the sheet 10, delivered from the supply roll 23, a wind-up roll 26 that winds up the backing sheet 11 from which the label 12 has been peeled off, and a roller drive mechanism 27 that drives the wind-up roll 26.

[0022] The roller drive mechanism 27 includes a driving roller 28 that rotates the wind-up roll 26, a motor 29 that rotationally drives the driving roller 28, and a driving belt 30 that transmits the driving force of the motor 29. The driving belt 30 is stretched across a rotation shaft 29a of the motor 29, a rotation shaft 28a of the driving roller 28, and a rotation shaft 35a of a platen roller 35, which will be described later, provided in the printing unit 17, and, in addition, the driving roller 28 and the platen roller 35, are

rotated via the driving belt 30. The wind-up roll 26 is rotated in accordance with a rotation of the driving roller 28. Therefore, the wind-up roll 26 is rotated in synchronization with the rotation of the platen roller 35.

[0023] A torque limiter 33 is provided on a rotation shaft 26a of the wind-up roll 26, a torque, which is applied to the rotation shaft 26a, is limited as a result of occurring idling due to a slide rotation of the wind-up roll 26 when a torque above a certain level is applied to the rotation shaft 26a. As a result of this, the torque limiter 33 prevents tension above a certain level from being applied to the sheet 10, which is supplied from the supply roll 23 and which is wound up around the wind-up roll 26. As a result of this, in the sheet supply mechanism 16, an amount of winding of the wind-up roll 26 is increased, and as the outer diameter of the wind-up roll 26 is increased, an amount of slippage of the wind-up roll 26 with respect to an amount of conveyance of the backing sheet 11, which is performed by the platen roller 35, is increased.

[0024] The peeling member 18 is arranged on the downstream side of the printing unit 17 in the path of the sheet 10 that is supplied from the supply roll 23. The peeling member 18 is formed in a flat plate shape, and is secured along the feeding direction (the X1 direction) of the sheet 10.

[0025] The sheet supply mechanism 16 peels off, from the front end 12a side, the label 12, on which the adhesive agent 13 is applied, from the backing sheet 11 that is included in the sheet 10, by turning back the sheet 10, which is delivered from the supply roll 23, at the leading end of the peeling member 18. The sheet supply mechanism 16 winds up only the backing sheet 11, which has passed through the leading end of the peeling member 18, onto the wind-up roll 26.

[0026] The sheet supply mechanism 16 includes, as illustrated in FIG. 4, a front end detection sensor 31 that detects the front end 12a of the label 12, which has been peeled off from the backing sheet 11 by the peeling member 18, and a rear end detection sensor 32 that detects a rear end 12b of the label 12, which is provided on the backing sheet 11 (see FIG. 7A).

[0027] The front end detection sensor 31 is arranged in an upper part (the Z direction) on the downstream side in the feeding direction (the X1 direction) of the sheet 10 with respect to the leading end of the peeling member 18, and is electrically connected to the control unit 21. The rear end detection sensor 32 is arranged at a predetermined position on the upstream side in the feeding direction (the X1 direction) of the sheet 10 with respect to the printing unit 17, and is electrically connected to the control unit 21.

[0028] Each of the front end detection sensor 31 and the rear end detection sensor 32 are constituted by using a transmission type optical sensor (not illustrated), and includes a light emitting unit that emits detection light, and a light receiving unit that receives the detection light sent from the light emitting unit. The light emitting unit and the light receiving unit are arranged so as to sandwich the path of the label 12, and detects the label 12 as a result of the label 12 blocking the detection light.

[0029] Furthermore, the sheet supply mechanism 16 includes a rotation detection unit 44 that is used to detect rotation of the wind-up roll 26, around which the backing sheet 11 of the sheet 10 is wound. Furthermore, the rotation detection unit 44 also has a function of the detection unit that is used to detect the outer diameter (winding diameter) of the wind-up roll 26, around which the backing sheet 11 is wound. The rotation detection unit 44 is electrically connected to the control unit 21, and the control unit 21 controls the sheet supply mechanism 16 on the basis of the detection result, which is obtained by the rotation detection unit 44.

[0030] FIG. 6 is a schematic view for explaining a rotary encoder used for the wind-up roll 26 according to the embodiment. As illustrated in FIG. 6, the rotary encoder is used as the rotation detection unit 44, and the rotation detection unit 44 includes a transmission type optical sensor 44a and a slit disc 44b. The transmission type optical sensor 44a includes, although not illustrated, a light emitting unit that emits detection light, and a light receiving unit that receives the detection unit, which has been emitted by the light emitting unit. The slit disc 44b is secured on the rotation shaft 26a of the wind-up roll 26, and a plurality of slits 44c are formed around the circumferential direction of the outer circumferential portion. The rotation detection unit 44 detects a speed of rotation and an angle of rotation of the rotation shaft 26a of the wind-up roll 26 (a speed of rotation and an angle of rotation of the wind-up roll 26) as a result of the transmission type optical sensor 44a receiving the detection light, which passes through each of the slits 44c provided on the slit disc 44b.

[0031] When the sheet supply mechanism 16 starts a supply of the sheet 10, the rotation detection unit 44 detects a change in the speed of rotation of the rotation shaft 26a of the wind-up roll 26, to which the starting end of the backing sheet 11 is attached. When the speed of rotation of the rotation shaft 26a detected by the rotation detection unit 44 becomes equal to or larger than a predetermined speed, the control unit 21 determines that predetermined tension is applied to the sheet 10, which is delivered from the supply roll 23, and starts control of the label pasting apparatus 3. In other words, when the wind-up roll 26 starts winding up of the backing sheet 11, the control unit 21 determines, on the basis of the speed of rotation of the wind-up roll 26 detected by the rotation detection unit 44, whether or not the tension, which is applied to the backing sheet 11 whose starting end side has been wound around the wind-up roll 26, becomes equal to or larger than the predetermined tension. As a result of this, the sheet supply mechanism 16 is able to feed the sheet 10 in an appropriate feeding state, in which the predetermined tension is applied to the sheet 10.

[0032] In addition, the control unit 21 calculates the outer diameter of the wind-up roll 26, around which the backing sheet 11 is wound, on the basis of, for example, the angle of rotation of the rotation shaft 26a of the wind-

up roll 26 (an amount of rotation of the wind-up roll 26) that has been detected by the rotation detection unit 44. In the present embodiment, it is assumed that the calculation result of the outer diameter of the wind-up roll 26 that has been obtained on the basis of the detection result obtained by the rotation detection unit 44, is also included in the detection result obtained by the rotation detection unit 44. When it is detected by the rotation detection unit 44 that the outer diameter of the wind-up roll 26 becomes equal to or larger than a predetermined outer diameter, the control unit 21 controls the sheet supply mechanism 16 such that the sheet supply mechanism 16 starts the preliminary peeling operation for peeling off the front end 12a of the label 12 from the backing sheet 11 and returning the label 12 to the backing sheet 11 by feeding the sheet 10 backward, and, after the preliminary peeling operation, the sheet supply mechanism 16 peels off the front end 12a of the label 12 from the backing sheet 11.

[0033] By performing the preliminary peeling operation in this way, the label pasting apparatus 3 according to the present embodiment, is able to appropriately paste the label 12 on the blood collection tube 4, so that it is possible to suppress an occurrence of poor pasting of the label 12. Moreover, further details about control of the preliminary peeling operation, performed by the control unit 21, will be described later.

[0034] In addition, as described above, the rotation detection unit 44 has a function for detecting tension of the backing sheet 11, applied at the time of beginning to wind up the backing sheet 11, as well as a function of detecting the outer diameter of the wind-up roll 26. As a result of this, in the label pasting apparatus 3, it is possible to suppress an increase in the number of rotation detection units that are used to control the sheet supply mechanism 16, so that it is possible to simplify the configuration of the sheet supply mechanism 16.

(Configuration of printing unit)

[0035] As illustrated in FIG. 4, the printing unit 17 includes a thermal head 34 that performs printing on the label 12, the platen roller 35 that supports the sheet 10 by sandwiching the sheet 10 between the thermal head 34 and the platen roller 35, and a head holder member 36 that holds the thermal head 34. The printing unit 17 sandwiches the label 12 together with the backing sheet 11 between the thermal head 34 and the platen roller 35, and performs printing on the label 12 by the thermal head 34 while feeding the sheet 10 by the platen roller 35. Furthermore, the printing unit 17 is not limited to the configuration in which the printing unit 17 includes the thermal head 34, but the printing unit 17 may also be configured to have, for example, an inkjet head.

[0036] Furthermore, the label pasting apparatus 3 according to the embodiment includes, as illustrated in FIG. 3, in order to manually paste the label 12 on the blood collection tube 4, a sheet supply mechanism 37 that includes a manual use supply roll 38, and a printing unit 39 that performs printing on the label 12, which has been supplied from the manual use supply roll 38. Each of the sheet supply mechanism 37 and the printing unit 39 has the same configuration as the configuration of each of the sheet supply mechanism 16 and the printing unit 17 described above.

(Configuration of pasting mechanism)

[0037] As illustrated in FIG. 4, the pasting mechanism 19 includes a pasting roller 41 that pastes the label 12 on the blood collection tube 4 by rotating along the outer circumferential surface of the blood collection tube 4, a guide roller 42 that rotatably supports the blood collection tube 4 on which the label 12 is pasted by the pasting roller 41, and a pressure roller 43 that presses the blood collection tube 4 on the pasting roller 41. Furthermore, although not illustrated, the pasting mechanism 19 includes a supporting member that supports the blood collection tube 4, which has been supplied from the blood collection tube supply apparatus 2 together with the pressure roller 43, a rotation mechanism for rotating the pasting roller 41, and a moving mechanism for moving the pressure roller 43.

[0038] The pasting roller 41 is arranged on the downstream side of the feeding direction (the X1 direction) of the label 12 with respect to the leading end of the peeling member 18. The pasting roller 41 is located at a position, in which the lower side of the outer circumferential surface of the pasting roller 41 is located at an upper part in the vicinity of the leading end of the peeling member 18, and is arranged on the opposite side of the side, on which the adhesive agent 13 is applied to the label 12 that is peeled off by the peeling member 18 (see FIG. 10A). Therefore, the lower side of the outer circumferential surface of the pasting roller 41 is located at an upper part in the vicinity of the front end 12a of the label 12, which has been peeled off from the backing sheet 11 by the leading end of the peeling member 18.

[0039] The guide roller 42 is arranged on a lower part with respect to the leading end of the peeling member 18, and the outer circumferential surface of the guide roller 42 is located opposite the outer circumferential surface of the pasting roller 41. Furthermore, as illustrated in FIG. 3, a tray 47, in which the blood collection tubes 4, on each of which the label 12 is pasted, are accommodated, is provided on the lower part of the pasting mechanism 19.

(Preliminary peeling operation)

[0040] In the following, a description will be given of control of a start of the preliminary peeling operation performed on the label 12 as a result of the control unit 21 controlling the sheet supply mechanism 16.

[0041] As described above, the torque limiter 33 is provided on the rotation shaft 26a of the wind-up roll 26 that is included in the sheet supply mechanism 16, so that the amount of winding of the wind-up roll 26 is

increased, and thus, the amount of slippage of the wind-up roll 26, with respect to the amount of conveyance of the backing sheet 11 due to the platen roller 35 is increased as the outer diameter of the wind-up roll 26, is larger. As a result of this, the torque, which is applied to a rotation shaft 26aa of the wind-up roll 26, is constant, so that the tension, which is applied to the backing sheet 11 that is wound up by the wind-up roll 26, is gradually decreased as the outer diameter of the wind-up roll 26, around which the backing sheet 11 is wound, is larger.

[0042] In the case where the tension of the backing sheet 11 becomes lower than the predetermined threshold, when the front end 12a of the label 12 is peeled off by the peeling member 18, the orientation of the front end 12a of the label 12, disposed on the backing sheet 11, is changed, and poor pasting of the label 12, which is pasted on the blood collection tube 4, is likely to occur.

[0043] Accordingly, in the label pasting apparatus 3 according to the embodiment, the preliminary peeling operation is started when the tension of the backing sheet 11 falls the level lower than the predetermined threshold. Here, the preliminary peeling operation indicates an operation performed such that, as illustrated in FIG. 7A, the front end 12a of the label 12 is peeled off by the peeling member 18, by an amount of preliminary peeling that is larger than the amount of the reference peeling, and then, as illustrated in FIG. 7B, the sheet 10 is fed backward such that, for example, the entire of the label 12 is returned to the backing sheet 11. As one example, the amount of the reference peeling is about 3.5 [mm], and the amount of the preliminary peeling is about 6,5 [mm] to 4.5 [mm]. In the preliminary peeling operation, for example, a plurality of preliminary peeling operations each using a different amount of the preliminary peeling, may also be included.

[0044] After the preliminary peeling operation, by peeling the front end 12a of the label 12 off to a position corresponding to, for example, the amount of the reference peeling, it is possible to prevent an occurrence of poor pasting of the label 12. Therefore, in the label pasting apparatus 3, without leading to a decrease in the pasting efficiency of the label 12 as in the case of the preliminary peeling operation to be performed on all of the labels 12, and it is thus possible to enhance the pasting efficiency of the label 12 by starting the preliminary peeling operation at the predetermined timing, at which poor pasting of the label 12 tends to occur and the preliminary peeling operation is needed.

[0045] FIG. 8 is a flowchart for explaining control of the preliminary peeling operation according to the embodiment. As illustrated in FIG. 8, the control unit 21 included in the label pasting apparatus 3 determines whether or not the tension of the backing sheet 11 is equal to or larger than the threshold of the predetermined tension on the basis of the speed of rotation of the rotation shaft 26a of the wind-up roll 26, detected by the rotation detection unit 44 (Step S1). At Step S1, if the tension of the backing sheet 11 is less than the threshold of the predetermined tension (No at Step S1), the control unit 21 repeats the determination of the detection result that has been obtained by the rotation detection unit 44. At Step S1, if the tension of the backing sheet 11 is equal to or larger than the value of the predetermined tension (Yes at Step S1), the control unit 21 controls the label pasting apparatus 3, and starts the pasting operation with respect to the label 12 (Step S2).

[0046] Then, the control unit 21 determines whether or not the outer diameter of the wind-up roll 26 is equal to or larger than the threshold of the predetermined outer diameter on the basis of the outer diameter of the wind-up roll 26, detected by the rotation detection unit 44 (Step S3). At Step S3, if the outer diameter of the wind-up roll 26 is less than the threshold of the predetermined outer diameter (No at Step S3), the control unit 21 repeats the determination of the detection result that has been obtained by the rotation detection unit 44. If the outer diameter of the wind-up roll 26 is equal to or larger than the threshold of the predetermined outer diameter (Yes at Step S3), the control unit 21 starts the preliminary peeling operation (Step S4). After the control unit 21 starts the preliminary peeling operation, the control unit 21 continues the preliminary peeling operation with respect to each of the labels 12, until all of the labels 12 have been pasted.

[0047] FIG. 9 is a diagram illustrating a change in the tension of the backing sheet 11 in accordance with a change in the outer diameter of the wind-up roll 26. Furthermore, here, as one example, it is assumed that a single roll sheet includes the 900 labels 12, and the pasting operation is ended when the 900 labels 12 have been pasted.

[0048] As illustrated in FIG. 9, the sheet supply mechanism 16 is constituted such that the amount of conveyance at the time of printing performed on the single label 12 is kept constant to 30 [mm] during a period of time between the start and the end of the pasting operation performed on the label 12. In the sheet supply mechanism 16, in accordance with an increase in the amount of winding of the backing sheet 11 that is wound around the wind-up roll 26, the outer diameter of the wind-up roll 26 is gradually increased, the rotation angle [deg] of the rotation shaft 26a at the time of printing performed on the single label 12, is gradually decreased, and the tension of the backing sheet 11 gradually falls. In the embodiment, the preliminary peeling operation is started when, for example, the outer diameter of the wind-up roll 26 becomes equal to or larger than the predetermined threshold and when, for example, the 600^{th} label 12 is pasted. In other words, in the present embodiment, as one example, setting has been configured such that the preliminary peeling operation is started when the tension of the backing sheet 11 becomes equal to or less than about 5,4 [N].

[0049] In this way, the present embodiment starts the preliminary peeling operation at the timing at which the tension of the backing sheet 11 falls below the predetermined threshold in accordance with an increase in the

outer diameter of the wind-up roll 26 (an increase in the amount of winding of the backing sheet 11). As a result of this, in accordance with the size (thickness), a material, and the like of the backing sheet 11, the label 12, and the adhesive agent 13 that are included in the sheet 10 to be used, the timing of the start of the preliminary peeling operation is different as a result of the tension of the backing sheet 11 being equal to or less than the predetermined threshold. According to the present embodiment, the control unit 21 controls the sheet supply mechanism 16 on the basis of the detection result obtained by the rotation detection unit 44, so that, by setting the control such that the preliminary peeling operation is started at an arbitrary timing in accordance with the sheets 10 having a plurality of types, it is possible to easily cope with a case, in which the sheets 10, having the plurality of types, are used.

[0050] In other words, for example, in the case where the preliminary peeling operation is started on the basis of the number of labels 12 to be pasted, a variation occurs in the start timing of the preliminary peeling operation, due to a difference in the size of the label 12 provided on the sheet 10 to be used, a difference in the thickness of the backing sheet 11, and the like, so that it is not possible to start the preliminary peeling operation with high accuracy at the timing at which the tension of the backing sheet 11 is equal to or less than the predetermined threshold. As a result of this, if it is attempted to start the preliminary peeling operation at the predetermined timing, there is a need to prepare a lot of thresholds in accordance with the size or the like of the backing sheet 11, the label 12, and the like that are associated with the sheet 10 to be used, and there is a need to switch a lot of thresholds, which leading to complicated setting work. In contrast, according to the present embodiment, it is possible to start the preliminary peeling operation with high accuracy by starting the preliminary peeling operation at the predetermined timing on the basis of the outer diameter of the wind-up roll 26 regardless of the thickness or the like of the backing sheet 11 of the sheet 10 to be used.

[0051] In addition, control, performed by the control unit 21 according to the embodiment, is not limited to the control of starting of the preliminary peeling operation that is performed on the basis of the outer diameter of the wind-up roll 26. The control unit 21 may also control the sheet supply mechanism 16 such that the sheet supply mechanism 16 changes the feeding speed of the sheet 10 when the outer diameter of the wind-up roll 26, which is detected by the rotation detection unit 44, becomes equal to or larger than the threshold of the predetermined outer diameter. With this control, for example, by reducing the feeding speed of the sheet 10, it is possible to correct, in accordance with the tension of the backing sheet 11, the operation for peeling off the front end 12a of the label 12 by an amount of the reference peeling by the peeling member 18, and it is thus possible to further suppress an occurrence of poor pasting of the label 12.

[0052] Furthermore, in accordance with a drop in the tension of the backing sheet 11, the orientation of the front end 12a of the label 12, which has been peeled off from the backing sheet 11, is changed. As a result of this, when the outer diameter of the wind-up roll 26, which is detected by the rotation detection unit 44, becomes equal to or larger than the threshold of the predetermined outer diameter, the control unit 21 may also control the pasting mechanism 19 such that the pasting mechanism 19 corrects the position of the blood collection tube 4 with respect to the front end 12a of the label 12. With this control, for example, in the case where the new label 12 is pasted on the label 12 that has already been pasted on the blood collection tube 4 in an overlapped manner, it is possible to appropriately paste the new label 12 by adjusting the orientation of the front end 12a of the new label 12 with respect to the blood collection tube 4, and by correcting the paste position of the new label 12 with respect to the label 12 that has already been pasted on the blood collection tube 4.

[0053] Furthermore, the control unit 21 may perform control such that, after the preliminary peeling operation has been started, the number of preliminary peeling operations to be performed on the single label 12, is increased on the basis of the outer diameter of the wind-up roll 26. In other words, the control unit 21 may perform control such that the preliminary peeling operation is started when the outer diameter of the wind-up roll 26 becomes equal to or larger than a first threshold, and then, the control unit 21 may perform control such that the number of preliminary peeling operations is increased when the outer diameter of the wind-up roll 26 becomes equal to or larger than a second threshold. As a result of this, it is possible to further suppress an occurrence of the poor pasting of the label 12 due to a drop in the tension of the backing sheet 11. Furthermore, the control unit 21 may also perform control such that the amount of preliminary peeling at the time of the preliminary peeling operation, is changed on the basis of the outer diameter of the wind-up roll 26, and the amount of reference peeling, at the time when the label 12 is pasted on the blood collection tube 4, is changed. With this control, it is possible to appropriately perform the preliminary peeling operation and the pasting operation in accordance with a drop in the tension of the backing sheet 11, due to a change in the outer diameter of the wind-up roll 26. In addition, the control unit 21 may also perform the above described plurality of types of control in combination, and it is thus possible to efficiently suppress an occurrence of poor pasting of the label 12.

(Method of controlling label pasting apparatus)

[0054] A method of controlling the label pasting apparatus 3 according to the embodiment causes the control unit 21 to execute a process of controlling the sheet supply mechanism 16 such that the sheet supply mechanism 16 starts, when it is detected by the rotation detection unit 44 that the outer diameter of the wind-up

roll 26, around which the backing sheet 11 is wound, becomes equal to or larger than the threshold of the predetermined outer diameter, the preliminary peeling operation for peeling off the front end 12a of the label 12 from the backing sheet 11 and returning the label 12 to the backing sheet 11 by feeding the sheet 10 backward, peels off the front end 12a of the label 12 from the backing sheet 11 after the preliminary peeling operation.

(Program for controlling label pasting apparatus)

[0055] The program for controlling the label pasting apparatus 3 according to the embodiment, causes the control unit 21 to execute a process of controlling the sheet supply mechanism 16 such that the sheet supply mechanism 16 starts, when it is detected by the rotation detection unit 44 that the outer diameter of the wind-up roll 26, around which the backing sheet 11 is wound, becomes equal to or larger than the threshold of the predetermined outer diameter, the preliminary peeling operation for peeling off the front end 12a of the label 12 from the backing sheet 11 and returning the label 12 to the backing sheet 11 by feeding the sheet 10 backward, peels off the front end 12a of the label 12 from the backing sheet 11 after the preliminary peeling operation.

(Effects of embodiment)

[0056] The label pasting apparatus 3 according to the embodiment includes the sheet supply mechanism 16 that includes the wind-up roll 26, the rotation detection unit 44 for detecting the outer diameter of the wind-up roll 26, and the control unit 21 that controls the sheet supply mechanism 16. The control unit 21 controls the sheet supply mechanism 16 such that the sheet supply mechanism 16 starts, when it is detected by the rotation detection unit 44 that the outer diameter of a wind-up roll 46 becomes equal to or larger than the threshold of the predetermined outer diameter, the preliminary peeling operation for peeling off the front end 12a of the label 12 from the backing sheet 11 and returning the label 12 to the backing sheet 11 by feeding the sheet 10 backward, and peels off the front end 12a of the label 12 from the backing sheet 11 after the preliminary peeling operation. As a result of this, the label pasting apparatus 3 is able to start the preliminary peeling operation at the timing, at which the tension of the backing sheet 11 is reduced in accordance with an increase in the outer diameter of the wind-up roll 26 and poor pasting of the label 12 is likely to occur, and is able to prevent an occurrence of poor pasting of the label 12. Furthermore, the label pasting apparatus 3 is able to enhance the pasting efficiency of the label 12 by avoiding the preliminary peeling operation, which is performed on all of the labels 12 that are included in the roll sheet.

[0057] Furthermore, the control unit 21 included in the label pasting apparatus 3 according to the embodiment determines, when the wind-up roll 26 starts to wind up the backing sheet 11, whether or not the tension of the backing sheet 11 whose starting end side has been wound around the wind-up roll 26, is equal to or larger than the predetermined tension, on the basis of the speed of rotation of the wind-up roll 26, which is detected by the rotation detection unit 44. As a result of this, the rotation detection unit 44 has the function for detecting the outer diameter of the wind-up roll 26, and also has the function for detecting the tension of the backing sheet 11 that is obtained when the wind-up roll 26 starts to wind up the backing sheet 11, so that it is possible to suppress an increase in the number of rotation detection units that is used to control the sheet supply mechanism 16, and it is thus possible to simplify the configuration of the sheet supply mechanism 16.

[0058] Furthermore, the control unit 21, included in the label pasting apparatus 3 according to the embodiment, controls the sheet supply mechanism 16 such that the sheet supply mechanism 16 changes the feeding speed of the sheet 10 when the outer diameter of the wind-up roll 26, which is detected by the rotation detection unit 44, becomes equal to or larger than the threshold of the predetermined outer diameter. As a result of this, it is possible to correct, in accordance with the tension of the backing sheet 11, an operation for peeling off the front end 12a of the label 12 by the amount of the reference peeling by the peeling member 18, and it is thus possible to further suppress an occurrence of poor pasting of the label 12.

[0059] Furthermore, the control unit 21, included in the label pasting apparatus 3 according to the embodiment, controls the sheet supply mechanism 16 such that the sheet supply mechanism 16 corrects the position of the blood collection tube 4 with respect to the front end 12a of the label 12 when the outer diameter of the wind-up roll 26, which is detected by the rotation detection unit 44, becomes equal to or larger than the threshold of the predetermined outer diameter. As a result of this, for example, in the case where the new label 12 is pasted on the label 12 that has already been pasted on the blood collection tube 4 in an overlapped manner, it is possible to appropriately paste the new label 12 by adjusting the orientation of the front end 12a of the new label 12 with respect to the blood collection tube 4, and by correcting the paste position of the new label 12 with respect to the label 12 that has already been pasted on the blood collection tube 4.

Reference Signs List

[0060]

1 blood collection tube preparation apparatus
3 label pasting apparatus
4 blood collection tube (cylindrical body)
10 sheet
11 backing sheet (base material)
12 label

12a front end
12b rear end
13 adhesive agent
16 sheet supply mechanism (feeding mechanism)
17 printing unit
18 peeling member
19 pasting mechanism
21 control unit
23 supply roll
26 wind-up roll
44 rotation detection unit (detection unit)

Claims

1. A label pasting apparatus comprising:

a feeding mechanism that includes

a supply roll around which a sheet, which includes a base material and a label that is provided on the base material by means of an adhesive agent, is wound, and
a wind-up roll around which the base material, which is included in the sheet that is supplied from the supply roll, is wound;

a printing unit that performs printing on the label;
a peeling member that peels off the label from the base material included in the sheet that has been fed by the feeding mechanism;
a pasting mechanism that pastes the label, whose front end of the sheet in a feeding direction has been peeled off from the base material, on a cylindrical body along an outer circumferential surface;
a detection unit for detecting an outer diameter of the wind-up roll, around which the base material has been wound; and
a control unit that controls the feeding mechanism, wherein
the control unit controls the feeding mechanism such that the feeding mechanism starts, when it is detected by the detection unit that the outer diameter of the wind-up roll becomes equal to or larger than a predetermined outer diameter, a preliminary peeling operation for peeling off the front end of the label from the base material and returning the label to the base material by feeding the sheet backward, and peels off the front end of the label from the base material after the preliminary peeling operation.

2. The label pasting apparatus according to claim 1, wherein, when the wind-up roll starts to wind up the base material, the control unit determines whether or not tension of the base material, whose starting end side has been wound around the wind-up roll, becomes equal to or larger than predetermined tension based on a speed of rotation of the wind-up roll detected by the detection unit.

3. The label pasting apparatus according to claim 1, wherein, when the outer diameter of the wind-up roll, detected by the detection unit, becomes equal to or larger than the predetermined outer diameter, the control unit controls the feeding mechanism such that the feeding mechanism changes a feeding speed of the sheet.

4. The label pasting apparatus according to claim 1, wherein, when the outer diameter of the wind-up roll, detected by the detection unit, becomes equal to or larger than the predetermined outer diameter, the control unit controls the pasting mechanism such that the pasting mechanism corrects a position of the cylindrical body with respect to the front end of the label.

5. The label pasting apparatus according to claim 1, wherein the cylindrical body is a blood collection tube.

6. A method of controlling a label pasting apparatus that includes

a feeding mechanism that includes

a supply roll around which a sheet, which includes a base material and a label that is provided on the base material by means of an adhesive agent, is wound, and
a wind-up roll around which the base material, which is included in the sheet that is supplied from the supply roll, is wound,

a printing unit that performs printing on the label,
a peeling member that peels off the label from the base material included in the sheet that has been fed by the feeding mechanism,
a pasting mechanism that pastes the label, whose front end of the sheet in a feeding direction has been peeled off from the base material, on a cylindrical body along an outer circumferential surface, and

a control unit that controls the feeding mechanism,
the method that causes the control unit to execute a process comprising:
controlling the feeding mechanism such that the feeding mechanism starts, when it is detected by the detection unit that the outer diameter of the wind-up roll becomes equal to or larger than a predetermined outer diameter, a preliminary peeling operation for peeling off the front end of the label from the base material and returning the label to the base

material by feeding the sheet backward, and peels off the front end of the label from the base material after the preliminary peeling operation.

7. A program for controlling a label pasting apparatus that includes

a feeding mechanism that includes

a supply roll around which a sheet, which includes a base material and a label that is provided on the base material by means of an adhesive agent, is wound, and
a wind-up roll around which the base material, which is included in the sheet that is supplied from the supply roll, is wound,

a printing unit that performs printing on the label,
a peeling member that peels off the label from the base material included in the sheet that has been fed by the feeding mechanism,
a pasting mechanism that pastes the label, whose front end of the sheet in a feeding direction has been peeled off from the base material, on a cylindrical body along an outer circumferential surface, and

a control unit that controls the feeding mechanism, the program that causes the control unit to execute a process comprising:
controlling the feeding mechanism such that the feeding mechanism starts, when it is detected by the detection unit that the outer diameter of the wind-up roll becomes equal to or larger than a predetermined outer diameter, a preliminary peeling operation for peeling off the front end of the label from the base material and returning the label to the base material by feeding the sheet backward, and peels off the front end of the label from the base material after the preliminary peeling operation.

FIG.1

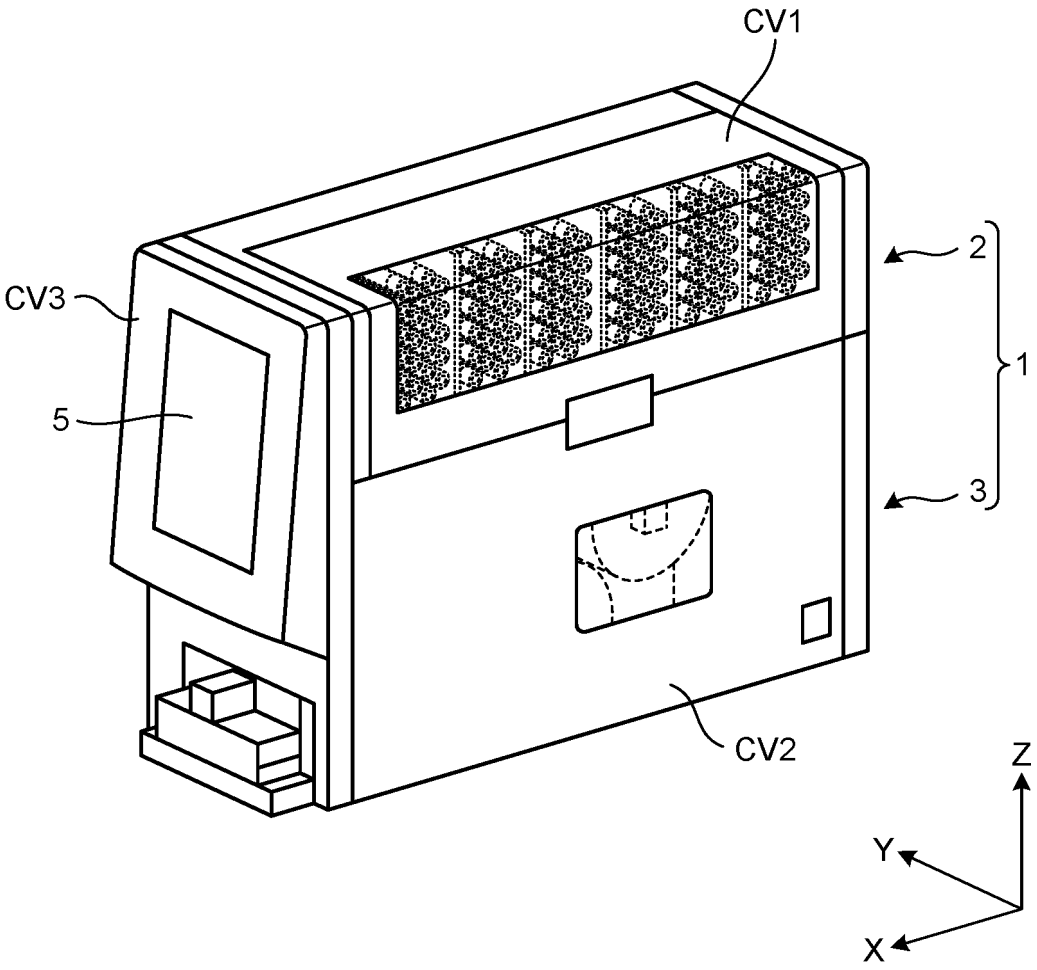


FIG.2

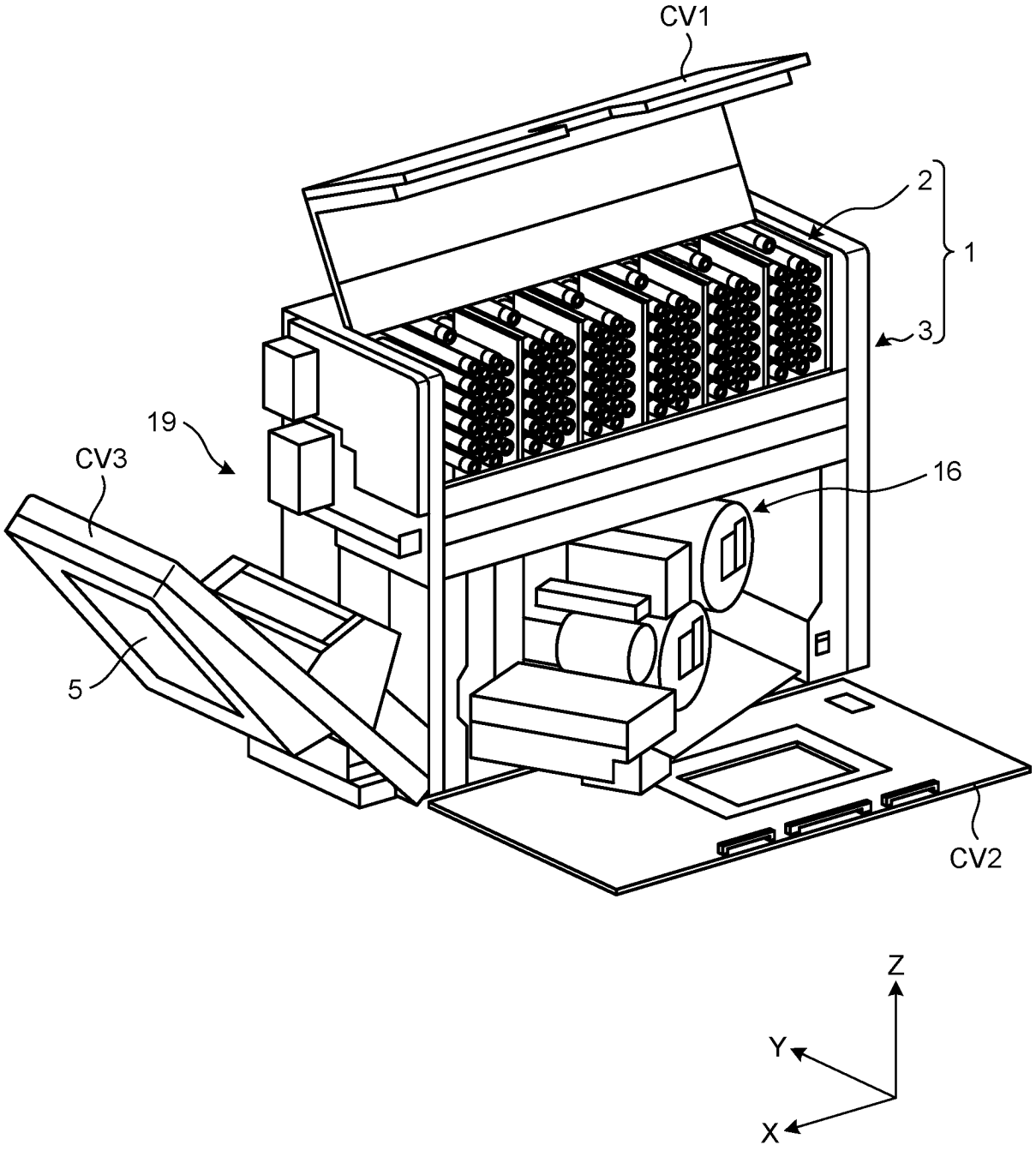


FIG.3

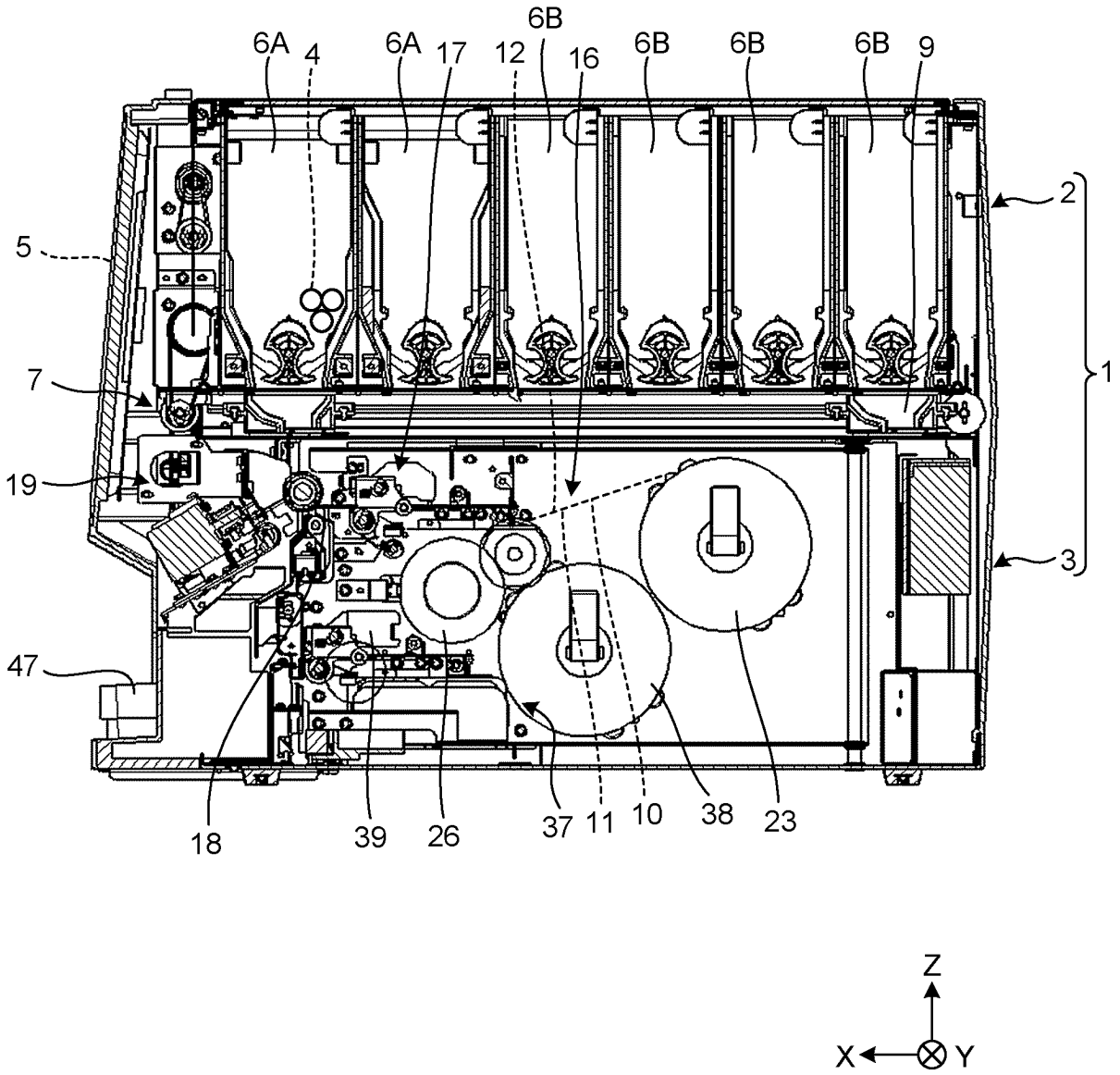
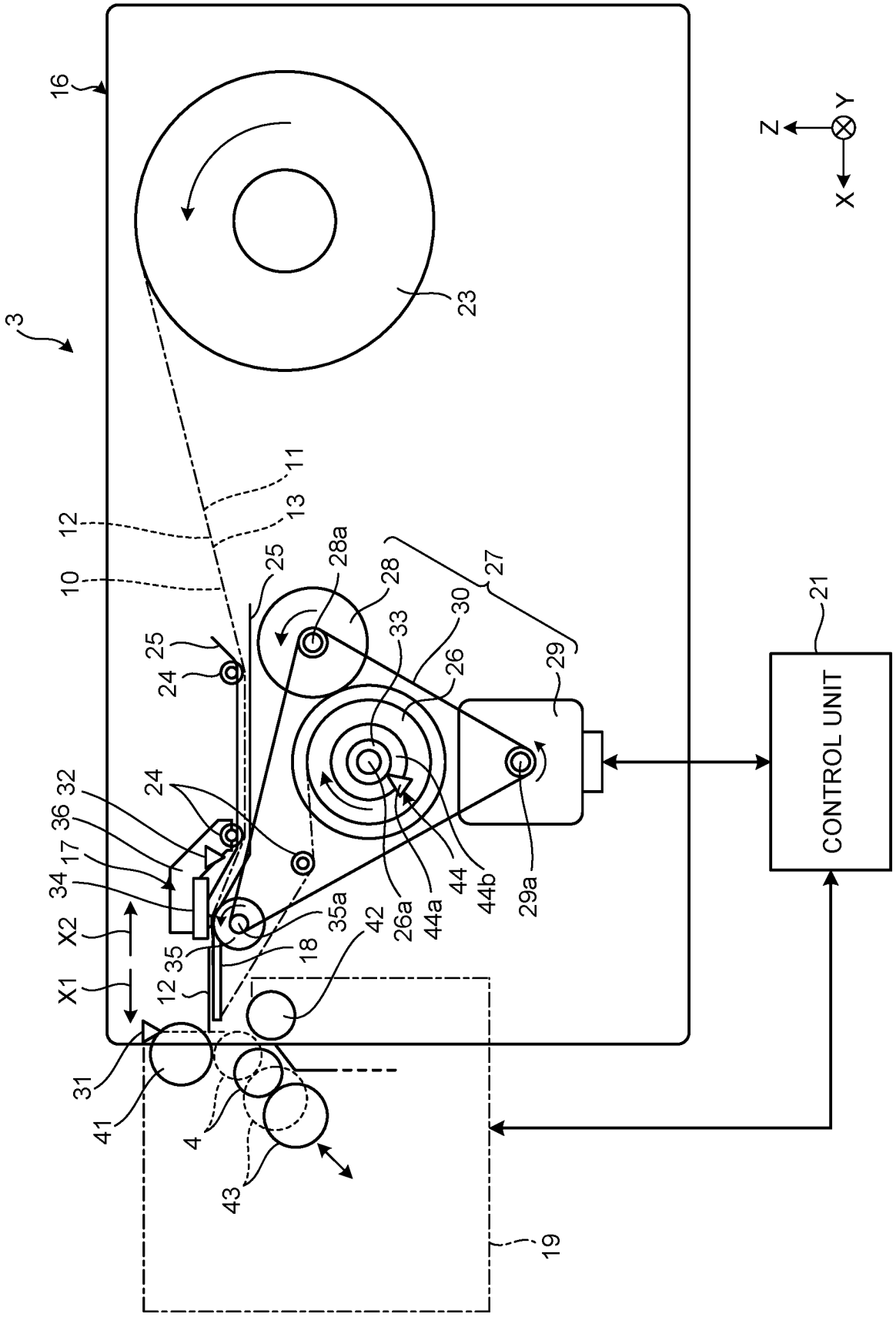


FIG.4


16
3
23
Z
Y
X
11
13
12
10
25
28a
28
27
30
33
26
29
21
CONTROL UNIT
25
24
24
32
36
17
34
X2
X1
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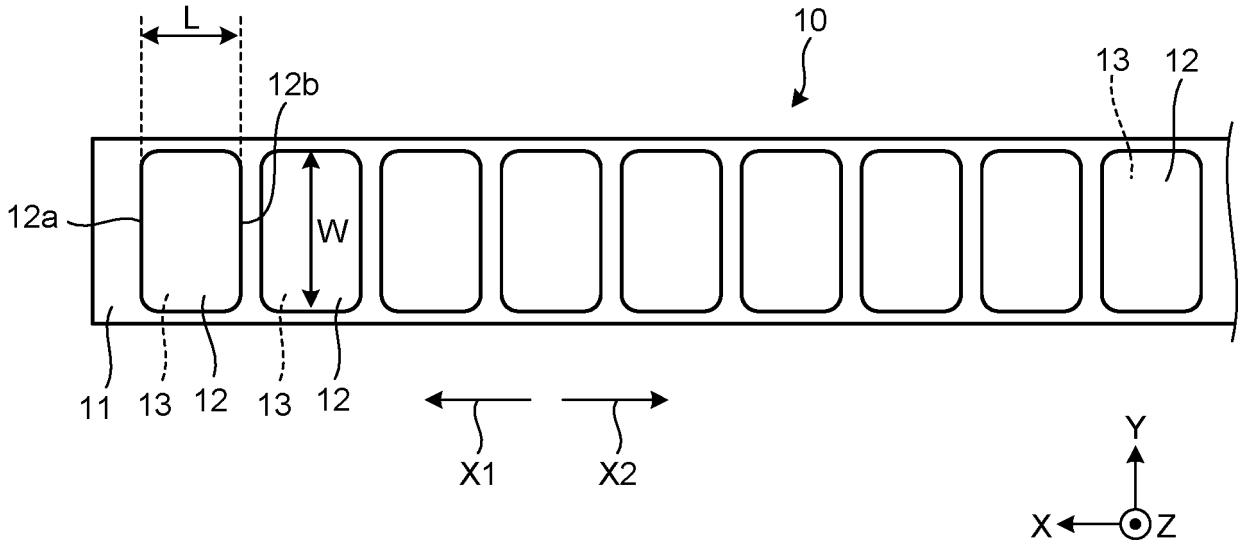
12
18
35a
42
26a
44a
44
44b
29a
31
41
4
43
19

FIG.5


L
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12b
13
12
12a
W
11
13
12
13
12
X1
X2
Y
X
Z

FIG.6

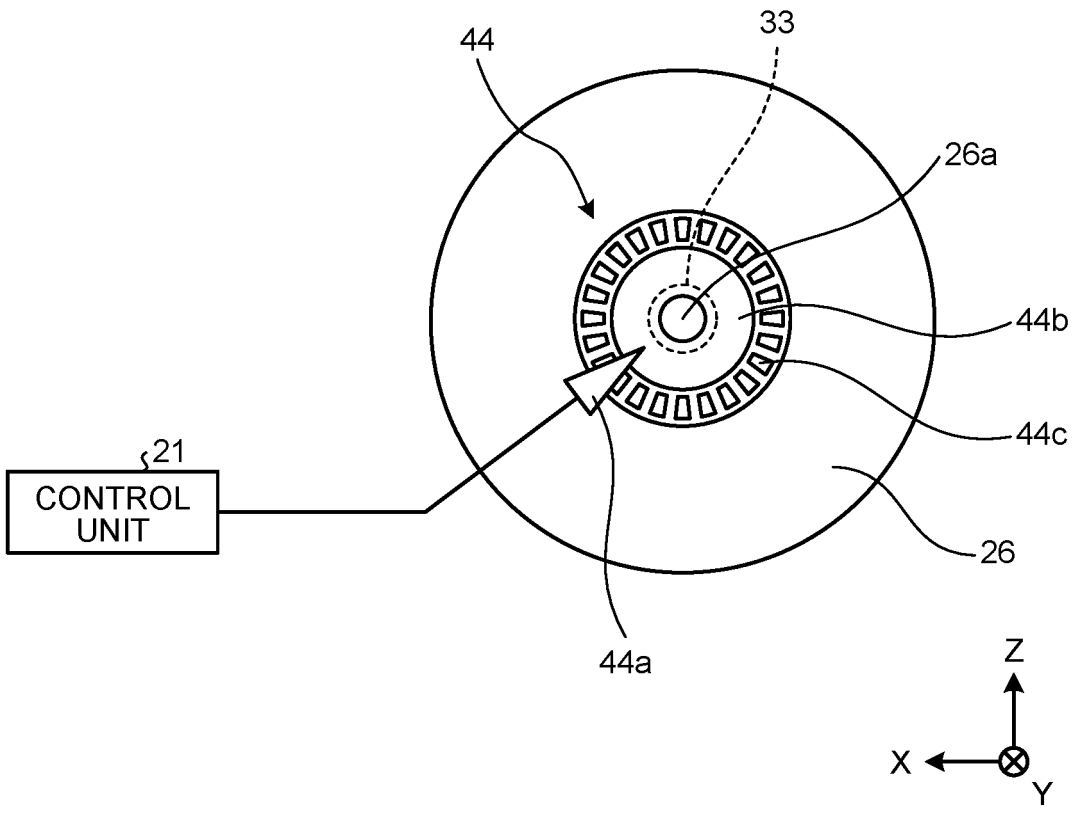
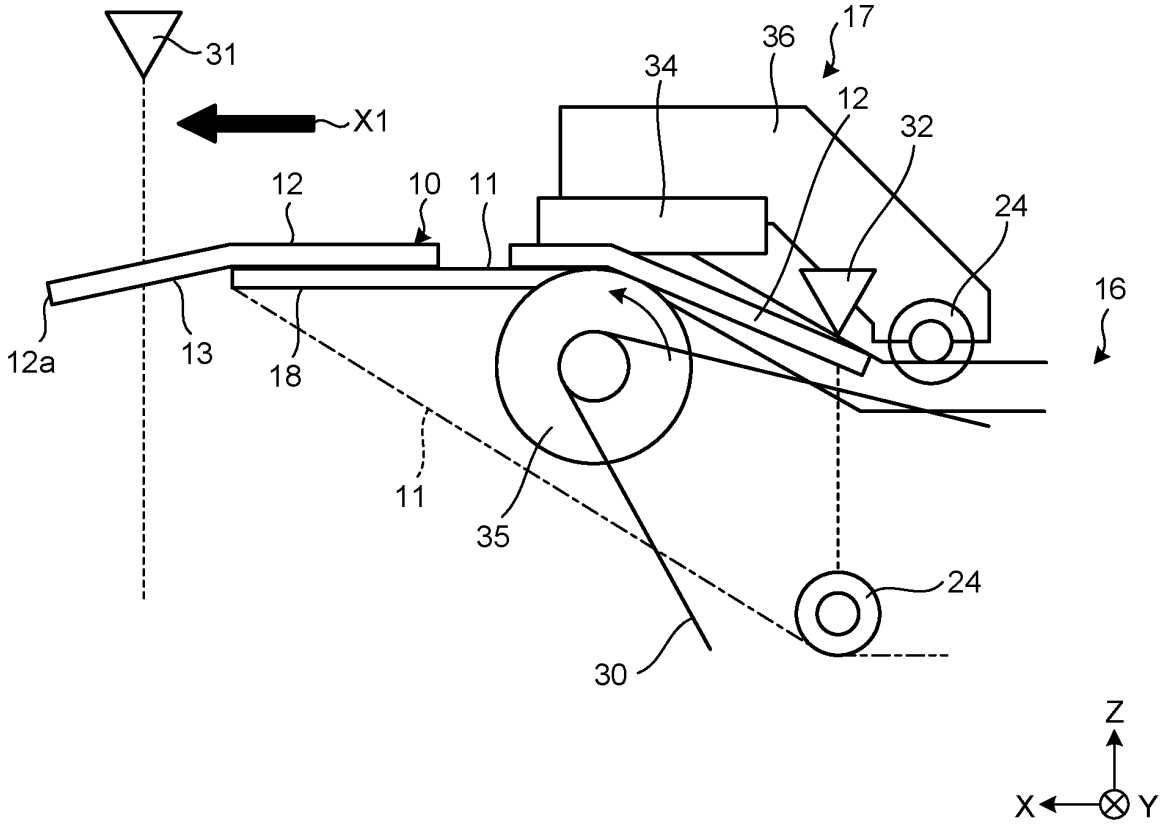

44
33
26a
44b
44c
21
CONTROL UNIT
26
44a
Z
X
Y

FIG.7A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X1
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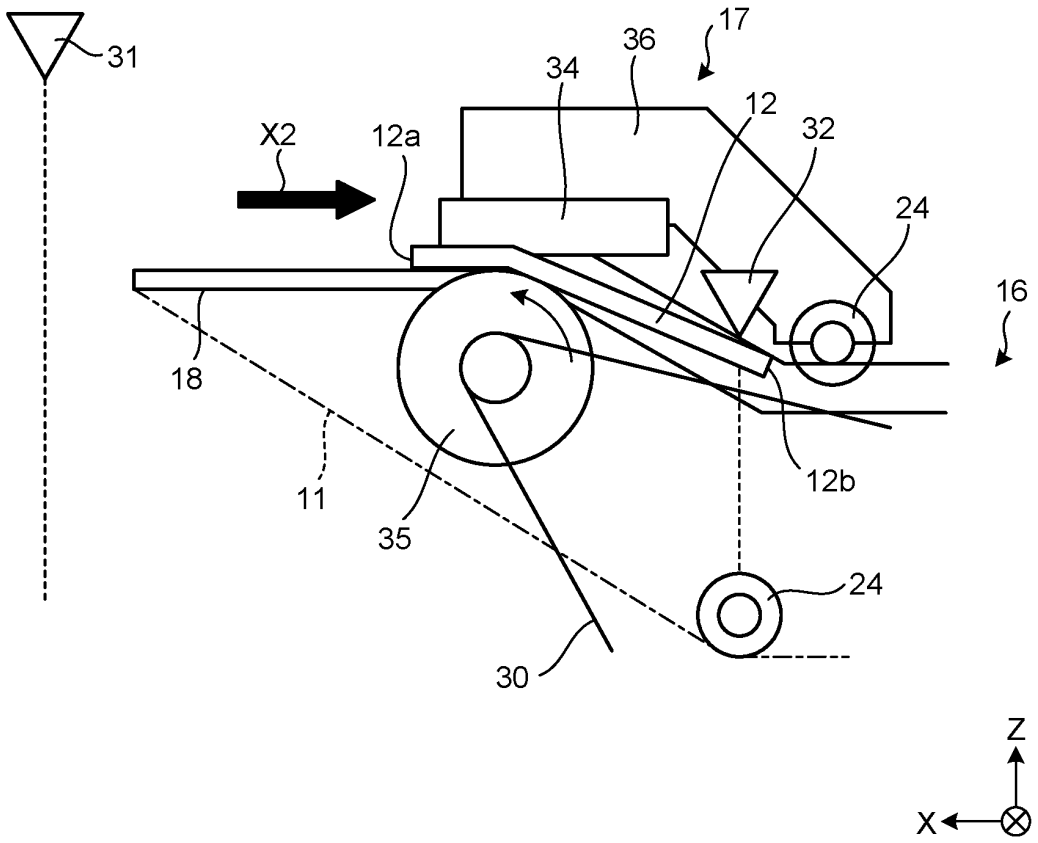
10
11
34
36
17
12
32
24
16
12a
13
18
11
35
24
30
Z
X
Y

FIG.7B


31
X2
12a
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36
17
12
32
24
16
18
11
35
12b
24
30
Z
X
Y

FIG.8

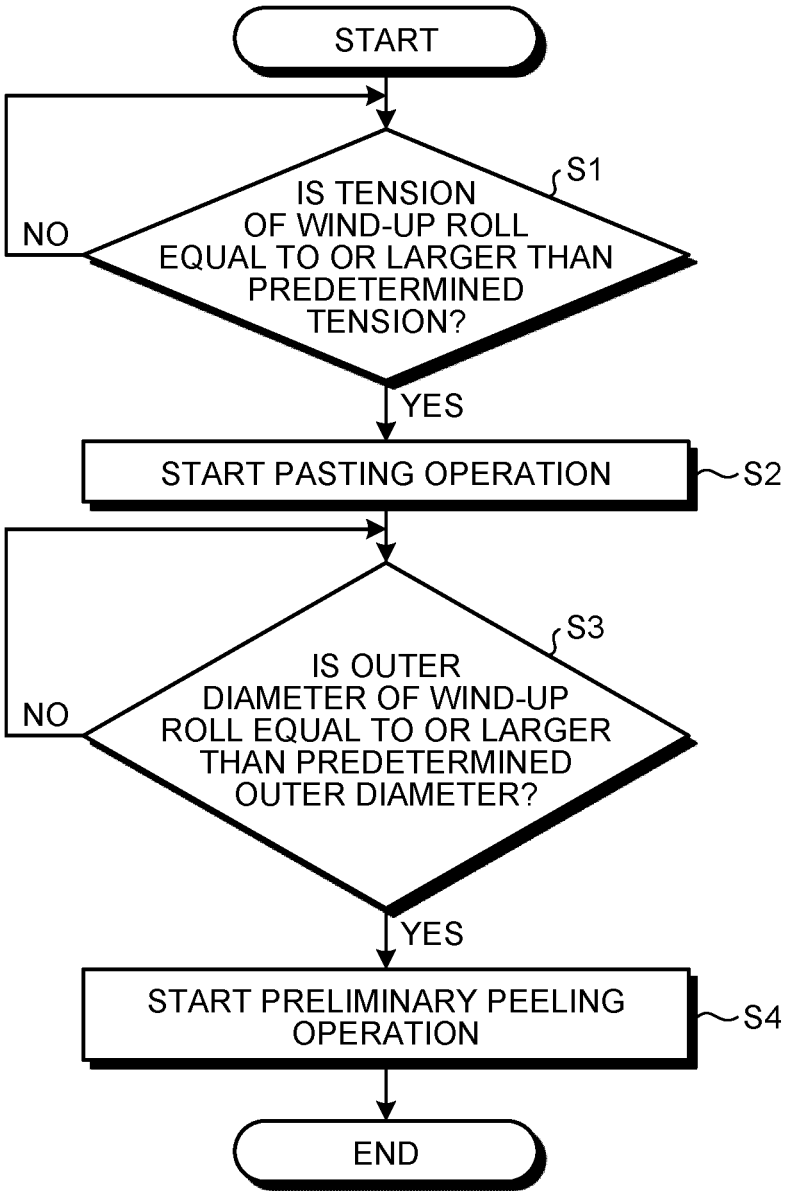
START
S1
IS TENSION OF WIND-UP ROLL EQUAL TO OR LARGER THAN PREDETERMINED TENSION?
NO
YES
START PASTING OPERATION
S2
S3
IS OUTER DIAMETER OF WIND-UP ROLL EQUAL TO OR LARGER THAN PREDETERMINED OUTER DIAMETER?
NO
YES
START PRELIMINARY PEELING OPERATION
S4
END

FIG.9

NUMBER OF PASTED LABELS	OUTER DIAMETER OF WIND-UP ROLL ϕ (mm)	AMOUNT OF CONVEYANCE AT TIME OF PRINTING PERFORMED ON SINGLE LABEL (mm)	ROTATION ANGLE OF ROTATION AXIS AT TIME OF PRINTING PERFORMED ON SINGLE LABEL (deg)	TENSION OF BACKING SHEET (N)
0 LABELS	20.0	30	164.6	12.50
300 LABELS	35.9	30	95.8	6.96
600 LABELS	46.2	30	74.4	5.41
900 LABELS	54.6	30	63.0	4.58

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2021/047446

A. CLASSIFICATION OF SUBJECT MATTER

B65C 3/08(2006.01)i; ***B65C 9/42***(2006.01)i
FI: B65C3/08; B65C9/42

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)

B65C3/08; B65C9/42

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

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2022
Registered utility model specifications of Japan 1996-2022
Published registered utility model applications of Japan 1994-2022

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	WO 2020/261445 A1 (FUJITSU FRONTECH LTD) 30 December 2020 (2020-12-30) paragraphs [0001], [0007], [0014]-[0019], [0069], fig. 4-6	1-3, 5-7
A		4
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 146078/1986 (Laid-open No. 53314/1988) (TOKIWA KOGYO KK) 09 April 1988 (1988-04-09), specification, p. 2, lines 6-11, p. 3, line 18 to p. 6, line 17	1-3, 5-7
Y	JP 2017-132576 A (STAR MFG CO) 03 August 2017 (2017-08-03) paragraphs [0001], [0004]-[0006], [0010]-[0011], [0021], [0066]	1-3, 5-7
Y	JP 56-123231 A (DATAFILE LTD) 28 September 1981 (1981-09-28) p. 12, upper right column, line 18 to lower right column, line 19	2
A	JP 59-223643 A (FUJI XEROX CO LTD) 15 December 1984 (1984-12-15) entire text, all drawings	1–7

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

* Special categories of cited documents:
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 February 2022	**08 March 2022**

Name and mailing address of the ISA/JP	Authorized officer
Japan Patent Office (ISA/JP) **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2021/047446

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
WO 2020/261445 A1	30 December 2020	(Family: none)	
JP 63-53314 U1	09 April 1988	(Family: none)	
JP 2017-132576 A	03 August 2017	(Family: none)	
JP 56-123231 A	28 September 1981	US 4294644 A column 13, lines 17-64 EP 33609 A1	
JP 59-223643 A	15 December 1984	(Family: none)	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2020261445 A **[0006]**