(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 005 809 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.06.2022 Bulletin 2022/22

(21) Application number: **21211145.4**

(22) Date of filing: **29.11.2021**

(51) International Patent Classification (IPC):
B41J 11/04 *(2006.01)* ***B41J 3/36*** *(2006.01)*
B41J 2/32 *(2006.01)* ***B41J 3/46*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B41J 11/04; B41J 2/32; B41J 3/36; B41J 3/46

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **30.11.2020 JP 2020197976**

(71) Applicant: **Seiko Instruments Inc.**
Chiba-shi, Chiba 261-8507 (JP)

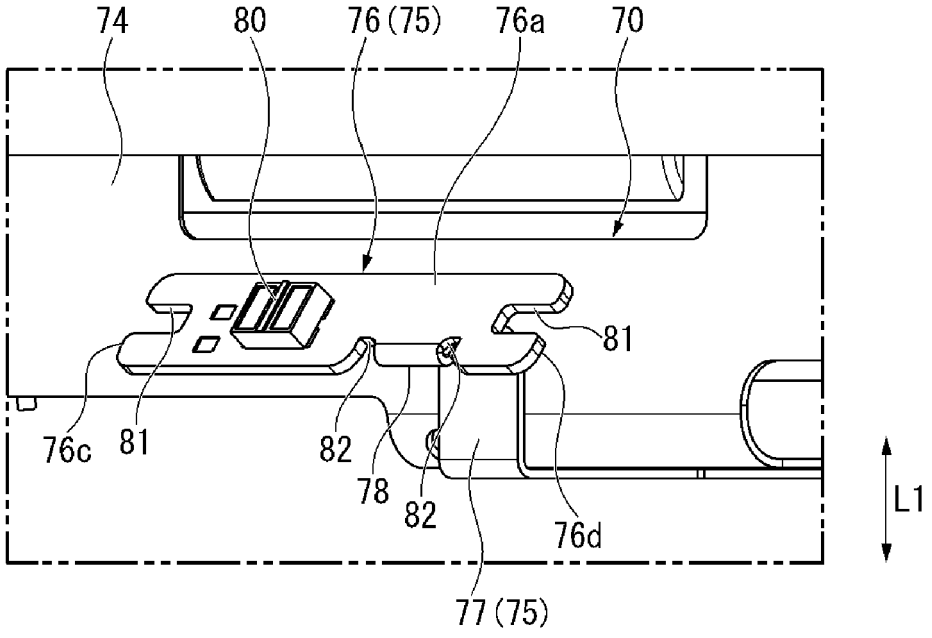
(72) Inventor: **MIYAWAKI, Kouhei**
Chiba-shi, 261-8507 (JP)

(74) Representative: **Miller Sturt Kenyon**
9 John Street
London WC1N 2ES (GB)

(54) **PRINTING UNIT AND PORTABLE TERMINAL**

(57) A printing unit (6) includes: a platen roller (50) configured to convey a recording sheet (P); a thermal head (40) configured to perform printing on the recording sheet (P) through press contact with an outer peripheral surface of the platen roller (50); a sensor (80), which is arranged in such a manner as to face the platen roller (50), and is configured to detect the recording sheet (P); a flexible printed board (70) including a sensor mounting portion (76) on which the sensor (80) is mounted; and a frame (10), which is configured to support the platen roller (50) in a rotatable manner, and includes a locking projection (26) to which the sensor mounting portion (76) is to be locked.

FIG.5



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a printing unit and a portable terminal.

2. Description of the Related Art

[0002] A printing unit which has hitherto been known is configured to perform printing by heating a printing surface of a recording sheet with heating elements of a thermal head to develop a color on the printing surface while feeding the recording sheet through rotation of a platen roller under a state in which the recording sheet is nipped between the platen roller and the thermal head.

[0003] In the related-art printing unit described above, on a near side of the thermal head, a sheet guide portion for guiding the recording sheet toward the thermal head is provided. Moreover, a sensor for detecting the recording sheet conveyed along the sheet guide portion is mounted to the sheet guide portion.

[0004] However, in the related-art printing unit, in order to mount the sensor to the sheet guide portion, there is sometimes adopted a configuration in which the sensor is sandwiched between the sheet guide portion and a holder being a member provided separately from the sheet guide portion. However, in the configuration in which the sensor is sandwiched between the sheet guide portion and the holder, the number of parts is increased due to provision of the separate member. Further, in order to fix the holder to the sheet guide portion, the sheet guide portion is arranged so as to surround the holder, and hence a size of a contour of the sheet guide portion is increased. Accordingly, a size of the printing unit may be increased. Therefore, the related-art printing unit has a room for improvement in view of achieving downsizing of the printing unit through simplification of a fixing structure for the sensor for detecting the recording sheet.

[0005] In view of the above, in this technical field, there have been demands for providing a printing unit that is downsized, and a portable terminal including the printing unit.

SUMMARY OF THE INVENTION

[0006] According to one embodiment of the present invention, there is provided a printing unit, including: a platen roller configured to convey a recording sheet; a thermal head configured to perform printing on the recording sheet through press contact with an outer peripheral surface of the platen roller; a sensor, which is arranged in such a manner as to face the platen roller, and is configured to detect the recording sheet; a flexible printed board including a sensor mounting portion on which the sensor is mounted; and a frame, which is configured to support the platen roller in a rotatable manner, and includes a locking projection to which the sensor mounting portion is to be locked.

[0007] In the above-mentioned printing unit according to the one embodiment of the present invention, the locking projection may include a climb projection including a side surface facing in a direction inclined with respect to a plane direction of the sensor mounting portion, and the sensor mounting portion may include a first locked portion that passes through the sensor mounting portion in a thickness direction of the sensor mounting portion and allows the climb projection to be inserted therethrough.

[0008] In the above-mentioned printing unit according to the one embodiment of the present invention, the locking projection may include a boss extending in the thickness direction of the sensor mounting portion, and the sensor mounting portion may include a second locked portion that is formed by cutting out an edge of the sensor mounting portion, and allows the boss to be inserted therethrough.

[0009] In the above-mentioned printing unit according to the one embodiment of the present invention, the frame may include a seat portion configured to support the sensor mounting portion from a back side of the sensor.

[0010] In the above-mentioned printing unit according to the one embodiment of the present invention, the sensor mounting portion may include a mounting surface on which the sensor is mounted, and a back surface formed on a side opposite to the mounting surface, and the flexible printed board may include a tab portion extending from the sensor mounting portion along the back surface.

[0011] In the above-mentioned printing unit according to the one embodiment of the present invention, the frame may include a sheet guide portion extending along an axial direction of the platen roller, the sheet guide portion may include a guide surface configured to guide the recording sheet toward the thermal head, the sheet guide portion may include a receiving portion formed therein and configured to receive the sensor mounting portion, and the receiving portion may be wider than the sensor mounting portion on both sides of the sensor mounting portion in the axial direction, and be opened in the guide surface to a side apart from the thermal head.

[0012] In the above-mentioned printing unit according to the one embodiment of the present invention, the flexible printed board may include a tab portion extending from the sensor mounting portion, the sensor mounting portion may have a pair of cutouts formed in line along an edge of the sensor mounting portion, and the tab portion may be connected to a portion between the pair of cutouts.

[0013] In the above-mentioned printing unit according to the one embodiment of the present invention, the sensor may face in a direction inclined at an acute angle with respect to a thickness direction of the thermal head.

[0014] In the above-mentioned printing unit according to the one embodiment of the present invention, the flexible printed board may include a tab portion extending

from the sensor mounting portion, wherein the tab portion is connected to the sensor mounting portion through intermediation of a bent portion, and wherein the sensor mounting portion is urged by a restoring force of the bent portion in a direction of keeping the sensor mounting portion to be locked to the locking projection.

[0015] According to one embodiment of the present invention, there is provided a portable terminal, including the above-mentioned printing unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Embodiments of the present invention will now be described by way of further example only and with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view for illustrating a portable terminal according to at least one embodiment of the present invention.
FIG. 2 is a perspective view for illustrating a printing unit according to a first embodiment of the present invention.
FIG. 3 is an exploded perspective view for illustrating the printing unit according to the first embodiment.
FIG. 4 is a perspective view for illustrating the printing unit according to the first embodiment.
FIG. 5 is a perspective view for illustrating a part of a flexible printed board in the first embodiment.
FIG. 6 is a front view for illustrating a part of the printing unit according to the first embodiment.
FIG. 7 is a perspective view for illustrating a part of the printing unit according to the first embodiment when viewed from a lower front side thereof.
FIG. 8 is a sectional view taken along the line VIII-VIII of FIG. 6.
FIG. 9 is a sectional view taken along the line IX-IX of FIG. 6.
FIG. 10 is a sectional view taken along the line X-X of FIG. 6.
FIG. 11 is a perspective view for illustrating a printing unit according to a second embodiment of the present invention.
FIG. 12 is an exploded perspective view for illustrating the printing unit according to the second embodiment.
FIG. 13 is a perspective view for illustrating the printing unit according to the second embodiment.
FIG. 14 is a front view for illustrating a part of the printing unit according to the second embodiment.
FIG. 15 is a perspective view for illustrating a part of the printing unit according to the second embodiment when viewed from a lower front side thereof.
FIG. 16 is a sectional view taken along the line XVI-XVI of FIG. 14.

DESCRIPTION OF THE EMBODIMENTS

[0017] Now, an embodiment of the present invention is described with reference to the drawings. In the following description, components having the same or similar function are denoted by the same reference symbols. In some cases, overlapping description of the components is omitted.

[0018] FIG. 1 is a perspective view for illustrating a portable terminal according to at least one embodiment of the present invention. As illustrated in FIG. 1, a portable terminal 1 is capable of performing printing on a recording sheet P. The recording sheet P is a heat sensitive sheet that develops a color when heat is applied thereto, and is used suitably for printing a variety of labels, receipts, and tickets. The recording sheet P is set in the portable terminal 1 in a state of a roll sheet R obtained by rolling the recording sheet P so as to have a hollow hole, and printing is performed on a part drawn from the roll sheet R.

[0019] The portable terminal 1 includes a casing 3, a display unit 4, a control unit 5, and a printing unit 6. The casing 3 formed into a hollow box-shape is made of a metal material or plastic such as ABS or a composite material of ABS and polycarbonate. The casing 3 includes a main body portion 7 having a rectangular parallelepiped shape, and a roll sheet receiving portion 8 formed at one end portion of the main body portion 7 in a longitudinal direction thereof so as to be bent toward one side of a thickness direction of the main body portion 7. The printing unit 6 is received at the one end portion of the main body portion 7 in the longitudinal direction. A discharge port 3a is formed in one end surface of the main body portion 7 in the longitudinal direction. The discharge port 3a is configured to discharge the recording sheet P printed by passing through the printing unit 6. The display unit 4 is arranged on a main surface of the main body portion 7, which faces the other side in the thickness direction. The display unit 4 is, for example, a liquid crystal panel. The display unit 4 is connected to the control unit 5, and is configured to display various kinds of information. The roll sheet receiving portion 8 is configured to receive the roll sheet R. The printing unit 6 is a so-called thermal printer.

[0020] FIG. 2 and FIG. 4 are each a perspective view for illustrating a printing unit according to a first embodiment. FIG. 3 is an exploded perspective view for illustrating the printing unit according to the first embodiment. As illustrated in FIG. 2 to FIG. 4, the printing unit 6 includes a platen roller 50, a motor 60, a main body frame 10 (frame), a first reduction gear 31, a second reduction gear 32, a thermal head 40, a head support member 45, and a flexible printed board 70. The platen roller 50 includes a driven gear 54. The motor 60 is configured to rotate the platen roller 50 about a rotation axis O (predetermined axis). The main body frame 10 (frame) supports the platen roller 50 in a rotatable manner, and the motor 60 is fixed to the main body frame 10. The first reduction gear 31 and the second reduction gear 32 are configured to reduce a driving force of the motor 60 and transmit the driving force to the driven gear 54. The thermal head 40 is to be brought into press contact with an outer peripheral

surface of the platen roller 50. The head support member 45 is supported on the main body frame 10, and the thermal head 40 is fixed to the head support member 45. The flexible printed board 70 is configured to electrically connect the control unit 5 of the portable terminal 1 and each portion of the printing unit 6 to each other.

[0021] As illustrated in FIG. 2, the printing unit 6 is configured to discharge the recording sheet P passing between the platen roller 50 and the thermal head 40 in a direction indicated by an arrow A. Mainly in the description for the printing unit 6 below, a direction along the arrow A is defined as a vertical direction L1, and the direction indicated by the arrow A is defined as an upper side. Further, a direction which is orthogonal to the vertical direction L1 and matches a width direction of the recording sheet P is defined as a horizontal direction L2. In addition, a direction orthogonal to the vertical direction L1 and the horizontal direction L2 is defined as a fore-and-aft direction L3, and the platen roller 50 side with respect to the thermal head 40 in the fore-and-aft direction L3 is defined as a front side.

[0022] As illustrated in FIG. 3, the main body frame 10 is formed of, for example, a plate member such as a polycarbonate resin containing glass fibers. The main body frame 10 is formed into a U-shape opened toward the front side when viewed in the vertical direction L1. Specifically, the main body frame 10 includes a rear plate portion 11 extending in the horizontal direction L2, a first side wall portion 12 formed upright from one (left) end portion of the rear plate portion 11 in the horizontal direction L2 toward the front side, a second side wall portion 13 formed upright from another (right) end portion of the rear plate portion 11 in the horizontal direction L2 toward the front side and a rear side, and a sheet guide portion 18 formed between the first side wall portion 12 and the second side wall portion 13.

[0023] The rear plate portion 11 is formed into a plate shape having a thickness in the fore-and-aft direction L3. The first side wall portion 12 is formed into a plate shape having a thickness in the horizontal direction L2. A portion of an upper edge of the first side wall portion 12 is cut downward to form a first roller insertion groove 14A. The second side wall portion 13 is formed into a plate shape having a thickness in the horizontal direction L2. A portion of an upper edge of the second side wall portion 13 is cut downward to form a second roller insertion groove 14B. The first roller insertion groove 14A and the second roller insertion groove 14B are formed so as to match each other when viewed in the horizontal direction L2. The platen roller 50 is removably inserted into the first roller insertion groove 14A and the second roller insertion groove 14B. The sheet guide portion 18 is arranged below the platen roller 50. One (left) end portion of the sheet guide portion 18 in the horizontal direction L2 is connected to an inner surface of the first side wall portion 12, and another (right) end portion of the sheet guide portion 18 in the horizontal direction L2 is connected to an inner surface of the second side wall portion 13. The details of the sheet guide portion 18 are to be described later.

[0024] A gearbox portion 15 is formed on an outer side of the second side wall portion 13. The gearbox portion 15 includes a peripheral wall portion 16 formed to extend upright from a peripheral edge of the second side wall portion 13 toward the outer side in the horizontal direction L2. That is, the gearbox portion 15 is formed of the second side wall portion 13 and the peripheral wall portion 16, and is opened toward the outer side in the horizontal direction L2. The peripheral wall portion 16 is opened upward when viewed in the horizontal direction L2. The peripheral wall portion 16 includes a pair of locking recessed portions 17 formed so as to be recessed downward. The pair of locking recessed portions 17 are formed on both front and rear sides of an upper opening of the peripheral wall portion 16, respectively. A gear cover 30 is engaged with the pair of locking recessed portions 17. The gear cover 30 covers an inner side of the gearbox portion 15 from an outer side thereof in the horizontal direction.

[0025] The first reduction gear 31 and the second reduction gear 32 are assembled inside the gearbox portion 15 so as to be rotatable. The first reduction gear 31 and the second reduction gear 32 mesh with each other.

[0026] The motor 60 generates torque about an output axis Q. The motor 60 is arranged so that the output axis Q is parallel to the rotation axis O of the platen roller 50 (see FIG. 2). The motor 60 is arranged on a side opposite to the platen roller 50 across the rear plate portion 11. The motor 60 is fixed to an inner surface of the second side wall portion 13 in the horizontal direction L2. An output shaft 61 of the motor 60 passes through the second side wall portion 13. The output shaft 61 meshes with the first reduction gear 31 inside the gearbox portion 15. The flexible printed board 70 is connected to the motor 60. The motor 60 is electrically connected to the control unit 5 (see FIG. 1) via the flexible printed board 70. The motor 60 is configured to be driven based on a signal from the control unit 5.

[0027] The thermal head 40 is configured to perform printing on the recording sheet P (see FIG. 2). The thermal head 40 is formed into a rectangular shape having its longitudinal direction defined as the horizontal direction L2 when viewed in the fore-and-aft direction L3. The thermal head 40 is arranged under a state in which a thickness direction of the thermal head 40 matches the fore-and-aft direction L3. A head surface 40a of the thermal head 40 faces a side opposite to the rear plate portion 11 (front side). On the head surface 40a of the thermal head 40, a large number of heating elements 41 are arrayed in the horizontal direction L2.

[0028] The head surface 40a is opposed to a printing surface of the recording sheet P, and the recording sheet P may be nipped between the head surface 40a and the outer peripheral surface of the platen roller 50. The thermal head 40 is connected to the control unit 5 (see FIG. 1) through intermediation of the flexible printed board 70. A driver IC (not shown) mounted on the thermal head 40

is configured to control heat generation of the heating elements 41 based on the signal from the control unit 5. Through the control of the heat generation of the heating elements 41, the thermal head 40 prints, for example, various kinds of letters and figures on the printing surface of the recording sheet P. The thermal head 40 is fixed by being bonded onto the head support member 45.

[0029] The head support member 45 is arranged in front of the rear plate portion 11, behind the sheet guide portion 18, and between the first side wall portion 12 and the second side wall portion 13. The head support member 45 is made of a metal material. The head support member 45 is a plate-like member having its longitudinal direction defined as the horizontal direction L2. The head support member 45 is arranged under a state in which a thickness direction of the head support member 45 matches the fore-and-aft direction. The thermal head 40 is fixed to a front surface of the head support member 45.

[0030] A pair of stoppers 45a configured to regulate a pivot range of the head support member 45 are formed at upper end portions of the head support member 45. Each of the pair of stoppers 45a is formed in substantially a quadrangular prism shape and extends outward in the horizontal direction L2 of the head support member 45. The pair of stoppers 45a are inserted into a hole portion 12a formed in an upper part of the first side wall portion 12 of the main body frame 10 and a hole portion 13a having a rectangular shape formed in an upper part of the second side wall portion 13. The stoppers 45a are movable inside the hole portions 12a and 13a, respectively, along with the pivot of the head support member 45, and may be brought into contact with inner wall surfaces of the hole portions 12a and 13a, respectively. Through the contact of the stoppers 45a with the inner wall surfaces of the hole portions 12a and 13a, the pivot amount of the head support member 45 is regulated.

[0031] Each of the elastic members 47 is interposed between the head support member 45 and the rear plate portion 11. The elastic member 47 is configured to urge the head support member 45 and the rear plate portion 11 so as to separate the head support member 45 and the rear plate portion 11 from each other. That is, the elastic member 47 is configured to always press the head support member 45 toward the front side. The plurality of (three in the first embodiment) elastic members 47 are arrayed with intervals in the horizontal direction L2.

[0032] As illustrated in FIG. 2, the platen roller 50 is arranged so as to be opposed to the thermal head 40 under a state in which the rotation axis O matches the horizontal direction L2. The platen roller 50 is rotated about the rotation axis O under a state in which the recording sheet P is nipped between the platen roller 50 and the thermal head 40, to thereby convey the recording sheet P in the direction indicated by the arrow A.

[0033] As illustrated in FIG. 3, the platen roller 50 includes a roller shaft 51, a roller main body 52 mounted on the roller shaft 51, and a pair of bearings 53 mounted at both ends of the roller shaft 51. The roller shaft 51 is formed slightly longer than the separation distance between the first side wall portion 12 and the second side wall portion 13 of the main body frame 10. The roller main body 52 is made of, for example, rubber, and is arranged along the horizontal direction L2 uniformly over the entire region excluding portions corresponding to both the ends of the roller shaft 51.

[0034] As illustrated in FIG. 2 and FIG. 3, the pair of bearings 53 of the platen roller 50, which are mounted on both ends thereof, are inserted into the first roller insertion groove 14A and the second roller insertion groove 14B of the main body frame 10, respectively. The bearings 53 are held in the first roller insertion groove 14A and the second roller insertion groove 14B by locking springs 19 supported on the main body frame 10. With this configuration, the platen roller 50 is held so as to be rotatable relative to the main body frame 10. Further, when the locking springs 19 are elastically deformed in order to insert and remove the bearings 53 into and from the first roller insertion groove 14A and the second roller insertion groove 14B, the platen roller 50 is mountable to and removable from the main body frame 10. Under a state in which the platen roller 50 is inserted into the first roller insertion groove 14A and the second roller insertion groove 14B, the platen roller 50 is arranged so that the roller main body 52 is brought into contact with the thermal head 40 through intermediation of the recording sheet P drawn out from the roll sheet R (see FIG. 1).

[0035] As illustrated in FIG. 3, the driven gear 54 is fixed on another (right) end portion of the platen roller 50 in the horizontal direction L2. The driven gear 54 is assembled to an upper part of the gearbox portion 15 when the platen roller 50 is held on the first side wall portion 12 and the second side wall portion 13. The driven gear 54 meshes with the second reduction gear 32. With this, a rotational driving force from the motor 60 is transmitted to the driven gear 54 via the first reduction gear 31 and the second reduction gear 32. The platen roller 50 is rotated under a state of being held on the first side wall portion 12 and the second side wall portion 13, thereby being capable of conveying the recording sheet P (see FIG. 2).

[0036] As illustrated in FIG. 4, the flexible printed board 70 is configured to electrically connect the thermal head 40, the motor 60, and a sensor 80 to be described later to the control unit 5 of the portable terminal 1 via a wiring pattern formed on the flexible printed board 70. The flexible printed board 70 is configured to supply power to the thermal head 40, the motor 60, and the sensor 80, and to input/output a signal from/to the control unit 5. The flexible printed board 70 includes a base portion 71, an extending portion 72, a motor connection portion 73, a head connection portion 74, and a sensor connection portion 75. The base portion 71 is arranged along a lower surface of the rear plate portion 11. The extending portion 72 extends from the base portion 71 in a branching manner.

[0037] The base portion 71 is arranged so that front

and back (top and bottom) surfaces of the base portion 71 face in the vertical direction L1. The base portion 71 extends in the horizontal direction L2 along the lower surface of the rear plate portion 11. The extending portion 72 extends from a rear edge of the base portion 71. A terminal to be connected to the control unit 5 is provided at a distal end of the extending portion 72. All the wiring extending toward the terminal is arranged on the extending portion 72. The motor connection portion 73 is electrically connected to the motor 60. The motor connection portion 73 extends rearward from a front edge of the base portion 71 through a lower side of the extending portion 72 and a lower side of the motor 60, and then is connected to the motor 60.

[0038] The head connection portion 74 is electrically connected to the thermal head 40. The head connection portion 74 extends upward from the front edge of the base portion 71 through a space between the rear plate portion 11 and the sheet guide portion 18, and then is connected to the thermal head 40. The sensor connection portion 75 is electrically connected to the sensor 80 (see FIG. 3). The sensor connection portion 75 extends forward from the rear edge of the base portion 71 through a lower side of the base portion 71, and then extends upward through the space between the rear plate portion 11 and the sheet guide portion 18 in front of the head connection portion 74 so as to be supported on the sheet guide portion 18.

[0039] FIG. 5 is a perspective view for illustrating a part of the flexible printed board in the first embodiment. As illustrated in FIG. 5, the sensor connection portion 75 includes a sensor mounting portion 76 on which the sensor 80 is mounted, and a tab portion 77 extending from the sensor mounting portion 76 toward the base portion 71 (see FIG. 4).

[0040] The sensor 80 is configured to detect the recording sheet P that is guided toward the thermal head 40 by a guide surface 20 to be described later. The sensor 80 is, for example, a reflector-type photo interrupter sensor (PI sensor). The sensor 80 is configured to detect the recording sheet P in such a manner that light emitted from a light emitter is reflected by the recording sheet P, and then a light receiver receives the reflected light. For example, when the reflected light having a predetermined intensity is detected by the light receiver of the sensor 80, the control unit 5 of the portable terminal 1 determines that the recording sheet P is present within a detection range of the sensor 80.

[0041] The sensor mounting portion 76 is formed into a rectangular plate shape. The sensor mounting portion 76 includes a mounting surface 76a on which the sensor 80 is mounted, and a back surface 76b (see FIG. 7) formed on a side opposite to the mounting surface 76a. The sensor mounting portion 76 is formed to be less flexible than the tab portion 77. For example, the sensor mounting portion 76 is formed to be thicker than the tab portion 77. The sensor mounting portion 76 includes a locked portion 81 formed therein. The locked portion 81 passes through the sensor mounting portion 76 in a thickness direction of the sensor mounting portion 76, and is formed so as to be lockable to a protruding structure. The locked portion 81 is formed by cutting out each edge of the sensor mounting portion 76 in a longitudinal direction of the sensor mounting portion 76. The locked portion 81 extends in the longitudinal direction of the sensor mounting portion 76 so as to have a constant width.

[0042] In an edge of the sensor mounting portion 76 extending along the longitudinal direction thereof, a pair of cutouts 82 are formed in line. The pair of cutouts 82 are formed only in the edge of the sensor mounting portion 76 extending along the longitudinal direction thereof on one side of the sensor 80. The tab portion 77 is connected to a portion between the pair of cutouts 82.

[0043] The tab portion 77 is routed so as to be prevented from being arranged more on the front side than the sensor mounting portion 76. The tab portion 77 is connected to the portion between the pair of cutouts 82 of the sensor mounting portion through intermediation of a bent portion 78. The tab portion 77 extends from the portion between the pair of cutouts 82 along the back surface 76b of the sensor mounting portion 76, and then is connected to the base portion 71 of the flexible printed board 70.

[0044] The sheet guide portion 18 is described in detail. As illustrated in FIG. 3, the sheet guide portion 18 is formed into a column shape extending along the horizontal direction L2. The sheet guide portion 18 includes the guide surface 20 configured to guide the recording sheet P, which is drawn from the roll sheet R (see FIG. 1) arranged on the front side of the printing unit 6, to a space between the thermal head 40 and the platen roller 50. The guide surface 20 as a whole extends downward and forward from an upper edge of the sheet guide portion 18 on the thermal head 40 side, and faces a space on the front side of the printing unit 6. Specifically, the guide surface 20 includes a first guide surface 20A extending forward and downward from the upper edge of the sheet guide portion 18, and a second guide surface 20B extending downward from a front edge of the first guide surface 20A. The first guide surface 20A and the second guide surface 20B are each formed into a flat surface shape extending along the horizontal direction L2. In the first embodiment, the first guide surface 20A is inclined at an angle of 37.5° with respect to the head surface 40a of the thermal head 40. A rear surface of the sheet guide portion 18 is continuous with a rear edge of the first guide surface 20A. A lower surface of the sheet guide portion 18 is continuous with a lower edge of the second guide surface 20B.

[0045] The sheet guide portion 18 includes a receiving portion 21 configured to receive the sensor mounting portion 76 of the flexible printed board 70. The receiving portion 21 is formed into a recessed shape opened in the guide surface 20. Moreover, the receiving portion 21 is opened not only in the guide surface 20 but also in the rear surface and the lower surface of the sheet guide

portion 18. A portion of the receiving portion 21 in the second guide surface 20B is wider than the sensor mounting portion 76 on both sides of the sensor mounting portion 76 in the horizontal direction L2, and is opened to a side apart from the thermal head 40.

[0046] FIG. 6 is a front view for illustrating a part of the printing unit according to the first embodiment. FIG. 7 is a perspective view for illustrating a part of the printing unit according to the first embodiment when viewed from a lower front side thereof.

[0047] As illustrated in FIG. 6 and FIG. 7, a first holding portion 22, a second holding portion 23, and a seat portion 24 protrude from the receiving portion 21. The first holding portion 22 protrudes rightward from a left side wall of the receiving portion 21. The second holding portion 23 protrudes leftward from a right side wall of the receiving portion 21. The first holding portion 22 and the second holding portion 23 extend along a boundary between the first guide surface 20A and the second guide surface 20B. The first holding portion 22 and the second holding portion 23 are formed so as to have an interval between a distal end of the first holding portion 22 and a distal end of the second holding portion 23 in the horizontal direction L2. The first holding portion 22 and the second holding portion 23 are located above the lower edge of the second guide surface 20B. With this configuration, the receiving portion 21 is opened between the first holding portion 22 and the second holding portion 23 and below the first holding portion 22 and the second holding portion 23. The seat portion 24 protrudes from a deep wall of the receiving portion 21 toward an opening of the receiving portion 21 formed on the guide surface 20. The seat portion 24 is formed between the first holding portion 22 and the second holding portion 23 in the horizontal direction L2.

[0048] FIG. 8 is a sectional view taken along the line VIII-VIII of FIG. 6. As illustrated in FIG. 8, the first holding portion 22 includes a first support surface 22a. The first support surface 22a is formed into a flat surface shape extending in the horizontal direction L2. The first support surface 22a faces downward and rearward at acute angles. The first support surface 22a extends in parallel to the first guide surface 20A.

[0049] FIG. 9 is a sectional view taken along the line IX-IX of FIG. 6. As illustrated in FIG. 9, the second holding portion 23 includes a second support surface 23a. The second support surface 23a is formed into a flat surface shape extending in the horizontal direction L2. The second support surface 23a faces downward and rearward at acute angles. The second support surface 23a and the first support surface 22a extend along the same imaginary plane. The second support surface 23a extends in parallel to the first guide surface 20A.

[0050] FIG. 10 is a sectional view taken along the line X-X of FIG. 6. As illustrated in FIG. 10, the seat portion 24 includes a third support surface 24a. The third support surface 24a is formed into a flat surface shape extending in the horizontal direction L2. The third support surface 24a faces upward and forward at acute angles. The third support surface 24a extends in parallel to the first support surface 22a and the second support surface 23a. The third support surface 24a is opposed to the first support surface 22a and the second support surface 23a with an interval when viewed in the horizontal direction L2. The interval between the third support surface 24a and the first support surface 22a and between the third support surface 24a and the second support surface 23a is substantially equal to a thickness of the sensor mounting portion 76 when viewed in the horizontal direction L2.

[0051] As illustrated in FIG. 6 and FIG. 7, the sensor mounting portion 76 is mounted to the receiving portion 21. The sensor mounting portion 76 is arranged under a state in which the longitudinal direction of the sensor mounting portion 76 matches the horizontal direction L2. The sensor mounting portion 76 is arranged so as to be sandwiched between the first support surface 22a and the third support surface 24a and between the second support surface 23a and the third support surface 24a when viewed in the horizontal direction L2 (see FIG. 8 to FIG. 10). The sensor mounting portion 76 is arranged so that a first end portion 76c of the sensor mounting portion 76 in the longitudinal direction overlaps the first support surface 22a and a second end portion 76d of the sensor mounting portion 76 in the longitudinal direction overlaps the second support surface 23a. The sensor mounting portion 76 is supported by the third support surface 24a from a back side of the sensor 80. The sensor mounting portion 76 is arranged so that a connection portion between the sensor mounting portion 76 and the tab portion 77 is located on a side of the opening formed on the second guide surface 20B. The sensor mounting portion 76 is urged toward the first support surface 22a and the second support surface 23a by a restoring force of the bent portion 78 formed at the connection portion between the sensor mounting portion 76 and the tab portion 77.

[0052] As illustrated in FIG. 10, the sensor mounting portion 76 is arranged so that the mounting surface 76a faces the side of the opening formed on the guide surface 20. In the first embodiment, the first support surface 22a, the second support surface 23a, and the third support surface 24a extend in parallel to the first guide surface 20A, and hence the sensor 80 faces in a direction normal to the first guide surface 20A. With this configuration, the sensor 80 faces in a direction inclined at an acute angle with respect to the thickness direction of the thermal head 40. The facing direction of the sensor 80 matches a direction normal to the mounting surface 76a of the sensor mounting portion 76.

[0053] As illustrated in FIG. 7, the sheet guide portion 18 includes a locking projection 26 to which the sensor mounting portion 76 received in the receiving portion 21 is to be locked. The locking projection 26 includes a boss 27 formed on the first support surface 22a, and a climb projection 28 formed on the second support surface 23a.

[0054] As illustrated in FIG. 7 and FIG. 8, the boss 27 protrudes from the first support surface 22a in a direction

normal to the first support surface 22a. A side surface of the boss 27 is orthogonal to the first support surface 22a. In the first embodiment, the boss 27 is formed into a circular column shape. The boss 27 is inserted through the locked portion 81 formed on the first end portion 76c side of the sensor mounting portion 76.

[0055] As illustrated in FIG. 7 and FIG. 9, the climb projection 28 protrudes from the second support surface 23a in a direction normal to the second support surface 23a. The climb projection 28 is inserted through the locked portion 81 formed on the second end portion 76d side of the sensor mounting portion 76. A guiding surface 28a is formed on a side surface of the climb projection 28. The guiding surface 28a is inclined with respect to a plane direction of the sensor mounting portion 76. The guiding surface 28a is inclined so as to be away from an imaginary plane extended from the second support surface 23a as extending along a plane direction of the second support surface 23a from the side of the opening on the second guide surface 20B toward an inside of the receiving portion 21.

[0056] In the configuration described above, when the sensor mounting portion 76 is mounted to the sheet guide portion 18, first, the first end portion 76c of the sensor mounting portion 76 is inserted into the opening of the receiving portion 21 formed on the second guide surface 20B, and then the boss 27 is inserted into the locked portion 81 formed on the first end portion 76c side of the sensor mounting portion 76. At this time, the sensor mounting portion 76 can be locked to the locking projection 26 without bending the sensor mounting portion 76 because the locked portion 81 is a cutout. Next, the sensor mounting portion 76 is turned about the locking projection 26, and then the second end portion 76d of the sensor mounting portion 76 is inserted into the receiving portion 21. In the process of inserting the second end portion 76d of the sensor mounting portion 76 into the receiving portion 21, after the second end portion 76d of the sensor mounting portion 76 is brought into slide contact with the guiding surface 28a of the climb projection 28 and climbs over the climb projection 28, the climb projection 28 is inserted into the locked portion 81 formed on the second end portion 76d side. In the manner described above, the sensor mounting portion 76 is mounted to a predetermined position of the sheet guide portion 18.

[0057] As described above, the printing unit 6 according to the first embodiment includes the flexible printed board 70 and the main body frame 10. The flexible printed board 70 includes the sensor mounting portion 76 on which the sensor 80 is mounted. The main body frame 10 includes the locking projections 26 to which the sensor mounting portion 76 is to be locked. With this configuration, when the sensor mounting portion 76 is locked to the locking projections 26 of the main body frame 10, the sensor mounting portion 76 can be mounted to the main body frame 10 without combining a separate member with the main body frame 10. Therefore, as compared to a configuration in which the sensor mounting portion is mounted to the main body frame by combining a separate member with the main body frame, the downsized printing unit 6 can be provided.

[0058] Further, the locking projection 26 includes, on the side surface, the climb projection 28 including the guiding surface 28a facing in the direction inclined with respect to a plane direction of the sensor mounting portion 76. The sensor mounting portion 76 includes the locked portion 81 that passes through the sensor mounting portion 76 in the thickness direction of the sensor mounting portion 76 and allows the climb projection 28 to be inserted therethrough. With this configuration, when the sensor mounting portion 76 is displaced along the plane direction of the sensor mounting portion 76 and brought into slide contact with the guiding surface 28a of the climb projection 28, the sensor mounting portion 76 can be caused to climb over the climb projection 28. Further, when the sensor mounting portion 76 that has climbed over the climb projection 28 is further displaced along the plane direction of the sensor mounting portion 76 so as to bring the locked portion 81 closer to the climb projection 28, the climb projection 28 can be inserted through the locked portion 81. Accordingly, as compared to a configuration that causes a worker to handle the sensor mounting portion 76 so as to lift up the sensor mounting portion 76 in the thickness direction of the sensor mounting portion 76 when the sensor mounting portion 76 is locked to the locking projection, workability can be increased. Further, the sensor mounting portion 76 can be prevented from being bent significantly due to application of an excessive force to the sensor mounting portion 76, thereby being capable of suppressing occurrence of a failure, such as disconnection, in the sensor mounting portion 76. Therefore, reliability of the printing unit 6 can be increased.

[0059] Further, the locking projection 26 includes the boss 27 extending in the thickness direction of the sensor mounting portion 76. The sensor mounting portion 76 includes the locked portion 81 that is formed by cutting out an edge of the sensor mounting portion 76, and allows the boss 27 to be inserted therethrough. With this configuration, through displacement of the sensor mounting portion 76 along the plane direction of the sensor mounting portion 76, the boss 27 can be arranged inside the locked portion 81. Accordingly, without displacing the sensor mounting portion 76 in the thickness direction of the sensor mounting portion 76, the sensor mounting portion 76 can be locked to the boss 27. Accordingly, as compared to a configuration that causes a worker to handle the sensor mounting portion 76 so as to lift up the sensor mounting portion 76 in the thickness direction of the sensor mounting portion 76 when the sensor mounting portion 76 is locked to the locking projection, workability can be increased. Further, the sensor mounting portion 76 can be prevented from being bent significantly due to application of an excessive force to the sensor mounting portion 76, thereby being capable of suppress-

ing occurrence of a failure, such as disconnection, in the sensor mounting portion 76. Therefore, reliability of the printing unit 6 can be increased.

[0060] The main body frame 10 includes the seat portion 24 configured to support the sensor mounting portion 76 from a back side of the sensor 80. With this configuration, a position of the sensor 80 can be stabilized. Therefore, accuracy in detecting the recording sheet P by the sensor 80 can be stabilized.

[0061] The flexible printed board 70 includes the tab portion 77 extending from the sensor mounting portion 76 along the back surface 76b of the sensor mounting portion 76. This configuration achieves arrangement of the recording sheet P on the mounting surface 76a side, and provides the tab portion 77 extending along the back surface 76b of the sensor mounting portion 76, thereby being capable of suppressing interference of the tab portion 77 with the recording sheet P. Therefore, the recording sheet P can be prevented from being stained by contact of the tab portion 77 with the recording sheet P.

[0062] The sheet guide portion 18 includes the guide surface 20 configured to guide the recording sheet P toward the thermal head 40. The sheet guide portion 18 includes the receiving portion 21 formed therein and configured to receive the sensor mounting portion 76. The receiving portion 21 is wider than the sensor mounting portion 76 on both sides of the sensor mounting portion 76 in the horizontal direction L2, and is opened in the guide surface 20 to the side apart from the thermal head 40. With this configuration, the sensor mounting portion 76 can be received in the receiving portion 21 from the side apart from the thermal head 40. Accordingly, it is not required that a space, through which the sensor mounting portion 76 is to be passed when the sensor mounting portion 76 is received in the receiving portion 21, be defined between the sheet guide portion 18 and the thermal head 40, and hence the sheet guide portion 18 can be arranged close to the thermal head 40. Therefore, the printing unit 6 can be further downsized.

[0063] The sensor mounting portion 76 has the pair of cutouts 82 formed in line along the edge of the sensor mounting portion 76. The tab portion 77 is connected to the portion between the pair of cutouts 82. With this configuration, stress applied to the connection portion between the sensor mounting portion 76 and the tab portion 77 can be concentrated on the cutouts 82. Accordingly, the stress can be prevented from affecting the mounted portion (soldered portion) of the sensor 80 and causing a contact failure of the sensor 80. Therefore, reliability of the printing unit 6 can be increased.

[0064] The sensor 80 faces in the direction inclined at an acute angle with respect to the thickness direction of the thermal head 40. With this configuration, the sensor mounting portion 76 is arranged so as to be inclined with respect to the thickness direction of the thermal head 40, and hence a region occupied by the sensor mounting portion 76 in the thickness direction of the thermal head 40 can be reduced. Accordingly, the printing unit 6 can be downsized in the thickness direction of the thermal head 40, thereby being capable of providing the printing unit 6 that enables closer arrangement of the roll sheet R formed of the recording sheet P.

[0065] The tab portion 77 is connected to the sensor mounting portion 76 through intermediation of the bent portion 78. The sensor mounting portion 76 is urged by the restoring force of the bent portion 78 in a direction of keeping the sensor mounting portion 76 to be locked to the locking projection 26. With this configuration, without providing a structure configured to prevent the sensor mounting portion 76 from falling from the locking projections 26 on at least any one of the sensor mounting portion 76 and the main body frame 10, the sensor mounting portion 76 can be held at a predetermined position of the main body frame 10. Accordingly, complication of a fixing structure for the sensor 80 can be suppressed.

[0066] The portable terminal 1 according to the first embodiment includes the downsized printing unit 6 described above, and hence the portable terminal can be downsized as compared to the related-art portable terminal.

[0067] FIG. 11 and FIG. 13 are each a perspective view for illustrating a printing unit according to a second embodiment of the present invention. FIG. 12 is an exploded perspective view for illustrating the printing unit according to the second embodiment. In the second embodiment, an inclination angle of a first guide surface 120A is different from that of the first guide surface 20A in the first embodiment. The second embodiment is the same as the first embodiment except for a configuration to be described below.

[0068] As illustrated in FIG. 11 to FIG. 13, the main body frame 10 of a printing unit 6A includes a sheet guide portion 118 in place of the sheet guide portion 18 in the first embodiment. The sheet guide portion 118 includes a guide surface 120. The guide surface 120 entirely extends downward and forward from an upper edge of the sheet guide portion 118 on the thermal head 40 side, and faces a space on the front side of the printing unit 6A. Specifically, the guide surface 120 includes a first guide surface 120A extending forward and downward from the upper edge of the sheet guide portion 118, and a second guide surface 120B extending downward from a front edge of the first guide surface 120A. The first guide surface 120A and the second guide surface 120B are each formed into a flat surface shape extending along the horizontal direction L2. In the second embodiment, the first guide surface 120A is inclined at an angle of 80° with respect to the head surface 40a of the thermal head 40.

[0069] The sheet guide portion 118 includes a receiving portion 121 configured to receive the sensor mounting portion 76 of the flexible printed board 70. The sensor mounting portion 76 is received in the receiving portion 121 under a state in which the longitudinal direction of the sensor mounting portion 76 matches the horizontal direction L2. The receiving portion 121 is formed into a recessed shape opened in the guide surface 120. More-

over, the receiving portion 121 is opened not only in the guide surface 120 but also in the rear surface and the lower surface of the sheet guide portion 118. A portion of the receiving portion 121 in the second guide surface 120B is wider than the sensor mounting portion 76 on both sides of the sensor mounting portion 76 in the horizontal direction L2, and is opened to a side apart from the thermal head 40.

[0070] FIG. 14 is a front view for illustrating a part of the printing unit according to the second embodiment. FIG. 15 is a perspective view for illustrating a part of the printing unit according to the second embodiment when viewed from a lower front side thereof. FIG. 16 is a sectional view taken along the line XVI-XVI of FIG. 14. As illustrated in FIG. 14 to FIG. 16, the first holding portion 22, the second holding portion 23, and the seat portion 24 protrude from the receiving portion 121 similarly to the receiving portion 21 in the first embodiment. Further, the sensor mounting portion 76 is mounted to the receiving portion 121. In the second embodiment, the sensor 80 faces along a direction normal to the first guide surface 120A. With this configuration, the sensor 80 faces in the direction inclined at an acute angle with respect to the thickness direction of the thermal head 40.

[0071] As described above, the printing unit 6A according to the second embodiment has a configuration similar to that of the printing unit 6 according to the first embodiment. Therefore, the second embodiment provides the same operations and effects as those of the first embodiment.

[0072] Note that, the present invention is not limited to the embodiments described above with reference to the drawings, and various modification examples may be employed within the technical scope of the present invention as defined by the appended claims. For example, in the first and second embodiments described above, the printing unit 6 or the printing unit 6A holds the platen roller 50 in the roller insertion grooves 14A and 14B of the main body frame 10 by the locking springs 19. However, the printing unit may be configured to hold the platen roller in the roller insertion grooves by lock arms that are provided so as to be pivotable relative to the main body frame.

[0073] Besides the above, components in the above-mentioned embodiments may be replaced by well-known components as appropriate without departing from the scope of the present invention as defined by the appended claims.

Claims

1. A printing unit (6), comprising:

a platen roller (50) configured to convey a recording sheet (P);
a thermal head (40) configured to perform printing on the recording sheet (P) through press contact with an outer peripheral surface of the platen roller (50);
a sensor (80), which is arranged in such a manner as to face the platen roller (50), and is configured to detect the recording sheet (P);
a flexible printed board (70) including a sensor mounting portion (76) on which the sensor (80) is mounted; and
a frame (10), which is configured to support the platen roller (50) in a rotatable manner, and includes a locking projection (26) to which the sensor mounting portion (76) is to be locked.

2. The printing unit (6) according to claim 1,

wherein the locking projection (26) includes a climb projection (28) including a side surface facing in a direction inclined with respect to a plane direction of the sensor mounting portion (76), and
wherein the sensor mounting portion (76) includes a first locked portion (81) that passes through the sensor mounting portion (76) in a thickness direction of the sensor mounting portion (76) and allows the climb projection (28) to be inserted therethrough.

3. The printing unit (6) according to claim 1 or 2,

wherein the locking projection (26) includes a boss (27) extending in the thickness direction of the sensor mounting portion (76), and
wherein the sensor mounting portion (76) includes a second locked portion (81) that is formed by cutting out an edge of the sensor mounting portion (76), and allows the boss (27) to be inserted therethrough.

4. The printing unit (6) according to any one of claims 1 to 3, wherein the frame (10) includes a seat portion (24) configured to support the sensor mounting portion (76) from a back side of the sensor (80).

5. The printing unit (6) according to any one of claims 1 to 4,

wherein the sensor mounting portion (76) includes a mounting surface (76a) on which the sensor (80) is mounted, and a back surface (76b) formed on a side opposite to the mounting surface (76a), and
wherein the flexible printed board (70) includes a tab portion (77) extending from the sensor mounting portion (76) along the back surface (76b).

6. The printing unit (6) according to any one of claims 1 to 5,

wherein the frame (10) includes a sheet guide portion (18, 118) extending along an axial direction of the platen roller (50),
wherein the sheet guide portion (18, 118) includes a guide surface (20, 120) configured to guide the recording sheet (P) toward the thermal head (40),
wherein the sheet guide portion (18, 118) includes a receiving portion (21, 121) formed therein and configured to receive the sensor mounting portion (76), and
wherein the receiving portion (21, 121) is wider than the sensor mounting portion (76) on both sides of the sensor mounting portion (76) in the axial direction, and is opened in the guide surface (20, 120) to a side apart from the thermal head (40).

7. The printing unit (6) according to any one of claims 1 to 6,

wherein the flexible printed board (70) includes a tab portion (77) extending from the sensor mounting portion (76),
wherein the sensor mounting portion (76) has a pair of cutouts (82) formed in line along an edge of the sensor mounting portion (76), and
wherein the tab portion (77) is connected to a portion between the pair of cutouts (82).

8. The printing unit (6) according to any one of claims 1 to 7, wherein the sensor (80) faces in a direction inclined at an acute angle with respect to a thickness direction of the thermal head (40).

9. The printing unit (6) according to any one of claims 1 to 8,

wherein the flexible printed board (70) includes a tab portion (77) extending from the sensor mounting portion (76),
wherein the tab portion (77) is connected to the sensor mounting portion (76) through intermediation of a bent portion (78), and
wherein the sensor mounting portion (76) is urged by a restoring force of the bent portion (78) in a direction of keeping the sensor mounting portion (76) to be locked to the locking projection (26).

10. A portable terminal (1), comprising the printing unit (6) of any one of claims 1 to 9.

FIG.1

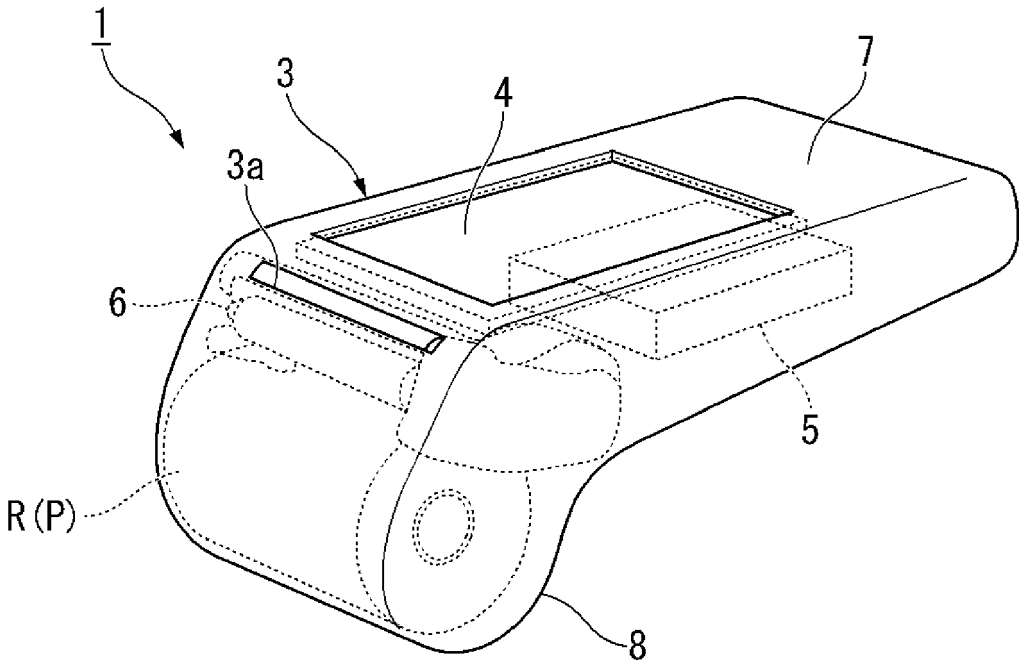


FIG.2

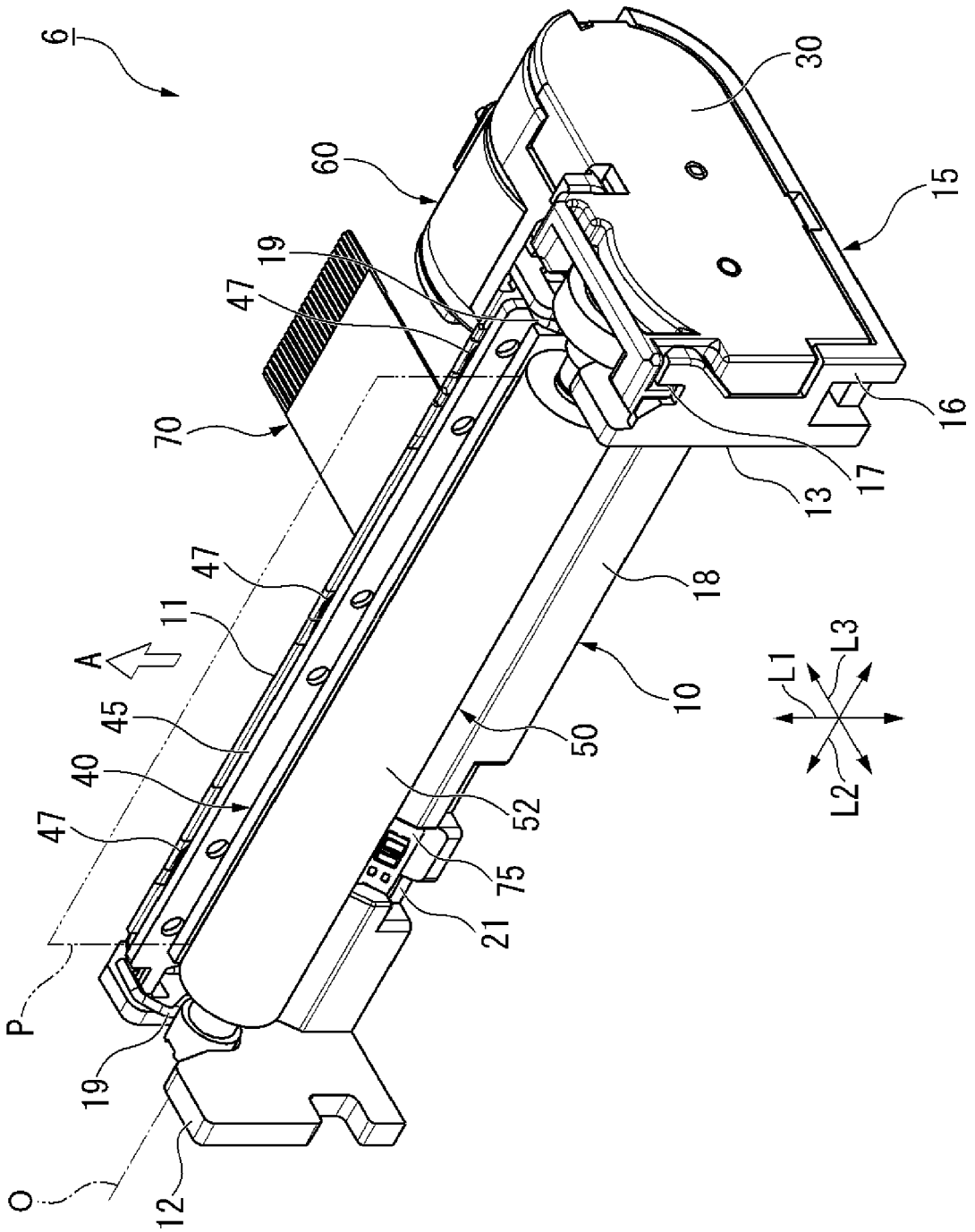

6
30
60
15
19
47
70
16
17
13
47
18
11
A
10
45
50
40
52
47
75
21
L1
L3
L2
P
19
O
12

FIG.3

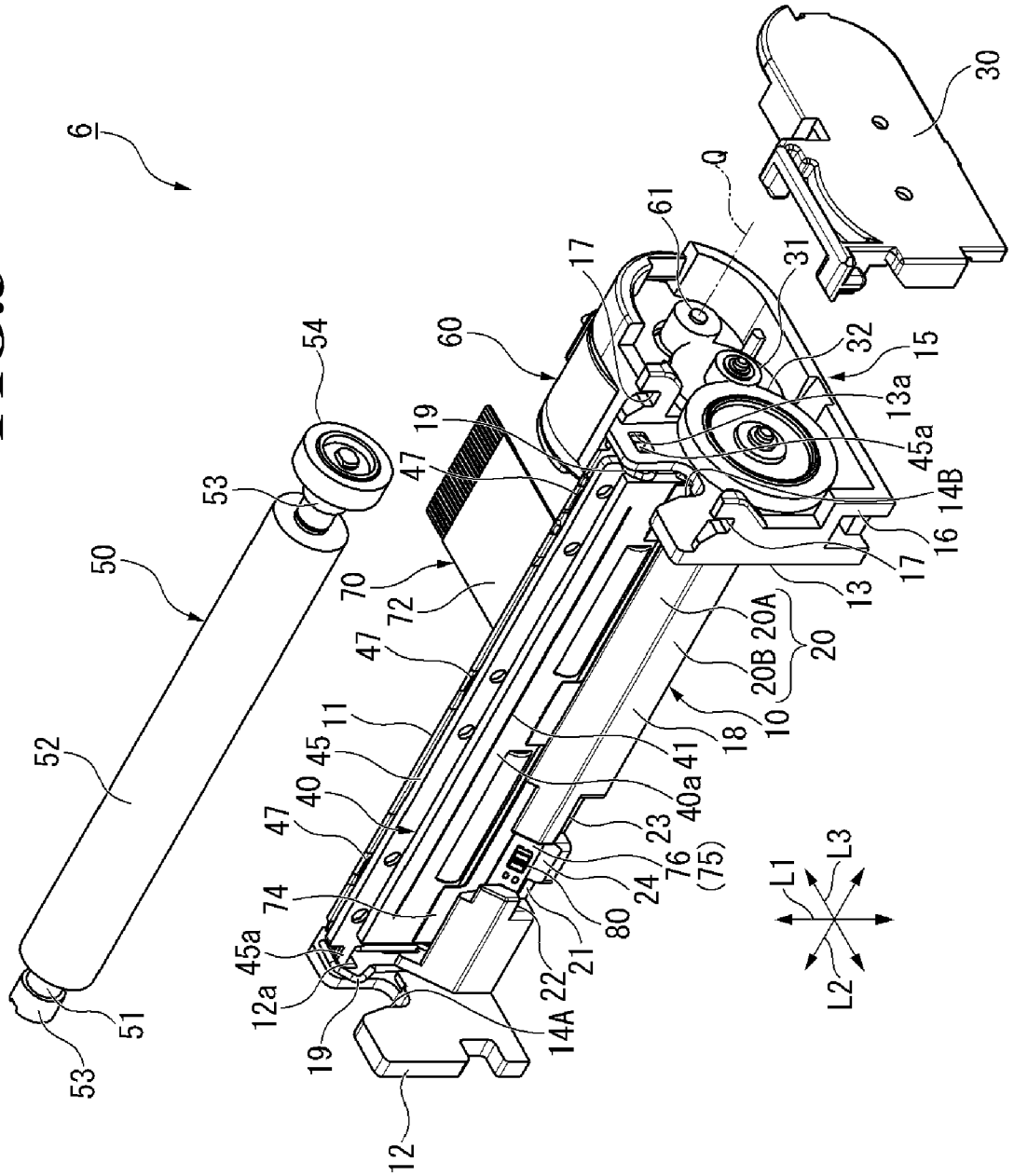

6
30
Q
61
17
31
60
54
32
15
13a
19
45a
47
53
14B
16
17
50
70
72
13
20A
20
20B
47
10
18
11
41
52
45
40a
40
23
47
76
(75)
24
74
80
L1
L3
45a
21
12a
22
L2
14A
19
51
53
12

FIG.4

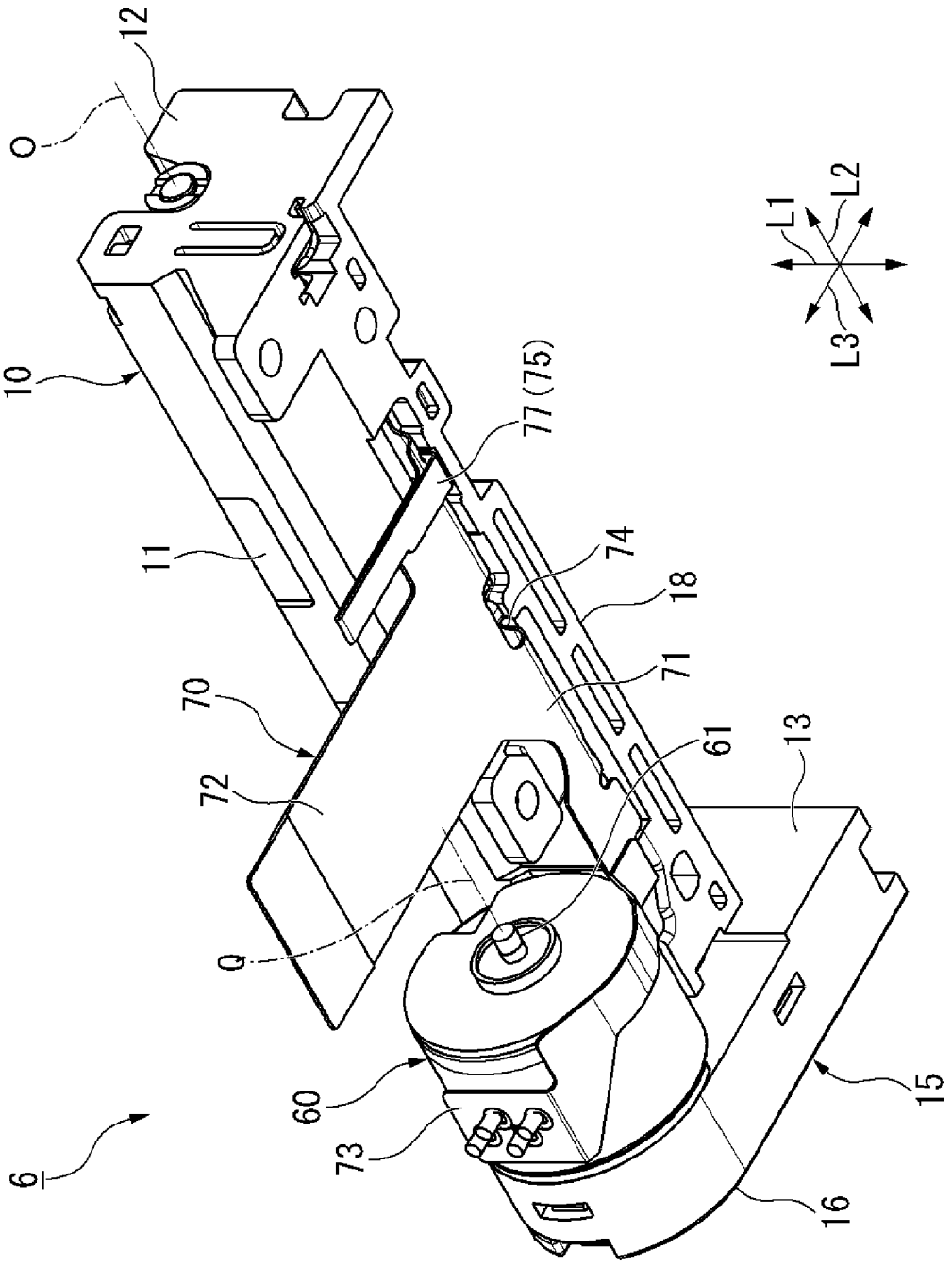


FIG.5

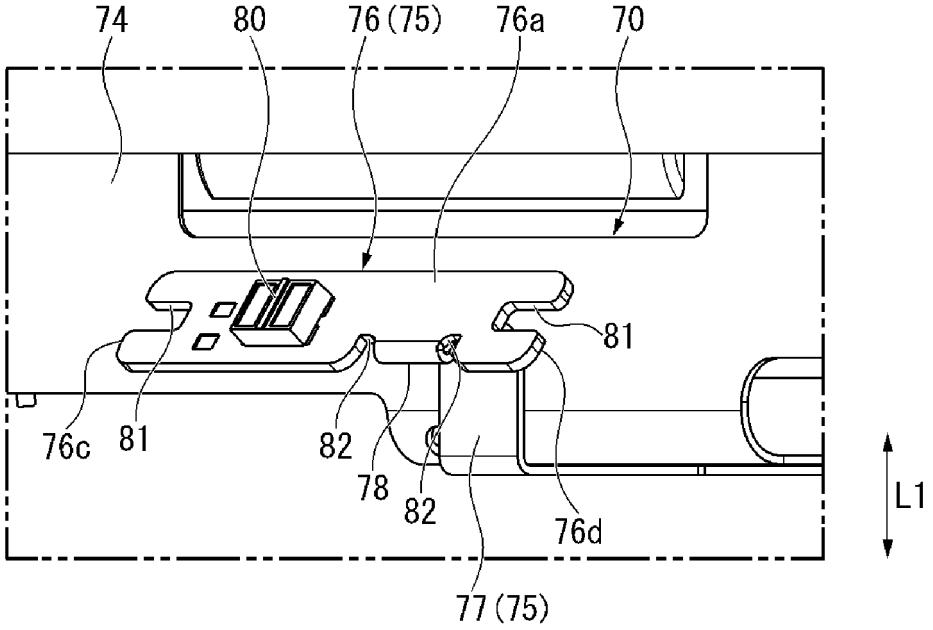

74
80
76 (75)
76a
70
81
76c
81
82
78
82
76d
77 (75)
L1

FIG.6

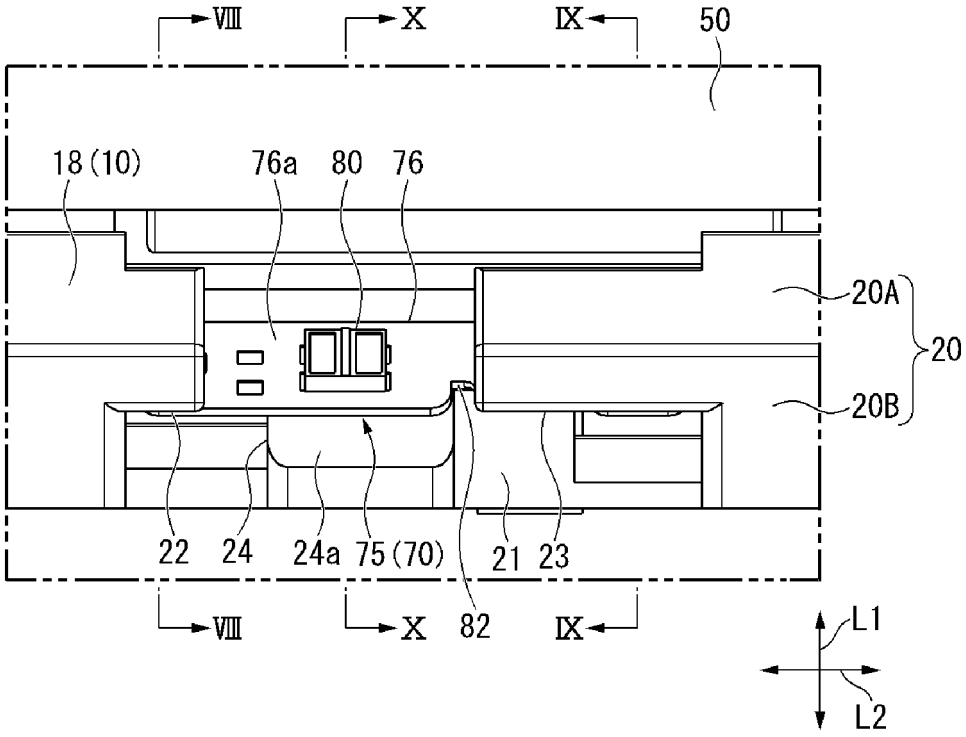

VIII
X
IX
50
18 (10)
76a
80
76
20A
20
20B
22
24
24a
75 (70)
21
23
VIII
X
82
IX
L1
L2

FIG.7

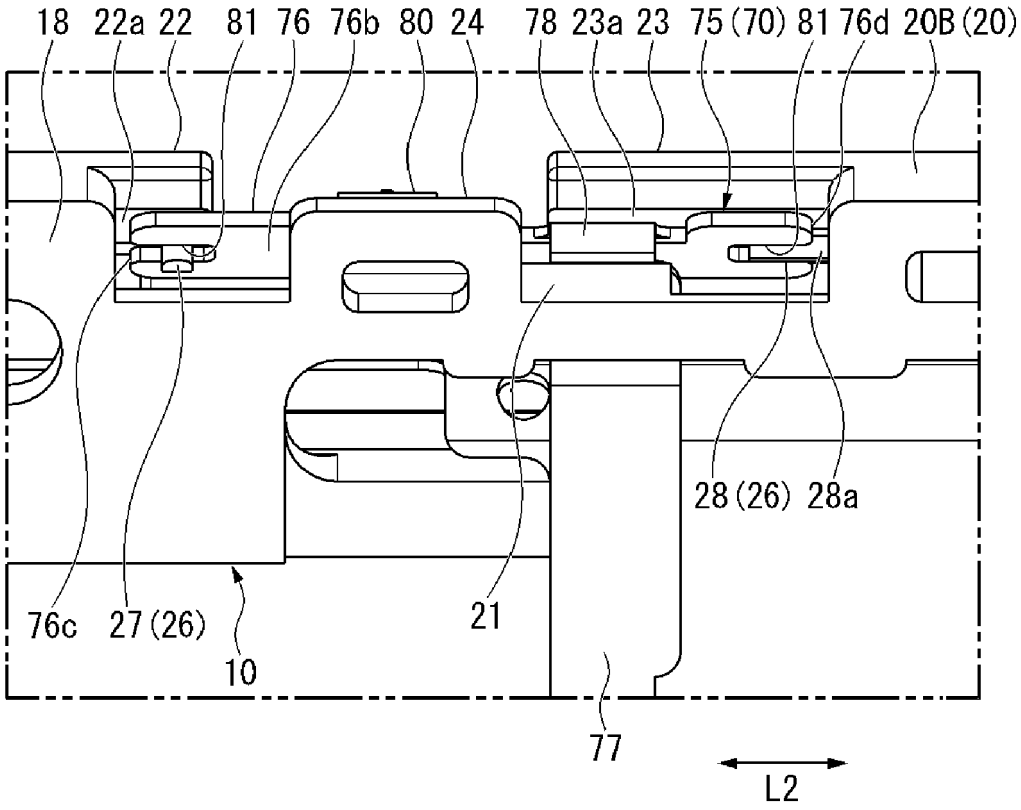

18
22a
22
81
76
76b
80
24
78
23a
23
75 (70)
81
76d
20B (20)
28 (26)
28a
76c
27 (26)
10
21
77
L2

FIG.8

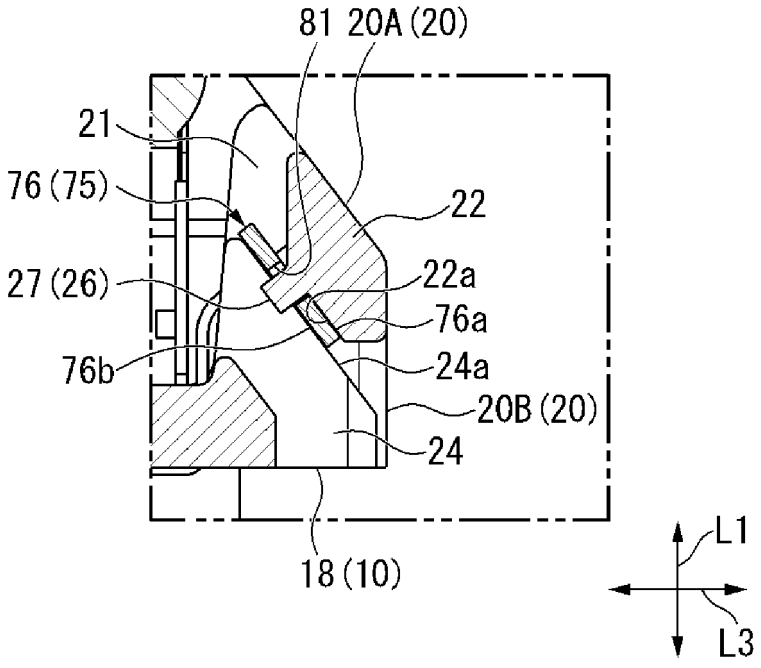

81
20A (20)
21
76 (75)
22
27 (26)
22a
76a
76b
24a
20B (20)
24
18 (10)
L1
L3

FIG.9

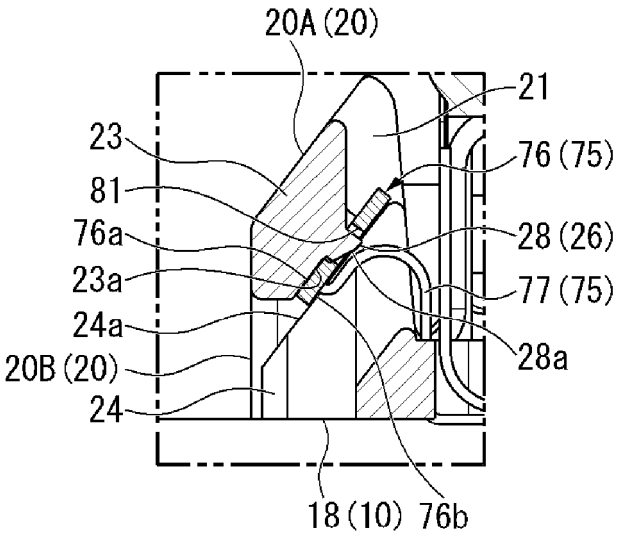

20A (20)
21
23
76 (75)
81
28 (26)
76a
23a
77 (75)
24a
28a
20B (20)
24
18 (10)
76b

FIG.10

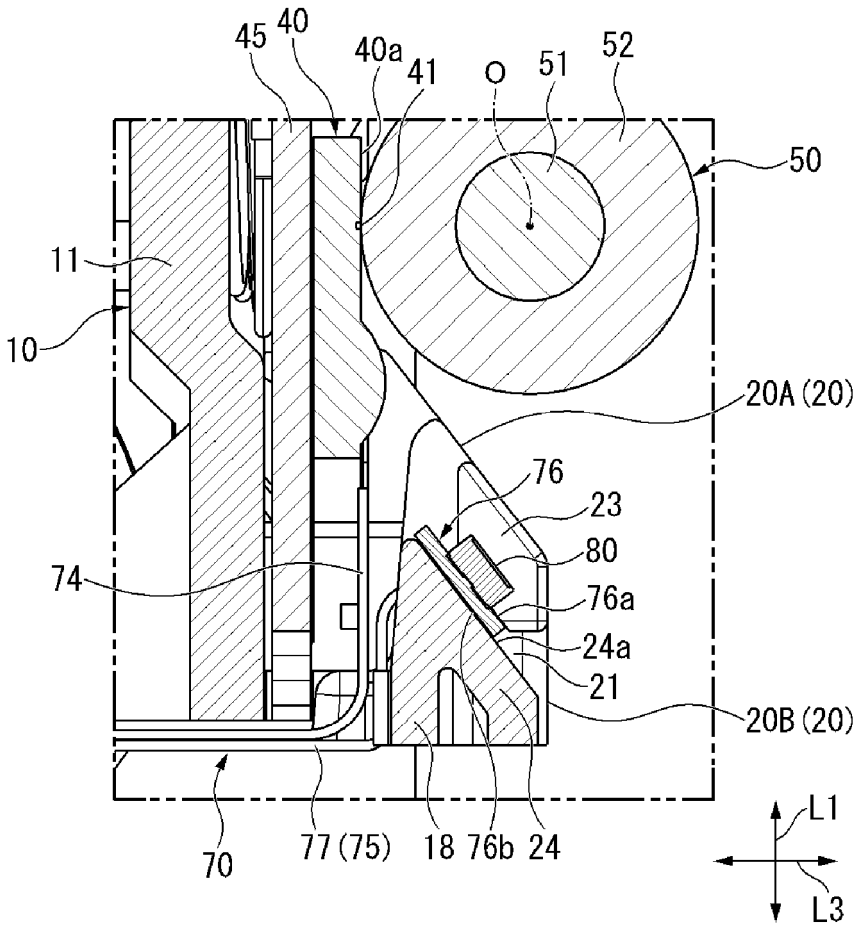

45
40
40a
41
O
51
52
50
11
10
20A (20)
76
23
80
74
76a
24a
21
20B (20)
70
77 (75)
18
76b
24
L1
L3

FIG.11

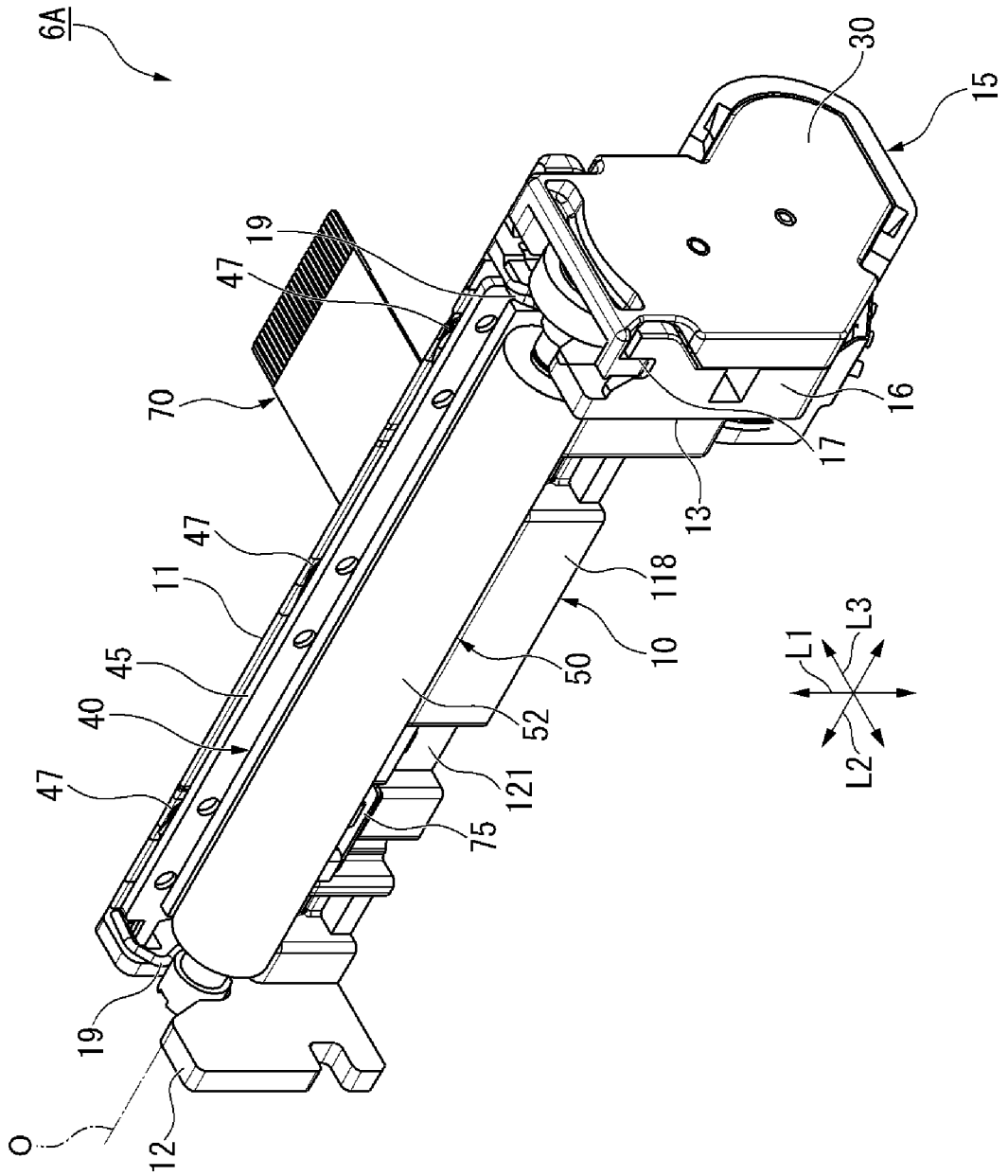
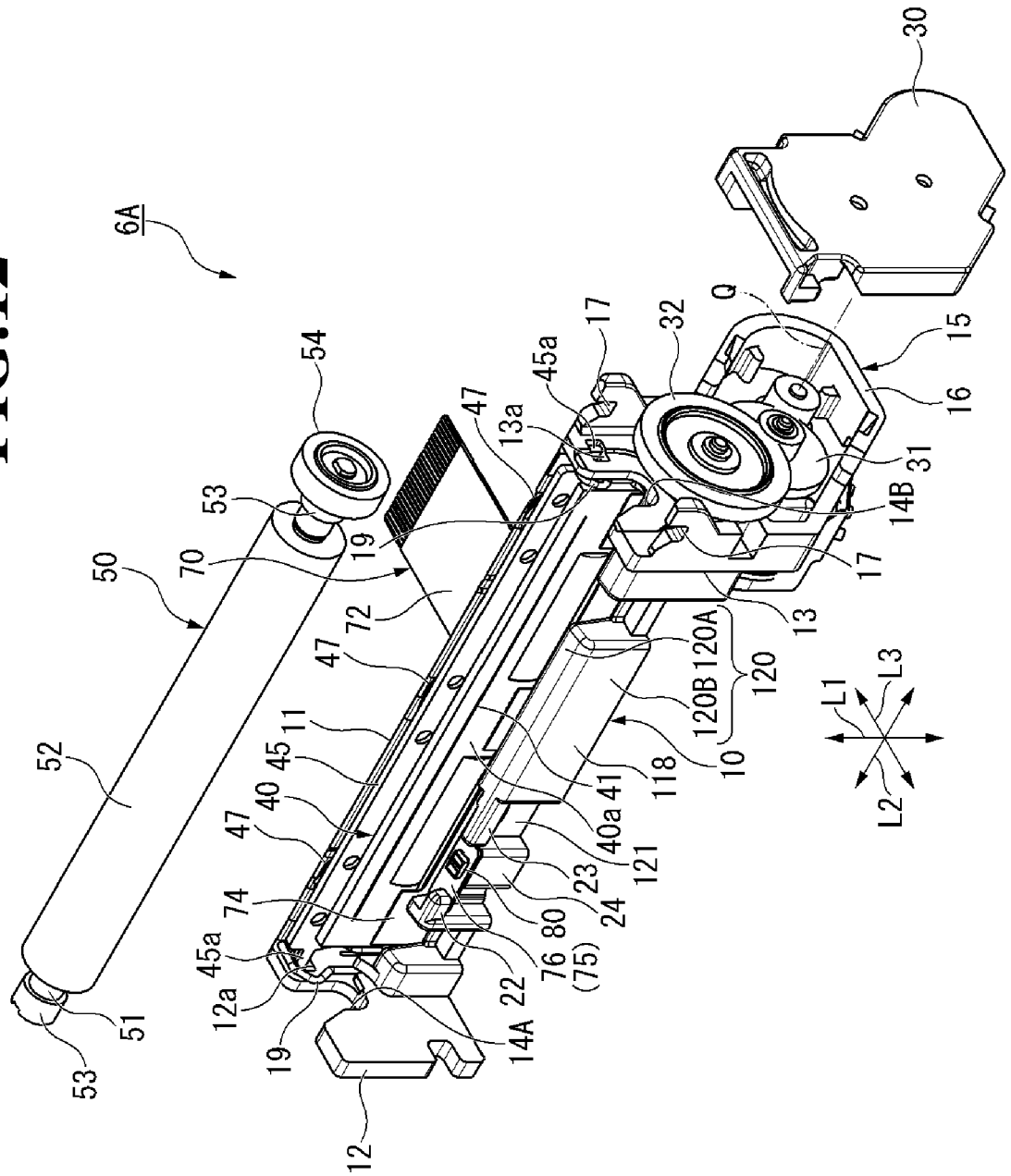

6A
30
15
19
47
70
16
17
13
47
11
118
45
10
50
40
52
47
121
75
19
L1
L3
L2
O
12

FIG.12


6A
30
Q
15
16
31
14B
17
13
120A
120B
120
L1
L3
L2
10
118
41
40a
121
23
24
80
(75)
76
22
14A
12
19
12a
45a
74
40
47
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53
51
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70
72
54
53
19
47
13a
45a
17
32

FIG.13

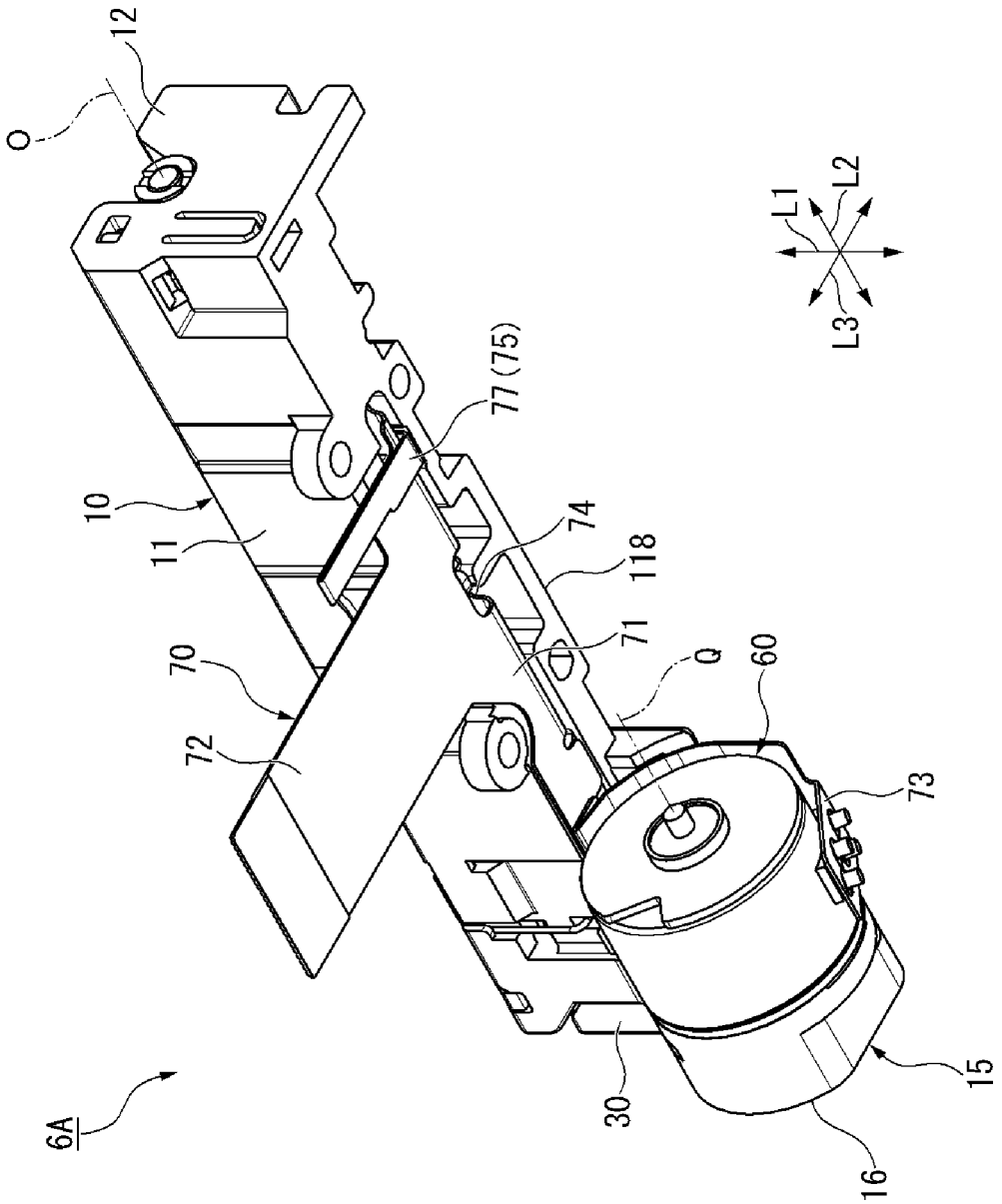


FIG.14

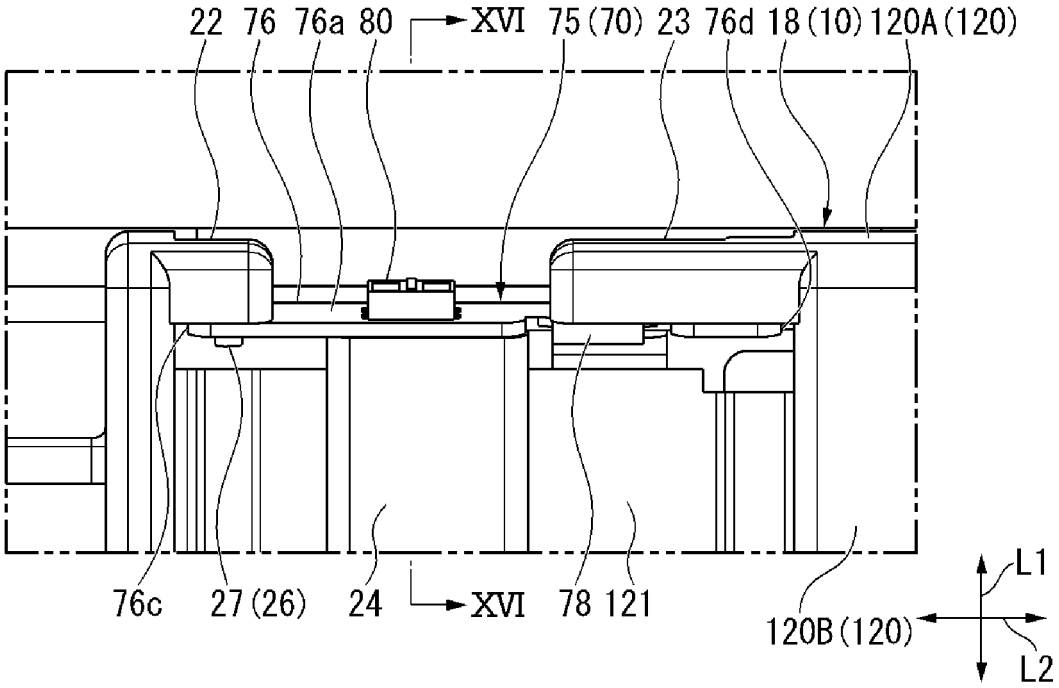

22
76
76a
80
XVI
75 (70)
23
76d
18 (10)
120A (120)
76c
27 (26)
24
XVI
78
121
120B (120)
L1
L2

FIG.15

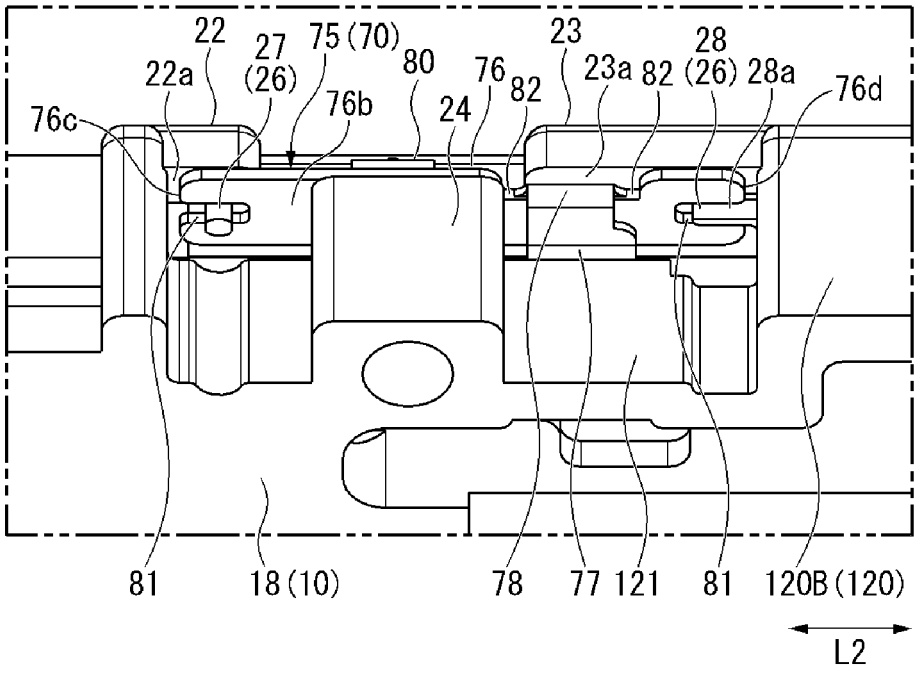
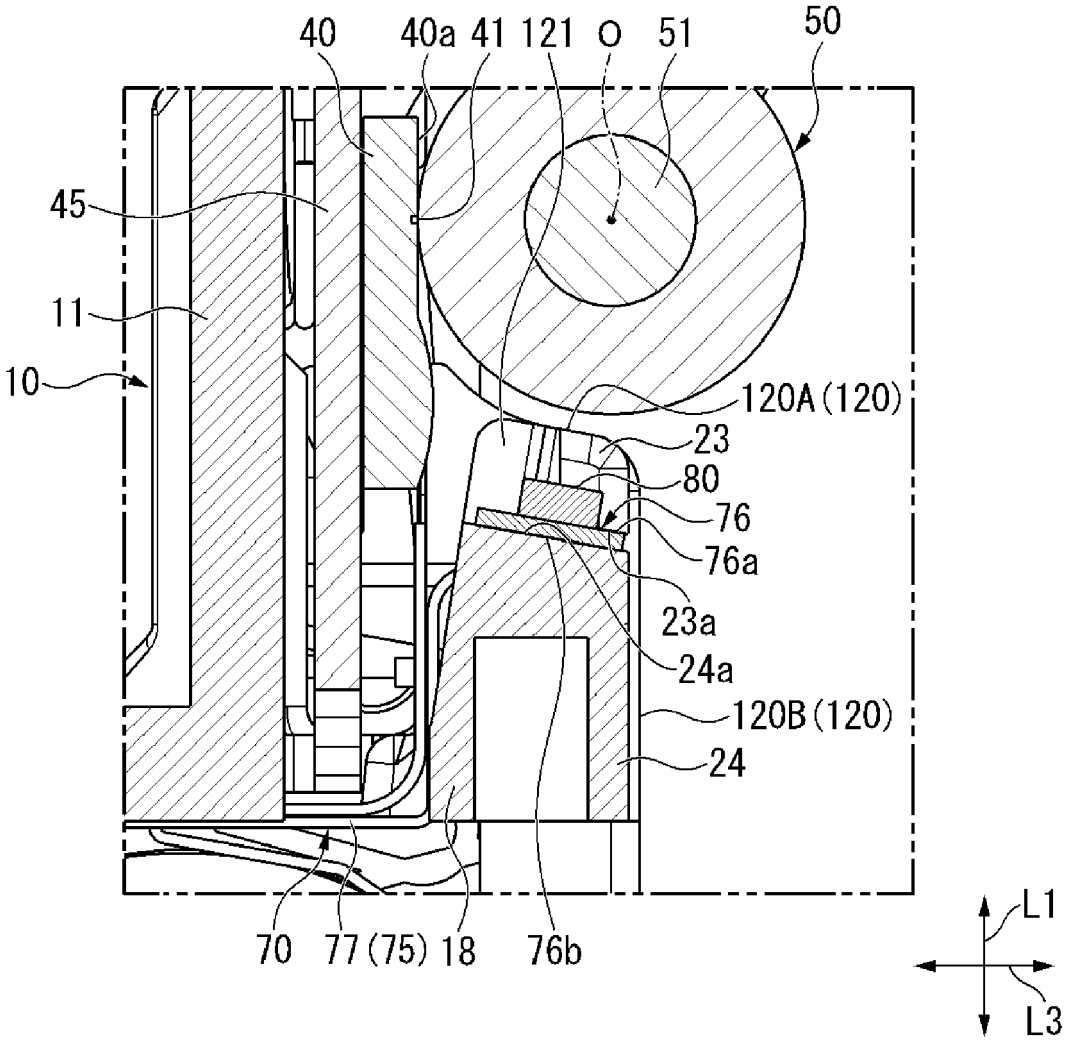

22
27 (26)
75 (70)
80
76
23
28 (26)
22a
76b
24
82
23a
82
28a
76d
76c
81
18 (10)
78
77
121
81
120B (120)
L2

FIG.16


40
40a
41
121
O
51
50
45
11
10
120A (120)
23
80
76
76a
23a
24a
120B (120)
24
70
77 (75)
18
76b
L1
L3

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 21 1145

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2018/029389 A1 (ANDO NORIHISA [JP]) 1 February 2018 (2018-02-01) * paragraphs [0009] - [0014], [0020] - [0023], [0037], [0042], [0056], [0059]; claims 1-10; figures 1-5 *	1-10	INV. B41J11/04 B41J3/36 B41J2/32 B41J3/46

TECHNICAL FIELDS SEARCHED (IPC)

B41J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 March 2022	Bacon, Alan

CATEGORY OF CITED DOCUMENTS

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