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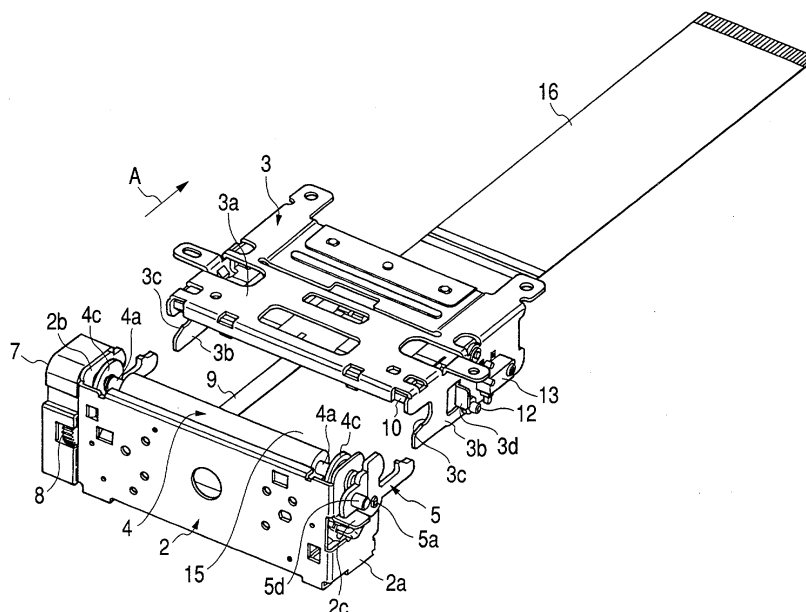
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(54) **Thermal printer**

(57) There is provided a thermal printer that prevents dust or the like from entering the printing part by having no open parts and allows printing with high quality. The thermal printer is provided with a first frame that supports a platen roller and a driving source for rotationally driving the platen roller, a second frame mounted with a thermal head, and a body housing mounted with the first and second frames. The first frame is mounted slidably along the body housing and arranged to be attachable and detachable to and from the second frame.

The second frame is formed with supporting hollows that can support the rotation shaft, of the platen roller, supported by the first frame, and the supporting hollows are formed with coming-out preventing parts which can prevent the rotation shaft supported by the supporting hollows from coming out. The first frame is slid to the second frame side to engage the rotation shaft with the supporting hollows so that the rotation shaft is prevented from coming out by the coming-out preventing parts, and thus the first frame can be connected to the second frame.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a thermal printer that prevents dust from entering the printing part by eliminating an open part and allows printing with high quality.

2. Related Background Art

[0002] A conventional thermal printer is comprised of a body housing 51 with the inside thereof in the state of a cavity, as shown in Fig. 15, and a motor 52 which is the driving source of a platen roller 59 described later is housed inside of the body housing 51.

[0003] The body housing 51 mounts, on a side thereof where a rotation shaft (not shown) of the motor 52 protrudes, a gear box 54 housing a gear group 53 of a plurality of gears for transmitting the rotation of the motor 52 to a platen roller 59 described later.

[0004] The gear box 54 is open at a part, and the gear group 53 is exposed. With the exposed gear group 53, a transmission gear 59a of the platen roller 59, described later, engages.

[0005] A thermal head 55 having a longitudinal shape and comprised of a line head is mounted on the side wall, shown on the left side in the figure, of the body housing 51.

[0006] The body housing 51 is arranged with supporting side walls 56, 56 protruding in the left direction in the figure, wherein the supporting walls are formed on the near and deep sides shown in the figure, facing each other and sandwiching a thermal head 55 in the longitudinal direction thereof.

[0007] The supporting walls 56, 56 are formed with a circular-arc-shaped roller supporting part 56a which can support the platen roller 59 described later and are open upward.

[0008] Further, hook members 57 that can open and close the open upper side of the roller supporting parts 56a are circularly-movably supported by the respective supporting side walls 56.

[0009] The roller supporting parts 56a are arranged to be able to support the rotatable platen roller 59 supported by a roller supporting frame 58, as shown in Fig. 16.

[0010] If the platen roller 59 is supported by the roller supporting parts 56a, the hook members 57 circularly move so that the platen roller 59 is prevented from coming out from the roller supporting parts 56a.

[0011] The shaft of a transmission gear 59b that can transmit the rotation of the motor 52 by engaging with the gear group 53 in the gear box 54 is fixed to a rotation shaft 59a of the platen roller 59.

[0012] Further, an FPC 60 to be connected to the mo-

tor 52 and the thermal head 55 is formed protruding from the right side, shown in the figure, of the body housing 51.

[0013] For printing operation by a conventional thermal printer like this, a sheet (not shown) which is disposed in the body housing 51, made, for example, of thermal paper, and wound in a roll state is mounted by dropping the rotation shaft 59a of the platen roller 59 onto the roller supporting parts 56a in a state of being rotationally pulled ahead of the thermal head 55, as shown in Fig. 15, before the platen roller 59 is mounted. Then, the sheet is brought into pressure contact between the thermal head 55 and the platen roller 59, and the platen roller 59 is prevented from coming out from the roller supporting parts 56a by the hook members 57.

[0014] After bringing the sheet into pressure contact between the thermal head 55 and the platen roller 59, a plurality of heating elements of the thermal head 55 are selectively heated according to printing information, the sheet is fed by rotating the platen roller 59 by driving the motor 52, and thus a desired image can be printed on the sheet.

[0015] The sheet after performing printing thereon can be cut to a desired length by a cutter (not shown).

[0016] In replacing a sheet or doing the like on a thermal conventional thermal printer like this, the hook members 57 are circularly moved to open the upper side of the roller supporting parts 56a, and thus the platen roller 59 in a state of being supported by a roller supporting frame 58 is taken out from the roller supporting parts 56a.

[0017] Thereafter, the end part of the sheet is pulled out from below the thermal head 55, and then the platen roller 59 is dropped again onto the roller supporting parts 56a.

[0018] Consequently, the transmission gear 59a engages with the gear group 53 in the gear box 54, and the platen roller 59 is prevented from coming out from the roller supporting parts 56a by the hook members 57, which allows printing on the sheet.

[0019] However, in replacing the sheet or doing the like on a conventional thermal printer as described above, when the platen roller 59 is dropped on to the roller supporting parts 56a, tips of the transmission gear 59a of the platen roller 59 and tips of the gear group 53 in the gear box 54 collide with each other and thus the tips of gears get broken, which disables normal engagement between gears, causing uneven rotation of the platen roller 59, and thus may reduce the printing quality.

[0020] Further, with a conventional thermal printer, as shown in Fig. 16, the upper side of the platen roller 59 and the upper side of the gear box 54 are respectively open, and thus dust or the like comes in from the open parts, which may cause printing failure or the like.

SUMMARY OF THE INVENTION

[0021] The present invention was carried out in con-

sideration of the above described problem, and an object of the invention is to provide a thermal printer that prevents dust or the like from entering a printing place by eliminating open parts in such a manner that a platen roller and a driving source are housed in a same frame, thereby allowing printing with high quality.

[0022] As first means for solving the problem, a thermal printer according to the invention is comprised of a thermal head having a plurality of heating elements, a platen roller with which the thermal head can be brought into pressure contact, a first frame supporting the platen roller and a driving source for rotational driving of the platen roller, a second frame mounted with the thermal head, and a body housing mounted with the first and second frames, wherein the first frame is mounted slidably along the body housing, and attachable and detachable to and from the second frame.

[0023] The thermal head may be fixed on a head mounting table disposed on the top plate side of the second frame, an elastic member that can elastically energize the thermal head to the platen roller side is disposed between the top plate of the second frame and the head mounting table, and when the first frame is mounted to the second frame, the thermal head elastically contacts with the platen roller.

[0024] When the first frame is mounted to the second frame, the top plate of the second frame may cover the upper side of the platen roller.

[0025] The first frame may be mounted with a gearbox housing a plurality of gears that can transmit the rotation of the driving source to the platen roller.

[0026] The platen roller may be mounted with lifting members that can lift the head mounting table to the top plate side against the energizing force of the elastic member, wherein when the first frame is moved to the side of the second frame, the lifting members lift the head mounting table to move the thermal head away from the platen roller, and when the first frame has been mounted to the second frame, the lifting of the head mounting table by the lifting members is released, and thus the thermal head is brought into pressure contact with the platen roller.

[0027] The lifting members may be formed into a disc shape larger than the diameter dimension of the platen roller and fixed to the shaft at the ends in the longitudinal direction of the platen roller, and the head mounting table is formed with contact parts with which the lifting members can contact and non-contact parts where the contact of the lifting members is released, wherein when the first frame gets mounted to the second frame, the lifting members contact with the contact parts to lift the head mounting table, and when the first frame has been mounted to the second frame, the lifting members are positioned at the non-contact parts so that the lifting of the head mounting table is released.

[0028] In a further aspect, a thermal printer according to the invention comprises of a first frame that supports a rotation shaft of a platen roller, a second frame that

supports a thermal head which can be brought into pressure contact with the platen roller, and a body housing that slidably supports the first frame and is mounted with the second frame, wherein the second frame is formed with supporting hollows that can support the rotation shaft of the platen roller, the supporting hollows being formed with a coming-out preventing part that can prevent the supported rotation shaft from coming out so that when the first frame is slid to the second frame side and the rotation shaft is engaged with the supporting hollows, the rotation shaft is prevented from coming out by the coming-out preventing parts, and thus the first frame can be connected to the second frame.

[0029] The supporting hollows may have a one guide face and another guide face facing each other at a certain distance, wherein each coming-out preventing part is formed to each one guide face, and when the first frame is slid and connected with the second frame, the rotation shaft goes over the coming-out preventing parts and gets positioned at the deep part of the supporting hollows, thus the thermal head makes pressure contact with the platen roller, and by the pressure contact pressure of the thermal head applied to the platen roller, the rotation shaft is prevented from coming out from the supporting hollows.

[0030] Each coming-out preventing part may be formed of a convex part that protrudes from the one guide face, wherein the root part of the convex part is taper-shaped.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031]

Fig. 1 is a schematic perspective view explaining a first frame and a second frame of a thermal printer according to a first embodiment according to the present invention;

Fig. 2 is a schematic perspective view in which a record sheet is disposed between the first frame and the second frame of the thermal printer according to the first embodiment of the invention;

Fig. 3 is a side view of Fig. 2;

Fig. 4 is a perspective view of the thermal printer, shown in Fig. 1, viewed from the opposite side;

Fig. 5 is a perspective view in which the first frame according to the first embodiment of the invention is mounted to the second frame; Fig. 6 is a side view explaining a lock member of the thermal printer according to the first embodiment of the invention;

Fig. 7 is a side view explaining the lock member of the thermal printer according to the first embodiment of the invention;

Fig. 8 is an enlarged view of an essential part explaining a lifting member of the thermal printer according to the first embodiment of the invention;

Fig. 9 is an enlarged view of the essential part explaining the lifting member of the thermal printer ac-

cording to the first embodiment of the invention;
 Fig. 10 is an enlarged view of the essential part explaining the lifting member of the thermal printer according to the first embodiment of the invention;
 Fig. 11 is a schematic perspective view explaining a first frame and a second frame of a thermal printer according to a second embodiment of the invention;
 Fig. 12 is a perspective view in which the first frame of the thermal printer according to the second embodiment of the invention is mounted to the second frame;
 Fig. 13 is an enlarged view of an essential part explaining support operation of a platen roller of the thermal printer according to the second embodiment of the invention at a supporting hollow;
 Fig. 14 is an enlarged view of an essential part explaining support operation of the platen roller of the thermal printer according to the second embodiment of the invention at the supporting hollow;
 Fig. 15 is a perspective view explaining a conventional thermal printer; and
 Fig. 16 is a perspective view explaining the conventional thermal printer.

DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0032] Preferred embodiments of thermal printers according to the invention will be described below with reference to the attached drawings, by way of example only.

[0033] First of all, Figs. 1 to 10 show a thermal printer according to a first embodiment of the invention, wherein Fig. 1 is a schematic perspective view explaining a first frame and a second frame; Fig. 2 is a schematic perspective view in which a record sheet is arranged between the first frame and the second frame according to the invention; Fig. 3 is a side view of Fig. 2; Fig. 4 is a perspective view of the thermal printer, shown in Fig. 1, viewed from the opposite side; Fig. 5 is a perspective view in which the first frame is mounted to the second frame according to the invention; Figs. 6 and 7 are side views explaining a lock member according to the invention; and Figs. 8 to 10 are enlarged views of an essential part explaining a lifting member according to the invention.

[0034] First, with a thermal printer 1 according to a first embodiment of the invention, as shown in Fig. 1, a first frame 2 that is open on the upper side thereof and a second frame 3 that is open on the lower side thereof are mounted to a body housing (not shown), the second frame 3 being positioned on the deep side in the figure and facing the first frame 2, wherein the first frame 2 can slide to the second frame 3 side in the direction of arrow A.

[0035] The first frame 2 is made of a metallic plate formed, by bending, with a first side plate 2a on the right side shown in the figure and a second side plate 2b on

the left side shown in the figure which face each other, and the rotation shaft 4a of a rotatable platen roller 4 is shaft-supported on the upper side of the first and second side plates 2a and 2b.

[0036] The platen roller 4 is formed in such a manner that a large roller part 4b of hard rubber or the like with a large friction coefficient is fixed to the rotation shaft 4a.

[0037] On the both end sides of the rotation shaft 4a, disc-shaped lifting members 4c that can lift a head mounting table 11, described later, supported on the second frame 3 side are fixed.

[0038] By the first side plates 2a of the first frame 2, the lock members 5 made of a metallic plate are supported circularly-movably around a circular fulcrum 5a.

[0039] For the lock members 5, as shown in Fig. 6, a lock arm 5b is formed protrudingly from the circular fulcrum 5a to the right, and a hook-shaped lock part 5c is formed near the end of the lock arm part 5b.

[0040] Further, an operation arm part 5d is formed protruding at a right angle from above the circular fulcrum 5a to the left direction in the figure, and the operation arm part 5d is formed with a pressing surface 5e having a curved surface shape at the right end in the figure and provided with an operation bar 5f, in the vicinity of the left end in the figure, standing in the perpendicular direction to the sheet of the figure. Still further, a stopper part 5g is formed protruding from the circular fulcrum 5a in the left oblique direction, and when the lock member 5 is circularly moved in the clockwise direction shown by the arrow B, as shown in Fig. 7, the stopper part 5g can contact with a stopper part 2c formed by cutting and bending a part of the first side plate 2a of the first frame 2.

[0041] Such a lock member 5 is always energized in the counter-clockwise direction by a twisted coil spring (not shown) for example.

[0042] Still further, on the side of the body housing (not shown), lock release parts 6 that can operate in the clockwise direction the lock parts 5 which are energized in the counter-clockwise direction are arranged.

[0043] Each lock release member 6 is formed with a slope surface 6a at the front end, and, as shown in Fig. 6, when the lock release member 6 is operated by pressing in the direction of arrow C, the slope surface 6a lifts the operation bar 5f upward.

[0044] Thus, the lock member 5 circularly moves in the clockwise direction shown by the arrow B around the circular fulcrum 5a, as shown in Fig. 7, against the energizing force in the counter-clockwise direction.

[0045] The circular movement of the lock members 5 in the direction of arrow B causes the first frame 2, of which the lock members 5 having been unlocked, to slide in the direction of arrow D opposite to the direction of arrow A, and thus the first frame 2 moves away from the second frame 3.

[0046] On the second side plate 2b of the first frame 2 shown in Fig. 1, a gear box 7 is mounted, and in the gear box 7, a plurality of gears 8 are housed in the state

that the gears 8 are engaging.

[0047] Through the plurality of gears 8, rotation of a driving source (not shown) comprised of a motor can be transmitted to the platen roller 4.

[0048] From the deep side of the first frame 2, an FPC 9 is formed protruding and connected to the inner driving source (not shown) of the motor and the like.

[0049] As shown in Fig. 1, on the deep side facing the first frame 2, the second frame 3 is disposed, and the second frame 3 is made of a metallic plate and has a bracket-shape which is open downward and formed of a top plate 3a arranged on the upper side and side plates 3b, 3b made by bending downward the right and left edges of the top plate 3a such that the edges face each other.

[0050] At the front edge of each side plate 3b, a supporting hollow 3c of a cut hollow almost in a U-shape is formed by blanking, and when the first frame 2 is slid in the direction of arrow A and mounted to the second frame 3, the supporting hollow 3c engages with the rotation shaft 4a of the platen roller 4, which restrains the downward movement of the first frame 2 so that a thermal head 10 described later elastically contacts with the platen roller 4.

[0051] Projecting pieces 3d are formed by cutting and bending the side plates 3b located at the deeper side than the supporting hollows 3c, and pressing surfaces 5e of the lock members 5 contact with the projecting pieces 3d to be able to press the projecting pieces 3d.

[0052] On the second frame 3, a thermal head mounting table 11 as shown in Fig. 8 on which the longitudinal thermal head 10 of a line head is fixed is disposed near the front edge of the lower surface of the top plate 3a and between the side plates 3b, 3b facing each other, with a certain gap to the top plate 3a.

[0053] The thermal head 10 is formed with a plurality of heating elements on the lower surface side in line. The head mounting table 11 fixed with such a thermal head 10 is provided with an elastic member (not shown) at a part with a gap to the top plate 3a, and is always elastically energized downward by the elastic member.

[0054] The head mounting table 11 is formed with contact parts 11a with which a disc-shaped lifting members 4c of the platen roller 4 can contact, and formed with non-contact parts 11b at which the contact of the lifting members 4c is released.

[0055] The side plates 3b of the second frame 3 are arranged with a lock pin 12 standing in the vicinity of right side the projecting piece 3d, as shown in Fig. 6. When the first frame 2 is mounted to the second frame 3, the lock parts 5c of the lock parts 5 engage with the lock pins 12, as shown in Fig. 6, thereby allowing the first frame 2 to be locked.

[0056] One of the side plates 3b of the second frame 3 is disposed with a detection switch 13 on the deeper side than the lock pins 12, as shown in Fig. 6, and when the lock member 5 circularly moves, the front end of the lock arm part 5b (the right end in the figure) operates

the detection switch 13 for ON/OFF.

[0057] On the right side of the first frame 2 shown in Fig. 6, a sheet loading part 15 to which a record medium 14 made of, for example, thermal paper wound in a roll state can be disposed is formed. The first frame 2 including the record medium 14 loaded on the sheet loading part 15 is slidable to the second frame 3 which is supported by the body housing (not shown).

[0058] Further, from the deep side of the second frame 3, an FPC 16 for current carrying control of the thermal head 10 is formed protruding.

[0059] The operation of a thermal printer 1 like this according to the invention can be explained that before the record medium 14 is loaded on the sheet loading part 15, the first frame 2 is in a state being away from the second frame 3, as shown in Fig. 1.

[0060] As shown in Fig. 2, the record medium 14 is loaded on the sheet loading part 15 in this state, and the edge side of the record medium 14 is rotationally pulled on the roller part 4b of the platen roller 4.

[0061] The head mounting table 11 at this time is, as shown in Fig. 8, in a state of being away from the platen roller 4, and if the first frame 2 is slid in the direction of arrow A from this state, the contact parts 11a of the head mounting table 11 contact with the disc-shaped lifting members 4c, then the head mounting table 11 is lifted upward against the energizing force of the elastic member between the top plate 3a and the head mounting table 11, as shown in Fig. 9.

[0062] Thus, when the first frame 2 is mounted to the second frame 3, the thermal head 10 is prevented from colliding with the roller part 4b of the platen roller 4.

[0063] In this state, if the first frame 2 is further slid in the direction of arrow A, the lifting members 4c are positioned at the non-contact parts 11b, as shown in Fig. 10, and thereby the lifting of the head mounting table 11 by the lifting members 4c is released so that the thermal head 10 elastically contacts with the platen roller 4.

[0064] Then, the supporting hollows 3c of the second frame 3 engage with the rotation shaft 4a of the platen roller 4, which allows the thermal head 10 to elastically contact with the platen roller 4 due to the energizing force of the elastic member between the top plate 3a and the head mounting table 11.

[0065] Further, the lock parts 5c of the lock members 5 simultaneously engage with the lock pins 12 of the second frame 3 to restrain the movement of the first frame 2 in the direction of arrow D, thus locking the frames.

[0066] When the first frame 2 has been mounted to the second frame 3, the detection switch 13 is turned ON, and accordingly the printer enters a waiting state for printing.

[0067] When a print command is issued during this waiting state for printing, a plurality of heating elements of the thermal head 10 generates heat in a selected way, according to print information, thus color is created on the record medium 14 by thermal paper for example,

besides, the platen roller 4 rotates to transport the record medium 14 after printing in the paper discharge direction, and thus a desired image is printed on the record medium 14.

[0068] When the record medium 14 loaded on the sheet loading part 15 is run out, or the record medium 14 is replaced, if the lock release members 6 are pressed in the direction of arrow C, as shown in Fig. 6, the slope surfaces 6a of the lock release members 6 lift the operation bars 5f of the lock members 5 upward.

[0069] Thus, as shown in Fig. 7, the lock members 5 circularly move in the direction of arrow B, thereby the engagement between the lock pins 12 of the second frame 3 and the lock parts 5c of the lock members 5 is released, in addition, the curved-surfaced pressing surfaces 5e of the lock members 5 press the projecting pieces 3d of the second frame 3 to slide the first frame 2 in the direction of arrow D, and thus the first frame 2 is ejected.

[0070] Further, as the lock arm part 5b of one of the lock member 5 also simultaneously moves away from the detection switch 13, the detection switch 13 turns OFF, which releases the waiting state for printing.

[0071] Then, the first frame 2 having been ejected is moved away from the second frame 3 to a predetermined position to allow replacement of the record medium 14 at the sheet loading part 15.

[0072] For a thermal printer 1 like this according to the invention, the platen roller 4 and the driving source for rotational driving of the platen roller 4 are built in the first frame 2 to be unitized, which can eliminate problems such as collision of conventional gears.

[0073] Still further, since all the plurality of gears 8 for transmission of the rotation of the driving source to the platen roller 4 are housed in the gear box 7, dust or the like is prevented from entering the engaging part of the plurality of gears 8.

[0074] The upper side of the platen roller 4 in printing is covered by the top plate 3a of the second frame 3 through the thermal head 10, and thereby dust or the like is prevented from entering the printing part.

[0075] Further in the embodiment of the invention, although the gear box 7 that houses the plurality of gears 8 has been explained to be mounted to the first frame 2, the part of the gear box 7 may be formed in one body with the first frame 2, and accordingly the first frame 2 houses and supports the plurality of gears 8.

[0076] To the one and the other side plates 3b, supporting hollows 7 almost in a U-shape are formed at the front end, and at the supporting hollows 7, the rotation shaft 4a of the platen roller 4 can be rotatively supported.

[0077] Next, a second embodiment of a thermal printer according to the invention will be described below with reference to the attached drawings.

[0078] Fig. 11 is a schematic perspective view explaining a first frame and a second frame according to the invention; Fig. 12 is a perspective view in which the first frame according to the invention is mounted to the

second frame according to the invention; and Figs. 13 and 14 are enlarged views of an essential part explaining support operation of a platen roller according to the invention at a supporting hollow.

[0079] First, with the thermal printer 21 according to the present embodiment of the invention, as shown in Fig. 11, a first frame 22 that is open at the upper side thereof is disposed, and a second frame 23 that is open at the lower side is disposed on the side facing the first frame 22.

[0080] The first frame 22 is supported by a body housing (not shown) slidably to the second frame 23 side in the direction of arrow B, and the second frame 23 is mounted to the body case.

[0081] The first frame 22 is arranged by bending a metallic plate, and is formed with a one and another side plates 22a and 22b facing each other, wherein near the upper edge of the one and the other side plates 22a and 22b, a rotation shaft 24a of the platen roller 24 is rotatively shaft-supported.

[0082] The platen roller 24 is formed in such a manner that a large roller part 24b of hard rubber or the like with a large friction coefficient is fixed to the rotation shaft 24a.

[0083] Further, at the left and right ends of the rotation shaft 24a, discs 24c that can lift a head mounting table 30a, described later, supported on the second frame 23 side are fixed.

[0084] The other side plate 22b of the first frame 22 shown in Fig. 11 is mounted with a gear box 25, and the rotation shaft 24a which projects from the other side plate 22b and is positioned in the gear box 25 is mounted with a gear group 26 of a plurality of gears that is connected to a driving force (not shown) comprised of a motor, thereby allowing transmission of the rotation of the driving force to the platen roller 24 through the gear group 26.

[0085] As shown in Fig. 11, the second frame 23 which is disposed on the side facing the first frame 22 is arranged by bending a metallic plate and formed with a top plate 23a on the upper side, and a one side plate 23b and another side plate 23c which are made by bending downward the right and left edges of the top plate 23a such that the edges face each other, the second frame 23 having a U-shape that is open downward.

[0086] The one and the other side plates 23b and 23c are formed with supporting hollows 27 almost in a U-shape at the front end, and the rotation shaft 24a of the platen roller 24 can be rotatively supported by the supporting hollows 27.

[0087] Each supporting hollow 27 is made by a certain gap formed in a dimension a little larger than the diameter dimension of the rotation shaft 24a, as shown in Figs. 13 and 14, wherein a one guide face 27a is formed on the lower side in the figure and another guide face 27b is formed on the upper side facing the one guide face 27a, the guide faces 27a and 27b sandwiching the certain gap.

[0088] Deep walls 27c are formed at the deep part of the supporting hollows 27 with which the rotation shaft 24a that is supported by the supporting hollows 27 can contact.

[0089] To the one guide face 27a in the vicinity of the entrance of each supporting hollow 27, a coming-out preventing part 28 that can prevent the rotation shaft 24a supported by the supporting hollow 27 from coming out is provided.

[0090] The coming-out preventing part 28 has a convex part 28a which projects upward in the figure with a certain height from the one guide face 27a, and to the convex part 28a, a first tapered face 28b is formed at the root part on the right side shown in the figure, and a second tapered face 28c is formed at the root part on the left side shown in the figure which is the entrance part of the supporting hollow 27.

[0091] To the top plate 23a of the second frame 23, as shown in Figs. 13 and 14, the head mounting table 30a is elastically energized through an elastic member 29 such as a coil spring, and by the head mounting table 30a, a thermal head 30 comprised of a line head is supported.

[0092] The head mounting table 30a is, though not shown, formed with contact parts which the discs 24c of the platen roller 24 can contact and lift upward, and formed with non-contact parts at which the contact of the discs 24c is released, allowing the thermal head 30 to make pressure contact with the platen roller 24.

[0093] When the first frame 22 is slid in the direction of arrow B and the platen roller 24 is at the entrance parts of the supporting hollows 27, the discs 24c contact the contact parts to lift and move the thermal head 30 away from the roller part 24b of the platen roller 24, and when the rotation shaft 24a contacts the deep walls 27c shown in Fig. 14, the discs 24c are positioned at the non-contact parts, and thus the thermal head 30 makes pressure contact with the platen roller 24.

[0094] Due to the pressure contact pressure of the thermal head 30 applied to the platen roller 24, the rotation shaft 24a is pressed on the one guide faces 27a and thus prevented from coming out from the supporting hollows 27 by the coming-out preventing parts 28.

[0095] On the right side in the figure of the first frame 22, there is provided a sheet housing part (not shown) that can house a record medium (not shown) of, for example, thermal paper which is wound in a roll state, and when the first frame 22 slides in the direction of arrow B, the sheet receiving part also slides. From the deep side of the second frame 23, an FPC 31 for current carrying control of a plurality of heating elements of the thermal head 30 is protruded.

[0096] The printing operation of a thermal printer 21 like this according to the invention can be explained that, first, as shown in Fig. 11, in the state that the first frame 22 is away from the second frame 23, the record medium is housed by the sheet housing part. Thereafter, the edge of the record medium is rotationally pulled on the

platen roller 24.

[0097] In this state, when the first frame 22 is slid in the direction of arrow B and the platen roller 24 is positioned at the entrance part of the supporting hollows 27c, the discs 24c which are shaft-supported by the rotation shaft 24a of the platen roller 24 contact with the contact parts of the head mounting table 30a to lift the thermal head 30 upward.

[0098] Thus, the platen roller 24 which slides in the direction of arrow B and the thermal head 30 do not collide with each other.

[0099] In this state, when the first frame 22 is further slid in the direction of arrow B, the discs 24c are positioned at the non-contact parts of the head mounting table 30a to release the lifting of the head mounting table 30a, then the thermal head 30 is caused to make pressure contact with the platen roller 24 through the record medium, and the rotation shaft 24a goes over the coming-out preventing parts 28 to be positioned at the deep part of the supporting hollows 27, as shown in Fig. 14.

[0100] Then, the pressure contact pressure due to the pressure contact of the thermal head 30 with the platen roller 24 causes the rotation shaft 24a to make pressure contact with the one guide faces 27a of the supporting hollows 27 so that the rotation shaft 24a is prevented from coming-out by the coming-out preventing parts 28. Thus, the rotation shaft 24a turns into a coming-out prevented state, the first frame 22 is connected with the second frame 23, and thereby the printer enters a waiting state for printing.

[0101] When a print command is issued during this waiting state for printing, a plurality of heating elements of the thermal head 30 generates heat in a selected way, according to print information, thus color is created on the record medium, for example, of thermal paper, besides, the platen roller 24 is rotated in the counter-clockwise direction to transport the record medium in the paper discharge direction shown by the arrow C, and thus a desired image is printed on the record medium.

[0102] In replacing or providing a record medium after printing, the first frame 22 is loaded with a force in the direction opposite to the arrow B so that the rotation shaft 24a goes over the coming-out preventing parts 28 and the connection between the first frame 22 and the second frame 23 is released, forming a gap between the first frame 22 and the second frame 23, as shown in Fig. 11.

[0103] The record medium can be replaced or provided from this gap.

[0104] In a thermal printer 21 like this according to the second embodiment of the invention, the first frame 22 is slid in the direction of arrow B and the rotation shaft 24a of the platen roller 24 is supported by the supporting hollows 27, thus the platen roller 24 is caused to make pressure contact with the thermal head 30 and the rotation shaft 24a is prevented from coming-out by the coming-out preventing parts 28, which allows secure connection of the first frame 22 to the second frame 23

even without a latch member.

[0105] Although in the present embodiment of the invention, the coming-out preventing parts 28 have been explained by the convex part 28a having the first and second tapered faces 28b and 28c, the convex parts 28a may be formed in a step state without the first and the second tapered faces 28b and 28c.

[0106] In a thermal printer according to the invention, a first frame that supports a platen roller is mounted slidably along a body housing, and is attachable and detachable to and from a second frame mounted with a thermal head, and thus the platen roller and a driving source are unitized by the first frame, eliminating the conventional problem that gears collide with each other and the tips of the gears get broken, for example.

[0107] Thus, the platen roller can be smoothly rotated to provide a thermal printer allowing image printing with high quality.

[0108] Between the top plate of the second frame and a head mounting table, an elastic member that can elastically energize the thermal head to the platen roller side is disposed, and when the first frame is mounted to the second frame, the thermal head elastically contacts with the platen roller, which enables image printing with high quality.

[0109] Further, when the first frame is mounted to the second frame, the top plate of the second frame covers the upper side of the platen roller, and thus dust or the like can be prevented from entering the printing part.

[0110] The first frame is disposed with a gear box housing a plurality of gears which can transmit the rotation of the driving source to the platen roller, and thus dust or the like can be prevented from entering the engaging part between the plurality of gears, thereby enabling transmission of smooth rotation to the platen roller.

[0111] Further, the first frame is disposed with lock members that can restrain the movement of the first frame mounted to the second frame and can lock the first frame, and thereby the movement of the first frame mounted to the second frame is securely restrained by the lock members, which reduces the fluctuation in the pressure contact pressure of the thermal head that makes pressure contact with the platen roller to allow image printing with high quality.

[0112] The body housing is disposed with lock release members that can release the locking of the first frame, which provides a thermal printer that can easily release the locking of the first frame, thereby offering easy operation.

[0113] Further, when the lock release members release the locking of the first frame, the lock members press the second frame so that the first frame moves away from the second frame, allowing easy ejection of the first frame after releasing the locking.

[0114] The second frame is disposed with a detection switch that can detect the locking of the first frame by the lock members so that printing can start only when

the detection switch detects that the first frame has been locked. Thus, problems such as printing failure can be prevented.

[0115] When the first frame is moved to the second frame side, lifting members lift the head mounting table, and when the first frame has been mounted to the second frame, the lifting of the head mounting table by the lifting members is released so that the thermal head makes pressure contact with the platen roller, and thus, when the first frame is mounted to the second frame, the thermal head is prevented from colliding with the platen roller and damaging the platen roller.

[0116] Further, when the first frame gets mounted to the second frame, the lifting members contact with contact parts to lift the head mounting table, and when the first frame has been mounted to the second frame, the lifting members are positioned at non-contact parts to release the lifting of the head mounting table. Therefore, by forming the contact parts and the non-contact parts in a simple structure on the head mounting table, the thermal head is easily lifted at the time of mounting the first frame, thereby preventing the thermal head from colliding with the platen roller.

[0117] In another thermal printer according to the invention, when a first frame is slid to a second frame side and a rotation shaft is engaged with supporting hollows, the rotation shaft is prevented from coming-out by coming-out preventing parts, and thus the first frame can be connected to the second frame. Therefore, if only the first frame is pulled by a certain force, the connection with the second frame can be released, and thereby a thermal printer which does not require operation of a special latch member like one used in conventional examples, and offers easy operation can be provided.

[0118] Further, when the first frame is connected to the second frame, the rotation shaft goes over the coming-out preventing parts to be positioned at the deep part of the supporting hollows, and in addition, the rotation shaft is prevented from coming out from the supporting hollows by pressure contact pressure due to the pressure contact of a thermal head with a platen roller, which does not require a special latch member as used in conventional examples, enabling reduction in cost.

[0119] Further, the coming-out preventing parts are formed of a convex part that is formed projecting from a one guide face, and since the root part of the convex part is tapered, it is easy to attach and detach the rotation shaft to and from the supporting hollows.

Claims

1. A thermal printer comprising:

- a first frame that rotatively supports a platen roller;
- a second frame that is mounted with a thermal head which has a plurality of heating resistors

and can make pressure contact with the platen roller; and

a body housing that is mounted with the first and second frames, wherein the first frame is mounted slidably along the body housing, and is attachable and detachable to and from the second frame.

2. The thermal printer according to claim 1, wherein the thermal head is fixed to a head mounting table that is disposed on a top plate side of the second frame,

an elastic member that can elastically energize the thermal head to the platen roller side is disposed between the top plate of the second frame and the head mounting table, and

when the first frame is mounted to the second frame, the thermal head elastically contacts with the platen roller.

3. The thermal printer according to claim 2, wherein when the first frame is mounted to the second frame, the top plate of the second frame covers an upper side of the platen roller.

4. The thermal printer according to claim 2, wherein the first frame is disposed with a gear box that houses a plurality of gears which can transmit rotation of a driving source to the platen roller.

5. The thermal printer according to claim 2, wherein the platen roller is disposed with lifting members that can lift the head mounting table to the top plate side against an energizing force of the elastic member,

when the first frame is moved to a side of the second frame, the lifting members lift the head mounting table to move the thermal head away from the platen roller, and

when the first frame has been mounted to the second frame, the lifting of the head mounting table by the lifting members is released, and thus the thermal head makes pressure contact with the platen roller.

6. The thermal printer according to claim 5, wherein the lifting members are formed in a disc shape larger than a diameter dimension of the platen roller and fixed to a shaft at ends of the platen roller in a longitudinal direction of thereof, and the head mounting table is formed with contact parts with which the lifting members can contact and non-contact parts where the contact of the lifting members is released,

when the first frame gets mounted to the second frame, the lifting members contact with the contact parts to lift the head mounting table, and

when the first frame has been mounted to the

second frame, the lifting members are positioned at the non-contact parts so that the lifting of the head mounting table is released.

- 5 7. A thermal printer comprising:

a first frame that rotatively supports a platen roller;

a second frame that is mounted with a thermal head which has a plurality of heating resistors and can make pressure contact with the platen roller; and

a body housing that is mounted with the first and second frames, wherein

the first frame is slidably mounted to the body housing, the second frame is formed with supporting hollows that can support a rotation shaft of the platen roller, the supporting hollows being formed with respective coming-out preventing parts which can prevent the rotation shaft supported by the support hollows from coming out, and

when the first frame is slid to a side of the second frame and the rotation shaft is engaged with the supporting hollows, the rotation shaft is prevented from coming out by the coming-out preventing parts, thus allowing the first frame to be connected to the second frame.

- 30 8. The thermal printer according to claim 7, wherein each supporting hollow is provided with a one guide face and another guide face facing each other at a certain distance,

the one guide face is formed with the coming-out preventing part thereof, and

when the first frame is slid and connected to the second frame, the rotation shaft goes over the coming-out preventing parts and gets positioned at a deep part of the supporting hollows, the thermal head makes pressure contact with the platen roller, and pressure contact pressure of the thermal head applied to the platen roller prevents the rotation shaft from coming out from the supporting hollows.

- 45 9. The thermal printer according to claim 7 or 8, wherein each coming-out preventing part is formed of a convex part that protrudes from the one guide face, and a root part of the convex part is taper-shaped.

FIG. 1

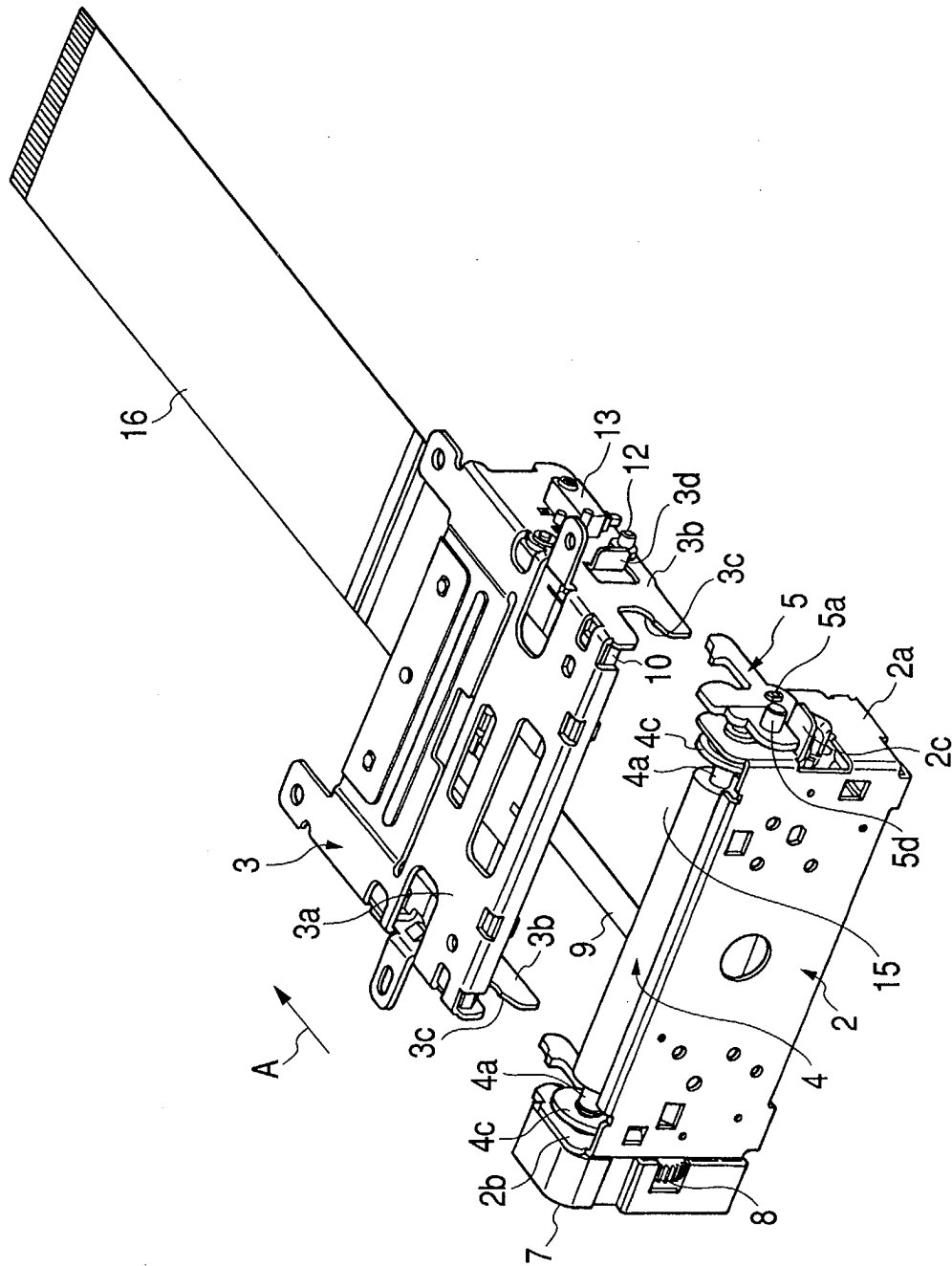


FIG. 2

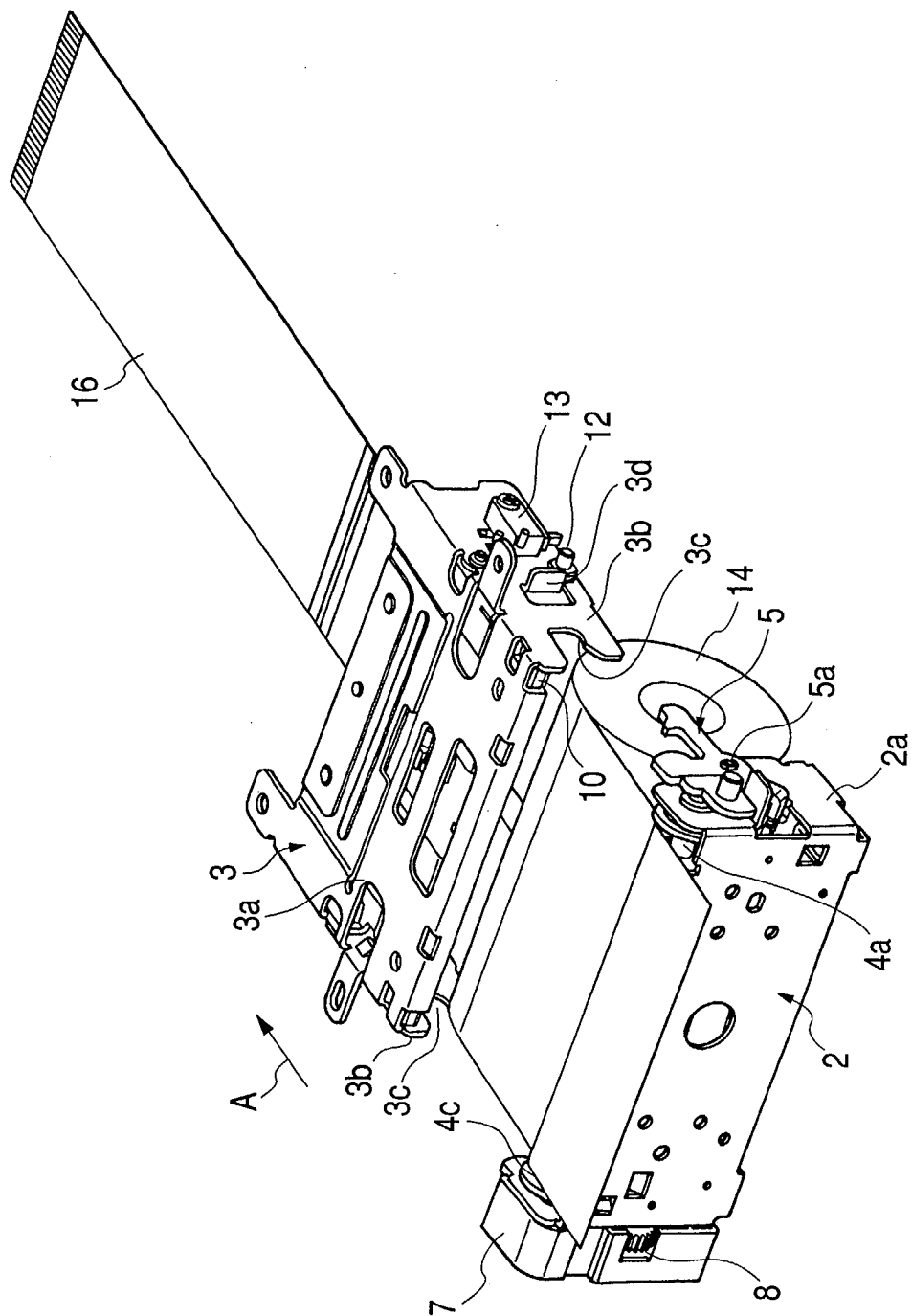


FIG. 3

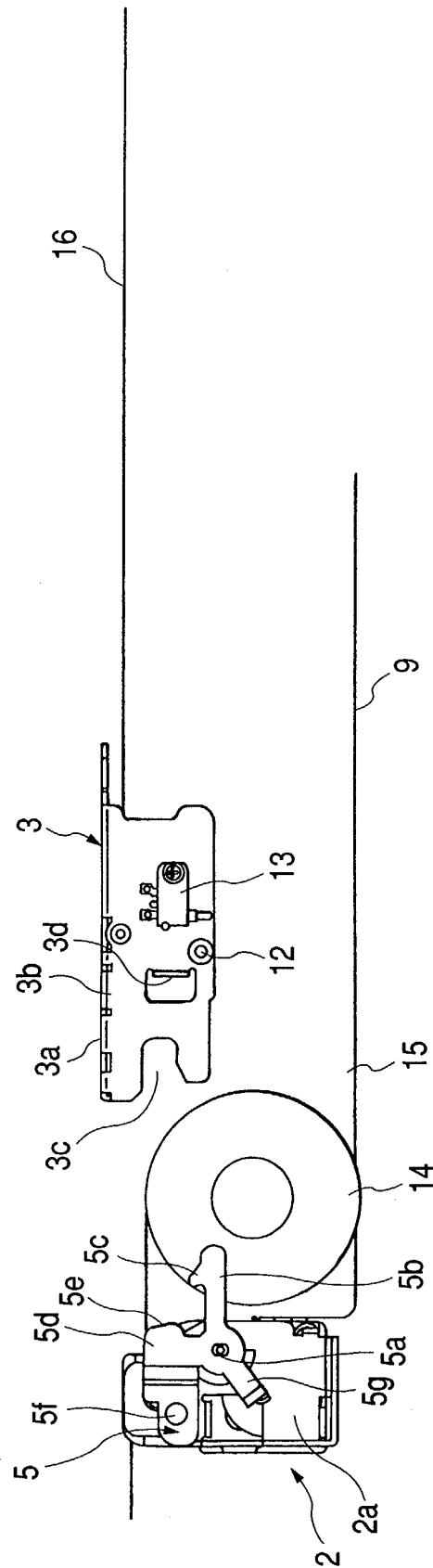


FIG. 4

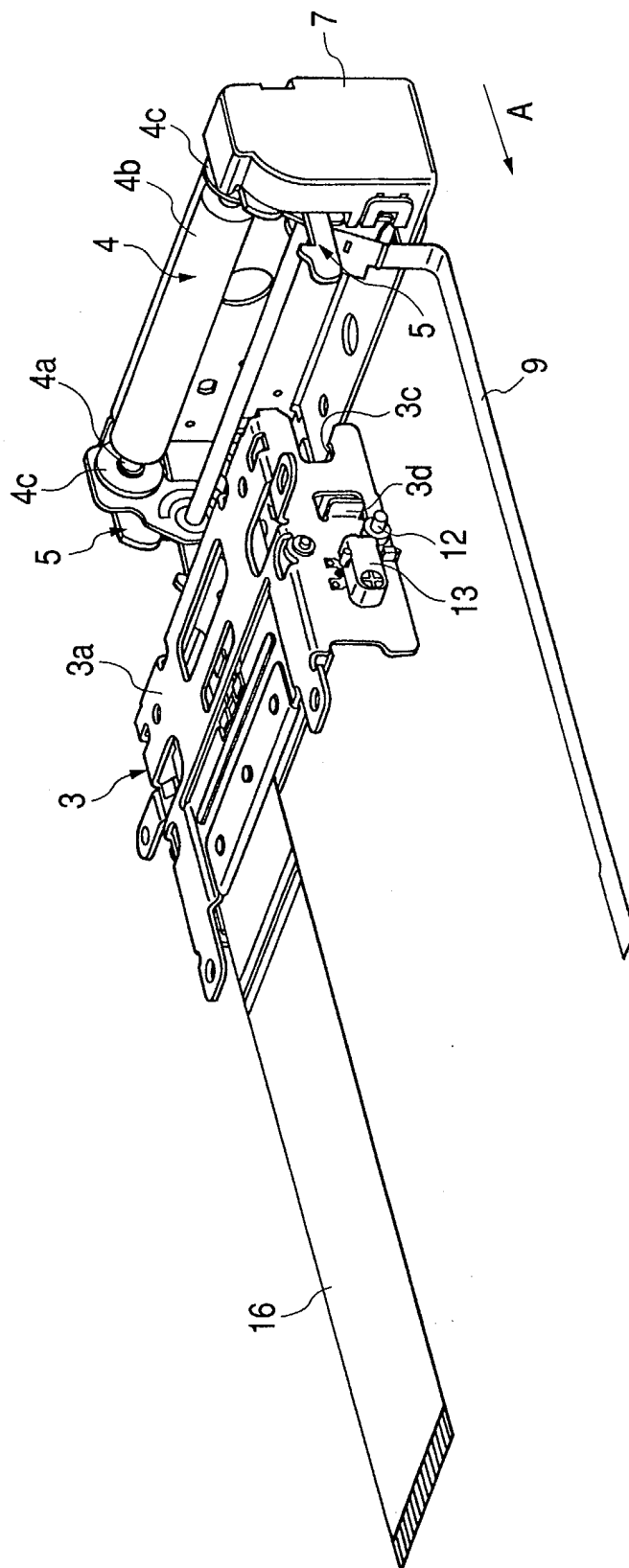


FIG. 5

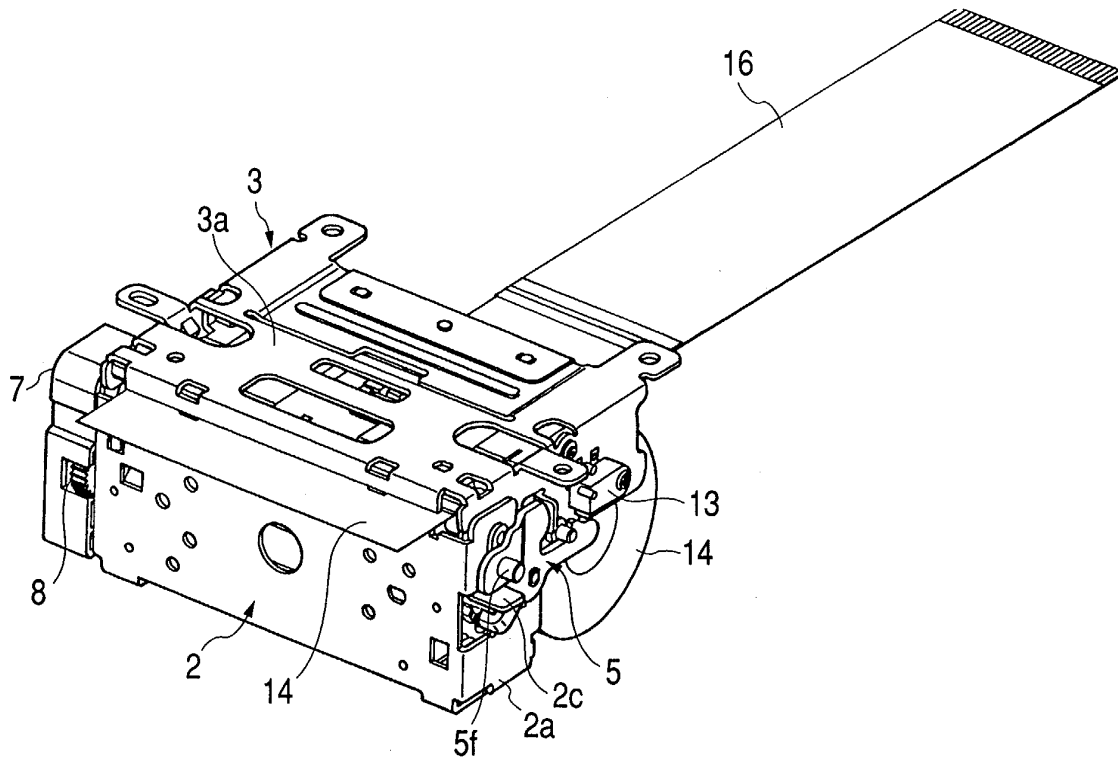


FIG. 6

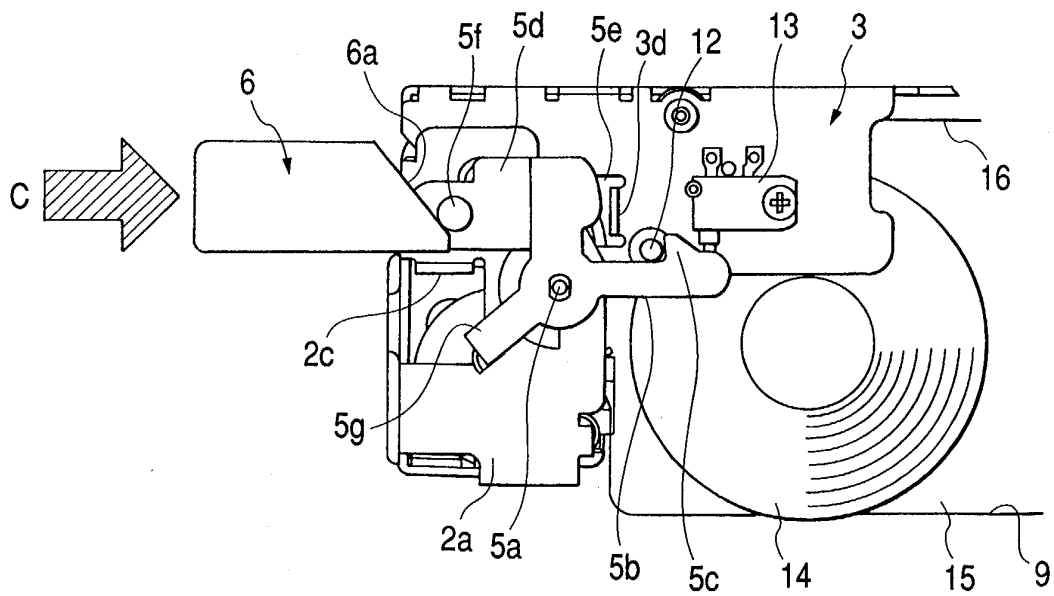


FIG. 7

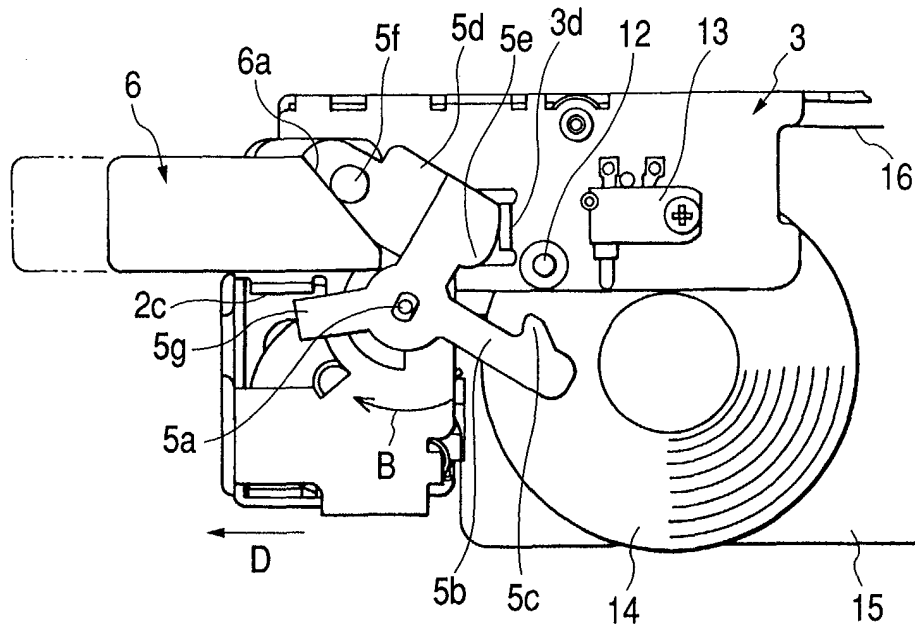


FIG. 8

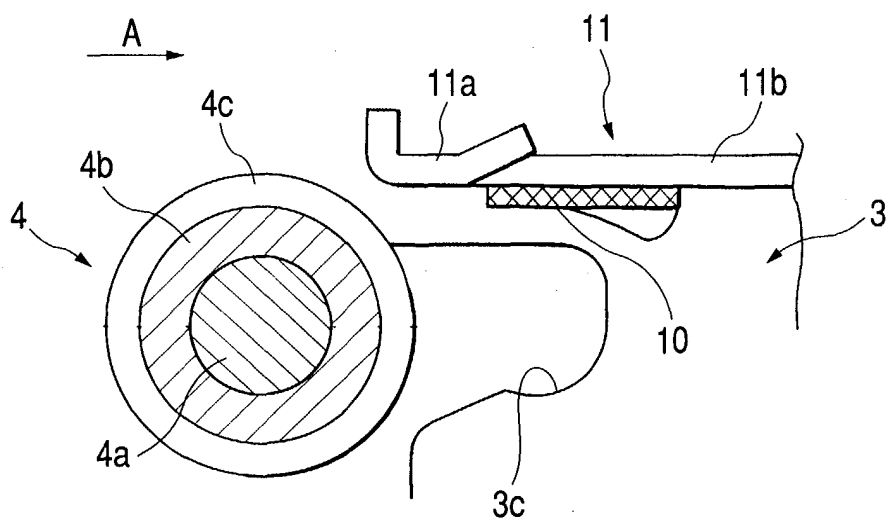


FIG. 9

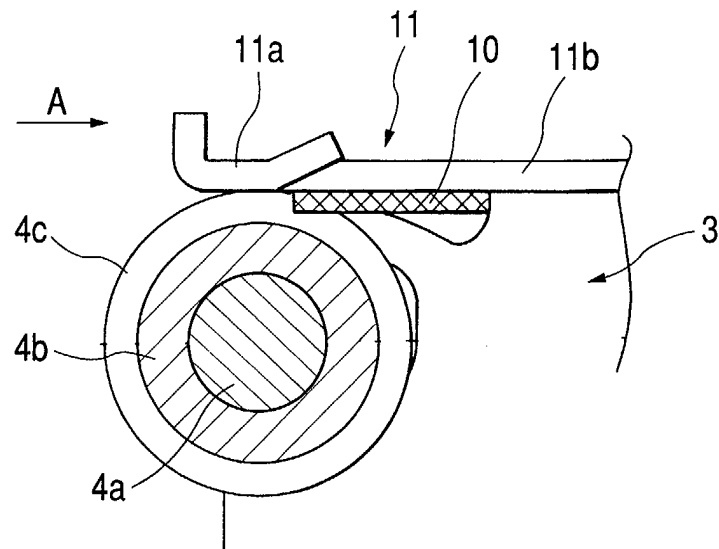


FIG. 10

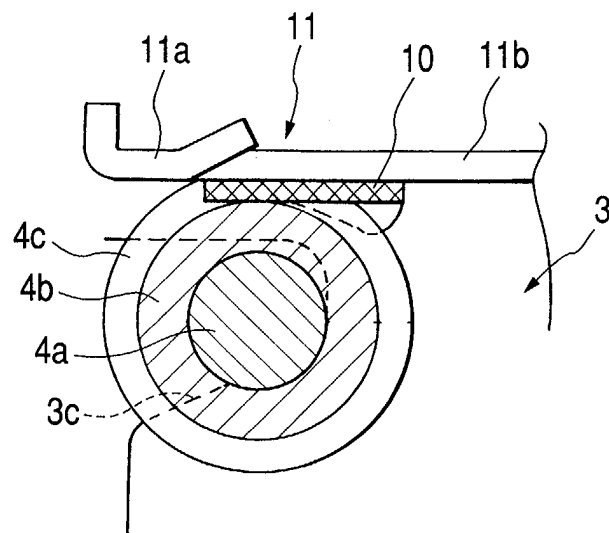


FIG. 11

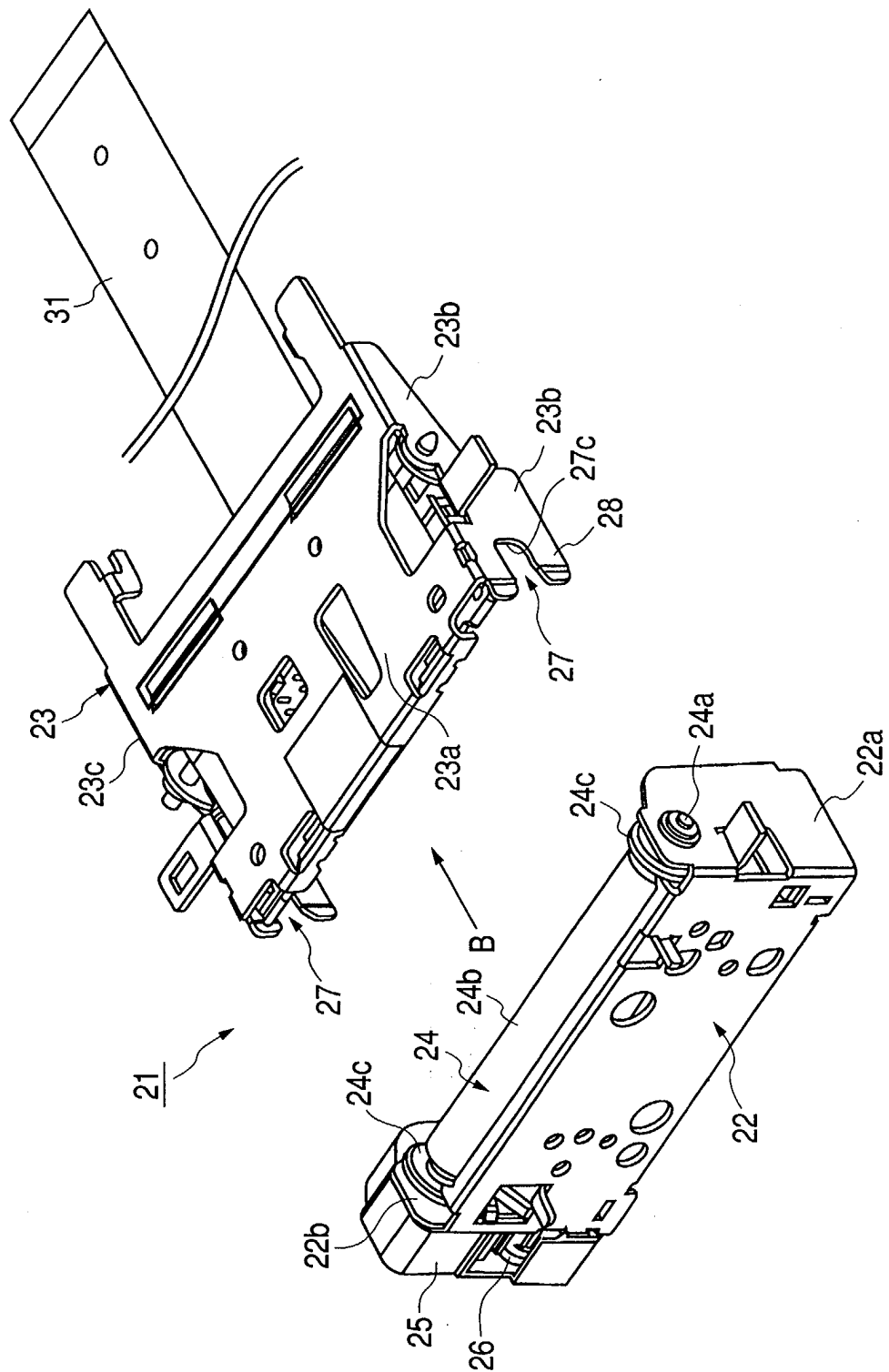


FIG. 12

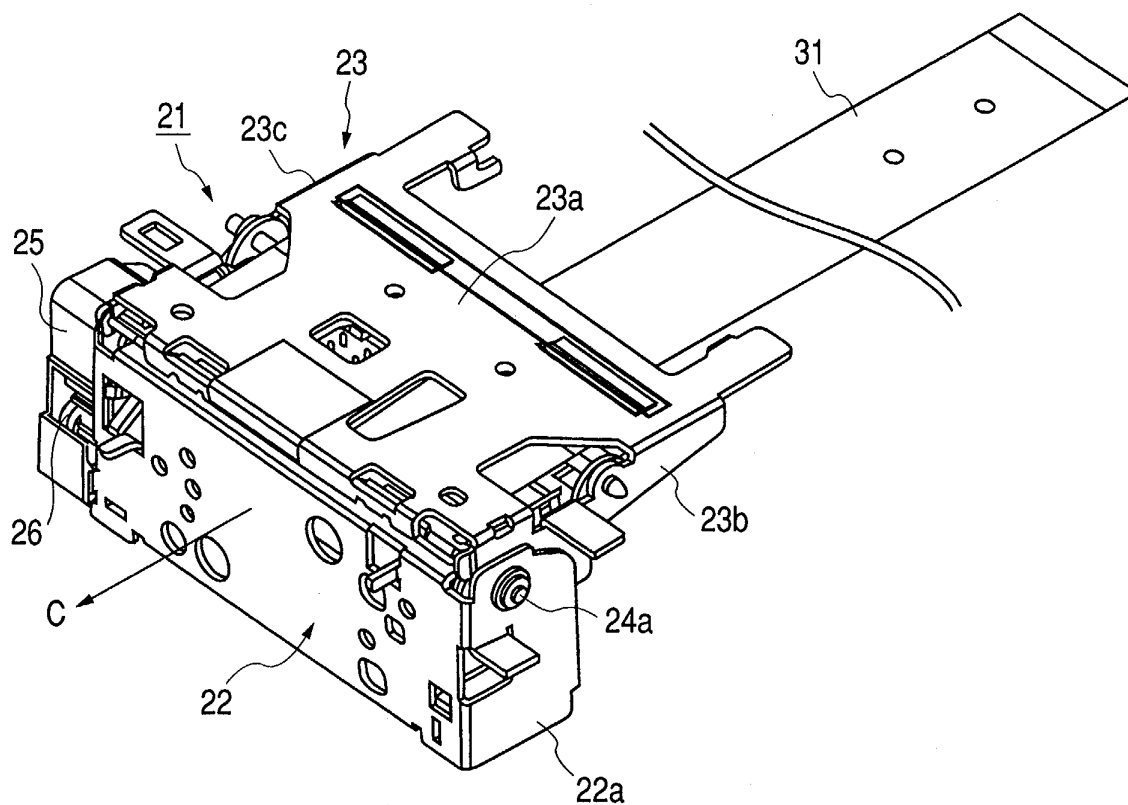


FIG. 13

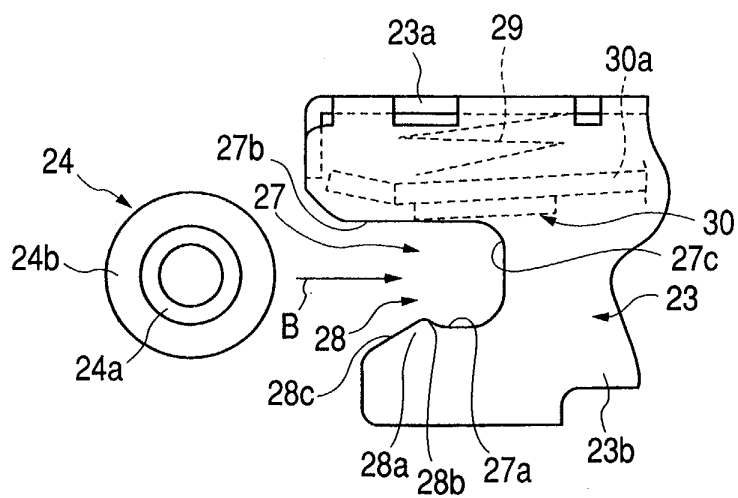


FIG. 14

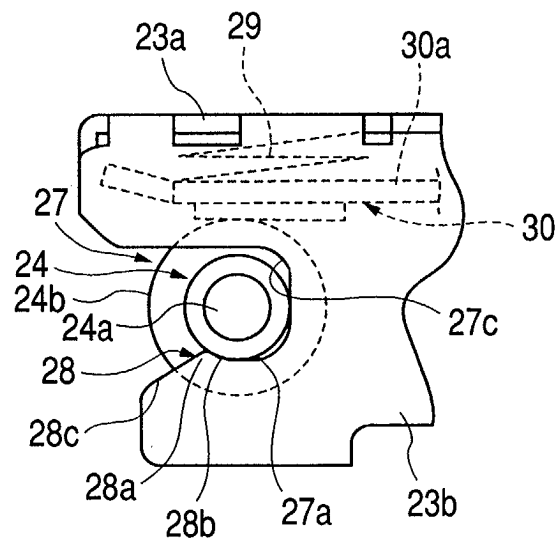


FIG. 15

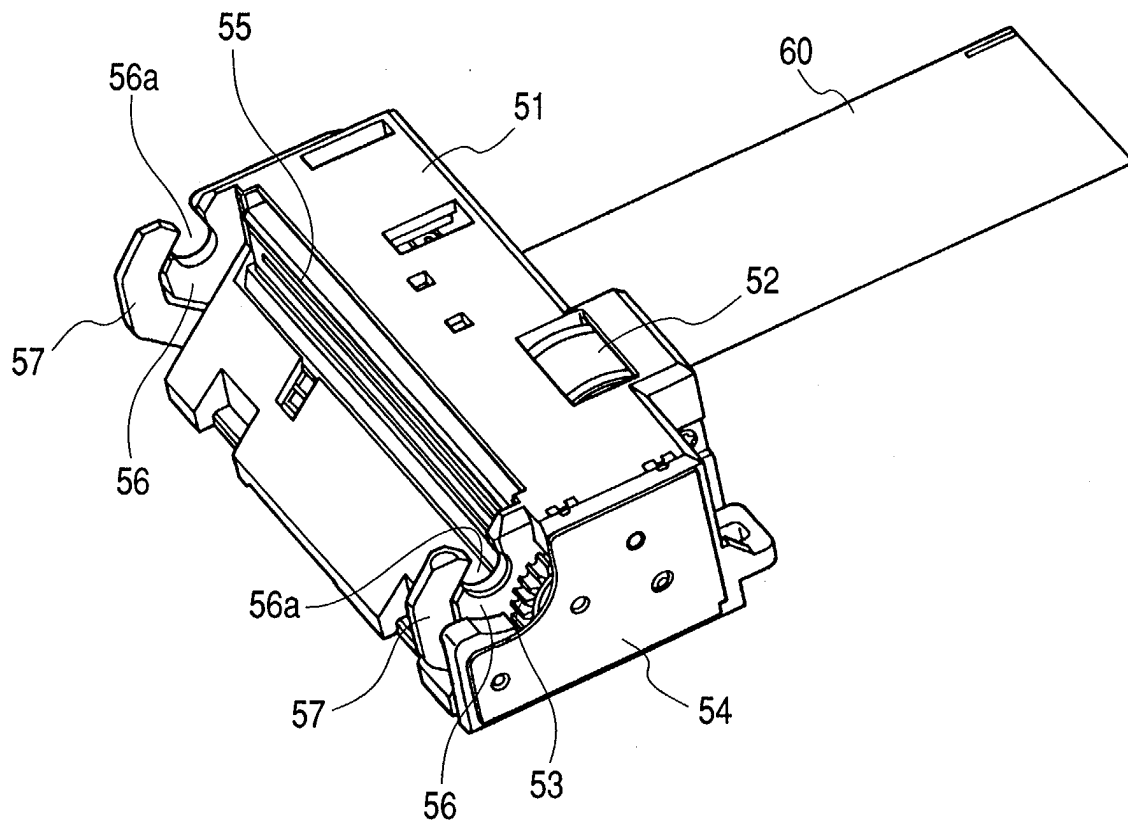
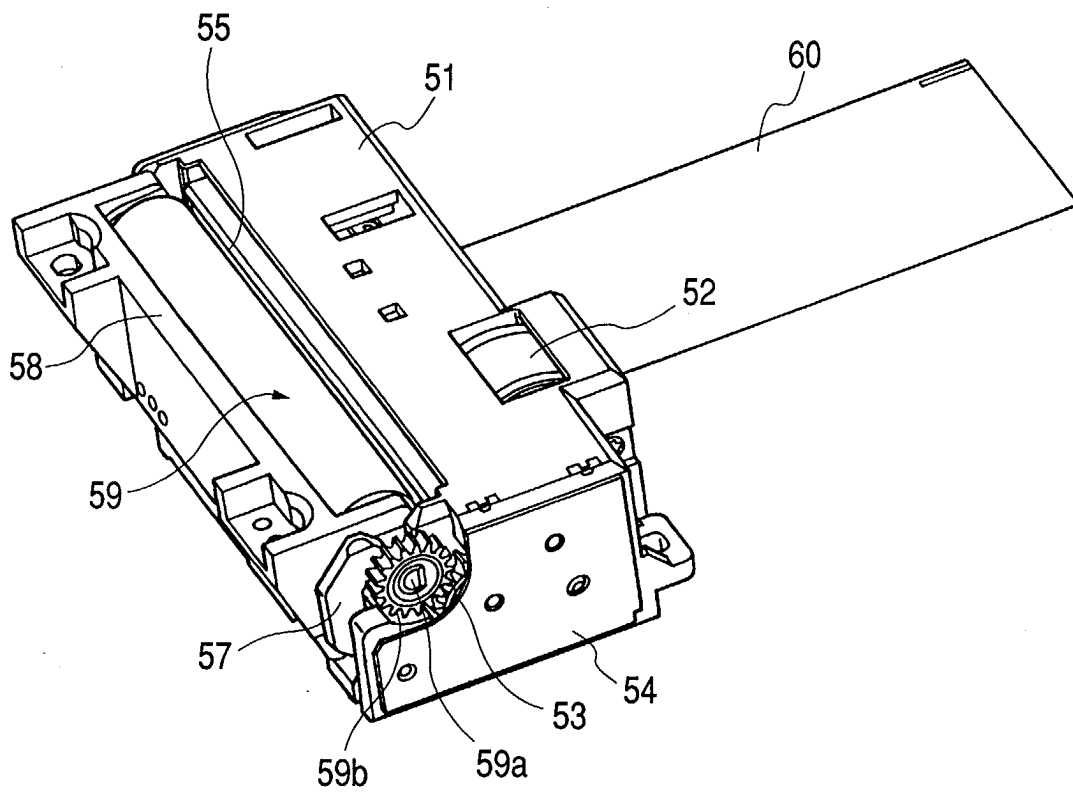


FIG. 16





European Patent
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Application Number
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Place of search THE HAGUE		Date of completion of the search 7 January 2004	Examiner Didenot, B
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ON EUROPEAN PATENT APPLICATION NO.**

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The members are as contained in the European Patent Office EDP file on
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