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(54) **PRINTING DEVICE**

(57) The present invention provides a printing device with which a device size reduction is possible. This printing device comprises: a table having a placement surface on which food is placed; and a carriage on which

a head that discharges edible ink toward the food and an ink supply unit that supplies ink to the head are mounted and which is movable in a main scanning direction along the placement surface.

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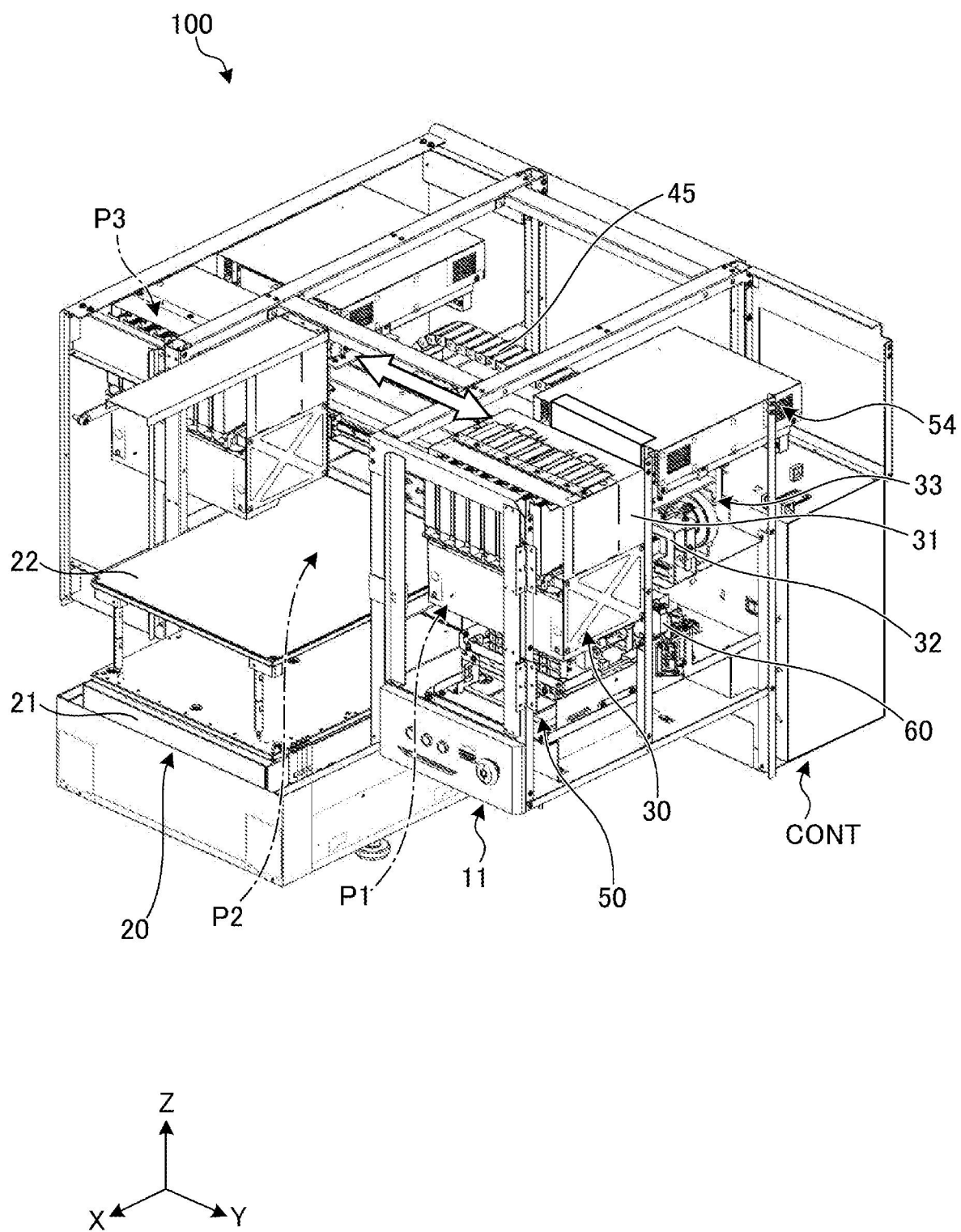


FIG. 2

Description

Technical Field

[0001] The present invention relates to a printing apparatus.

Background Art

[0002] For example, an inkjet-based printing apparatus that discharges edible ink onto food (for example, see Patent Document 1) is known as an apparatus for forming characters, patterns, and the like on food such as confectionery.

Related Art Document

Patent Document

[0003] Patent Document 1: Japanese Patent No. 6888719

SUMMARY OF INVENTION

Problem to be Solved by the Invention

[0004] In regard to the above printing apparatus, there is a need to make the apparatus compact.

[0005] The present invention has been made in view of the above, and an object of the present invention is to provide a printing apparatus that can be made compact.

Means for Solving the Problem

[0006] A printing apparatus according to the present invention includes: a table that has a placement surface for placing food; and a carriage on which a head that discharges edible ink toward the food and an ink supply unit that supplies ink to the head are mounted, and which is movable in a main scanning direction along the placement surface.

[0007] Further, a printing apparatus according to the present invention includes: a table that has a placement surface for placing food; a carriage on which a head that discharges edible ink toward the food is mounted and which is movable in a main scanning direction with respect to the table; a guide bar that is arranged along the main scanning direction and guides the carriage; and a carriage drive unit that is arranged on a rear side of the guide bar when the printing apparatus is viewed from a front, is provided in a range which does not protrude from the guide bar in the main scanning direction, and drives the carriage.

[0008] Further, a printing apparatus according to the present invention includes: a table that has a placement surface for placing a medium and is movable in a sub-scanning direction along the placement surface; a carriage on which a head that discharges ink toward the

medium is mounted and which is movable in a main scanning direction that is a direction along the placement surface and intersects the sub-scanning direction; and a control unit that controls operation of the table, operation of the carriage, and operation of the head. The head includes a nozzle row in which a plurality of nozzles are aligned in the sub-scanning direction, and has a configuration in which a plurality of the nozzle rows are provided in the main scanning direction. In a case of starting discharge of the ink to a printing target region on the medium, the control unit arranges the head and the table so that ends, on a movement direction side of the table in the sub-scanning direction, of the nozzle row and the printing target region face each other, and discharges the ink from nozzles facing the printing target region to the printing target region while moving the head in the main scanning direction, with a relative positional relationship between the table and the head in the sub-scanning direction maintained.

Effects of the Invention

[0009] According to the present invention, the apparatus can be made compact.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

[FIG. 1] FIG. 1 is a view showing one example of the printing apparatus according to the present embodiment.

[FIG. 2] FIG. 2 is a view showing one example of the printing apparatus according to the present embodiment.

[FIG. 3] FIG. 3 is a view showing one example of the printing apparatus according to the present embodiment.

[FIG. 4] FIG. 4 is a perspective view showing one example of the table unit.

[FIG. 5] FIG. 5 is an exploded perspective view showing one example of the cover member.

[FIG. 6] FIG. 6 is a perspective view showing the configuration of a part of the image forming unit.

[FIG. 7] FIG. 7 is a perspective view of the carriage as viewed from below on the front side.

[FIG. 8] FIG. 8 is a view of the carriage as viewed from the front side.

[FIG. 9] FIG. 9 is a perspective view showing one example of the ink cartridge.

[FIG. 10] FIG. 10 is a view of the carriage as viewed from the rear side.

[FIG. 11] FIG. 11 is a view showing one example of the rear side of the carriage.

[FIG. 12] FIG. 12 is a view showing one example of the carriage drive unit.

[FIG. 13] FIG. 13 is a view showing one example of the carriage drive unit.

[FIG. 14] FIG. 14 is a view showing one example of the carriage drive unit.

[FIG. 15] FIG. 15 is a view showing one example of the carriage drive unit.

[FIG. 16] FIG. 16 is a view showing one example of the printing operation in the printing apparatus.

[FIG. 17] FIG. 17 is a view showing one example of the printing operation in the printing apparatus.

[FIG. 18] FIG. 18 is a view showing one example of the printing apparatus according to the present embodiment.

DESCRIPTION OF THE EMBODIMENTS

[0011] Hereinafter, an embodiment of a printing apparatus 100 according to the present invention will be described based on the drawings. It is noted that the present invention is not limited by the present embodiment. Furthermore, components in the following embodiment include components that may be easily replaced by those skilled in the art, or components that are substantially the same.

[0012] In the present embodiment, directions in the drawings are described using an XYZ coordinate system. In the XYZ coordinate system, a plane parallel to a floor surface on which the printing apparatus 100 is placed is defined as an XY plane. On this XY plane, a main scanning direction which is a movement direction of a head is denoted as a Y direction, and a direction orthogonal to the X direction on the XY plane is denoted as an X direction. Further, a direction perpendicular to the XY plane (height direction) is denoted as a Z direction. For each of the X direction, Y direction, and Z direction, the direction of the arrow in the drawings is a + direction, and the direction opposite to the direction of the arrow is a - direction. In the present embodiment, the +X direction may be denoted as a front direction (front side), the -X direction as a rear direction (rear side), the +Y direction as a left direction (left side), the -Y direction as a right direction (right side), the +Z direction as an upper direction (upper side), and the -Z direction as a lower direction (lower side).

[0013] FIG. 1 to FIG. 3 are views showing one example of the printing apparatus 100 according to the present embodiment. FIG. 1 is a perspective view, FIG. 2 is a view with a housing 10 removed, and FIG. 3 is a front view. Further, FIG. 2 shows both a state in which a carriage 31 is arranged at a standby position P1 and a state in which the carriage 31 is arranged at a movement end position P3.

[0014] The printing apparatus 100 includes a housing 10, a table unit 20, an image forming unit 30, a maintenance unit 50, and a control unit CONT. The printing apparatus 100 exemplified in the present embodiment is an inkjet-based printing apparatus that discharges edible ink onto food, for example, as an apparatus for forming characters, patterns, and the like on food such as confectionery. The control unit CONT comprehensively controls the operation of each of the table unit 20, the image

forming unit 30, and the maintenance unit 50.

[0015] The housing 10 forms the exterior of the printing apparatus 100. The housing 10 is provided with an operation unit 11. An operator performs various operations on the printing apparatus 100 through the operation unit 11. The operation unit 11 is provided with an operation member 12, a slot 13, and the like. Examples of the operation member 12 include buttons, dials, and the like. The operation member 12 is formed to reduce a gap between the operation member 12 and the housing 10. A storage medium that stores data such as printing count in the printing apparatus 100 is detachably provided in the slot 13. Furthermore, the housing 10 has a lid portion 14. By opening the lid portion 14, the standby position P1 which will be described later becomes accessible. The housing 10 may also have a cleaning window on at least one side surface in the Y direction, for example.

[0016] The table unit 20 includes a base 21, a table 22, and a table drive unit 23. FIG. 4 is a perspective view showing one example of the table unit 20 according to the present embodiment.

[0017] The base 21 supports the table 22 and the table drive unit 23. The base 21 includes a guide unit 24 that guides the table 22. The guide unit 24 is formed along the X direction.

[0018] The table 22 includes a top plate portion 25 and a top plate support portion 26. The top plate portion 25 is attachable to and detachable from the top plate support portion 26. The top plate portion 25 has, for example, a flat plate shape and includes a placement surface 25a. The placement surface 25a is arranged horizontally when the top plate portion 25 is mounted to the top plate support portion 26, and a medium M is placed thereon. The medium M is, for example, food such as confectionery. The placement surface 25a is formed flat to make it easy to remove foreign matter.

[0019] The top plate support portion 26 supports the top plate portion 25. The top plate support portion 26 includes a plate-shaped portion 26a and a columnar portion 26b. The top plate portion 25 is arranged on the upper surface of the plate-shaped portion 26a.

[0020] The plate-shaped portion 26a has a positioning portion 26c on the upper surface. A convex portion or a concave portion formed on the upper surface of the plate-shaped portion 26a may be used as the positioning portion 26c. Examples of the convex portion include the head of a screw portion provided on the upper surface of the plate-shaped portion 26a. The positioning portion 26c is provided at four corners of the plate-shaped portion 26a. The top plate portion 25 has cutout portions 25c formed at locations corresponding to the four corners. By arranging the four cutout portions 25c at positions corresponding to the four positioning portions 26c, movement of the top plate portion 25 in the horizontal direction is restricted.

[0021] The columnar portion 26b is connected to a cover member 29 that covers the table drive unit 23. With the columnar portion 26b connected to the cover member

29, the table 22 moves in the X direction along the guide unit 24 together with the table drive unit 23 and the cover member 29.

[0022] The table drive unit 23 moves the table 22 in the X direction and the Z direction. The table drive unit 23 includes an X drive system 23a for moving the table 22 in the X direction, and a Y drive system 23b for moving the table 22 in the Y direction. The X drive system 23a and the Y drive system 23b each include a drive source such as a motor, and a transmission mechanism that transmits the driving force of the drive source to the table 22. Examples of the transmission mechanism of the X drive system 23a include a belt mechanism or the like. Examples of the transmission mechanism of the Y drive system 23b include a cam mechanism or the like. The configurations of the X drive system 23a and the Y drive system 23b are not limited to the above, and may be other configurations.

[0023] The cover member 29 is formed in a box shape to accommodate the table drive unit 23. FIG. 5 is an exploded perspective view showing one example of the cover member 29. As shown in FIG. 5, the cover member 29 has a frame portion 29a and a lid portion 29b. The frame portion 29a is formed in a rectangular frame shape to surround sides (front, rear, left, right) of the table drive unit 23. The lid portion 29b is arranged to be placed over the frame portion 29a from above. The lid portion 29b is arranged to cover the outer peripheral side and the upper side of the frame portion 29a. The lid portion 29b may prevent foreign matter from entering the interior of the cover member 29. The upper surface of the lid portion 29b is formed flat.

[0024] The frame portion 29a is provided with bottom bent pieces 29c that bend inward from the lower ends at the front and rear. The bottom bent pieces 29c may more reliably prevent foreign matter from entering the interior of the cover member 29.

[0025] It is noted that the configuration of the cover member is not limited to the above-described cover member 29, and may be, for example, a bellows-like configuration that is arranged above the table drive unit 23 and provided to be extendable in the movement direction (X direction) of the table drive unit 23.

[0026] The image forming unit 30 includes a carriage 31, a guide bar 32, and a carriage drive unit 33. FIG. 6 is a perspective view showing a partial configuration of the image forming unit 30. FIG. 7 is a perspective view of the carriage 31 as viewed from below on the front side. FIG. 8 is a view of the carriage 31 as viewed from the front side.

[0027] The carriage 31 is formed in a box shape and is supported by the guide bar 32. The carriage 31 is movable in the Y direction along the guide bar 32. A head 34 and an ink supply unit are mounted on the carriage 31. A carriage cover 31a is provided at the front of the carriage 31. The carriage cover 31a covers the lower side from a holder 37, that is, a part where the head 34 is provided, on the front side of the carriage 31.

[0028] A plurality of heads 34 are provided on the bottom surface of the carriage 31. The plurality of heads

34 are arranged and aligned in the Y direction which is the main scanning direction. In the present embodiment, for example, two heads 34 are arranged with an interval in the Y direction. The two heads 34 are arranged at positions shifted in the X direction.

[0029] Each head 34 has a plurality of nozzles 34N. The plurality of nozzles 34N are arranged in a state of being aligned in the X direction, and form a nozzle row 34L. A plurality of nozzle rows 34L are arranged in the Y direction, for example, corresponding to the number of holders 37. Each head 34 discharges ink for image formation from the nozzles 34N to the placement surface 25a of the table 22. The head 34 discharges, for example, edible ink to the placement surface 25a as the ink. As such edible ink, for example, black edible ink, color edible ink, and the like may be appropriately used according to the color of the image. The carriage 31 scans the placement surface 25a in the Y direction through movement over the placement surface 25a in the Y direction which is the main scanning direction.

[0030] The ink supply unit supplies ink to the head 34. The ink supply unit includes an ink cartridge 36, a holder 37, a circulation mechanism 38, and a guide member 39.

[0031] FIG. 9 is a perspective view showing one example of the ink cartridge 36. As shown in FIG. 9, the ink cartridge 36 includes a cartridge body 36a, an ink storage bag 36b, and an ink remaining amount detection plate 36c.

[0032] The cartridge body 36a includes a storage portion 36d and a lid portion 36e. The storage portion 36d accommodates the ink storage bag 36b. The storage portion 36d is provided with a positioning portion 36g that positions a supply port 36f of the ink storage bag 36b. The lid portion 36e opens and closes the storage portion 36d.

[0033] The ink storage bag 36b is provided to be detachable from the cartridge body 36a. The ink storage bag 36b stores ink and deforms according to the ink storage amount.

[0034] The ink remaining amount detection plate 36c is supported by, for example, the lid portion 36e of the cartridge body 36a. The ink remaining amount detection plate 36c is biased toward the bottom surface of the storage portion 36d by an elastic member 36i. In response to the lid portion 36e being closed in a state where the ink storage bag 36b is accommodated in the cartridge body 36a, the ink storage bag 36b is held between the bottom surface of the storage portion 36d and the ink remaining amount detection plate 36c by the elastic force of the elastic member 36i. In response to the ink storage amount in the ink storage bag 36b decreasing due to ink usage, the ink remaining amount detection plate 36c moves toward the bottom surface side of the storage portion 36d according to deformation (contraction) of the ink storage bag 36b. A part of the ink remaining amount detection plate 36c protrudes externally from the cartridge body 36a. Accordingly, the position of the ink remaining amount detection plate 36c may be detected

from outside the ink cartridge 36 in a state where the ink cartridge 36 is mounted in the holder 37.

[0035] The ink cartridge 36 is mounted in the holder 37. The ink cartridge 36 is detachable from the holder 37. The holder 37 of the present embodiment allows the ink cartridge 36 to be mounted and removed from the front side thereof. The cartridge body 36a has a protrusion portion 36h at the upper portion on the front side when mounted in the holder 37. The protrusion portion 36h is formed to protrude upward from the upper portion of the cartridge body 36a. The protrusion portion 36h is a portion for the user to place a finger when removing the ink cartridge 36 mounted in the holder 37.

[0036] The circulation mechanism 38 circulates ink from the ink cartridge 36 mounted in the holder 37 to the head 34. FIG. 10 is a view of the carriage 31 as viewed from the rear side. The circulation mechanism 38 includes a valve 38a, a tube 38b, and a damper 38c. The valve 38a is arranged on the rear side of each holder 37. The valve 38a has a rectangular shape that is longitudinal in one direction as viewed from the rear side. As viewed from the rear side, the valve 38a is arranged in a state of being inclined with respect to the up-down direction. This arrangement enables the valve 38a to be arranged compactly in the left-right direction.

[0037] The tube 38b extends downward from the valve 38a. Ink circulates through the interior of the tube 38b. The damper 38c is connected to the lower end of the tube 38b. The damper 38c supplies ink that has passed through the tube 38b to the head 34.

[0038] FIG. 11 is a view showing one example of the rear side of the carriage 31. In FIG. 11, the carriage 31 is omitted from illustration. As shown in FIG. 11, the guide member 39 is arranged from the rear side of the carriage 31 to below the valve 38a (see FIG. 8, FIG. 10, and so on). The guide member 39 includes a locking portion 39a, a first flat portion 39b, a step portion 39c, a second flat portion 39d, and a support portion 39e. The locking portion 39a is locked to the housing of an airflow generation unit 54 which will be described later. The first flat portion 39b is arranged to extend downward from the end on the front side of the locking portion 39a. The first flat portion 39b is arranged along the YZ plane. The step portion 39c extends toward the front side from the lower end of the first flat portion 39b. The step portion 39c is arranged along the XY plane. The second flat portion 39d is arranged to extend downward from the end on the front side of the step portion 39c. The second flat portion 39d is arranged along the YZ plane. The support portion 39e extends toward the front side from the lower end of the second flat portion 39d. The guide member 39 guides ink that has leaked from the circulation mechanism 38 to a predetermined position P4. At the predetermined position P4, an absorption member 40 is provided to absorb ink. The absorption member 40 has, for example, a rectangular plate shape and is supported by the support portion 39e of the guide member 39. The absorption member 40 is arranged above the damper 38c. The

absorption member 40 is arranged along the XY plane. The absorption member 40 has a slit 40a. The slit 40a is formed along the X direction from the end on the front side to the central portion of the absorption member 40. A plurality of slits 40a are arranged in the Y direction. For example, a porous member such as a sponge may be used as the absorption member 40. Further, the predetermined position P4 is arranged, for example, above the maintenance unit 50 that is arranged at the standby position P1 of the carriage 31. It is noted that the maintenance unit 50 includes a wiping device 51 that wipes the nozzle surface of the head 34, a suction device 52 that suctions the nozzle surface of the head 34, an absorption member 53 (see FIG. 6) that absorbs ink removed from the head 34 by performing maintenance of the head 34, and the like. It is noted that the absorption member 53 of the maintenance unit 50 may be used as the above-described absorption member 40. That is, a configuration in which the guide member 39 guides ink to the absorption member 53 may be employed. Further, the wiping device 51 may be provided with a wiper 51a to come into contact with the head 34 in a replaceable manner. Furthermore, the wiper 51a may have a structure that can be disassembled.

[0039] Further, the carriage 31 includes an airflow generation unit 54 that generates airflow in the main scanning direction. Examples of the airflow generation unit 54 include a fan or the like. The airflow generation unit 54 generates airflow in the main scanning direction, so that the direction of airflow generated by movement of the carriage 31 and the direction of airflow generated by the airflow generation unit 54 may match, thereby cooling the carriage 31 efficiently. Furthermore, by generating airflow in the main scanning direction, foreign matter such as dust generated with movement of the carriage 31 may be suppressed from falling toward the table 22 side.

[0040] The guide bar 32 is provided on the upper side of the table unit 20. The guide bar 32 is provided linearly along the main scanning direction parallel to the Y-axis direction. The guide bar 32 guides reciprocating movement of the carriage 31 along the main scanning direction. With guidance of the guide bar 32, the carriage 31 moves across the standby position P1, the printing cleaning position P2, and the movement end position P3 from the left side to the right side in the main scanning direction. The standby position P1 is a position where the carriage 31 stands by (so-called home position). The printing cleaning position P2 is a position above the table 22, and is a position where printing is performed by discharging ink from the head 34. Further, at the printing cleaning position P2, respective portions of the carriage 31 may also be cleaned. The movement end position P3 is a position at the end in the movement direction in the case of the carriage 31 moving to the opposite side from the standby position P1. That is, the carriage 31 is configured not to move to the other side (right side) beyond the movement end position P3.

[0041] The guide bar 32 is arranged in a state of

protruding to both sides of the table 22 along the main scanning direction. The guide bar 32 has a protrusion distance from the table 22 in the main scanning direction (right side: movement end position P3 side) that is shorter than the dimension of the carriage 31 in the main scanning direction (see FIG. 3). That is, a position immediately after the head 34 passes through the placement surface 25a of the table 22 is set as the movement end position P3 of the carriage 31. Thereby, the dimension of the printing apparatus 100 in the Y direction is suppressed.

[0042] The carriage drive unit 33 moves (scans) the carriage 31 in the main scanning direction with respect to the guide bar 32. FIG. 12 to FIG. 15 are views showing one example of the carriage drive unit 33. FIG. 12 is a view from the front left side, FIG. 13 is a view from the rear left side, FIG. 14 is a view from the front, and FIG. 15 is a view from the left side. The carriage drive unit 33 moves the head 34 in the main scanning direction by moving the carriage 31 in the main scanning direction. The carriage drive unit 33 is arranged on the rear side of the guide bar 32. The carriage drive unit 33 is provided in a range that does not protrude from the guide bar 32 along the main scanning direction, and drives the carriage 31.

[0043] The carriage drive unit 33 includes a belt member 41, a rotation drive source 42, a guide member 43, a movable portion 44, and a cable chain 45. The carriage drive unit 33 is arranged on the rear side of the guide bar 32, and is provided in a range where the carriage drive unit 33 does not protrude from the guide bar 32 in the main scanning direction, as viewed from the front.

[0044] The belt member 41 is endless. The belt member 41 is provided to be stretched between pulleys 46 arranged on both sides in the left-right direction. The belt member 41 is detachably connected to the carriage 31 at a connection portion.

[0045] The rotation drive source 42 generates a rotational driving force for rotating the belt member 41. The rotation drive source 42 has an output shaft 42a along the front-rear direction. The center of the output shaft 42a serves as a rotation axis AX. The rotation axis AX is parallel to the front-rear direction.

[0046] The guide member 43 is attached to the front of the guide bar 32. The guide member 43 may be formed using metal such as aluminum, for example. The guide member 43 is arranged to extend linearly in the main scanning direction.

[0047] The movable portion 44 is supported by the guide member 43 of the guide bar 32. The movable portion 44 is fixed to the belt member 41. A plurality of movable portions 44, for example two, are provided in the Y direction. Further, the movable portion 44 is connected to the carriage 31. The movable portion 44 is movable in the main scanning direction along the guide member 43. The carriage 31 is provided detachably from the movable portion 44. For example, the carriage 31 is mounted to the movable portion 44 using a screw member or the like. In this case, the carriage 31 may be removed from the movable portion 44 by removing the screw member.

The operation of attaching the carriage 31 to and detaching the carriage 31 from the movable portion 44 may be performed at the printing cleaning position P2, for example. It is noted that a portion for hanging the removed carriage 31 may be provided at the printing cleaning position P2.

[0048] The present embodiment has a configuration in which the belt member 41 and the movable portion 44 are arranged on both sides of the guide bar 32 in the front-rear direction. With the above configuration, the force acting on the movable portion 44 becomes uniform between the two movable portions 44 during acceleration and deceleration of the carriage 31. Therefore, wear between the guide member 43 and the movable portion 44 may be suppressed, thereby extending the service life of the guide member 43.

[0049] The cable chain 45 has one end in the longitudinal direction connected to the carriage 31 and the other end connected to the guide bar 32. The cable chain 45 holds the cable extending from the carriage 31. The cable chain 45 deforms according to movement of the carriage 31. The cable chain 45 is curved and folded back in the up-down direction at the end on the other side (right side) opposite to one side (left side) in the main scanning direction. The cable chain 45 is provided in a state where the other side in the longitudinal direction is open.

[0050] A receiving member 55 is provided at the bottom portion of the guide bar 32. The receiving member 55 is arranged to protrude from the bottom portion of the guide bar 32 toward the front side. The receiving member 55 receives foreign matter from the carriage drive unit 33, such as dust generated according to rotation of the belt member 41, for example, thereby suppressing the foreign matter from falling toward the table 22 side. The receiving member 55 is provided in at least a range of the guide bar 32 where the carriage 31 moves in the main scanning direction, that is, from an end on the inner side (right side in the Y direction) of the standby position P1 to an end on the inner side (left side in the Y direction) of the movement end position P3. It is noted that the receiving member 55 may be provided in a range over the entire guide bar 32 in the main scanning direction. The receiving member 55 may be provided to be detachable. For example, a configuration may be adopted in which a belt-shaped plate member is arranged on the receiving member 55 and the plate member is replaced.

[0051] Further, an area sensor 60 is provided inside the housing 10. The area sensor 60 emits detection light in the main scanning direction and detects the medium M placed on the placement surface 25a of the table 22 based on a detection result of the detection light. The area sensor 60 may detect, for example, the height of the medium M with respect to the placement surface 25a by emission of the detection light. The area sensor 60 may be arranged, for example, on the rear side of the carriage 31 inside the housing 10. In the area sensor 60 of the present embodiment, a light emitting portion and a light receiving portion for the detection light are arranged at

the left end inside the housing 10, and the detection light is emitted toward the right side, that is, onto the placement surface 25a of the table 22 along the horizontal direction. Furthermore, a reflection portion (not shown) that reflects the detection light is arranged on the right side of the table 22. In the case where the detection light emitted from the light emitting portion is not irradiated to the medium M on the placement surface 25a, the detection light passes over the placement surface 25a, is reflected by the reflection portion, and is received by the light receiving portion. On the other hand, in the case where the detection light emitted from the light emitting portion is irradiated to the medium M on the placement surface 25a, the detection light does not reach the reflection portion and therefore is not received by the light receiving portion. Therefore, the height of the medium M may be measured by obtaining a light reception result of the light receiving portion for each emission position (height) of the light emitting portion.

[0052] Next, one example of the operation of the printing apparatus 100 configured as described above will be described. FIG. 16 and FIG. 17 are views showing one example of a printing operation in the printing apparatus 100. FIG. 16 and FIG. 17 show one example of an operation for starting discharge of ink to a printing target region on the placement surface 25a of the table 22. As shown in FIG. 16(A), the medium (food) M is placed on the placement surface 25a of the table 22. It is noted that a target region R, which is the printing target region in the present embodiment, is included on an upper surface Ma of the medium M.

[0053] In response to the medium M being placed on the placement surface 25a, the control unit CONT aligns positions of the rear side end of the head 34 and the rear side end of the medium M. In starting discharge of ink to the target region R on the medium M, the control unit CONT arranges the head 34 and the table 22 so that the ends, on the movement direction side in the sub-scanning direction, of the nozzle row 34L and the target region R face each other, as shown in FIG. 16(A).

[0054] Next, the control unit CONT causes the nozzles 34N facing the target region R to discharge ink while moving the head 34 in the main scanning direction, with the relative positional relationship between the table 22 and the head 34 in the sub-scanning direction maintained (FIG. 16(B)). The control unit CONT causes the nozzles 34N to perform the ink discharge operation without changing the relative positional relationship between the table 22 and the head 34 in the sub-scanning direction. By this operation, a discharge pattern Q1 is formed at the rear side end of the target region R.

[0055] After the discharge pattern Q1 is formed in the target region, the control unit CONT moves the table 22 by a predetermined distance in the sub-scanning direction. Then, similarly, the control unit CONT discharges ink from the nozzles 34N to the target region R while moving the head 34 in the main scanning direction, with the relative positional relationship between the table 22

and the head 34 in the sub-scanning direction maintained (FIG. 16(C)). The control unit CONT moves the table 22 stepwise by a predetermined distance, and discharges ink from the nozzles 34N facing the target region R to the target region R for each movement of the table 22. By this operation, a discharge pattern Q2 is formed from the rear side end of the target region R toward the front side.

[0056] In response to the front side end of the head 34 reaching the front side end of the medium M by movement of the table 22, the control unit CONT discharges ink from the nozzles 34N to the target region R while moving the head 34 in the main scanning direction, with the relative positional relationship between the table 22 and the head 34 in the sub-scanning direction maintained (FIG. 17(A)). The control unit CONT performs the discharge operation by controlling the nozzles 34N without changing the relative positional relationship between the table 22 and the head 34 in the sub-scanning direction. By this operation, a discharge pattern Q3 is formed in a predetermined range from the rear side end to the front side end of the target region R (FIG. 17(B)).

[0057] As described above, the printing apparatus 100 according to the present embodiment includes the table 22 that has the placement surface 25a for placing food; the head 34 that discharges edible ink toward the placement surface 25a; and the carriage 31 on which the ink supply unit that supplies ink to the head 34 is mounted and which is movable in the main scanning direction along the placement surface 25a.

[0058] In the printing apparatus 100 that forms characters and patterns on food, the head 34 and the ink supply unit are mounted on the carriage 31, enabling the carriage 31 to be made compact.

[0059] Further, in the printing apparatus 100 according to the present embodiment, the ink supply unit is arranged above the head 34.

[0060] According to this configuration, ink may be efficiently supplied from the ink supply unit to the head 34.

[0061] Furthermore, in the printing apparatus 100 according to the present embodiment, the ink supply unit includes the ink cartridge 36 that stores ink; the holder 37 that allows the ink cartridge 36 to be attached detachably from the front side thereof; and the circulation mechanism 38 that circulates ink from the ink cartridge 36 mounted in the holder 37 to the head 34.

[0062] According to this configuration, ink may be efficiently supplied from the ink supply unit to the head 34 through the ink cartridge 36, the holder 37, and the circulation mechanism 38.

[0063] Further, in the printing apparatus 100 according to the present embodiment, the circulation mechanism 38 includes the valve 38a arranged on the rear side with respect to the holder 37; a plurality of ink cartridges 36 and a plurality of holders 37 are arranged in a state of being aligned in the left-right direction; and the valve 38a is provided for each holder 37, has a rectangular shape extending in one direction respectively as viewed from the rear side, and is arranged in a state of being inclined

with respect to the up-down direction.

[0064] By forming the valve 38a in a rectangular shape extending in one direction and arranging the valve 38a in a state of inclining with respect to the up-down direction, the ink cartridge 36 and the holder 37 may be arranged closely packed in the main scanning direction.

[0065] Further, in the printing apparatus 100 according to the present embodiment, the ink cartridge 36 includes the protrusion portion 36h that protrudes upward at the upper portion on the front side in a state of being mounted in the holder 37.

[0066] With this configuration, the operator may place a finger or the like on the protrusion portion 36h to remove the ink cartridge 36, so the ink cartridge 36 may be arranged closely packed horizontally.

[0067] Further, in the printing apparatus 100 according to the present embodiment, the ink cartridge 36 includes the cartridge body 36a; the ink storage bag 36b that is detachably provided to the cartridge body 36a, stores ink, and deforms according to the ink storage amount; and the ink remaining amount detection plate 36c that is supported by the cartridge body 36a, is pressed against the ink storage bag 36b, and moves according to deformation of the ink storage bag 36b.

[0068] By adopting the configuration in which the ink storage bag 36b is replaceable with respect to the cartridge body 36a, the cost of parts to be replaced may be reduced.

[0069] Furthermore, the printing apparatus 100 according to the present embodiment includes the table 22 that has the placement surface 25a for placing food; the carriage 31 on which the head 34 that discharges edible ink toward the placement surface 25a side and which is movable in the main scanning direction with respect to the table 22; the guide bar 32 that is arranged along the main scanning direction and guides the carriage 31; and the carriage drive unit 33 that is arranged on the rear side of the guide bar 32, is provided in a range that does not protrude from the guide bar 32 in the main scanning direction, and drives the carriage 31.

[0070] In this configuration, since the carriage drive unit 33 is provided in a range that does not protrude from the guide bar 32 in the main scanning direction, the dimension of the apparatus in the main scanning direction may be reduced. This enables the apparatus to be made compact.

[0071] Further, in the printing apparatus 100 according to the present embodiment, the carriage drive unit 33 includes the belt member 41 that is endless, is provided in a range which fits on the rear side of the guide bar 32 in the front view, has a portion extending along the main scanning direction, and is connected to the carriage 31; and the rotation drive source 42 that rotates the belt member 41, and the rotation drive source 42 has the rotation axis AX arranged along the front-rear direction.

[0072] According to this configuration, the belt member 41 and the rotation drive source 42 may be efficiently arranged in a limited space.

[0073] Further, in the printing apparatus 100 according to the present embodiment, the carriage 31 includes the airflow generation unit 54 that generates airflow in the main scanning direction.

[0074] The airflow generation unit 54 generates airflow in the main scanning direction, so that the direction of airflow generated by movement of the carriage 31 and the direction of airflow generated by the airflow generation unit 54 may match. This enables the carriage 31 to be efficiently cooled without increasing the size of the airflow generation unit 54.

[0075] Furthermore, the printing apparatus 100 according to the present embodiment further includes the maintenance unit 50 that is arranged at the standby position P1 on one side relative to the position of the table 22 in the main scanning direction and performs maintenance of the head 34; and the cable chain 45 that has one end in the main scanning direction connected to the carriage 31 and the other end connected to the guide bar 32, holds the cable extending from the carriage 31, and deforms according to movement of the carriage 31, and the cable chain 45 has an end on the other side opposite to the one side in the main scanning direction, which is curved and folded back in the up-down direction.

[0076] According to this configuration, the cable chain 45 may be efficiently arranged according to the configuration of the carriage 31.

[0077] Further, the guide bar 32 of the printing apparatus 100 according to the present embodiment is arranged in a state of protruding to both sides of the table 22 in the main scanning direction, the protrusion distance of the guide bar 32 from the table 22 is longer on one side than on the other side, and the protrusion distance on the other side is shorter than the dimension of the carriage 31 in the main scanning direction.

[0078] According to this configuration, the dimension of the printing apparatus 100 in the main scanning direction may be reduced.

[0079] Furthermore, the printing apparatus 100 according to the present embodiment includes the table 22 that has the placement surface 25a for placing a medium M and is movable in the sub-scanning direction along the placement surface 25a; the carriage 31 on which the head 34 that discharges ink toward the placement surface 25a side is mounted and which is movable in the main scanning direction that is a direction along the placement surface 25a and orthogonal to the sub-scanning direction; and the control unit CONT that controls operation of the table 22, operation of the carriage 31, and operation of the head 34. The head 34 includes the nozzle row 34L in which a plurality of nozzles 34N are aligned in the sub-scanning direction, a plurality of the nozzle rows 34L are provided in the main scanning direction, and in a case of starting discharge of ink to the target region R on the medium M, the control unit CONT arranges the head 34 and the table 22 so that ends, on the movement direction side of the table 22 in the sub-scanning direction, of the nozzle row 34L and the

target region R face each other, and discharges ink from the nozzles 34N facing the target region R toward the placement surface 25a side while moving the head 34 in the main scanning direction, with the relative positional relationship between the table 22 and the head 34 in the sub-scanning direction maintained.

[0080] According to this configuration, ink may be discharged to the end of the target region R without arranging the head 34 ahead of the end on the movement direction side of the target region R, and the dimension of the printing apparatus 100 in the sub-scanning direction may be reduced. This enables the apparatus to be made compact.

[0081] Further, in the printing apparatus 100 according to the present embodiment, after discharging ink from the nozzle 34N on the rearmost side in the movement direction, the control unit CONT moves the table 22 stepwise by a predetermined distance in the movement direction, and for each movement of the table 22, discharges ink from the nozzles 34N facing the target region R toward the placement surface 25a side while moving the head 34 in the main scanning direction.

[0082] After discharging ink to the end of the target region R, the table 22 is moved stepwise by a predetermined distance in the movement direction, and ink is discharged from the nozzles 34N facing the target region R to the placement surface 25a while the head 34 is moved in the main scanning direction for each movement of the table 22, enabling the discharge operation to be performed efficiently.

[0083] In the printing apparatus 100 according to the present embodiment, the control unit CONT discharges ink from the nozzles 34N facing the target region R toward the placement surface 25a side while moving the head 34 in the main scanning direction, with the relative positional relationship between the table 22 and the head 34 in the sub-scanning direction maintained, in a case of the head 34 and the table 22 being arranged so that the end on the rear side of the target region R in the movement direction and the end on the rear side of the nozzle row 34L in the same direction face each other.

[0084] According to this configuration, when ending the discharge operation, discharge may be performed to the end of the target region R without arranging the head 34 ahead of the rear side end in the movement direction of the target region R, and the dimension of the printing apparatus 100 in the sub-scanning direction may be reduced. This enables the apparatus to be made compact.

[0085] Further, the printing apparatus 100 according to the present embodiment further includes the area sensor 60 that emits detection light in the main scanning direction and detects the medium M placed on the table 22 based on the detection result of the detection light, and the area sensor 60 is arranged on the rear side of the carriage 31.

[0086] According to this configuration, the medium M

may be detected by the area sensor 60 even in the case of starting the discharge operation from a state where the head 34 and the table 22 are arranged so that the ends, on the movement direction side of the table 22 in the sub-scanning direction, of the nozzle row 34L and the target region R face each other.

[0087] Furthermore, in the printing apparatus 100 according to the present embodiment, the medium M is food, and the ink is edible ink.

[0088] According to the present embodiment, the apparatus that discharges edible ink onto food may be made compact.

[0089] Further, the printing apparatus 100 according to the present embodiment includes the table 22 that has the placement surface 25a for placing food; the carriage 31 on which the head 34 that discharges edible ink toward the placement surface 25a side is mounted and which is movable in the main scanning direction with respect to the table 22; the guide bar 32 that is arranged along the main scanning direction and guides the carriage 31; and the carriage drive unit 33 that has the movable portion 44 which is movable along the guide bar 32 and connected to the carriage 31, and the rotation drive source 42 which moves the movable portion 44 in the main scanning direction, and the carriage 31 is detachable from the movable portion 44.

[0090] According to this configuration, the carriage 31 is detachable from the movable portion 44, enabling maintenance of the carriage 31 and the head 34 mounted on the carriage 31 to be easily performed.

[0091] Further, in the printing apparatus 100 according to the present embodiment, the carriage 31 mounts an ink supply unit that supplies ink to the head 34 above the head 34, and the ink supply unit includes the ink cartridge 36 that stores ink, the holder 37 that allows the ink cartridge 36 to be attached detachably from the front side, and the circulation mechanism 38 that circulates ink from the ink cartridge 36 mounted in the holder 37 to the head 34.

[0092] According to this configuration, the ink supply unit is mounted above the head 34 on the carriage 31, enabling maintenance of the ink cartridge 36, the holder 37, and the circulation mechanism 38 to be easily performed.

[0093] Furthermore, in the printing apparatus 100 according to the present embodiment, the circulation mechanism 38 includes the valve 38a that is arranged on the rear side of the holder 37; the tube 38b that extends downward from the valve 38a; and the damper 38c that is connected to the lower end of the tube 38b and supplies the ink that has passed through the tube 38b to the head 34, and further includes the guide member 39 that guides ink leaked from the circulation mechanism 38 to a predetermined position.

[0094] According to this configuration, ink leaked from the circulation mechanism 38 may be guided to a predetermined position by the guide member 39, enabling cleaning work to be easily performed.

[0095] Further, the absorption member 40 that absorbs ink is provided at a predetermined position of the printing apparatus 100 according to the present embodiment.

[0096] According to this configuration, the predetermined position may be cleaned by replacing the absorption member 40, enabling cleaning to be performed efficiently.

[0097] Furthermore, the printing apparatus 100 according to the present embodiment further includes the receiving member 55 that is arranged to protrude from the bottom portion of the guide bar 32 toward the front side and receives foreign matter from the carriage drive unit 33.

[0098] According to this configuration, the receiving member 55 may prevent foreign matter from the carriage 31 from falling onto the table 22, thereby reducing the effort for cleaning the table 22.

[0099] Further, in the printing apparatus 100 according to the present embodiment, the receiving member 55 is provided to cover at least a range in which the carriage 31 moves in the main scanning direction.

[0100] According to this configuration, falling of foreign matter in the range where the carriage 31 moves may be efficiently prevented.

[0101] Further, the receiving member 55 of the printing apparatus 100 according to the present embodiment is provided to be detachable.

[0102] According to this configuration, the receiving member 55 may be easily cleaned by replacing the receiving member 55.

[0103] Furthermore, the printing apparatus 100 according to the present embodiment includes the table 22 that has the placement surface 25a for placing a medium; and the carriage 31 on which the head 34 that discharges edible ink toward the placement surface 25a side is mounted and which is movable in the main scanning direction with respect to the table 22. The table 22 has the top plate portion 25 including the placement surface 25a and the top plate support portion 26 supporting the top plate portion 25, and the top plate portion 25 is provided to be detachable from the top plate support portion 26.

[0104] According to this configuration, maintenance such as cleaning of the top plate portion 25 may be easily performed by replacing the top plate portion 25.

[0105] Further, the top plate support portion 26 of the printing apparatus 100 according to the present embodiment has the positioning portion 26c that determines arrangement of the top plate portion 25 in the horizontal direction.

[0106] According to this configuration, the top plate portion 25 may be accurately positioned with respect to the top plate support portion 26.

[0107] Further, the printing apparatus 100 according to the present embodiment further includes the table drive unit 23 that is arranged below the table 22 and moves the table 22 in the sub-scanning direction intersecting the main scanning direction; and the cover member 29 that is

arranged between the table 22 and the table drive unit 23 and covers the table drive unit 23.

[0108] According to this configuration, the table drive unit 23 is covered by the cover member 29, thereby suppressing foreign matter from entering the table drive unit 23 side.

[0109] Further, in the printing apparatus 100 according to the present embodiment, the cover member 29 is formed in a box shape that accommodates the table drive unit 23.

[0110] According to this configuration, foreign matter may be more reliably suppressed from entering the table drive unit 23.

[0111] Further, the cover member 29 of the present embodiment is formed with a flat upper surface.

[0112] According to this configuration, the upper surface of the cover member 29 may be easily cleaned.

[0113] Further, the cover member 29 may be an extension member that is arranged above the table drive unit 23 and extends in the movement direction in accordance with movement of the table 22.

[0114] According to this configuration, foreign matter may also be more reliably suppressed from entering the table drive unit 23.

[0115] The technical scope of the present invention is not limited to the above embodiments, and modifications may be appropriately made to the present invention without departing from the spirit of the present invention. For example, the external shape, dimensions, and the like of the printing apparatus 100 may be changed where appropriate. FIG. 18 is a front view showing the configuration of the printing apparatus according to a modified embodiment. The printing apparatus 100A shown in FIG. 18 includes a housing 10A, a table unit 20A, an image forming unit 30A, a maintenance unit 50A, and a control unit CONT. As in the printing apparatus 100A exemplified in this modified embodiment, the dimensions in the main scanning direction (left-right direction, Y direction) with respect to the table 22 may be the same on the left and right sides.

Description of Reference Numerals

[0116] M...medium, P1...standby position, P2...printing cleaning position, R...target region, Q1, Q2, Q3...discharge pattern, P3...movement end position, P4...predetermined position, AX...rotation axis, Ma, 29d...upper surface, CONT...control unit, 10, 10A...housing, 11...operation unit, 12...operation member, 13...slot, 14, 29b, 36e...lid portion, 20, 20A...table unit, 21...base, 22...table, 23...table drive unit, 23a...X drive system, 23b...Y drive system, 24...guide unit, 25...top plate portion, 25a...placement surface, 25c...cutout portion, 26...top plate support portion, 26a...plate-shaped portion, 26b...columnar portion, 26c, 36g...positioning portion, 29...cover member, 29a...frame portion, 29c...bottom bent piece, 30, 30A...image forming unit, 31...carriage, 31a...carriage cover, 32...guide bar, 33...carriage drive

unit, 34...head, 34L...nozzle row, 34N...nozzle, 36...ink cartridge, 36a...cartridge body, 36b...ink storage bag, 36c...ink remaining amount detection plate, 36d...storage portion, 36f...supply port, 36h...protrusion portion, 36i...elastic member, 37...holder, 38...circulation mechanism, 38a...valve, 38b...tube, 38c...damper, 39...guide member, 39a...locking portion, 39b...first flat portion, 39c...step portion, 39d...second flat portion, 39e...support portion, 40, 53...absorption member, 40a...slit, 41...belt member, 42...rotation drive source, 42a...output shaft, 43...guide member, 44...movable portion, 45...cable chain, 46...pulley, 50, 50A...maintenance unit, 51...wiping device, 51a...wiper, 52...suction device, 54...airflow generation unit, 55...receiving member, 60...area sensor, 100, 100A...printing apparatus

Claims

1. A printing apparatus, comprising:
 - a table that has a placement surface for placing food; and
 - a carriage on which a head that discharges edible ink toward the food and an ink supply unit that supplies ink to the head are mounted, and which is movable in a main scanning direction along the placement surface.
2. The printing apparatus according to claim 1, wherein the ink supply unit is arranged above the head.
3. The printing apparatus according to claim 2, wherein the ink supply unit comprises:
 - an ink cartridge that stores the ink;
 - a holder that allows the ink cartridge to be attached detachably from a front side of the printing apparatus; and
 - a circulation mechanism that circulates the ink from the ink cartridge mounted in the holder to the head.
4. The printing apparatus according to claim 3, wherein the circulation mechanism comprises a valve arranged on a rear side of the holder,
 - a plurality of the ink cartridges and a plurality of the holders are arranged in a state of being aligned in a left-right direction, and
 - the valve is provided for each holder, has a rectangular shape extending in one direction respectively as viewed from the rear side of the holder, and is arranged in a state of being inclined with respect to an up-down direction.
5. The printing apparatus according to claim 3, wherein the ink cartridge comprises a protrusion portion that

protrudes upward at an upper portion on the front side thereof in a state of being mounted in the holder.

6. The printing apparatus according to claim 3, wherein the ink cartridge comprises:
 - a cartridge body;
 - an ink storage bag that is detachably provided to the cartridge body, stores the ink, and deforms according to an ink storage amount; and
 - an ink remaining amount detection plate that is supported by the cartridge body, is pressed against the ink storage bag, and moves according to deformation of the ink storage bag.
7. A printing apparatus, comprising:
 - a table that has a placement surface for placing food;
 - a carriage on which a head that discharges edible ink toward the food is mounted and which is movable in a main scanning direction with respect to the table;
 - a guide bar that is arranged along the main scanning direction and guides the carriage; and
 - a carriage drive unit that is arranged on a rear side of the guide bar when the printing apparatus is viewed from a front, is provided in a range which does not protrude from the guide bar in the main scanning direction, and drives the carriage.
8. The printing apparatus according to claim 7, wherein the carriage drive unit comprises:
 - a belt member that is endless, is provided in a range which fits on the rear side of the guide bar when the printing apparatus is viewed from the front, has a portion extending along the main scanning direction, and is connected to the carriage; and
 - a rotation drive source that rotates the belt member,
 - wherein the rotation drive source has a rotation axis arranged along a front-rear direction.
9. The printing apparatus according to claim 7, wherein the carriage comprises an airflow generation unit that generates airflow in the main scanning direction.
10. The printing apparatus according to claim 7, further comprising:
 - a maintenance unit that is arranged at a standby position on one side relative to a position of the table in the main scanning direction and performs maintenance of the head; and
 - a cable chain that has one end in a longitudinal

direction connected to the carriage and an other end connected to the guide bar, holds a cable extending from the carriage, and deforms according to movement of the carriage, wherein the cable chain has an end on an other side opposite to the one side in the main scanning direction, and the end is curved and folded back in an up-down direction.

11. The printing apparatus according to claim 10, wherein the guide bar is arranged in a state of protruding to both sides of the table in the main scanning direction, and a protrusion distance of the guide bar from the table toward the other side is shorter than a dimension of the carriage in the main scanning direction.

12. A printing apparatus, comprising:

a table that has a placement surface for placing a medium and is movable in a sub-scanning direction along the placement surface;
a carriage on which a head that discharges ink toward the medium is mounted and which is movable in a main scanning direction that is a direction along the placement surface and intersects the sub-scanning direction; and
a control unit that controls operation of the table, operation of the carriage, and operation of the head,
wherein the head comprises a nozzle row in which a plurality of nozzles are aligned in the sub-scanning direction, and has a configuration in which a plurality of the nozzle rows are provided in the main scanning direction, and in a case of starting discharge of the ink to a printing target region on the medium, the control unit:

arranges the head and the table so that ends, on a movement direction side of the table in the sub-scanning direction, of the nozzle row and the printing target region face each other, and
discharges the ink from nozzles facing the printing target region to the printing target region while moving the head in the main scanning direction, with a relative positional relationship between the table and the head in the sub-scanning direction maintained.

13. The printing apparatus according to claim 12, wherein the control unit:
after discharging the ink from the nozzle on a rear-most side in the movement direction, moves the table stepwise by a predetermined distance in the movement direction, and for each movement of the table, discharges the ink from the nozzles facing the

printing target region to the printing target region while moving the head in the main scanning direction.

14. The printing apparatus according to claim 13, wherein the control unit:
in a case of the head and the table being arranged so that an end on a rear side of the nozzle row in the movement direction and an end on the rear side of the printing target region in the movement direction face each other, discharges the ink from the nozzles facing the printing target region to the printing target region while moving the head in the main scanning direction, with the relative positional relationship between the table and the head in the sub-scanning direction maintained.

15. The printing apparatus according to claim 12, further comprising:

an area sensor that emits detection light in the main scanning direction and detects the medium placed on the table based on a detection result of the detection light,
wherein when the printing apparatus is viewed from a front, the area sensor is arranged on a rear side of the carriage.

16. The printing apparatus according to any one of claims 12 to 15, wherein the medium is food, and the ink is edible ink.

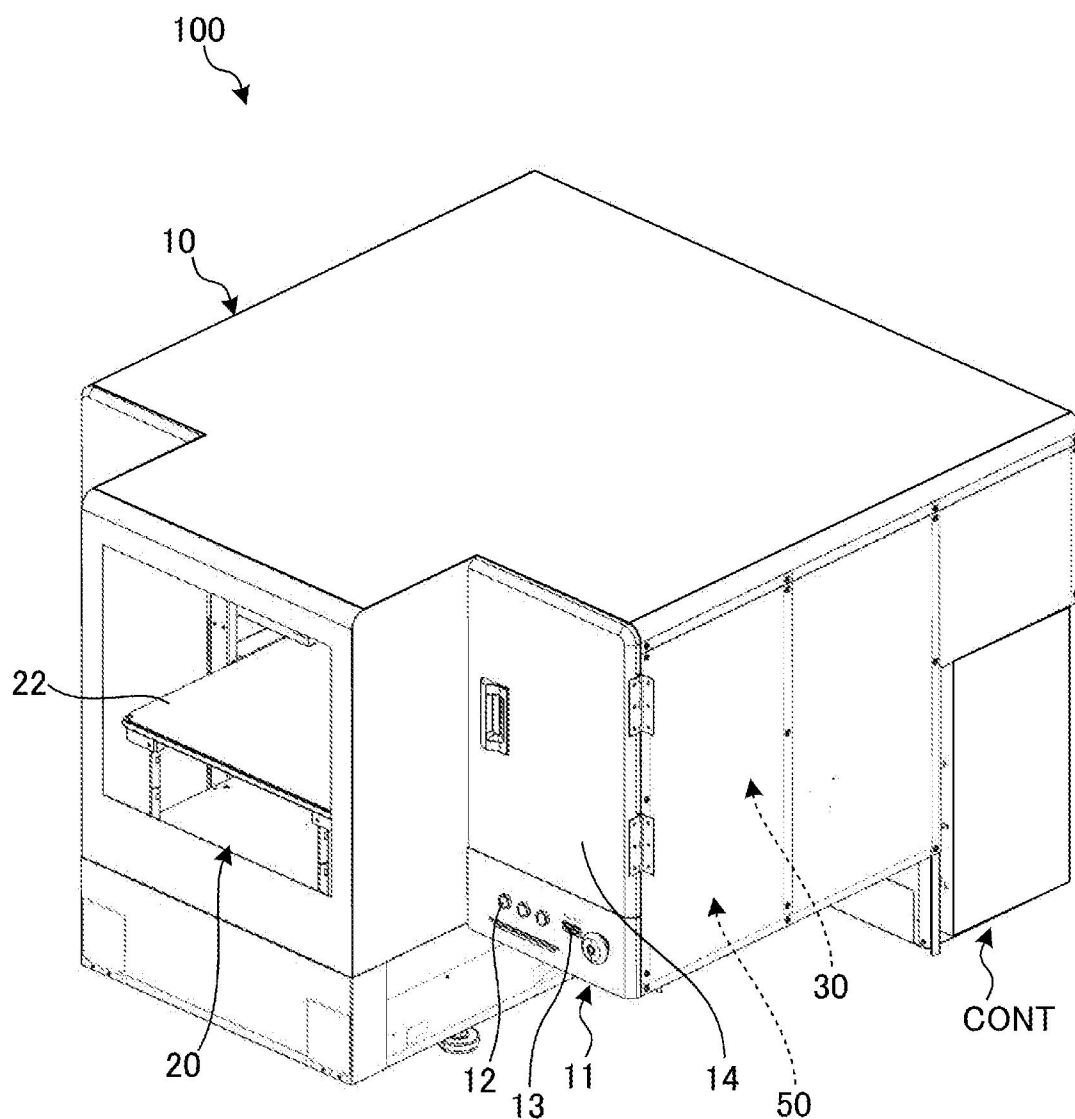


FIG. 1

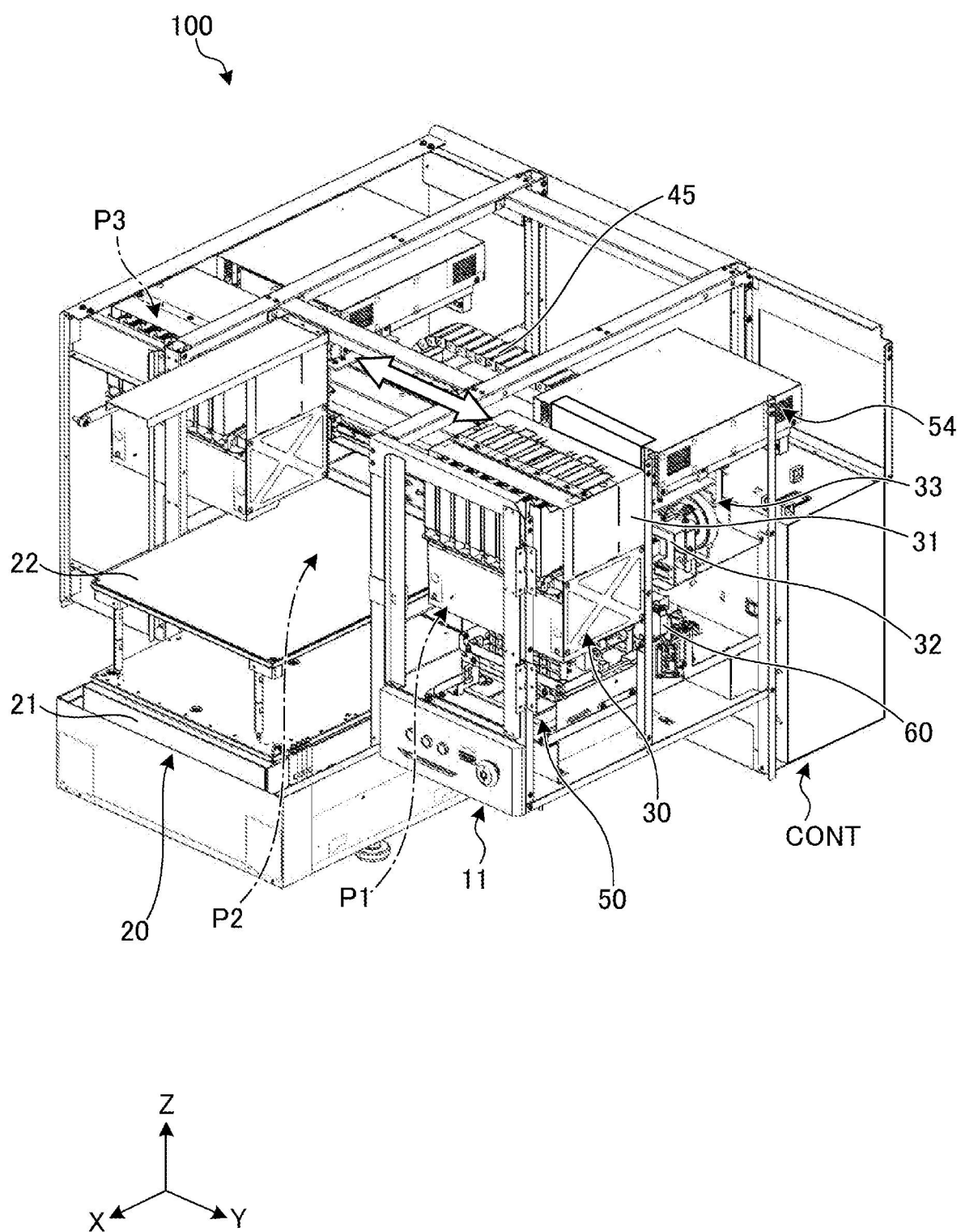


FIG. 2

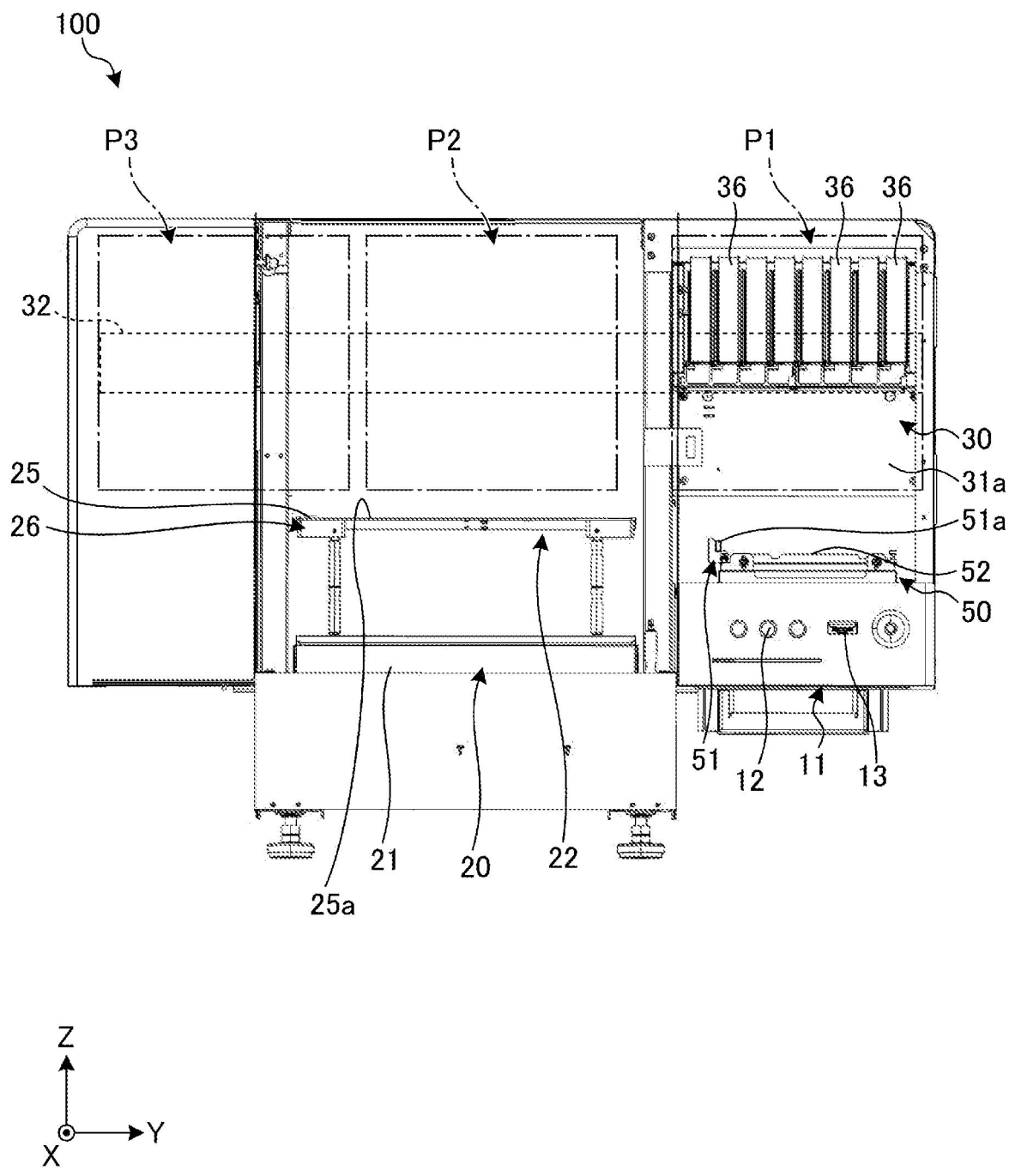


FIG. 3

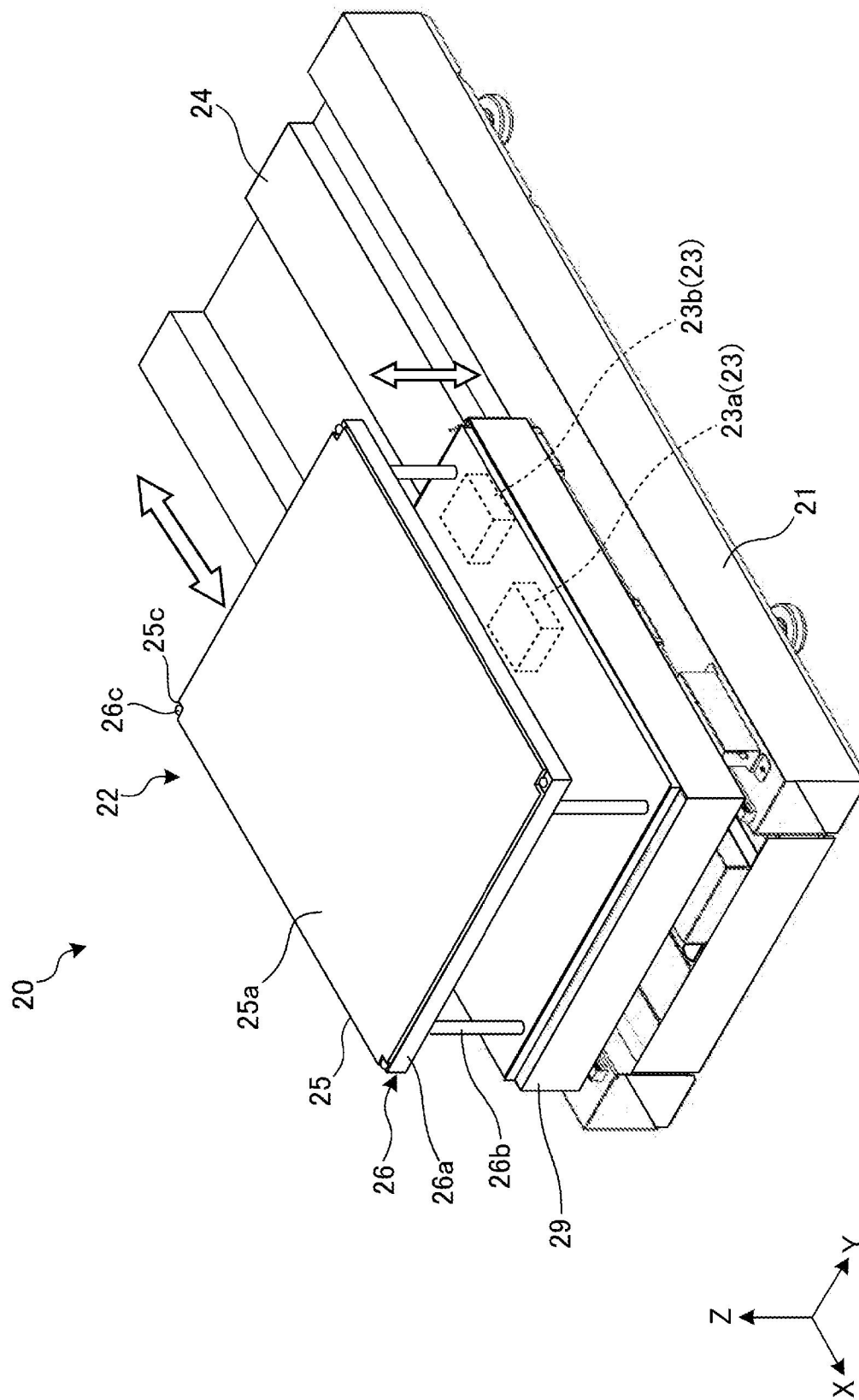


FIG. 4

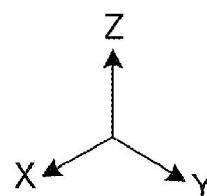
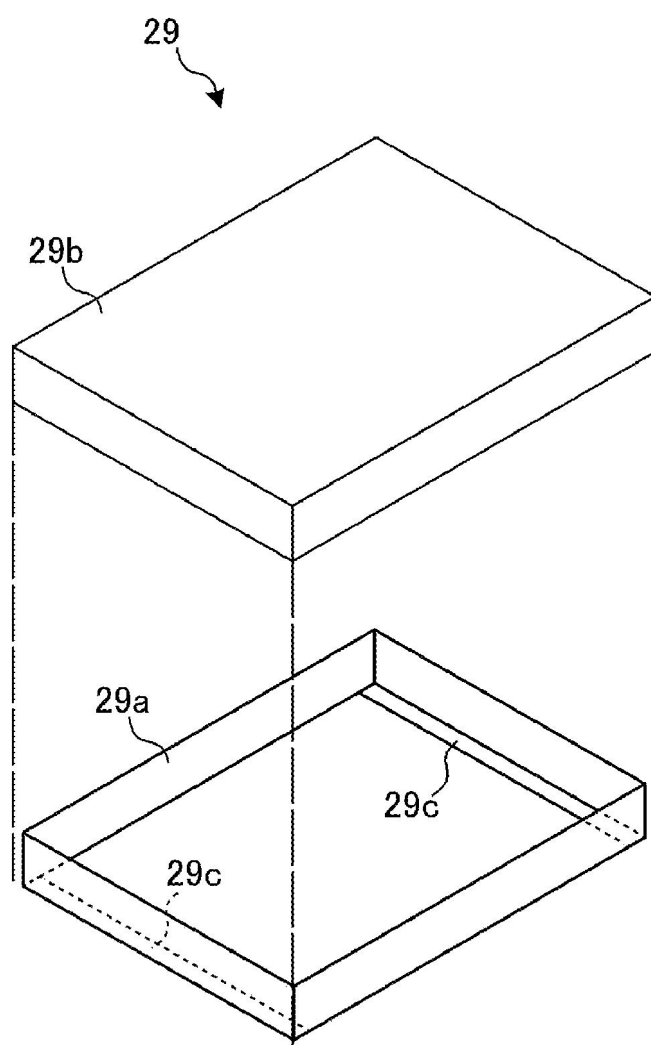


FIG. 5

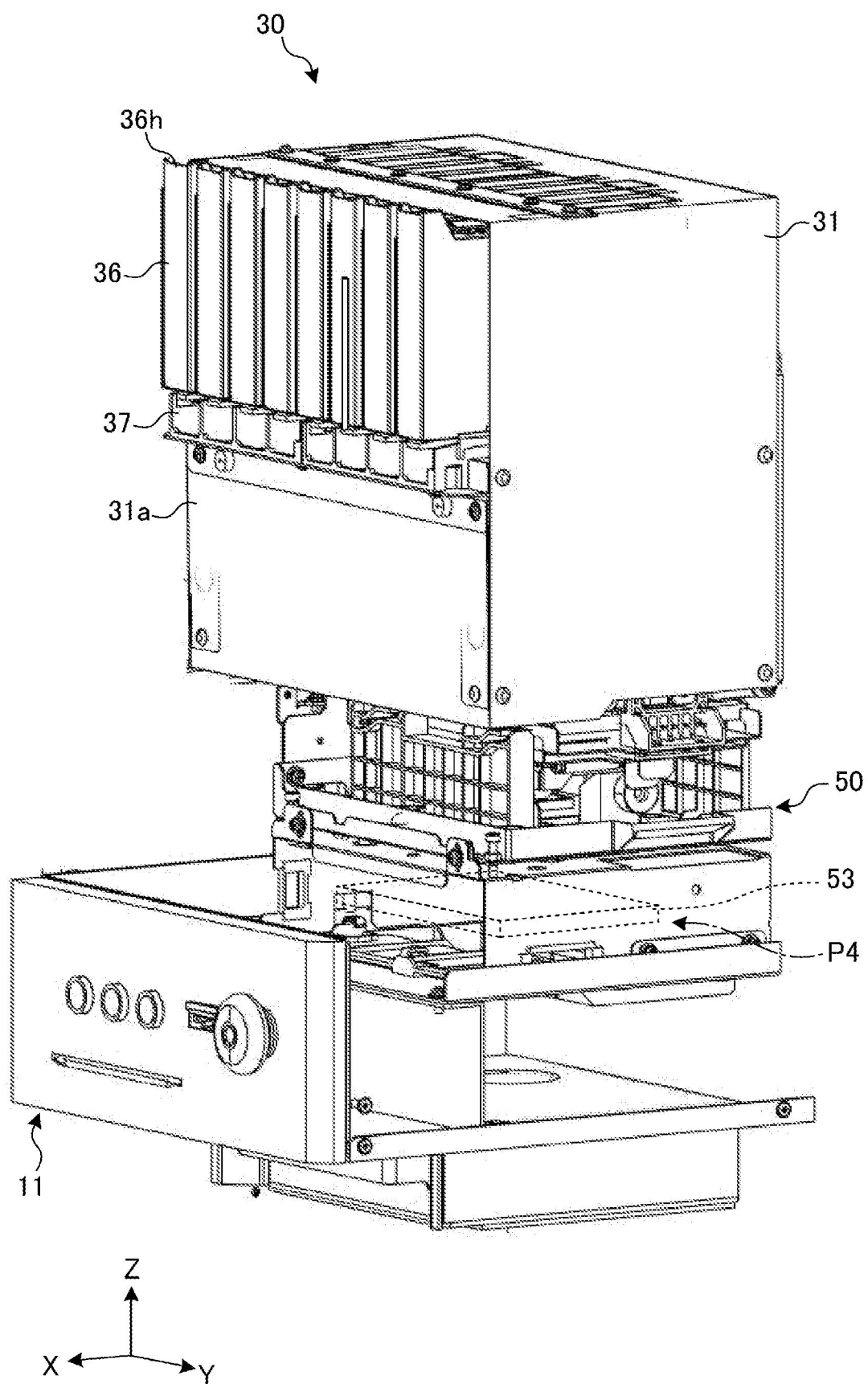


FIG. 6

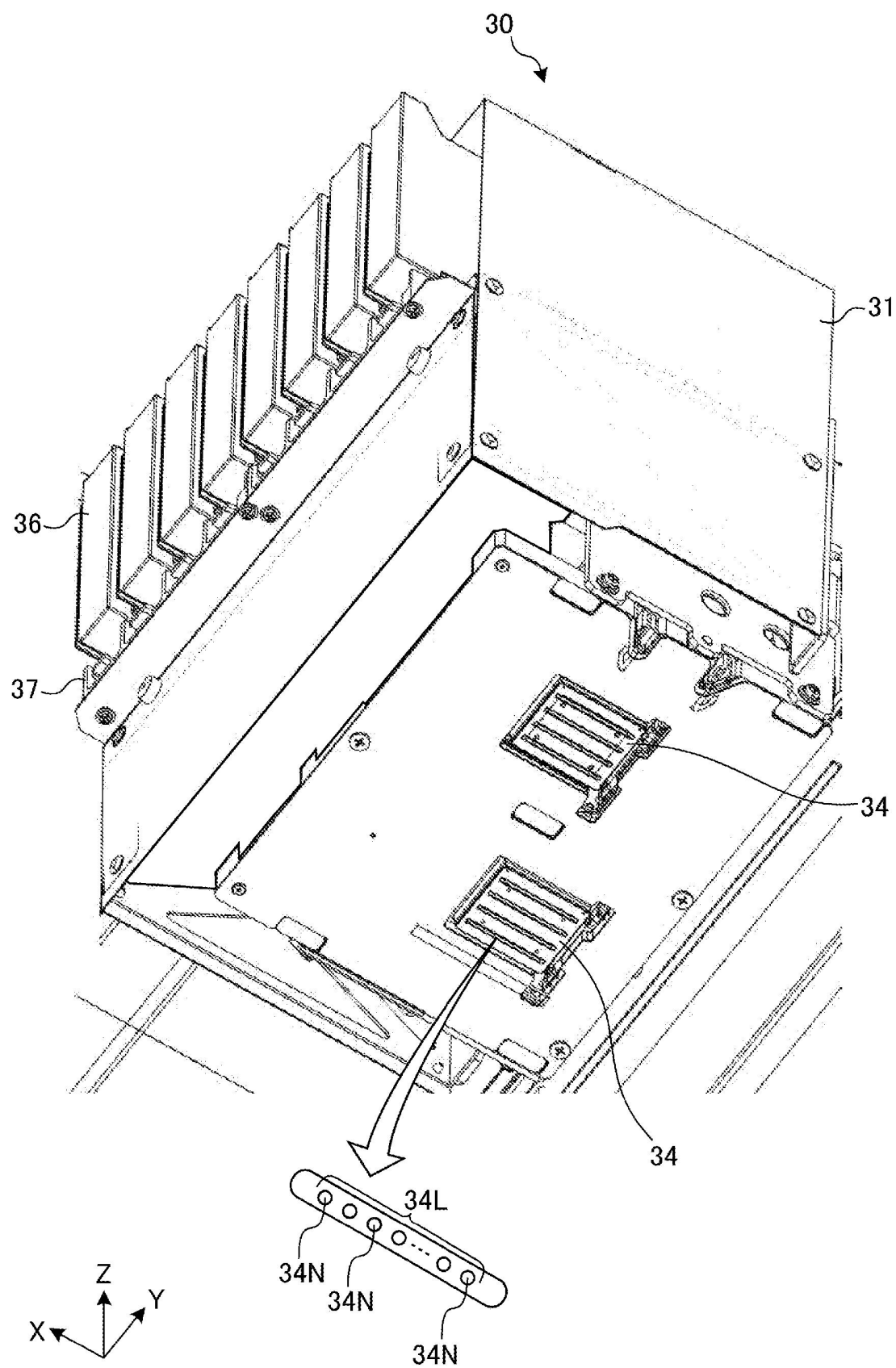


FIG. 7

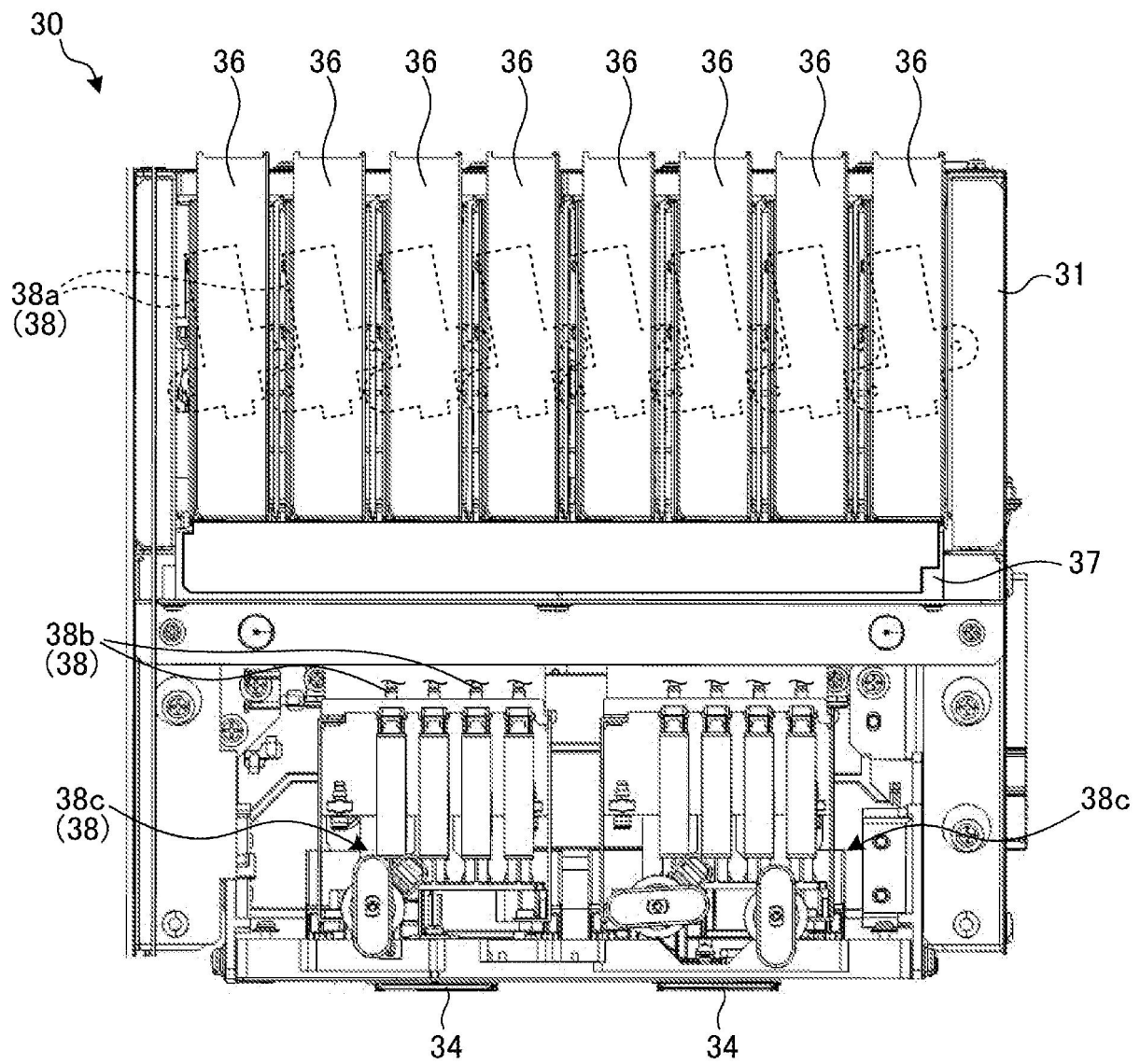


FIG. 8

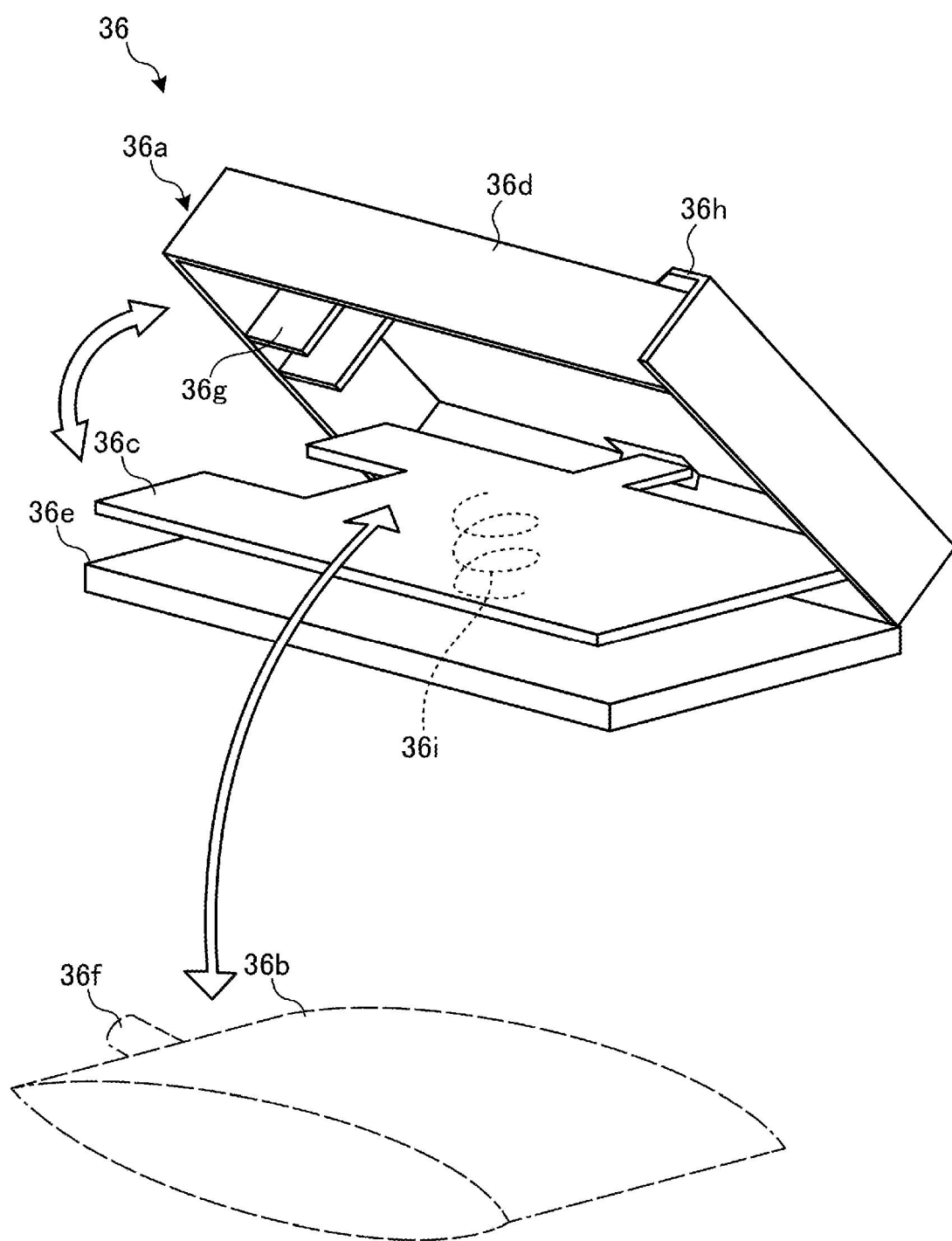


FIG. 9

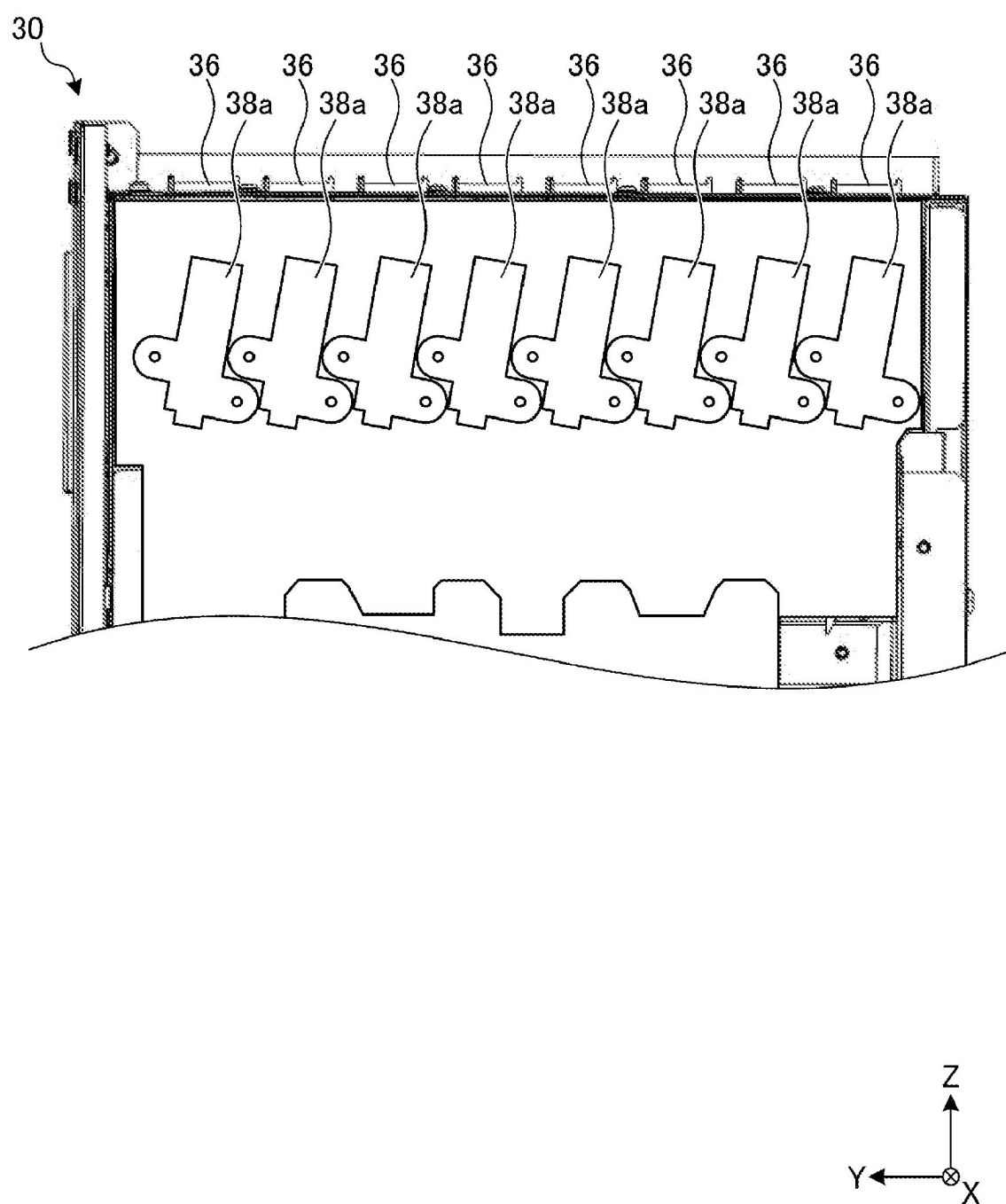


FIG. 10

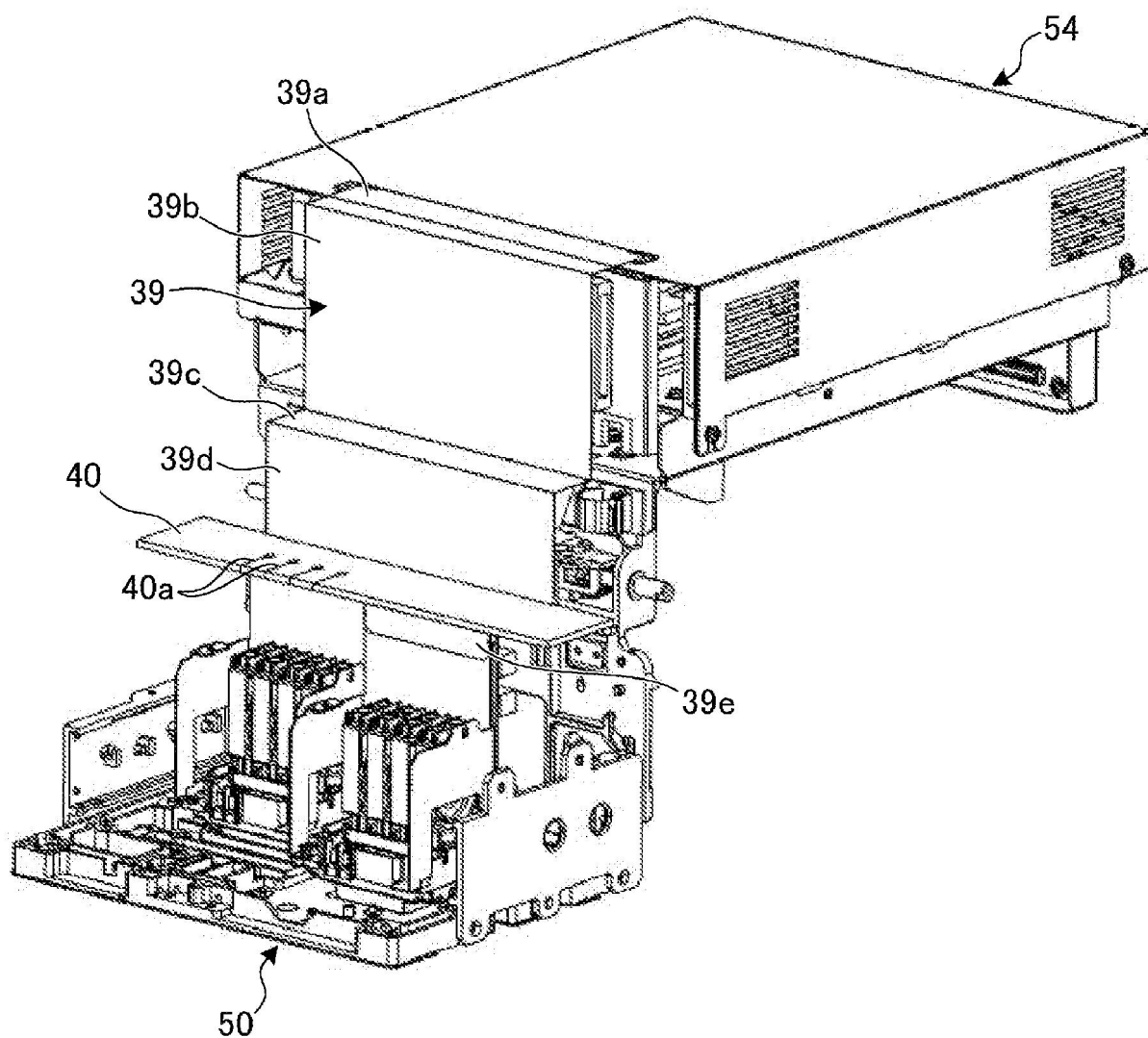


FIG. 11

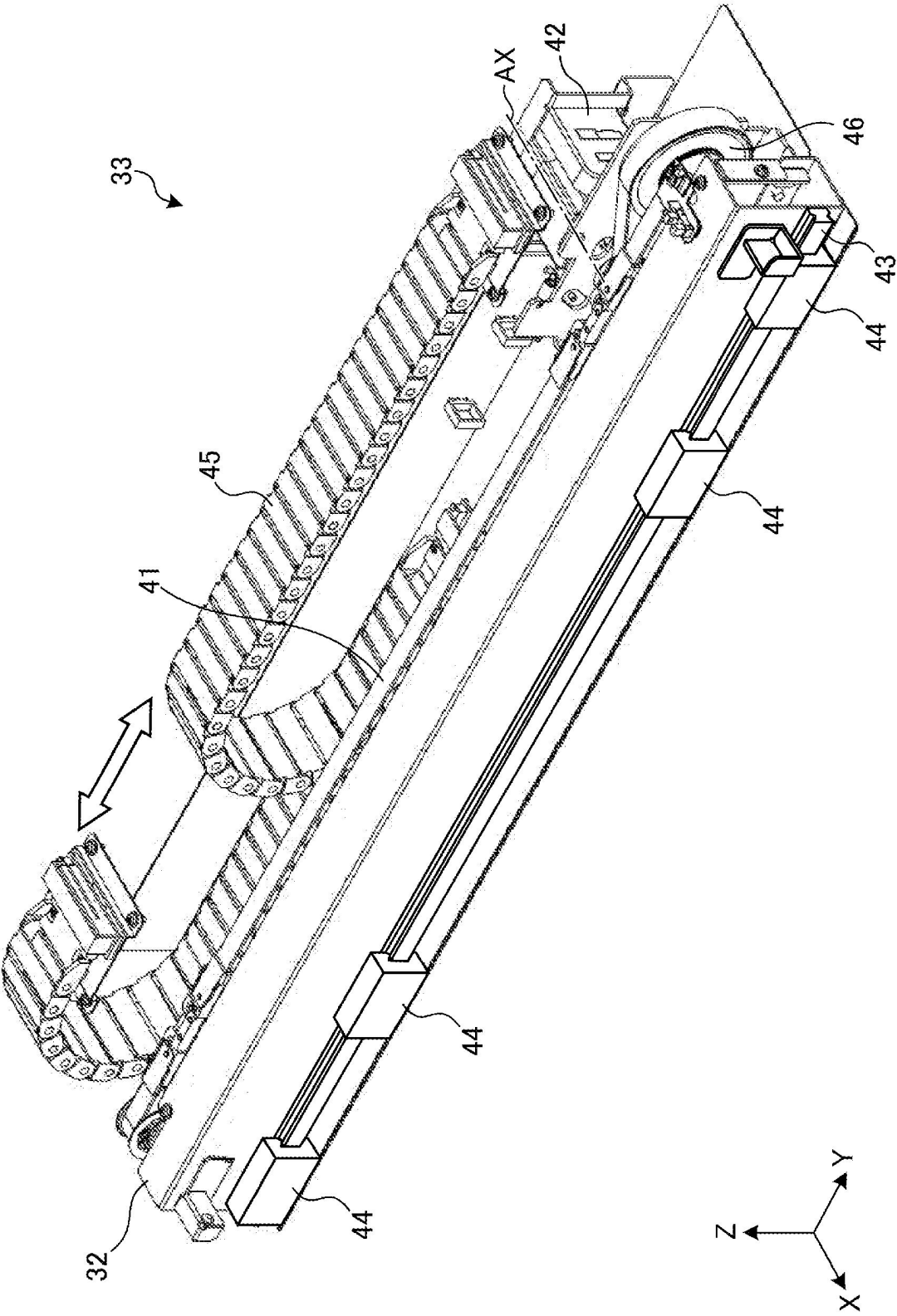


FIG. 12

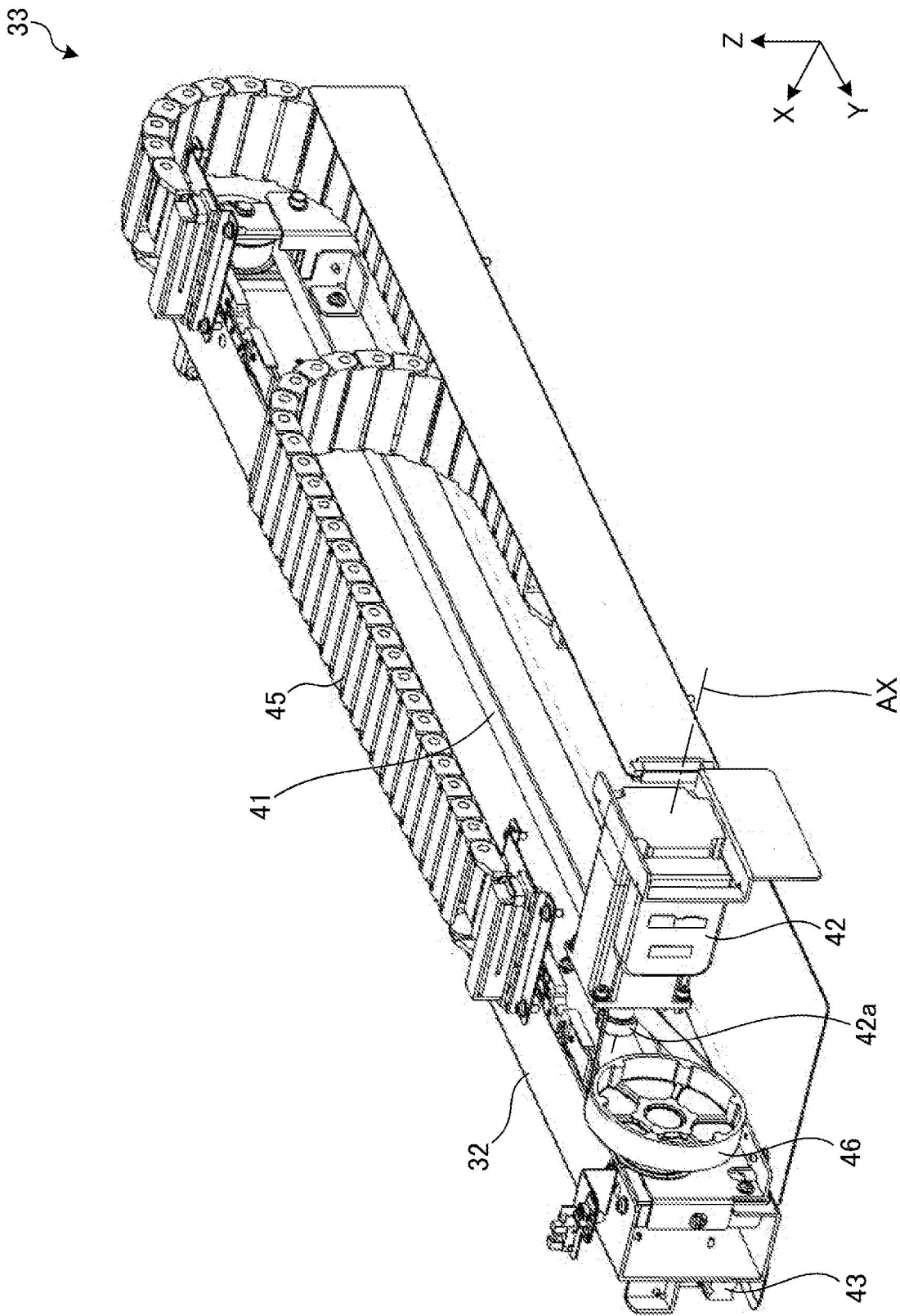


FIG. 13

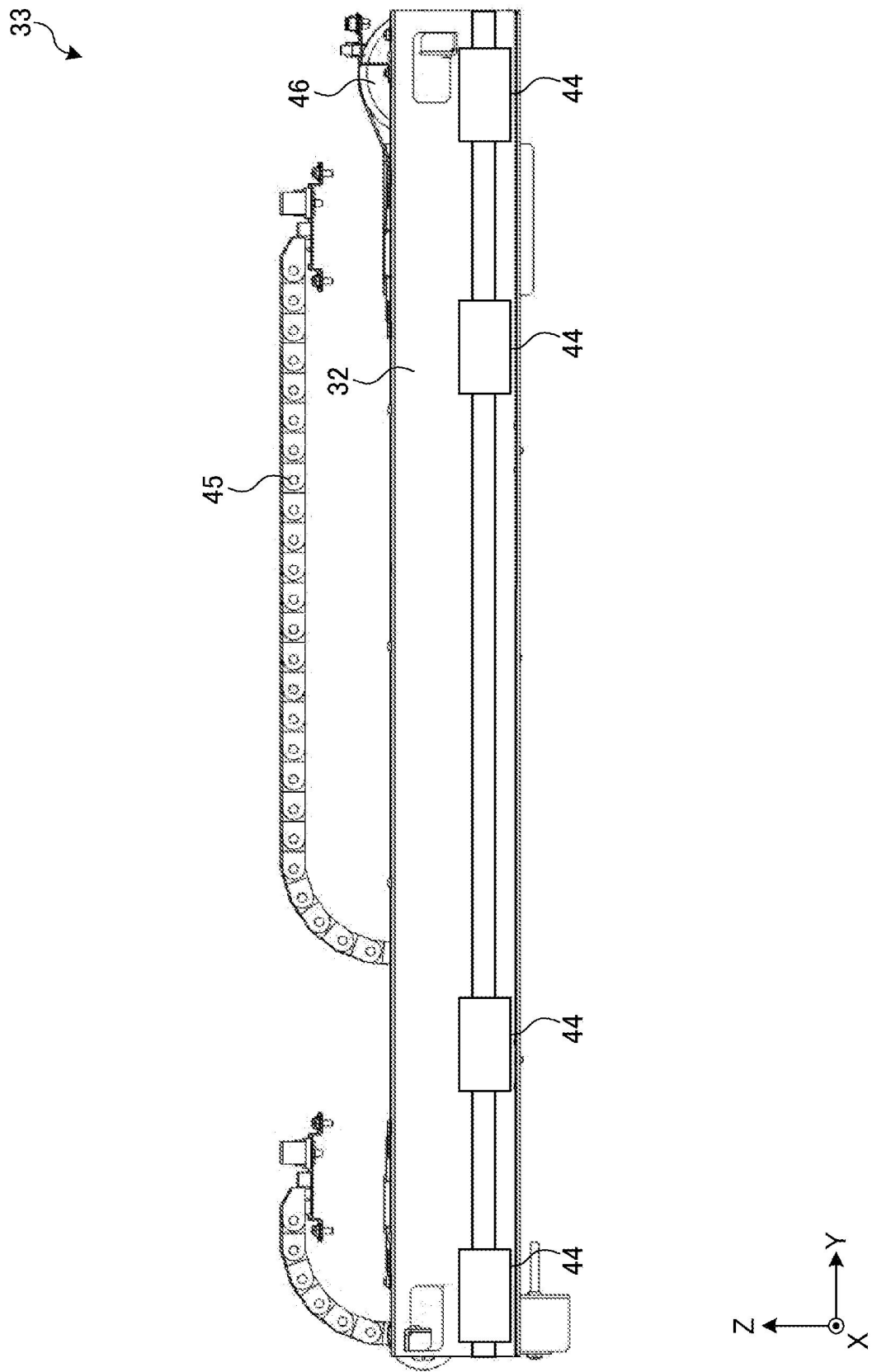


FIG. 14

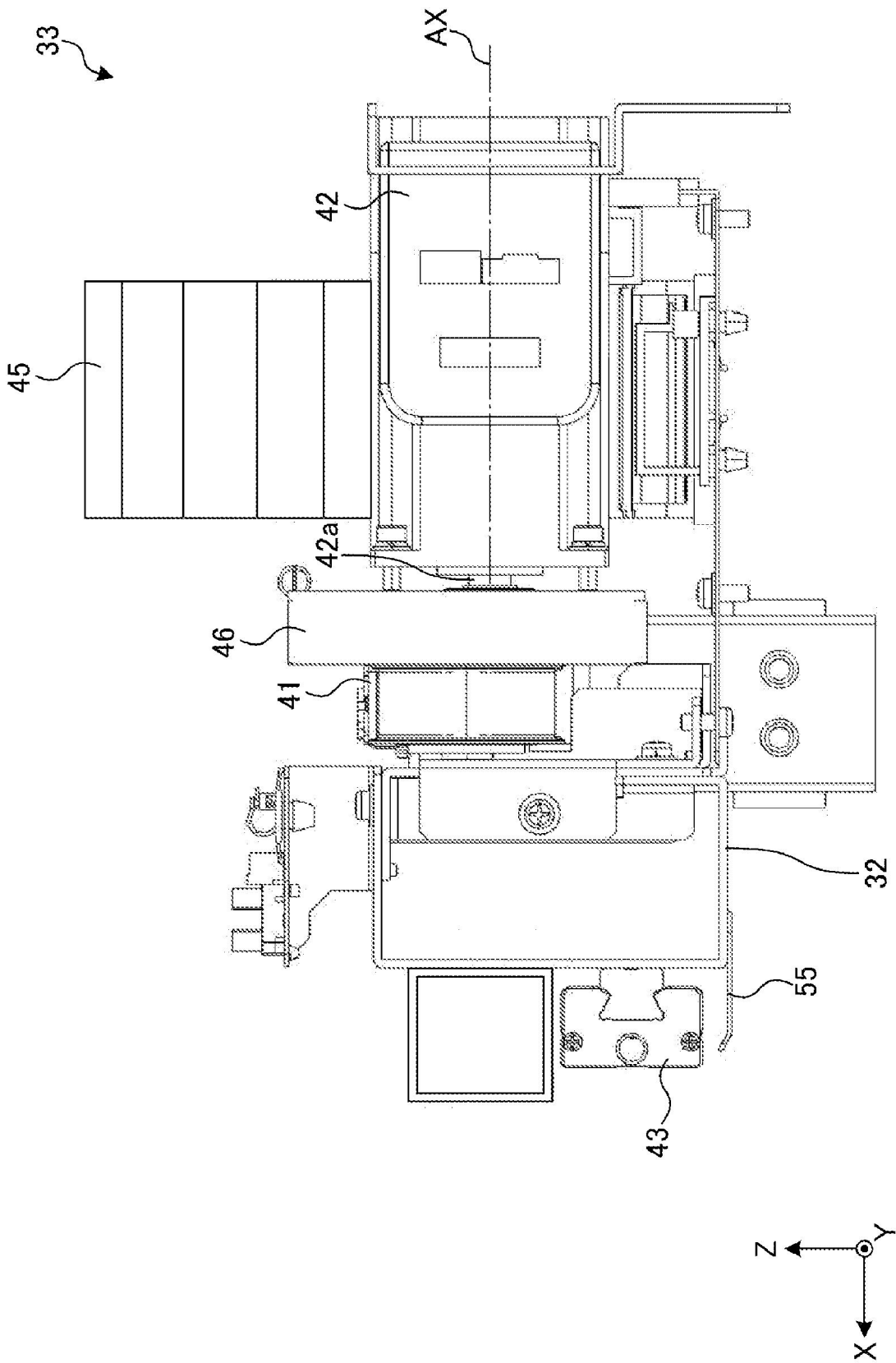
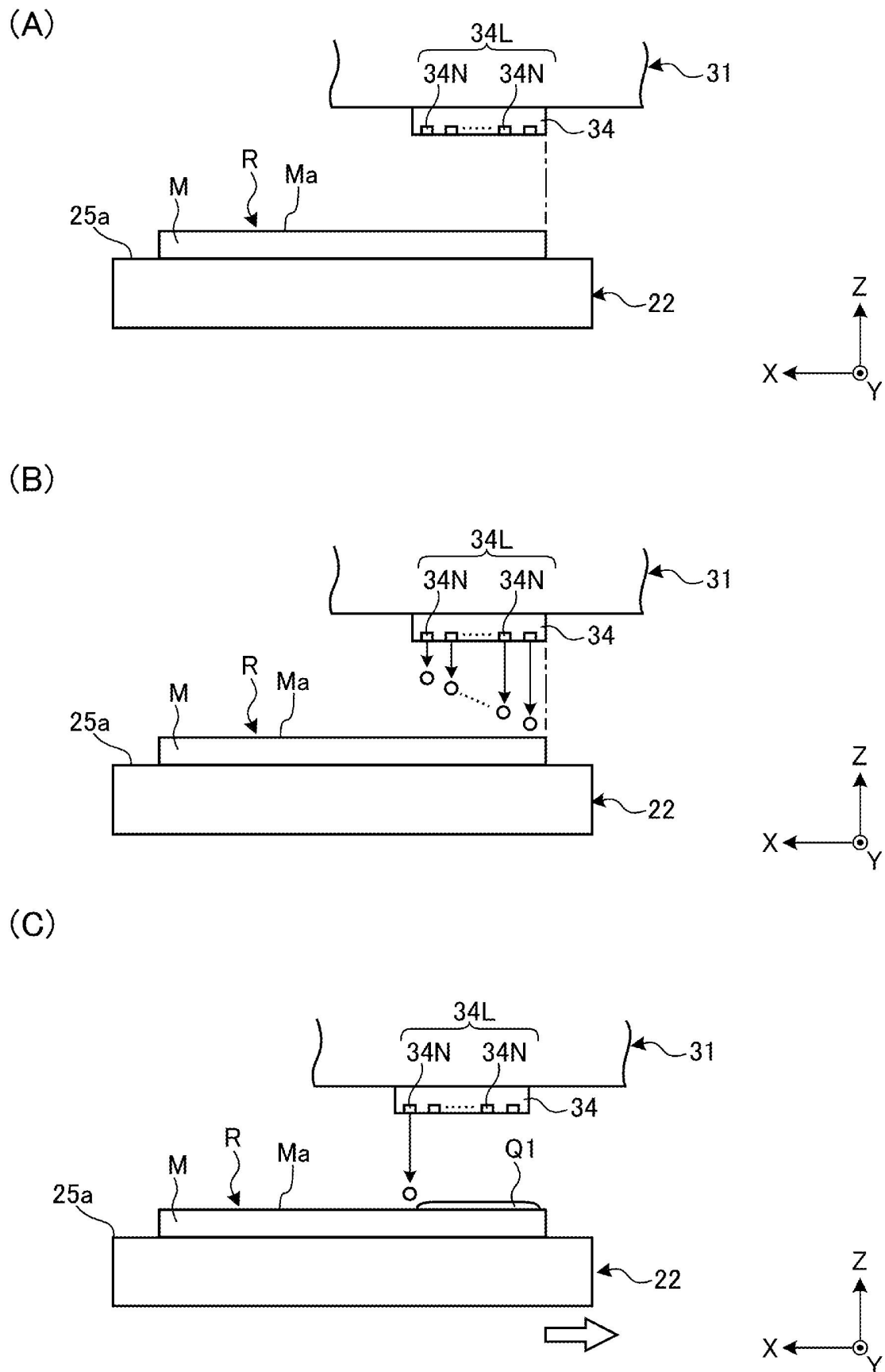
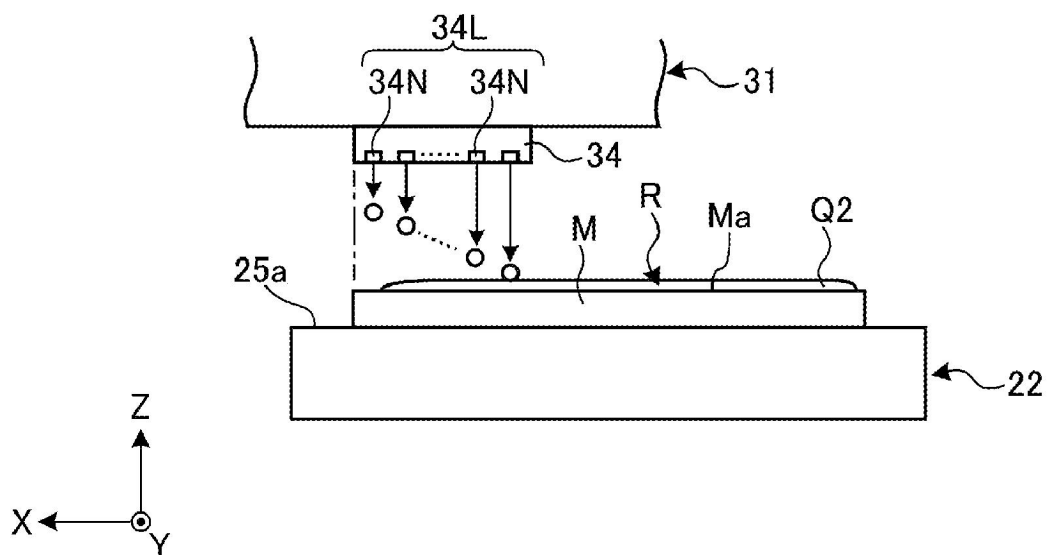


FIG. 15



(A)



(B)

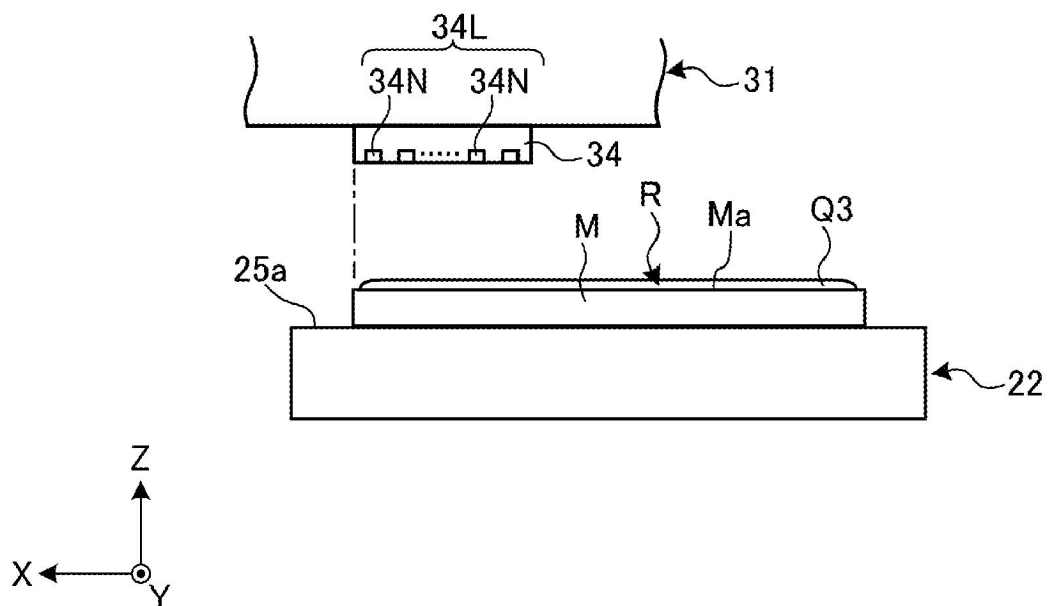


FIG. 17

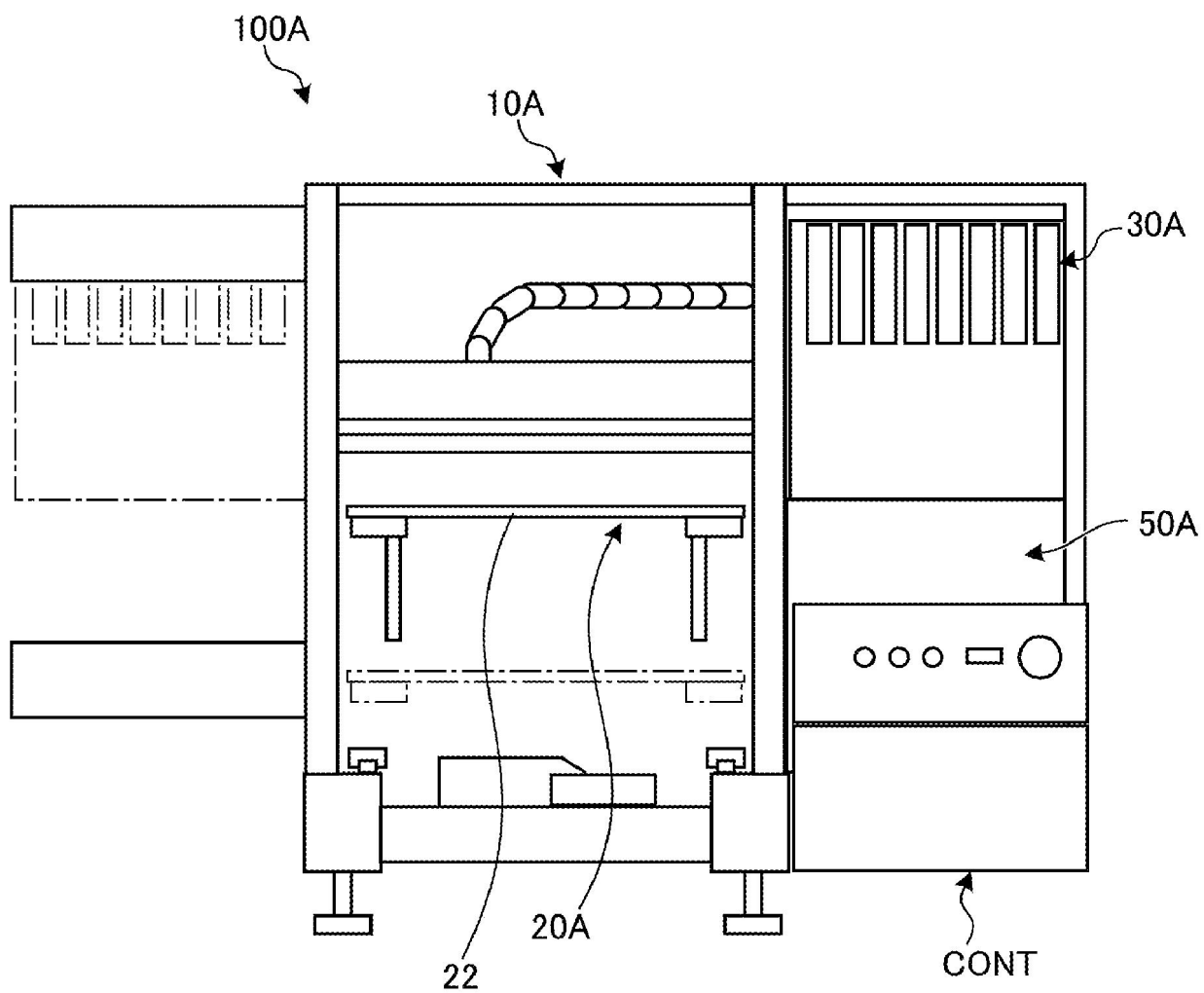


FIG. 18

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2024/030931

A. CLASSIFICATION OF SUBJECT MATTER

B41J 2/01(2006.01)i; **B41J 2/175**(2006.01)i; **B41J 3/407**(2006.01)i

FI: B41J2/01 305; B41J2/01 109; B41J2/01 303; B41J2/01 307; B41J2/01 401; B41J2/01 451; B41J2/01 501; B41J2/175 119; B41J2/175 143; B41J2/175 301; B41J3/407

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)

B41J2/01; B41J2/175; B41J3/407

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 1971-2024
 Registered utility model specifications of Japan 1996-2024
 Published registered utility model applications of Japan 1994-2024

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.
X	JP 2016-057662 A (NEWMIND CO., LTD.) 21 April 2016 (2016-04-21) paragraphs [0015], [0026], [0031]-[0032], [0035], [0042]-[0045], [0059]-[0069], fig. 1-12	1-2
Y		3, 7-14, 16
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Y	JP 2003-251826 A (CANON INC.) 09 September 2003 (2003-09-09) paragraphs [0117]-[0164], fig. 17-20	3
A		4-6
Y	JP 2015-003420 A (SEIKO EPSON CORPORATION) 08 January 2015 (2015-01-08) paragraphs [0017]-[0021], fig. 1-3	7-11



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

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Name and mailing address of the ISA/JP

Japan Patent Office (ISA/JP)
 3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915
 Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2024/030931

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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REFERENCES CITED IN THE DESCRIPTION

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