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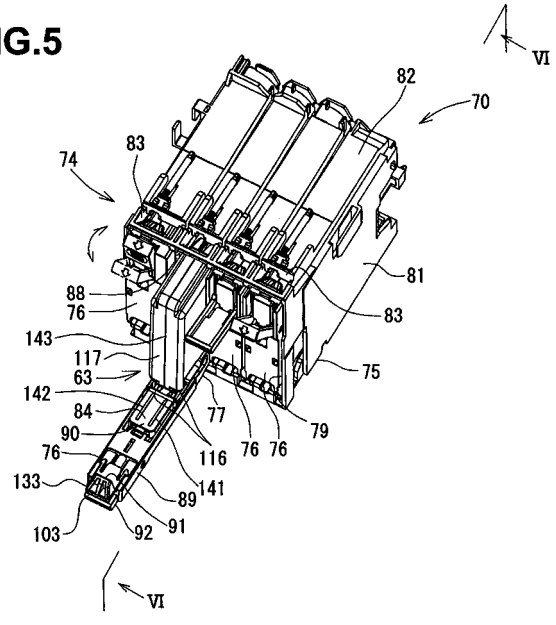
Remarks:
Amended claims in accordance with Rule 86 (2) EPC.

(54) Ink cartridge, main body and refill unit

(57) (PROBLEM) To provide a refill unit, which allows the user, to easily install and remove ink cartridges.

(MEANS FOR SOLVING) The refill unit 70 comprises a case 75 and an ink cartridge 63 which is housed in the case 75. The case 75 has an opening 88 on its front surface. Case 75 has a door 76, and this door 76 opens and closes said opening 88. Door 76 comprises pullout members 77. When door 76 is opened, the pullout members 77 pull the ink cartridge 63 out from the case 75. When the door 76 is closed, the pullout members 77 extend in the front-back direction and guide the insertion of a new ink cartridge. The pullout members 77 are arrange opposite each other in the width direction of the ink cartridge 63. The widthwise dimension of the pullout members 77 is set to be smaller than the width dimension of ink cartridge 63.

FIG.5



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Description

[0001] The present invention is relates to an ink cartridge, a main body and a refill unit of an ink jet recording apparatus.

[Background of the Invention]

[0002] The ink jet recording apparatus injects ink droplets from a recording head onto a transferred recording paper so as to record an image on the recording paper. Generally, ink is previously stored in an ink tank of a cartridge type (ink cartridge) and the ink is supplied to the recording head from the ink cartridge. Therefore, if the residual amount of the stored ink in the ink tank is reduced, the ink cartridge is required to be replaced with a new one (for example, refer Patent Documents 1 to 5). Generally, the ink cartridge is accommodated in a casing mounted in the ink jet recording apparatus.

[0003] Ink cartridges include an on-carriage type and an off-carriage type. The ink cartridge of the on-carriage type is mounted to a carriage where the recording head is mounted and that can reciprocate along a direction perpendicular to a paper transferring direction. A casing is mounted on the carriage and the ink is supplied to the recording head from the ink cartridge accommodated in the casing.

[0004] On the other hand, in the ink cartridge of the off-carriage type, a casing, which accommodates the ink cartridge, is provided somewhere in the ink jet recording apparatus other than on the carriage. That is, the ink cartridge and the casing are previously structured as a unit and the unit is provided in somewhere in the ink jet recording apparatus. Therefore, ink is supplied to the recording head from the casing which accommodates the ink cartridge via an ink supplying pipe and the like. The unit is called a refill unit in this application.

[0005] The casing of the refill unit generally has a door. The door is closed when the ink cartridge is accommodated in the casing. Accordingly, the ink cartridge is surely accommodated and held in the casing. An ink supplying needle is arranged inside the casing. The ink supplying needle is inserted to the ink cartridge when the ink cartridge is accommodated in the casing. The ink in the ink cartridge is supplied to the recording head via the ink supplying needle, the ink supplying pipe and the like. When the ink cartridge is replaced with a new one, the door is opened and the ink cartridge is removed from the casing (for example, refer to Patent Document 6).

[Patent Document 1] Japanese Laid-Open Patent Publication No. 11-348303
[Patent Document 2] Japanese Laid-Open Patent Publication No. 10-109427
[Patent Document 3] Japanese Laid-Open Patent Publication No. 2004-345246
[Patent Document 4] Japanese Laid-Open Patent Publication No. 2005-219416
[Patent Document 5] Japanese Laid-Open Patent Publication No. 2005-96446
[Patent Document 6] Japanese Laid-Open Patent Publication No. 6-106730

[Summary of the invention]

[0006] It is desired that the ink cartridge is replaced easily and in a short time by a user of the ink jet recording apparatus. That is, it is required that the used ink cartridge is easily removed from the casing and a new ink cartridge is easily inserted to the casing.

[0007] An object of the present invention is to provide a refill unit, a main body for a refill unit used in the refill unit and an ink cartridge for the refill unit which enable easy insertion/removal of the ink cartridge into/from a casing by a user.

1. Ink cartridge for Refill unit

[0008] In order to achieve the above mentioned object, an ink cartridge according to claim 1 is provided.

2. Main Body for a Refill Unit

[0009] In order to achieve the above-mentioned object, there is provided the main body for a refill unit of claim 8.

[0010] In the main body for a refill unit, the ink cartridge can be accommodated in the accommodating portion, and the ink cartridge is removed from the accommodating portion as follows. When the ink cartridge is removed from the casing, the door is first opened. When the door is moved to the open position from the closed position, the pulling member pulls out the ink cartridge toward the opening. Accordingly, a user can pull out the ink cartridge from the accommodating portion through the opening. When the ink cartridge is accommodated in the accommodating portion, the ink cartridge is inserted into the accommodating portion from the opening while the door is open. At this time, the ink cartridge, which is to be inserted to the accommodating portion, is previously supported by the pulling member. Then, the ink cartridge is inserted to the accommodating portion, being guided by the pulling member.

[0011] According to the main body for a refill unit of claim 9, when the door is moved from the closed position to the open position, the pulling member can surely pull out the ink cartridge toward the opening. Further, when a new ink cartridge is inserted to the accommodating portion from the opening, the ink cartridge is surely supported and guided by the pulling member. Therefore, the ink cartridge can be replaced more easily.

[0012] According to the main body for a refill unit of claim 10, since the distance between the pair of pulling members is set to equal to or smaller than a width of the ink cartridge, the door is designed in a compact size, which reduces a size of the unit body for a refill unit.

[0013] According to the main body for a refill unit of

claim 11, since the ink cartridge can be inserted into and removed from the accommodating portion on the front side of the unit body for a refill unit by a user, the ink cartridge can be replaced more easily. When the door is moved to the open position, the curved portion is rotated so that the ink cartridge is pulled out of the unit body and the curved portion functions as the guide member. Therefore, the structure of the pulling member is simple, which reduces manufacturing cost of the unit body for a refill unit

3. Refill Unit

[0014] In order to achieve the above-mentioned object, there is provided the refill unit of claim 12.

[0015] The used ink cartridge is replaced according to the following steps. When the used ink cartridge is removed from the casing, the door is opened. When the door is moved from a closed position to an open position, a pulling member pulls the ink cartridge toward the opening. Accordingly, a use can pull out the ink cartridge from the opening. Next, a new ink cartridge is inserted to an accommodating portion from the opening. At this time, the door is at the open position and the new ink cartridge, which is to be inserted to the accommodating portion, is previously supported by the pulling member. Then, the ink cartridge is inserted to the accommodating portion, being guided by the pulling member.

[0016] According to the refill unit, when the door is moved from the closed position to the open position, the pulling member can surely pull out the ink cartridge toward the opening. Furthermore, when a new ink cartridge is inserted to the accommodating portion from the opening, the ink cartridge is surely supported and guided by the pulling member. Therefore, a user can replace the ink cartridge easily.

[0017] According to the refill unit, each of the pulling members is received into the groove formed in the ink cartridge. Further, since the distance between the pair of pulling members is set to equal to or smaller than a width of the ink cartridge, the pulling members received in the ink cartridge do not protrude from the ink cartridge. Therefore, the door is designed in a compact size, which reduces a size of the refill unit.

[0018] According to the refill unit, since the ink cartridge can be inserted to and removed from the accommodating portion on the front side of the refill unit by a user, the ink cartridge can be replaced more easily. When the door is moved to the open position, the curved portion is rotated so that the ink cartridge is pulled out from the refill unit. The curved portion also functions as a guide member. Therefore, the structure of the pulling member becomes simple, which reduces manufacturing cost of the refill unit.

[Effects of the Invention]

[0019] According to the present invention, since the ink cartridge is pulled out from the casing by the pulling member when the door is moved from the closed position to the open position, the ink cartridge is removed from the casing easily. Further, when the door is open, a new ink cartridge is guided by the pulling member so as to be accommodated in the casing. Accordingly, a new ink cartridge is inserted to the casing easily. That is, when an operator simply opens the door, the used ink cartridge is pulled out from the casing, and the operator can easily accommodate a new ink cartridge into the casing while the door is open. Accordingly, the ink cartridge can be replaced quite easily.

(BRIEF DESCRIPTION OF THE DRAWINGS)

[0020]

(FIGURE 1) Figure 1 is an external perspective view of a multifunction device according to an embodiment of the present invention.

(FIGURE 2) Figure 2 is a drawing, which schematically illustrates the internal structure of a multifunction device according to an embodiment of the present invention.

(FIGURE 3) Figure 3 is a drawing, which schematically illustrates the internal structure of the scanner part of a multifunction device according to an embodiment of the present invention.

(FIGURE 4) Figure 4 is a drawing, which schematically illustrates the internal structure of the printer part of a multifunction device according to an embodiment of the present invention.

(FIGURE 5) Figure 5 is a perspective view of refill unit according to an embodiment of the present invention.

(FIGURE 6) Figure 6 is a cross-section along VI-VI in Figure 5.

(FIGURE 7) Figure 7 is a side view of the main parts of the unit main body of a refill unit according to an embodiment of the present invention.

(FIGURE 8) Figure 8 is a cross-section of the unit main body of a refill unit according to an embodiment of the present invention.

(FIGURE 9) Figure 9 is an exploded perspective view of the door of a refill unit according to an embodiment of the present invention.

(FIGURE 10) Figure 10 is an exploded perspective view of the door of a refill unit according to an embodiment of the present invention.

(FIGURE 11) Figure 11 is a cross-section of a refill unit according to an embodiment of the present invention.

(FIGURE 12) Figure 12 is an enlargement of the main parts of Figure 11.

(FIGURE 13) Figure 13 is a side view of an ink cartridge according to an embodiment of the present invention.

(FIGURE 14) Figure 14 is a perspective view of an ink cartridge according to an embodiment of the

present invention.

(FIGURE 15) Figure 15 is a drawing schematically illustrating the engagement structure of the ink cartridge, case, and pullout member according to an embodiment of the present invention.

(FIGURE 16) Figure 16 is a drawing schematically illustrating a modified example of the engagement structure of the ink cartridge, case, and pullout member according to an embodiment of the present invention.

(FIGURE 17) Figure 17 is a drawing schematically illustrating another modified example of the engagement structure of the ink cartridge, case and pullout member according to an embodiment of the present invention.

(BEST EMBODIMENTS OF THE INVENTION)

[0021] The present invention is described in detail below based on preferred embodiments while referring to the appropriate drawings.

[0022] Figure 1 is an external perspective view of a multifunction device according to an embodiment of the present invention.

[0023] The multifunction device 10 is an MFD (multi function device) integrally comprising a printer part 11 at the bottom and a scanner part 12 at the top, and has various functions such as a printer function, scanner function, copy function, and facsimile function. The multifunction device 10 is mainly connected to an unillustrated computer, and records images and texts on recording paper, which serves as the recording medium, based on image data and text data transmitted from the computer. Furthermore, the multifunction device 10 can be connected to an external device such as a digital camera to record image data outputted from the digital camera on the recording paper. Moreover, the multifunction device 10 comprises the subsequently described slot part 61, and allows image data or the like stored on a storage medium to be recorded on the recording paper by installing various types of storage medium such as a memory card in this slot part 61.

[0024] The distinguishing features of the multifunction device 10 according to the present embodiment are the point that the aforementioned printer part 11 is constituted as an ink jet recording device and has on the front surface of the device a refill unit 70 which stores in advance the ink which is supplied to the recording head which emits ink drops, and the point that this refill unit 70 has a structure which aids the ink cartridge insertion and ejection operation, so that the user of this multifunction device 10 can very simply and rapidly perform the ink cartridge replacement operation. Since the present invention is implemented in the form of the refill unit 70 which is incorporated into the multifunction device 10 described below, it goes without saying that the configuration of the multifunction device 10 can be modified in design as appropriate without changing the gist of the present invention.

[0025] Figure 2 is a drawing schematically illustrating the internal structure of the aforementioned multifunction device 10. Figure 3 is a drawing schematically illustrating the internal structure of the aforementioned scanner part 12 (the portion shown by the dotted line in Figure 2).

[0026] As shown in Figure 2, the scanner part 12 comprises a document bed 13 which functions as an FBS (flatbed scanner) and a document cover 15 provided thereon. The document cover 15 comprises an auto document feeder mechanism (hereinafter referred to as "ADF") 14, and is attached to the back surface of the document bed 13 via hinges to allow opening and closing. Thus, the document cover 15 is opened and closed by turning in the direction of arrow 16 relative to the document bed 13. In the present embodiment, the document bed 13 is comprised in the case of the multifunction device 10, and the document cover 15 constitutes part of the top surface of the multifunction device 10.

[0027] The document bed 13 also serves as the frame of the scanner part 12. As shown in Figure 3, a contact glass plate 20 is provided on the ceiling 19 of the document bed 13. Furthermore, an image reading unit 18 is arranged inside the document bed 13. Documents are placed between the document cover 15 and the contact glass plate 20. The image read unit 18 reads the image from the document by moving below the contact glass plate 20 along the contact glass plate 20, i.e. in the direction perpendicular to the paper surface in Figure 3.

[0028] The document read unit 18 comprises a CIS unit 21, guide shaft 22, roller unit 23 and an unillustrated belt drive mechanism. In the present embodiment, the document read unit 18 comprises a CIS (contact image sensor), but a reducing optical image sensor such as a CCD (charge coupled device) can be of course be used instead of a CIS. The CIS unit 21 comprises a slender cuboid case 43, and this case 43 is fitted to and supported by a carriage 24. The guide shaft 22 is mounted in a direction perpendicular to the paper surface of the same drawing. This guide shaft 22 passes through the bottom end part 25 of said carriage 24. Namely, the CIS unit 21 is supported by this guide shaft 22, and slides while being guided by the guide shaft 22. The aforementioned belt driving mechanism comprises a timing belt (not illustrated) driven by a motor, for instance. A portion of this timing belt is coupled to the bottom end part 25 of said carriage 24. Thus, when the belt driving mechanism is actuated, the carriage 24 moves together with the timing belt, and as a result, the CIS unit 21 moves below the contact glass plate 20.

[0029] The aforementioned roller unit 23 is arranged at both ends of the CIS unit 21. This roller unit 23 touches the bottom surface 26 of the contact glass plate 20. Furthermore, this roller unit 23 rolls in the direction of movement of the carriage 24 over the back surface 26 of the contact glass plate 20 when the carriage 24 moves. In other words, this roller unit 23 aids in the smooth movement of the CIS unit 21. Furthermore, the roller unit 23

also plays the role of a spacer, which maintains a constant distance between the CIS unit 21, and the document resting on the contact glass plate 20.

[0030] As shown in Figure 1, the document cover 15 comprises the aforementioned ADF 14. This ADF 14 is configured to allow continuous feeding of a document up to a prescribed number of sheets from the document tray 47 to the paper ejection tray 46. The mechanism for continuously feeding the document is built into the document cover 15. Since the ADF 14 has a known structure, detailed description thereof will be omitted. The ADF 14 may also be left out of the present embodiment.

[0031] Figure 4 is a drawing, which schematically represents the internal configuration of the printer part 11 (the part indicated by a dotted line in Figure 2). The direction perpendicular to the paper surface in Figure 4 is the width direction of the multifunction device 10, which matches the direction perpendicular to the paper surface in Figure 2.

[0032] As shown in Figure 2 and Figure 4, the printer part 11 comprises an image recording part 28 having a frame constituted by the aforementioned document bed 13, and an ink jet recording head 27 (hereinafter referred to simply as "recording head 27"). In other words, in the present embodiment, the printer part 11 is comprised of an ink jet recording device.

[0033] As shown in Figure 4, the printer part 11 comprises the aforementioned refill unit 70. This refill unit 70 is contained in from of the document bed 13, i.e. on the side of the front surface 71, as shown in Figure 1. In the present embodiment, the refill unit 70 is able to house and retain four ink cartridges. The ink cartridges hold ink of black, yellow, magenta, and cyan colors. The inks of the various colors held in these ink cartridges are designed to be supplied to the aforementioned recording head 27 via an ink tube (supply tube). Illustration of the ink tube has been omitted from Figure 4.

[0034] The document bed 13 constituting the frame of the printer part 11 has an opening and closing cover 72 on the aforementioned front surface 71 side. This opening and closing cover 72 opens and closes an opening 73 provided at an end part of this front surface 71. Specifically, the opening and closing cover 72 is rotatable between a position where it exposes the refill unit 70 through said opening 73 by leaning forward as shown in Figure 1, and a position where said opening 73 is closed to contain the refill unit 70.

[0035] Furthermore, the document bed 13 is provided with an opening 42 in the middle of its front surface, and a paper supply tray 29 is arranged inside this opening 42 (see Figure 4). As shown in Figure 4, the recording paper fed from the paper supply tray 29 is ejected into a paper ejection tray 32 provided in said opening 42 after the image has been recorded in the manner described below. A separation tilt plate 30 is arranged on the inner side of the aforementioned paper supply tray 29 (on the right side in Figure 4). This separation tilt plate 30 separates the recording paper sheets stacked in the paper supply tray 29 and guides them upward. A paper feed path 31 is formed going upward from the separation tilt plate 30. The paper feed path 31 extends upward and then curves to the left, extending from the back surface side of the multifunction device 10 to the front surface side. Furthermore, the paper feed path 31 passes through the image recording part 28 and into the paper ejection tray 32. Therefore, the recording paper housed in the paper supply tray 29 is guided to the image recording part 28 by the paper feed path 31 such that it makes a U-tum from the bottom upward. After the image recording part 28 has performed image recording on the recording paper being fed through the paper feed path 31, the recording paper is ejected into the paper ejection tray 32. In Figure 1, the paper ejection tray 32 and the aforementioned paper supply tray 29 are not shown.

[0036] As illustrated in Figure 4, a paper supply roller 34 is provided above the paper supply tray 29. The paper supply roller 34 separates the recording paper stacked in the paper supply tray 29 one sheet at a time and feeds it into the paper feed path 31. The structure of the paper supply roller 34 is known. In the present embodiment, the paper supply roller 34 and pivotally supported on the tip of a paper supply arm 35. This paper supply arm 35 is above to move up and down towards and away from the paper supply tray 29. The paper supply roller 34 is coupled to a motor via an unillustrated drive transmission mechanism. This drive transmission mechanism can be configured based on the engagement of a plurality of gears. Actuating the aforementioned motor causes its driving force to be transmitted to the paper supply roller 34, causing the paper supply roller 34 to rotate. The rotating paper supply roller 34 feeds the recording paper to the paper feed path 31.

[0037] The paper supply arm 35 is supported on a based end shaft 36 and is able to rotate around the base end shaft 36. As a result, the paper supply arm 35 is able to slide up and down with the base end shaft 36 as the center of sliding. This paper supply arm 35 is impelled toward the paper supply tray 29 by means of an unillustrated paper supply clutch, spring, etc. when the paper supply tray 29 is installed, and retracts upward during insertion or removal of the paper supply tray 29. The downward turning of the paper supply arm 35 causes the paper supply roller 34 pivotally supported on its tip to press against the surface of the recording paper on the paper supply tray 29. When the paper supply roller 34 rotates in this state, the friction between the roller surface of the paper supply roller 34 and the recording paper feeds the recording paper sheet in the uppermost position to the aforementioned separation tilt plate 30. The fed sheet of recording paper touches the separation tilt plate 30 with its leading edge and is guided upward and fed into the paper feed path 31. When the recording paper sheet in the uppermost position is fed out by the paper supply roller 34, the sheet of recording paper immediately below it may be fed out together due to the effects of friction and static electricity. However, this sheet of re-

cording paper is stopped by coming into contact with the separation tilt plate 30.

[0038] The paper feed path 31, outside of the places where the image recording part 28 and the like are arranged, is demarcated by an outer guide surface and inner guide surface which face each other at a prescribed spacing. In this multifunction device 10, the outer guide surface is comprised of the inner wall surface of the frame of the printer part 11 comprised of the document bed 13, while the inner guide surface is comprised of the surface of a guide member provided inside said frame. Furthermore, feed rollers may be provided, particularly in places where the paper feed path 31 curves. Although no feed rollers are shown in said figure, feed rollers may be arranged rotatably with the width direction of the paper feed path 31 (the direction perpendicular to the paper surface in Figure 4) as the rotational center shaft direction. The feed rollers are mounted so that their roller surface is exposed to the aforementioned outer guide surface or inner guide surface. Providing these feed rollers causes the recording paper to be fed smoothly in contact with the guide surface even in places where the paper feed path 31 curves.

[0039] The aforementioned image recording part 28 is arranged downstream of where the paper feed path 31 makes an upward U-turn. A platen 37 is arranged opposite the aforementioned recording head 27. The fed recording paper is brought over the platen 37. The recording head 27 emits ink drips on the recording paper arranged over the platen 37. The recording head 27 is mounted on an unillustrated carriage. This carriage moves back and forth in the direction perpendicular to the paper surface in said drawing by means of a CR motor. The location and reciprocating operation of the recording head 27 is monitored by an unillustrated carriage encoder. The recording head 27 emits ink of each of the aforementioned colors in the form of ink drops onto the aforementioned recording paper while moving back and forth, thereby recording an image on the recording paper.

[0040] A drive roller 39 and press roller 38 are provided on the upstream side of said recording head 27 in the paper feed path 31. The drive roller 39 is rotationally driven by an unillustrated LF motor. The drive roller 39 and press roller 38 sandwich the recording paper being fed along the paper feed path 31. The rotation of the drive roller 39 causes the recording paper to be fed downstream in the paper feed path 31 and to be arranged over the platen 37.

[0041] A paper ejection roller 40 and press roller 41 are provided downstream of said recording head 27 in the paper feed path 31. The paper ejection roller 40 is rotationally driven by the LF motor, which drives the aforesaid drive roller 39. Namely, the paper ejection roller 40 is driven synchronously with the drive roller 39 by means of an unillustrated interlocking mechanism. The paper ejection roller 40 and press roller 41 sandwich the recording paper onto which ink drops have been emitted, and rotation of the paper ejection roller 40 causes said recording paper to be fed downstream in the paper feed path 31.

[0042] The aforementioned press roller 38 is elastically impelled toward the drive roller 39 so as to depress said drive roller 39 with a prescribed pressure. Therefore, when the recording paper enters between the drive roller 39 and press roller 38, the press roller 38 sandwiches the recording paper in cooperation with the driver roller 39 while retracting elastically by the width of the recording paper. Since the recording paper is nipped by the drive roller 39 and press roller 38 in this manner, the rotational force of the drive roller 39 is reliably transmitted to the recording paper. Furthermore, the aforementioned press roller 41 is arranged in the same manner in relation to the aforementioned paper ejection roller 40. In the present embodiment, since the press roller 41 presses against recording paper on which recording has been completed, the roller surface is formed in a spurred shape so as to not degrade the image recorded on the recording paper.

[0043] The recording paper sandwiched between the drive roller 39 and press roller 38 is fed intermittently over the platen 37 by a prescribed line feed width. The recording head 27 is moved forward and/or back upon each line feed of the recording paper to perform image recording successively from the leading edge of the recording paper. Recording paper on which image recording has been carried out is sandwiched between the paper ejection roller 40 and press roller 41 staring at its leading edge. In other words, the recording paper is fed intermittently by a prescribed line feed width while being sandwiched at its leading edge side by the paper ejection roller 40 and press roller 41 and at its trailing edge side by the drive roller 39 and press roller 38, and image recording is carried out by the recording head 27 as the paper is being fed in this manner. Once an image has been recorded in the prescribed region of the recording paper, the paper ejection roller 40 is rotationally driven continuously and the recording paper sandwiched by the paper ejection roller 40 and press roller 41 is ejected into the paper ejection tray 32.

[0044] As shown in Figure 1, a control panel 45 is mounted on the upper sloping surface of the document bed 13 constituting the frame of the printer part 11. This control panel 45 is a device for controlling the printer part 11, scanner part 12, and the like. Various control keys 56 through 58, a liquid crystal display 59 and the like are provided on its top surface 44. Furthermore, a controller (not illustrated), which controls the actuation of the printer part 11 and scanner part 12 and the operation of the multifunction device 10 as a whole, is provided in the bottom part of the document bed 13.

[0045] As shown in Figure 2, a control board 54 is arranged below this control panel 45 (inside the document bed 13). The various control keys 56 through 58 arranged on the control panel 45 are connected to the control board 54 via an unillustrated flat cable. This control board 54 is connected to the aforementioned controller, which

processes the instructions from the aforementioned control keys 56 through 58 and controls the actuation of the multifunction device 10.

[0046] The user of the multifunction device 10 inputs the desired instructions using the various control keys 56 through 58 of the control panel 45. The multifunction device 10 receives this input and performs the prescribed operation. As discussed above, a personal computer or the like can be connected to this multifunction device 10. In this case, the multifunction device 10 can also operation according to instructions transmitted via a scanner driver, printer driver or the like from the personal computer, in addition to the instructions from the control panel 45.

[0047] As shown in Figure 1, the aforementioned slot part 61 is arranged on the front surface of the multifunction device 10. Storage media such as various compact memory cards can be installed in this slot part 61. Compact memory cards can store image data; the image data is read from the compact memory card installed in the slot part 61, and information on this image data is displayed on the liquid crystal display 59. Any image displayed on the liquid crystal display 59 can be recorded on recording paper by the printer part 11. The input for this purpose is performed via the aforementioned control panel 45.

[0048] Figure 5 is a perspective view of refill unit 70. Figure 6 is a cross-sectional view along VI-VI in Figure 5.

[0049] This refill unit 70 comprises a unit main body 74 and an ink cartridge 63 which can be installed in and removed from the unit main body 74.

[0050] The unit main body 74 comprises a case 75 which the ink cartridge 63 is inserted into and removed from, a door 76 provided on the case 75, and a pullout member 77 provided on the door 76.

[0051] The case 75 is made for instance from resin, and is overall formed in a substantially cuboid shape. A housing chamber 78 (retaining part) in which the ink cartridge 63 is housed and retained is demarcated inside the case 75 (see Figure 6). In the present embodiment, the case 75 has four housing chambers 78, which the aforementioned four ink cartridges 63 being inserted into and removed from the respective housing chambers 78. The inner wall surface shape of each housing chamber 78 corresponds to the outer circumferential surface shape of the ink cartridge 63. Thus, each ink cartridge 63 is retained reliably in the case 75 without any play.

[0052] The case 75 comprises a bottom plate part 80, a pair of side plate parts 81 arranged on the left and right sides of the bottom plate part 80, and a ceiling plate 82 arranged to span between the side plate parts 81, and is equipped with partition wall parts (not illustrated) serving to demarcate the aforementioned housing chambers 78. The partition wall parts are arranged according to the number of the ink cartridges 63 housed in the case 75. Of course, these partition wall parts do not need to be arranged so as to completely demarcate each housing chamber 78, and can be formed in the shape of ribs which partition adjacent housing chambers 78 on the bottom plate part 80 at least. The bottom plate part 80, side plate parts 81, ceiling plate part 82 and partition walls are preferably formed integrally.

[0053] Unillustrated push rods are provided on the back surface of the case 75. These push rod extend towards the housing chambers 78, and are inserted into an air intake valve 85 (see Figure 7, Figure 13 through Figure 14) provided in the ink cartridge 63 when an ink cartridge 63 is placed inside the case 75. This allows air to enter inside the ink cartridge 63 through the air intake valve 85, so that the ink from inside the ink cartridge 63 is fed smoothly toward the recording head 27. Furthermore, as shown in Figure 6, a liquid level sensor connector 86 is provided on the back surface of case 75. This liquid level sensor connector 86 is connected to a liquid level sensor 87 provided in the ink cartridge 63 when the ink cartridge 63 is installed in case 75. The liquid level sensor connector 86 is connected to the aforementioned controller, and the controller constantly monitors the remaining quantity of ink held in each ink cartridge 63.

[0054]) The top surface of the aforementioned bottom plate part 80 constitutes the placement surface 98 on which the ink cartridge 63 is placed. The height position of this placement surface 98 is set such that, when the ink cartridge 63 has been inserted into said housing chamber 78, the unillustrated ink supply tube is inserted into the ink supply valve 115 of ink cartridge 63, said push rod is inserted into the air intake valve 85 of ink cartridge 63 (see Figure 14), and said liquid level sensor connector 86 engages the liquid level sensor 87 of the ink cartridge 63.

[0055] A rib 124 is provided on the aforementioned ceiling plate part 80, thereby increasing the rigidity of the case 75. The ceiling plate part 80 comprises a swing arm 123. Figure 7 is a side view of the main parts of unit main body 74, and schematically illustrates the relationship between opening/closing of door 76 and sliding of the swing arm 123.

[0056] This swing arm 123, as shown in said figure, is formed as a whole approximately into an L shape, and has a first arm 125 and a second arm 126. A support shaft 127 is arranged in the boundary area between the first arm 125 and the second arm 126, and the swing arm 123 is supported rotatably on this support shaft 127. A tension spring 128 is mounted between the first arm 125 and the ceiling plate part 82. As a result, the swing arm 123 is constantly elastically impelled to rotate clockwise, i.e. to assume the position shown by the double-dotted dashed line in said figure. Since the swing arm 123 is elastically impelled in this manner, it can change to the position shown by the solid line when it receives a force in the counterclockwise direction opposing said elastic force. The swing arm 123 is made to engage the top surface 122 of the ink cartridge 63 and allows the ink cartridge 63 to be forcibly pushed out from said housing chamber 78 as described below.

[0057] As shown in Figure 5 and Figure 6, openings

88 are provided on the front surface 79 of the case 75. These openings 88 are arranged so as to correspond to each of the housing chambers 78. In other words, the aforementioned housing chambers 78 are arranged in the case 75 as a continuation of the opening 88, and the aforesaid four ink cartridges 63 are designed to be inserted into and removed from the housing chambers 78 through these openings 88 from the front surface 79 side.

[0058] Figure 8 is a cross-section of the unit main body 74 in the state where said door 76 is open. Figure 9 and Figure 10 are exploded perspective views of this door 76.

[0059] Said door 76 opens and closes said opening 88. A door 76 is provided on each of the opening 88, and is designed to change position between a position where the opening 88 is closed (closed position) as shown in Figure 6, and a position where the opening 88 is opened (open position) as shown in Figure 8. When the door 76 is in a closed position, the ink cartridge 63 is securely retained in said housing chamber 78. When the door 76 is in an open position, the ink cartridge 63 can be easily inserted into or removed from said housing chamber 78.

[0060] As shown in Figure 5 and Figure 6, the door 76 comprises a door main body 89, a pushing retaining member 90 provided thereon, a lock member 91 and a lock release lever 92, which are all molded from resin. As shown Figure 6, Figure 9, and Figure 10, the door main body 89 is formed into a slender rectangular plate shape. The outer shape of door main body 89 matches the shape of said opening 88. A rotational shaft part 94 is formed in the bottom end part 93 of door main body 89. This rotational shaft part 94 is formed integrally with the door main body 89. This rotational shaft part 94 is supported on the bottom part of the front surface 79 of case 75, as shown in Figure 6. Specifically, a bearing part 95 is formed on the front end part of the bottom plate part 80 of case 75, and said rotational shaft part 94 is rotatably fitted into this bearing part 95. As a result, the door main body 89 is able to stand up and close said opening 88 as shown in Figure 6, as well as to lie down and open said opening 88 as shown in Figure 8.

[0061] The aforementioned pullout member 77 is provided on the bottom end part 93 of door main body 89. This pullout member 77 is formed integrally with the door main body 89. The pullout member 77 is formed substantially into an L shape and has an extension part 96 and a curved part 97. The extension part 96 is provided continuously with said bottom end part 93. As shown in Figure 6, the extension part 96 extends rearward from said bottom end part 93 when the door 76 is in closed position. Furthermore, the curved part 97 continuous from the rear edge of said extension part 96 and extends upward, forming an approximately 90° angle. When the door 76 is in a closed position, the leading edge of said curved part 97 protrudes upward over said placement surface 98. The door main body 89 rotates with said rotational shaft part 94 as the center of rotation, thereby causing said pullout member 77, formed in an L shape, to also rotate about said rotational shaft part 94, as shown in Figure 6 and Figure 8. As will be discussed in detail below, this sort of rotation of the pullout member 77 causes the ink cartridge 63 to be pulled out from said housing chamber 78.

[0062] As shown in Figure 8, when said door 76 changes to an open position, the curved part 97 of said pullout member 77 rotates counterclockwise about the rotational shaft part 94. Here, the rotation of the curved part 97 causes its outer wall surface 110 to change from a substantially vertical standing state (see Figure 6) to a substantially horizontal state (see Figure 8). The length of the extension part 96 of the pullout member 77 is set to a prescribed dimension, so that when the curved part 97 has rotated, its outer wall surface 110 is positioned slightly above the placement surface 98 of the case 75, i.e. substantially as an extension of said placement surface 98, and extends in the front-back direction. When said door 76 is in an open position, this outer wall surface 110 functions as a guide surface which guides the ink cartridge 63 onto the placement surface 98 inside said housing chamber 78. In other words, said pullout member 77, in addition to functioning as a member for pulling the ink cartridge 63 out of said housing chamber 78, also functions as a guide member for inserting the ink cartridge 63 into said housing chamber 78.

[0063] In the present embodiment, each door main body 89 is provided with two pullout members 77. Namely, the pullout members 77, as shown in Figure 10, are arranged opposite each other in the width direction of the door main body 89. Arranging a pair of pullout members 77 in this manner allows the pair of pullout members 77 to support the ink cartridge 63 between them in the widthwise direction. Furthermore, in the present embodiment, the spacing (widthwise dimension) d1 between the pullout members 77 (see Figure 9) is made smaller than the widthwise dimension d2 of ink cartridge 63 (see Figure 14). The effect of defining the dimensions d1 and d2 in the manner will be discussed later.

[0064] As shown in Figure 6, Figure 8, Figure 9, and Figure 10, pushing retaining member 90 is attached to the inner surface of the door main body 89. Tabs 146 are provided on both side surfaces of the pushing retaining member 90, and tab accommodating parts 147 are provided in the door main body 89. Said tabs 146 are provided protruding from the side surface of the pushing retaining member 90. Said tab accommodating parts 147 are comprised of grooves extending in the front-back direction of the door main body 89. Said tabs 146 are slidably fitted into said tab accommodating parts 147, so that the pushing retaining member 90 is supported in a manner that allows it to move in the front-back direction relative to the door main body 89. In other words, the pushing retaining member 90 is able to changer between a protruding position where it rises from the inner surface of the door main body 89 (see Figure 8) and a retracted position where it is retracted toward the door main body 89 from the protruding position (see Figure 6). As shown in Figure 10, a coil spring 99 is located between the push-

ing retaining member 90 and the door main body 89. Thus, the pushing retaining member 90 is constantly elastically impelled to assume said protruding position, as shown in Figure 8.

[0065] As shown in Figure 6, when the door 76 assumes a closed position, the pushing retaining member 90 touches the front surface of the ink cartridge 63, and is displaced to said retracted position by being pushed relatively by the ink cartridge 63. Thus, the ink cartridge 63 receives the elastic force of said coil spring 99 through the pushing retaining member 90 and is pushed backward, so that the ink cartridge 63 is retained in a state positioned relative to the case 75. Therefore, leakage of ink from the ink supply valve 115 of the ink cartridge 63 is reliably prevented.

[0066] In the present embodiment, the pushing retaining member 90 is formed in a flat plate shape. The wall surface 84 of this pushing retaining member 90 (the surface which faces the front surface of ink cartridge 63 when the door 76 is in a closed position) is formed as a flat surface, and a pair of protrusions 141 and 142 are formed on the wall surface 84, as shown in Figure 5 and Figure 10. Thus, when the door 76 is in a closed position, these protrusions 141 and 142 touch and press against the front surface of the ink cartridge 63. These protrusions 141 and 142 are arranged at a prescribed spacing in the width direction of the door 76. Thus, when the door 76 is in a closed position, said protrusions 141 and 142 contact the two sides of the joint part 143 of the ink cartridge 63 without the pushing retaining member 90 coming into contact with the joint part 143.

[0067] The lock member 91 is attached to the top end part of the door main body 89. The lock member 91 comprises a main shaft part 132, a key part 133 which projects inward into the case 75 continuously from the top end of the main shaft part 132, and a seat part 109 which projects outward from the case 75 continuously from the bottom end of the main shaft part 132.

[0068] The lock member 91 is supported so as to allow it to advance and retract vertically relative to the door main body 89. A slide rail 101 is provided extending vertically on the top end part of the door main body 89. Furthermore, a slide groove 102 is provided extending vertically on the main shaft part 132 of the lock member 91 (see Figure 9). Said slide rail 101 is inserted into this slide groove 102, thereby allowing to lock member 91 to freely slide up and down.

[0069] Tabs 144 are provided on both side surfaces of said main shaft part 132. These tabs 144 project outward from the main shaft part 132. When the lock member 91 is fitted into the door main body 89, said tabs 144 are accommodated in tab accommodating parts 145 provided on the main shaft part 132 (see Figure 10). These tab accommodating parts 145 are comprised of grooves extending a prescribed length in the vertical direction. Thus, when the lock member 91 slides upward or downward, said tabs 144 contact the inner wall surface of said tab accommodating parts 145, thereby constraining the vertical sliding of the lock member 91. When the lock member 91 slides upward relative to the door main body 89, the lock member 91 assumes a position projecting upward from the top end of the door main body 89. Furthermore, when the lock member 91 slides downward relative to the door main body 89, the lock member 91 assumes a position retracted into the door main body 89. The range of sliding of the lock member 91 corresponds to the length of the aforementioned tab accommodating parts 145.

[0070] As shown in Figure 10, a coil spring 100 is interposed between the lock member 91 and the door main body 89. Thus, the lock member 91 is constantly elastically impelled so as to project upward from the door main body 89. Furthermore, the top surface 103 of the key part 133 of the lock member 91 constitutes a sloped surface, which is inclined downward. Thus, as shown in Figure 8 and Figure 6, when the door 76 changes from an open position to a closed position, said top surface 103 of the lock member 91 contacts the top edge part 130 of the opening 88 of the case 75 (see Figure 8), and when the door 76 turns toward the closed position, the lock member 91 is depressed relative by said top edge part 130 and retracts inward into the door main body 89. Once the door 76 has completely changed position to a closed position, the lock member 91 again projects from the door main body 89 and said key part 133 engages with the case 75 (see Figure 6). Specifically, the key part 133 of the lock member 91 fits into a lock member fitting hole 83 (see Figure 5 and Figure 11) provided in the case 75. Since the lock member 91 is constantly elastically impelled by said coil spring 100 so as to project from the door main body 89, having assumed a closed position, the door 76 is retained in said position.

[0071] As shown in Figure 9 and Figure 10, the lock release lever 92 is formed in a rectangular plate shape and is attached to the upper part of the outside surface 105 of the door main body 89. A support pin 106 is provided at the bottom end part of the lock release lever 92. Furthermore, the door main body 89 is provided with a pin support hole 107. Said support pin 106 fits into this pin support hole 107, whereby the lock release lever 92 becomes rotatable about the support pin 106. Specifically, the lock release lever 92 is able to rotationally change position between a position substantially parallel to the outer surface 105 of the door main body 89 by standing up as shown in Figure 6, a position where it is inclined approximately 45° (degrees) (see Figure 11) and a position where it is lying substantially horizontal (see Figure 12). When the lock release lever 92 is substantially parallel to the outer surface 105 of the door main body 89, the position of the lock release lever 92 is defined as "standing position," the position of the lock release lever 92 when inclined approximately 45° is defined as "neutral position" and the position of the lock release lever 92 when its lying substantially horizontal is defined as the "lying position." An arrow is labeled or engraved on the top surface 151 of the lock release lever 92. This makes the direction of operation of the lock release lever 92

clear.

[0072] The bottom end surface 108 of the lock release lever 92 is formed in a prescribed shape. This bottom end surface 108 constitutes a cam, which causes the lock member 91 to slide vertically when the position of the lock release lever 92 changes. The shape of said bottom end surface 108 is not particularly restricted, and can be any shape so long as it causes said lock member 91 to slide as described below when the lock release lever 92 is turned.

[0073] Figure 11 is a cross-section of refill unit 10 showing the manner of operation of the lock release lever 92. Figure 12 is an enlargement of the main part of Figure 11.

[0074] The bottom end surface 108 of the lock release lever 92 constitutes a cam, as discussed above. When the lock member 91 is fitted into the lock member fitting hole 83 of case 75, i.e. when the door 76 is in a closed position in relation to the case 75, the lock release lever 92 is able to undergo rotational displacement centered about said support pin 106 (see Figure 9 and Figure 10) in the area between said standing position and neutral position. In the present embodiment, the location of the center of gravity of the lock release lever 92 is set such that it will always move to the neutral position, i.e. to the position shown in Figure 11, under its own weight.

[0075] When the lock release lever 92 has moved to the neutral position, the aforementioned top end surface 108 touches the seat part 109 of the lock member 91. In this state, as shown in Figure 11, the lock release lever 92 attempts to rotate further clockwise under its own weight. In other words, the lock release lever 92 tries to rotate in the direction where it pushes the lock member 91 downward. However, since the lock member 91 is constantly elastically impelled upward by the aforementioned coil spring 100, the lock member 91 is not displaced solely by the effect of the weight of lock release lever 92, so the lock member 91 projects upward from the top end of door main body 89 and maintains a position of engagement with the lock member fitting hole 83.

[0076] However, as shown in Figure 12, if this lock release lever 92 is forcibly rotated further clockwise, for example if an operator attempting to replace the ink cartridge 63 manipulates and rotates the lock release lever 92, then the lock release lever 92 will be displaced up to the lying position. When the lock release lever 92 is displaced up to the lying position, said bottom end part 108 is displaced rotationally about said support pin 106, pushing down said seat part 109 of the lock member 91. Consequently, the lock member 91 moves downward against the elastic force of aforesaid coil spring 100 and is displaced to a position retracted into the door main body 89. Once the lock member 91 changes to this position, the lock of the door 76 is released and the door 76 can be change from a closed position to an open position.

[0077] Since the lock member 91 is constantly subject to the elastic force of aforesaid coil spring 100, once rotational force acting upon the lock release lever 92 disappears - in other words, once the operator lets go of the lock release lever 92 - the lock member 91 assumes a position of maximum projection from the door main body 89. Here, the lock release lever 92 is forcibly displaced to the aforementioned standing position. Namely, as shown in Figure 8, when the door 76 is in an open position, the lock release lever 92 assumes a position where it is essentially contained within the door main body 89. Therefore, as shown in Figure 1, Figure 5 and Figure 8, when replacing the ink cartridge 63, the lock release lever 92 assumes a state where it is essentially contained within the door main body 89, thus allowing the door 76 to rotate about the rotational shaft part 94 to a substantially horizontal state, thereby allowing the operator to easily replace the ink cartridge 63. Furthermore, the two protrusions 141 and 142 provided on the wall surface 84 of the aforementioned pushing retaining member 90, in cooperation with a subsequently described guide part between the curved parts 97, also act as a guide when installing an ink cartridge 63 in the housing chamber 78. Namely, when inserting an ink cartridge 63 into the housing chamber 78, the operator needs only to place the bottom surface of the ink cartridge 63 onto the protrusions 141 and 142 and put the leading edge part of the ink cartridge 63 between the curved parts 97, and then just push the ink cartridge 63 toward the housing chamber 78. Furthermore, when removing the ink cartridge 63 from the housing chamber 78, the operator needs only to pull out until the bottom surface of the ink cartridge 63 moves between the curved parts 97 onto the protrusions 141 and 142.

[0078] In the present embodiment, since the lock release lever 92 is arranged in the aforementioned neutral position when the door 76 is in a closed position in relation to the case 75, i.e. since the lock release lever 92 is tilted toward the operator, there is the advantage that the operator can easily manipulate the lock release lever 92. Now, since the refill unit 70 is arranged on the front surface 71 of the multifunction device 10, as shown in Figure 1, if the lock release lever 92 is arranged at said neutral position, i.e. if it is leaning forward, a large space would need to be secured inside the multifunction device 10 to accommodate the refill unit 70. Therefore, the refill unit 70 would need to be arranged further inward from the edge of the opening 73, and thus the external dimensions of the multifunction device 10 may need to increase.

[0079] However, in the present embodiment, when the door 76 is in a closed position in relation to the case 75, the lock release lever 92 is able to rotate freely between said neutral position and standing position, so the refill unit 70 can be arranged near the edge of said opening 73. This is because even if the refill unit 70 is arranged at the edge of the opening 73, when the opening/closing cover 72 is being closed, the inner wall surface of the opening/closing cover 72 touches said lock release lever 92, and when the opening/closing cover 72 is completely closed, the lock release lever 92 is displaced to said standing position while being pushed by the opening/

closing cover 72. Therefore, in the present embodiment, compact design of the multifunction device 10 is possible.

[0080] Figure 13 is a side view of ink cartridge 63. Figure 14 is a perspective view of ink cartridge 63.

[0081] The ink cartridge 63 serves to store the ink in advance, as discussed above, and comprises a cartridge main body 111 and ink held therein. In the present embodiment, the refill unit 70 houses four ink cartridges 63, with each ink cartridge 63 storing cyan, magenta, yellow and black color inks respectively. The structure of the ink cartridges, as is clear from Figure 1 and Figure 5, is such that the ink cartridge 63 storing black ink is fashioned to be somewhat larger in the thickness direction as compared to the ink cartridges 63 of other ink colors. This is because, generally speaking, the demand for black ink is greater and it is consumer in larger amounts. The structure of the ink cartridges 63 storing inks of colors other than black is all the same.

[0082] The cartridge main body 111 consists of resin. In the present embodiment, the cartridge main body 111 is formed overall into a thin-walled cuboid shape, with ink housing space that houses ink being demarcated inside it. This cartridge main body 111 is comprises of two tray-like members 112 and 113, and these two members 112 and 113 are joined by welding or other known fastening means. The aforementioned joint part 143 is formed by the joining of the cartridge main body 111.

[0083] The aforementioned air intake valve 85 is provided on the back surface 114 of the cartridge main body 111. In the present embodiment, a check valve is arranged in the inner part of the air intake valve 85. When the ink cartridge 63 is housed in said case 75, a push rod provided in said case 75 is inserted into said air intake valve 85, whereby said check valve is opened. Furthermore, an ink supply valve 115 is provided on the rear surface 114 of the cartridge main body 111. When the ink cartridge 63 is housed in said case 75, an ink supply tube provided in said case 75 is connected to this ink supply valve 115, and ink is supplied to said recording head 27 via this ink supply tube. Furthermore, the aforementioned liquid level sensor 87 is provided on said back surface 114. The structure of this liquid level sensor 87 is not particularly limited, and a known sensor can be used.

[0084] Engagement grooves 116 are provided on the bottom surface of the cartridge main body 111. The engagement grooves 116, as shown in Figure 14, are provided as recesses in the corner parts at the boundary between the side surfaces and bottom surface of the cartridge main body 111. These engagement grooves 116, as shown in said figure, extend in the lengthwise direction of the cartridge main body 111. In the present embodiment, the engagement grooves 116 are provided symmetrically on the left and right sides of the cartridge main body 111 (see Figure 5). As shown in Figure 13, the engagement grooves 116 comprise a shallow groove part 118 which opens on the back surface 114 of the cartridge main body 111 and extends continuously from the back surface 114 toward the front surface 117, a boundary groove part 119 which continues from the shallow groove part 118 and increases gradually in groove depth (the vertical dimension in said figure), and a deep groove part 120 that continues from the boundary groove part 119. The deep groove part 120 does not continue to the front surface 117 of the cartridge main body 111, so an end surface 121 is formed on the front surface 117 side of the deep groove part 120. In other words, the engagement groove 116 extends in the direction of insertion and removal of the ink cartridge 63 into and out of the case 75, and is connected to the back surface 114 but not the front surface 117 of the cartridge main body 111, and has an end surface 121 extending vertically. The leading edge of the curved part 97 of the aforementioned pullout member 77 comes into contact with this end surface 121 as described below.

[0085] A groove 149 is also formed on the top surface 122 of the cartridge main body 111. This groove 149, as shown in Figure 14, is recessed into the corner of the boundary of side surface and top surface 122 of cartridge main body 111. This groove 149, as shown in the same figure, extends in the lengthwise direction of the cartridge main body 111, and is connected to the front surface 117 and back surface 114 of the cartridge main body 111. Furthermore, a recessed part 134 is provided on the top surface 122 of the cartridge main body 111. This recessed part 134 is formed substantially in a V shape, and has a forward sloping surface 135 and a rearward sloping surface 136. As shown in Figure 6 and Figure 7, the aforementioned swing arm 123 is provided in the case 75 which houses the ink cartridges 63, and this swing arm 123 is constantly elastically impelled rotationally clockwise by a tension spring 128.

[0086] When an ink cartridge 63 is inserted into said case 75, as shown in Figure 7, first, the top surface rear end part 148 of the cartridge main body 111 contacts the second arm 126 of the swing arm 123. As the ink cartridge 63 continues to be inserted into the case 75, the swing arm 123 turns counterclockwise, assuming the position shown by the solid line in said figure. As the ink cartridge 63 is inserted further, the swing arm 123 turns clockwise while being guided by said rearward sloping surface 136, and engages said recessed part 134. As the ink cartridge 63 goes further into the case 75, the second arm 126 of the swing arm 126 turns counterclockwise while being guided by said forward sloping surface 135 and assumes the position indicated by a solid line in said figure. Furthermore, upon insertion of the ink cartridge 63 into the case 75, the ink cartridge 63 slides relative to the swing arm 123, and is arranged at a position displaced by a prescribed distance to the right form the position shown by a solid line in said figure, whereupon the ink cartridge 63 is completely installed in the case 75. The prescribed distance in this case is the distance L1 shown in Figure 8.

[0087] Figure 15 is a drawing schematically illustrating the engagement structure of the ink cartridge 63, case 75, and pullout member 77 of door 76. Figure 15 (a)

shows the engagement structure of the lower part of the ink cartridge 63 and the lower part of the case 75, while Figure 15 (b) shows the engagement structure of the ink cartridge 63 and pullout member 77.

[0088] As shown in Figure 15 (a), when the ink cartridge 63 has been installed in the case 75, a partition wall part 137 provided in case 75 engages with an engagement groove 116 of the ink cartridge 63. When the ink cartridge 63 has been installed in the case 75, the partition wall 137 provided on the side of the ceiling plate part 82 of the case 75 also engages with a groove 149 provided on the top surface 122 side of the ink cartridge 63. Here, the bottom surface 155 of the ink cartridge 63 is placed on the bottom plate part 80. As a result, the ink cartridge 63 is housed and retained in a positioned state in the case 75 (see Figure 6). Furthermore, when the ink cartridge 63 is housed in the case 75, as shown in Figure 15 (b), the bottom surface 155 of the ink cartridge 63 is placed on the door main body 89, and the curved part 97 of the pullout member 77 enters into the engagement groove 116. When the door 76 is opened from this state, as shown in Figure 6 and Figure 7, the pullout member 77 turns, and said curved part 97 pulls the end surface 121 of the engagement groove 116 forward (to the left in Figure 7).

[0089] The engagement structure of the ink cartridge 63, case 75, and pullout member 77 of door 76 is not limited to the above structure. Figure 16 is a drawing, which schematically illustrates a modified example of the engagement structure of the ink cartridge 63, case 75, and pullout member 77 of door 76. Figure 16 (a) shows the engagement structure of the lower part of ink cartridge 63 and the lower part of case 75, while Figure 16 (b) shows the engagement structure of the ink cartridge 63 and pullout member 77.

[0090] The difference between the engagement structure shown in said figure and the engagement structure shown in previously mentioned Figure 15 is that in the engagement structure shown in Figure 15, when the ink cartridge 63 is installed in the case 75, the bottom surface 155 of the ink cartridge 63 is placed on the bottom plate part 80 (see Figure 15 (a)) and on the door main body 89 (see Figure 15 (b)), while in the engagement structure shown in Figure 16, when the ink cartridge 63 is installed in the case 75, the bottom surface 155 of the ink cartridge 63 does not contact the bottom plate part 80 and the top wall surface 156 of said engagement groove 116 touches said partition wall part 137 (see Figure 16 (a)). Here, as shown in Figure 16 (b), the bottom surface 155 of the ink cartridge 63 does not contact the door main body 89, while said top wall surface 156 is place don the curved part 97 of the pullout member 77 and the curved part 97 enters into the engagement groove 116. In this modified example as well, the ink cartridge 63 is housed and retained in case 75 in a positioned state. When door 76 is opened, as shown in Figure 6 and Figure 7, the pullout member 77 turns, and said curved part 97 pulls the end surface 121 of the engagement groove 116 forward (to the left in Figure 7).

[0091] Furthermore, Figure 17 is a drawing, which schematically illustrates another modified example of another engagement structure of ink cartridge 63, case 75, and pullout member 77 of door 76. Figure 17 (a) shows the engagement structure of the lower part of ink cartridge 63 and the lower part of case 75, while Figure 17 (b) shows the engagement structure of the ink cartridge 63 and pullout member 77.

[0092] The difference between the engagement structure shown in said figure and the engagement structure shown in previously mentioned Figure 15 is that in the engagement structure shown in aforementioned Figure 15, when the ink cartridge 63 is installed in the case 75, the bottom surface 155 of the ink cartridge 63 is placed on the bottom plate part 80 (see Figure 15 (a)) and on the door main body 89 (see Figure 15 (b)), while in the engagement structure shown in Figure 17, the ink cartridge 63 is provided with a groove 138 on its bottom surface 155. This groove 138 extends in the same direction as the aforementioned engagement groove 116. A protrusion 139, which engages with this groove 138, is formed on the door main body 89. This protrusion 139 also extends in the same direction as said engagement groove 116, and is designed to engage with said groove 138. When the ink cartridge 63 is installed in the case 75, the bottom surface 155 of the ink cartridge 63 is placed on the bottom plate part 80 and on the door main body 89, and the curved part 97 of pullout member 77 enters the engagement groove 116.

[0093] When the door 76 is opened from this state, as shown in Figure 6 and Figure 7, the pullout member 77 turns, and said curved part 97 pulls the end surface 121 of the engagement groove 116 forward (to the left in Figure 7). Here, since said protrusion 139 is provided on the door main body 89, the protrusion 139 engages the groove 138 provided on the ink cartridge 63. Therefore, when the door 76 is opened, the ink cartridge 63 is stably pulled out from the case 75 without falling sideways. The operation of removing the ink cartridge 63 can thereby be performed more smoothly.

[0094] In the multifunction device 10 according to the present embodiment, spent ink cartridges are replaced in the following manner.

[0095] To remove an ink cartridge 63 from the multifunction device 10, as shown in Figure 1, the operator first opens the opening/closing cover 72. The refill unit 70 is thereby exposed on the front surface of the multifunction device 10. Furthermore, in the present embodiment, as discussed above, when the opening/closing cover 72 is opened, the lock release lever 92 of the refill unit 70 is displaced to the neutral position, and tilts toward the front surface of the multifunction device 10 as illustrated in said figure. Therefore, the operation of opening the door 76 of the refill unit 70 and the operation of the removing the ink cartridge 63 become extremely simple for the operator.

[0096] In this state, the operator opens the door 76 of

the refill unit 70. Specifically, the operator places a finger on the lock release lever 92 and pushes up toward himself, causing the lock release lever 92 to move to a lying position. As a result, the lock member 91 of door 76 slides downward, and the key part 133 (see Figure 12) of the lock member 91 is released from the lock member fitting hole 83 of the door 76. The operator can open the door 76 simply by pushing the lock release lever 92 toward himself.

[0097] When the door 76 changes from a closed position to an open position, as shown in Figure 8, the pullout member 77 rotates about the rotational shaft part 94 and the curved part 97 contacts the bottom surface 121 of the ink cartridge 63 and pushes it to the left in the drawing (out from the front in Figure 1). As a result, the ink cartridge 63 is dragged out toward the opening 88 , being pulled out forward from the opening 88 of the case 75 by a prescribed distance L1. Thus, the operator can easily grip the ink cartridge 63 and is able to pull them out simply from the opening 88.

[0098] Next, a new cartridge 63 is inserted into the housing chamber 78 of the case 75 through said opening 88. Here, the door 76 is in an open position and the ink cartridge 63 to be inserted into said housing chamber 78 is placed in advance on the outer wall surface 110 of the curved part 97 of said pullout member 77 and is inserted into said housing chamber 78 while being guided by the outer wall surface 110. In particular, in the present embodiment, because said pushing retaining member 90 is provided on the door 76, a new ink cartridge 63 is placed temporarily on protrusion 141 and 142 which are provided on the wall surface 84 of the pushing retaining member 90 and is guided onto the outer wall surface 110 of said curved part 97 while being sliding along these protrusion 141 and 142. With the new ink cartridge 63 having been installed in the case 75, the operator again moves the door 76 to a closed position. When the door 76 changes to a closed position, said pushing retaining member 90 contacts the front surface 117 of the ink cartridge 63, and when the door 76 has completely assumed the closed position, said pushing retaining member 90 elastically impels the ink cartridge 63 inward into the housing chamber 78 of the case 75. At the same time, the key part 133 of said lock member 91 engages the lock member fitting hole 83 provided in case 75 and the door 76 is retained in a closed position.

[0099] In this way, in the present embodiment, when the operator opens the door 76 of the refill unit 70, the spent ink cartridge is automatically pulled out, and the operator can easily install a new ink cartridge in the case 75 while the door 76 remains open. In other words, the ink cartridge replacement operation is extremely simple.

[0100] In the present embodiment, as shown in Figure 7, a swing arm 123 is provided on the ceiling plate part 82 of the case 75, and when the ink cartridge 63 is pulled out by said distance L1 from the case 75, said swing arm 123 pushes on the forward sloping surface 135. Namely, the elastic force of the tension spring 128 acts upon the forward sloping surface 135 of the cartridge main body 111 though the swing arm 123, elastically impelling the ink cartridge 63 toward said opening 88. Therefore, when said door 76 is opened as described above and the ink cartridge 63 is pulled out through the opening 88 of the case 75 by said pullout member 77, at the same time, said swing arm 123 turns clockwise in said figure, pushing the aforementioned forward sloping surface 135 toward said opening 88. As a result, the swing arm 123 engages the recessed part 134 formed between said forward sloping surface 135 and said rearward sloping surface 136 and the second arm 126 of the swing arm 123 contacts said rearward sloping surface 136. Namely, the swing arm 123 is retained in said recessed part 134.

[0101] The swing arm 123 turning and engaging into said recessed part 134 causes the ink cartridge 63 to be pushed further out from the case 75 by a distance L2. Therefore, the ink cartridge 63 is pushed out form said opening 88 by said distance (L1 + L2), which has the advantage of making it very simple for the operator to grasp the ink cartridge 63 and allowing it to be removed from the case 75 more simply.

[0102] Furthermore, in the present embodiment, a pair of pullout members 77 is provided, which sandwich the ink cartridge 63 arranged in the housing chamber 78 in the widthwise direction (see Figure 15). Thus, the ink cartridge 63 is pulled out through said opening 88 while being positioned in the widthwise direction by the pullout members 77. At this time, as shown in Figure 7 and Figure 8, the curved part 97 of the pullout members 77 is arranged substantially horizontally so as to continue smoothly from the placement surface 98 on which the ink cartridge 63 is placed, so that when a new ink cartridge is inserted through said opening 88 into the housing chamber 78, by simply placing the new ink cartridge temporarily on the outer wall surface 110 of the curved parts 97, the new ink cartridge becomes securely supported by pullout members 77 and is guided in that state onto said placement surface 98. Therefore, it becomes even easier to perform the ink cartridge replacement operation.

[0103] Moreover, since each pullout member 77 engages an engagement groove 116 recessed into the ink cartridge 63 and since the widthwise dimension d1 (see Figure 9) of the pair of pullout members 77 is set smaller than the width dimension d2 of the ink cartridge 63 (see Figure 14), said pullout members 77 do not project from the ink cartridge 63. By setting said dimension d1 smaller than said dimension d2, said door 76 can be designed more compactly, as a result allowing miniaturization of the refill unit 70 and thus of multifunction device 10 to be implemented.

[0104] In particular, in the present embodiment, the refill unit 70 is arranged on the front surface 71 of the multifunction device 10, and the operator is able to insert and remove the ink cartridge 63 into and out of the refill unit 70 from the front surface side, thereby making the operation of replacing the ink cartridge 63 simpler. Fur-

thermore, as shown in Figure 8, when the door 76 changes to an open position, the curved part 97 of said pullout members 77 rotates and pushes on the end surface 121 of the ink cartridge 63, whereby the ink cartridge 63 is pulled out from the case 75 and the curved parts 97 also constitute members, which guide the insertion of a new ink cartridge. Therefore, the structure of the pullout members 77 which double as guide members is extremely simple, which has the advantage of keeping the manufacturing costs of the refill unit 70 down.

(EXPLANATION OF REFERENCES)

[0105]

63	ink cartridge
70	refill unit
74	unit main body
75	case
76	door
77	pullout member
78	housing chamber
79	front surface
88	opening
89	door main body
93	bottom end part
94	rotational shaft part
95	bearing part
96	extension part
97	curved part
98	placement surface
106	support pin
107	pint support hole
111	cartridge main body
116	engagement groove
117	front surface
118	shallow groove part
119	boundary groove part
120	deep groove part

Claims

1. An ink cartridge (63) for use in an ink printer, comprising:

a cartridge main body (111) having a front surface (117) and a back surface (114);
an ink supply valve (115) provided at the back surface (114); and an engagement groove (116) formed in the cartridge main body (111) and extending to an end surface (121) formed at the front surface (117),

2. The ink cartridge according to claim 1,
wherein the cartridge main body (111) comprises a side surface (112, 113) and a bottom surface,
the engagement groove (116) being formed at the boundary between the side surface (112, 113) and the bottom surface.

3. The ink cartridge according to claim 1 or 2,
wherein the engagement groove (116) extends in a lengthwise direction of the cartridge main body (111).

4. The ink cartridge according to claim 3,
wherein the engagement groove (116) comprises
a shallow groove part (118) which opens on the back surface (114);
a boundary groove part (119) which continues from the shallow groove part (118) and increases gradually in a vertical direction; and a deep groove part (120) which continues from the boundary groove part (119).

5. The ink cartridge according to one of claims 1 to 4,
wherein the cartridge main body (111) comprises a top surface (122), an upper groove (149) being formed at the boundary of a side surface (112, 113) and the top surface (122) extending in a lengthwise direction of a cartridge main body (111) from the front surface (117) to the back surface (114).

6. The ink cartridge according to one of claims 1 to 5,
wherein a recessed part (134) is provided in a top surface (122) of the cartridge main body (111) in a substantially V shape and having a forward sloping surface (135) and a rearward sloping surface (136).

7. The ink cartridge according to one of claims 1 to 6,
wherein the ink supply valve (115) is formed adjacent to a bottom surface of the cartridge main body (111),
a liquid level sensor connector (86) being provided at the back surface (114) in a vertical direction above the ink supply valve (115) and
an air intake valve (85) being provided at the back surface (114) above the liquid level sensor connector (86).

8. A main body (74) for a refill unit (70) of an ink printer, comprising:

a casing (75) having an opening (88) and a accommodating portion which is communicated with the opening (88), wherein the accommodating portion is configured to accommodate an ink cartridge (63) therein and the opening (88) is configured such that an ink cartridge (63) is inserted into and removed from the accommodating portion through the opening (88);
a door (76) provided at the casing (75) and configure to change its position between an open position and a closed position, wherein when the opening (88) is opened the ink cartridge (63) is allowed to be inserted into and removed from the accommodating portion through the opening

(88) and the opening (88) is closed when the door (76) is in the closed position; and
a pulling member (77) provided at the door (76) configured to pull out the ink cartridge (63) accommodated in the accommodating portion toward the opening side when the door (76) is moved from the closed position to the open position, wherein the pulling member (77) is configured to function as a guide member which supports and guides the ink cartridge (63) during the insertion of the ink cartridge (63) into the accommodating portion when the door 76) is at the open position.

9. The main body according to claim 8, wherein the pulling member (77) comprises a pair of pulling members arranged so as to sandwich an ink cartridge (63) accommodated in the accommodation portion in a width direction of the ink cartridge (63) when the door (76) is at the closed position.

10. The main body according to claim 9, wherein the distance between the pair of pulling members is equal to or smaller than a width of the ink cartridge (63).

11. The main body according to any one of claims 8 to 10, wherein the opening (88) is provided on a front surface of the casing (75), wherein a lower end of the door (76) is rotatably supported at a lower portion of the front surface (71), wherein the pulling member (77) is provided on the lower end of the door (76) and the pulling member (77) is formed in a L shape including an extended portion (96), which extends rearward from the lower end of the door (76) when the door (76) is at the closed position, and a curved portion (97), which is connected to the extended portion (96) and extends upwardly.

12. A refill unit (70) of an ink printer, comprising:

an ink cartridge (63) as claimed in one of claims 1 to 7 and a main body (74) as claimed in one of claims 8 to 11.

13. The refill unit according to claim 12,
wherein the pulling member (77) of the main body (74) engages the end surface (121) of the ink cartridge (63) to pull the ink cartridge (63).

14. The refill unit according to claim 12 or 13,
comprising a swing arm (123),
the swing arm (123) engaging a recessed part (134) of the ink cartridge (63) to push the ink cartridge (63).

Amended claims in accordance with Rule 86(2) EPC.

1. An ink cartridge (63) for use in an ink printer, comprising:

a cartridge main body (111) having:

a front surface (117),
a back surface (114) opposite to the front surface (117),
a side surface (112, 113) which connects to the front surface (117) and the back surface (114), and
a bottom surface which connects to the front surface (117), the back surface (114) and side surface (112, 113); an ink supply valve (115) provided at the back surface (114); and an engagement groove (116) formed at the boundary between the side surface (112, 113) and the bottom surface and extending from the back surface (114) to an end surface (121) formed at the front surface (117),

characterized in that
the cartridge main body (111) comprises:

a top surface (122) opposite the bottom surface, which connects to the front surface (117), the back surface (114) and side surface (112, 113), and
an upper groove (149) being formed at the boundary of a side surface (112, 113) and the top surface (122) and extending from the front surface (117) to the back surface (114).

2. The ink cartridge according to claim 2,
wherein the engagement groove (116) comprises
a shallow groove part (118) which opens on the back surface (114);
a boundary groove part (119) which continues from the shallow groove part (118) and increases gradually in a vertical direction; and a deep groove part (120) which continues from the boundary groove part (119).

3. The ink cartridge according to one of claims 1 or 2, wherein a recessed part (134) is provided in a top surface (122) of the cartridge main body (111) in a substantially V shape and having a forward sloping surface (135) and a rearward sloping surface (136).

4. The ink cartridge according to one of claims 1 to 3, wherein the ink supply valve (115) is formed adjacent to a bottom surface of the cartridge main body (111),
a liquid level sensor connector (86) being provided at the back surface (114) in a vertical direction above

the ink supply valve (115) and
an air intake valve (85) being provided at the back surface (114) above the liquid level sensor connector (86).

5. A main body (74) for a refill unit (70) of an ink printer, comprising:

a casing (75) having an opening (88) and a accommodating portion which is communicated with the opening (88), wherein the accommodating portion is configured to accommodate an ink cartridge (63) therein and the opening (88) is configured such that an ink cartridge (63) is inserted into and removed from the accommodating portion through the opening (88);
a door (76) provided at the casing (75) and configured to change its position between an open position and a closed position, wherein when the opening (88) is opened the ink cartridge (63) is allowed to be inserted into and removed from the accommodating portion through the opening (88) and the opening (88) is closed when the door (76) is in the closed position; and
a pulling member (77) provided at the door (76) configured to pull out the ink cartridge (63) accommodated in the accommodating portion toward the opening side when the door (76) is moved from the closed position to the open position, wherein the pulling member (77) is configured to function as a guide member which guides the ink cartridge (63) during the insertion of the ink cartridge (63) into the accommodating portion when the door (76) is at the open position.

6. The main body according to claim 5, wherein the pulling member (77) comprises a pair of pulling members arranged so as to sandwich an ink cartridge (63) accommodated in the accommodation portion in a width direction of the ink cartridge (63) when the door (76) is at the closed position.

7. The main body according to claim 6, wherein the distance between the pair of pulling members is equal to or smaller than a width of the ink cartridge (63).

8. The main body according to any one of claims 5 to 7, wherein the opening (88) is provided on a front surface of the casing (75), wherein a lower end of the door (76) is rotatably supported at a lower portion of the front surface (71), wherein the pulling member (77) is provided on the lower end of the door (76) and the pulling member (77) is formed in a L shape including an extended portion (96), which extends rearward from the lower end of the door (76) when the door (76) is at the closed position, and a curved portion (97), which is connected to the extended portion (96) and extends upwardly.

9. A refill unit (70) of an ink printer, comprising:

an ink cartridge (63) as claimed in one of claims 1 to 4 and a main body (74) as claimed in one of claims 5 to 8.

10. The refill unit according to claim 9,
wherein the pulling member (77) of the main body (74) is configured to engage the end surface (121) of the ink cartridge (63) to pull the ink cartridge (63).

11. The refill unit according to claim 9 or 10,
comprising a swing arm (123),
the swing arm (123) configured to engage a recessed part (134) of the ink cartridge (63) to push the ink cartridge (63).

FIG.1

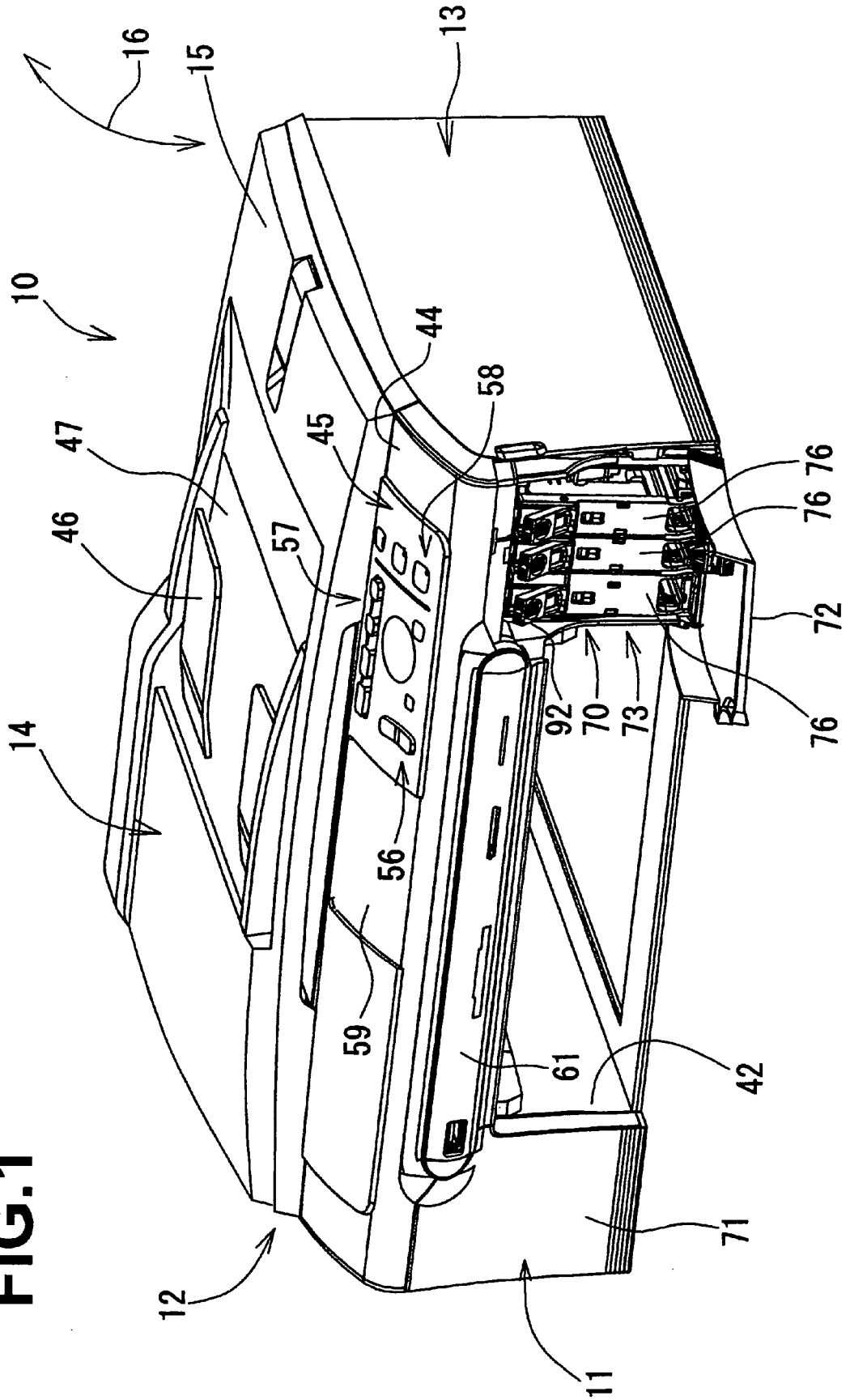
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FIG.2

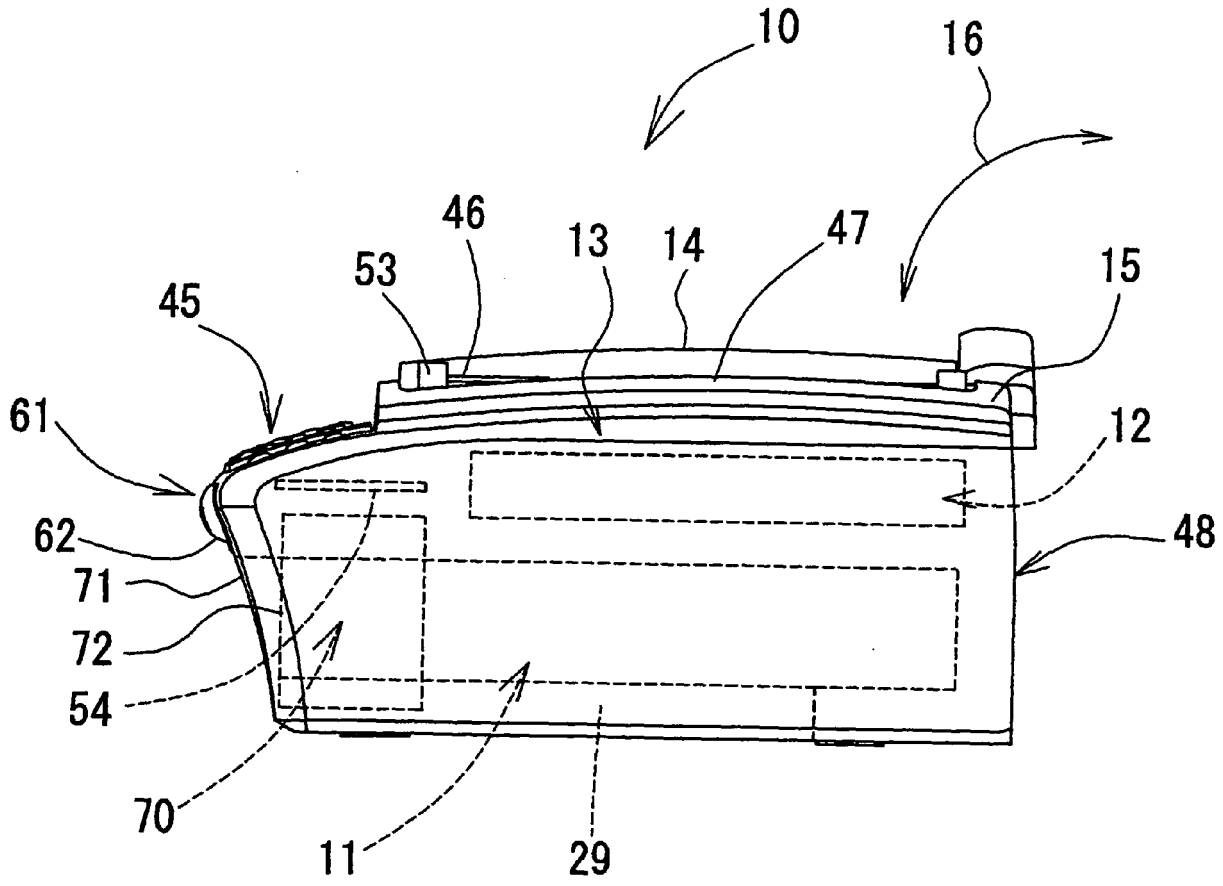

FIG.3

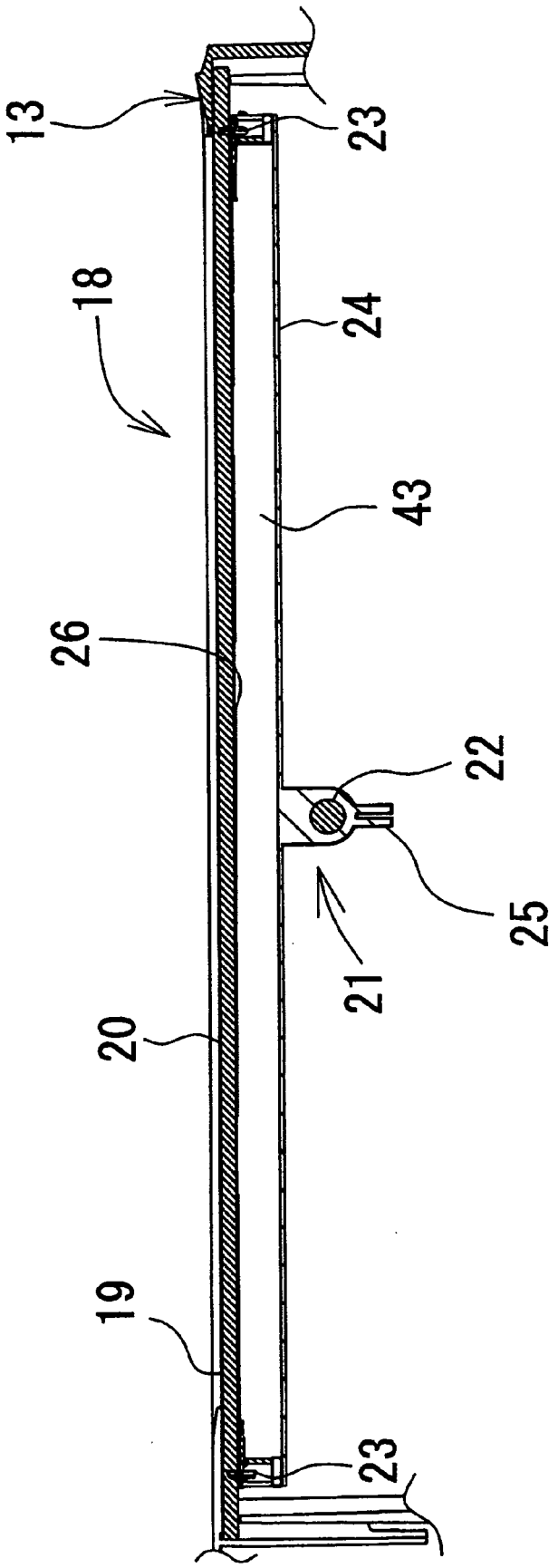

FIG.4

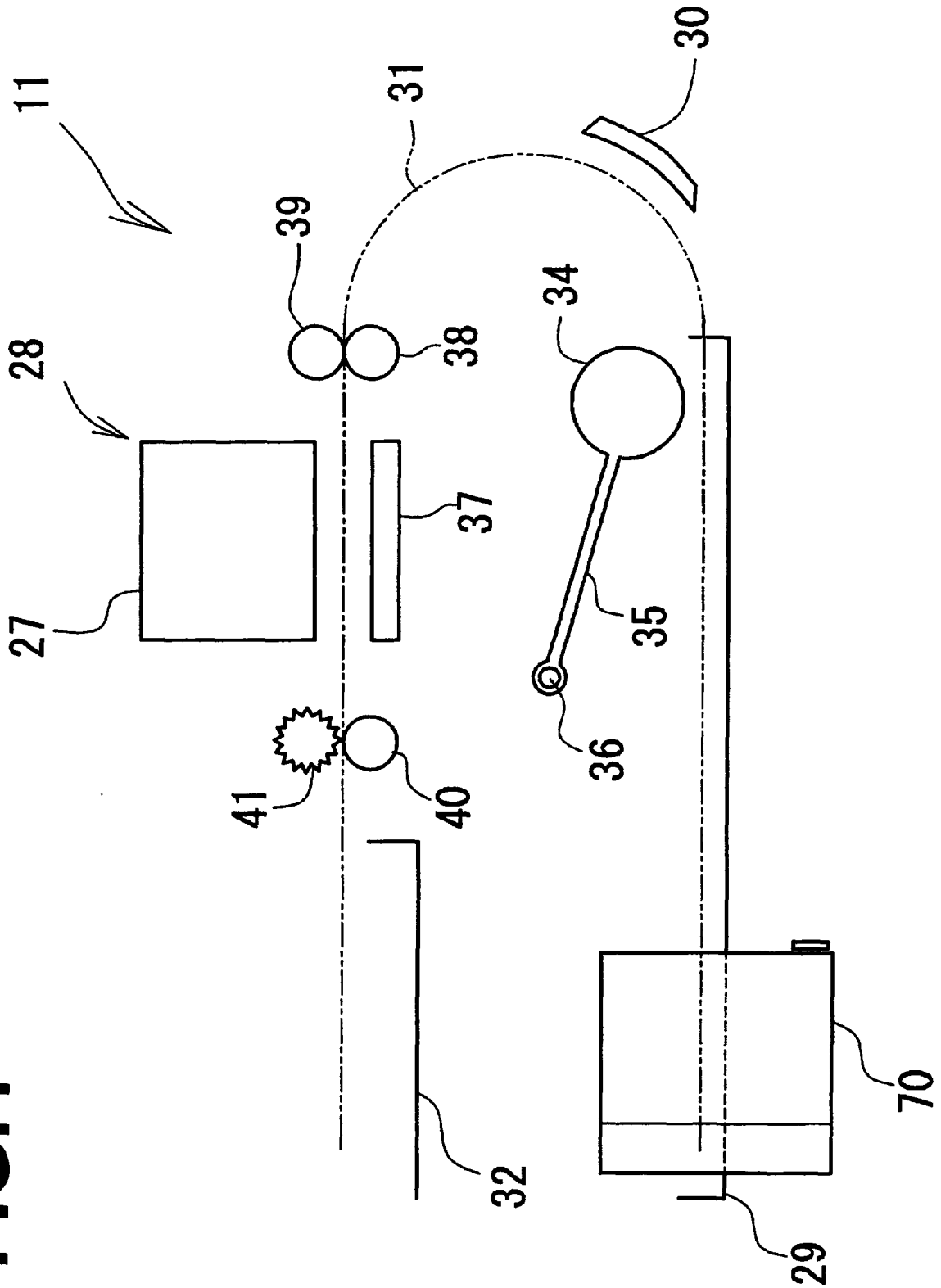

FIG.5

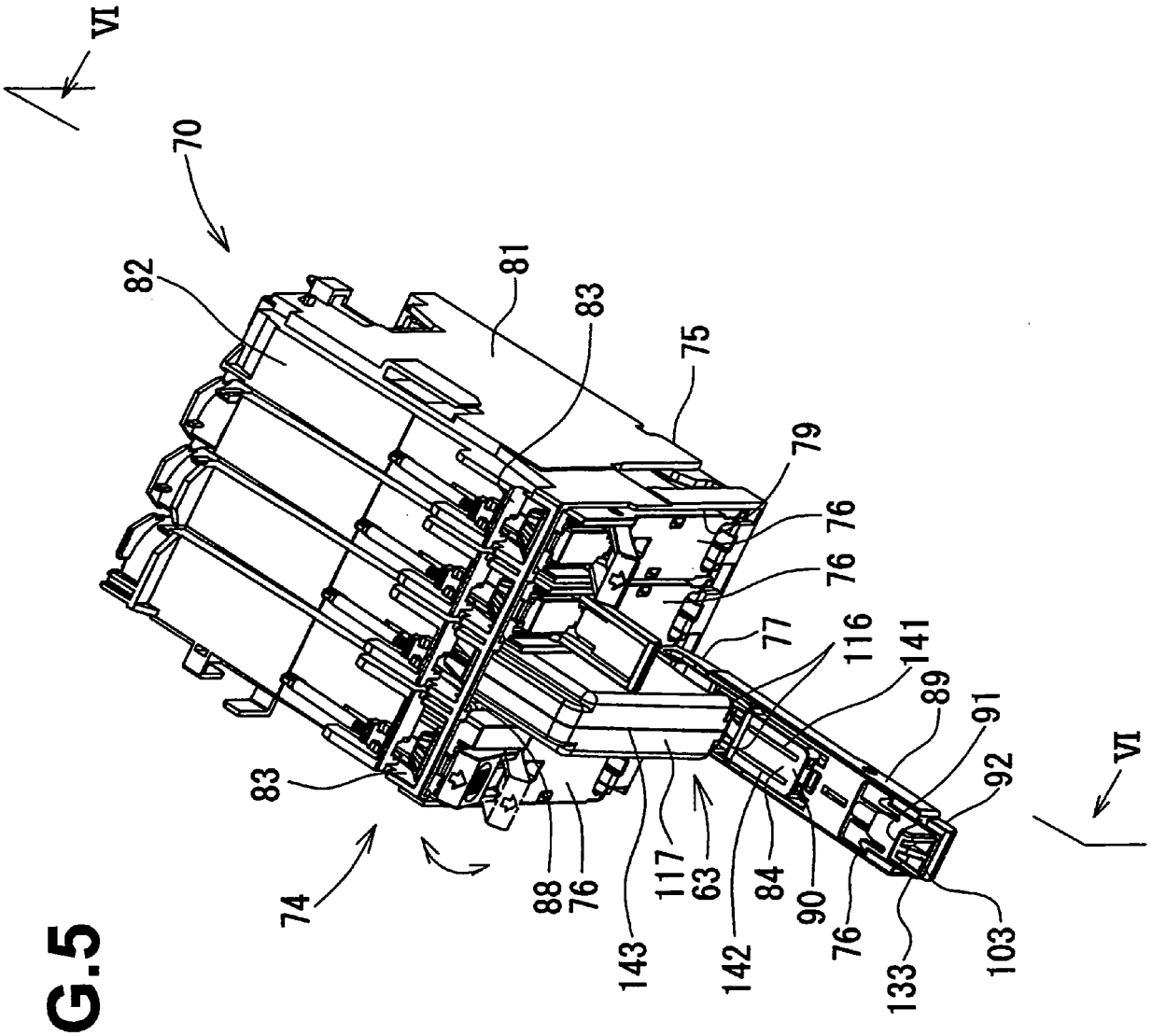
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FIG.6

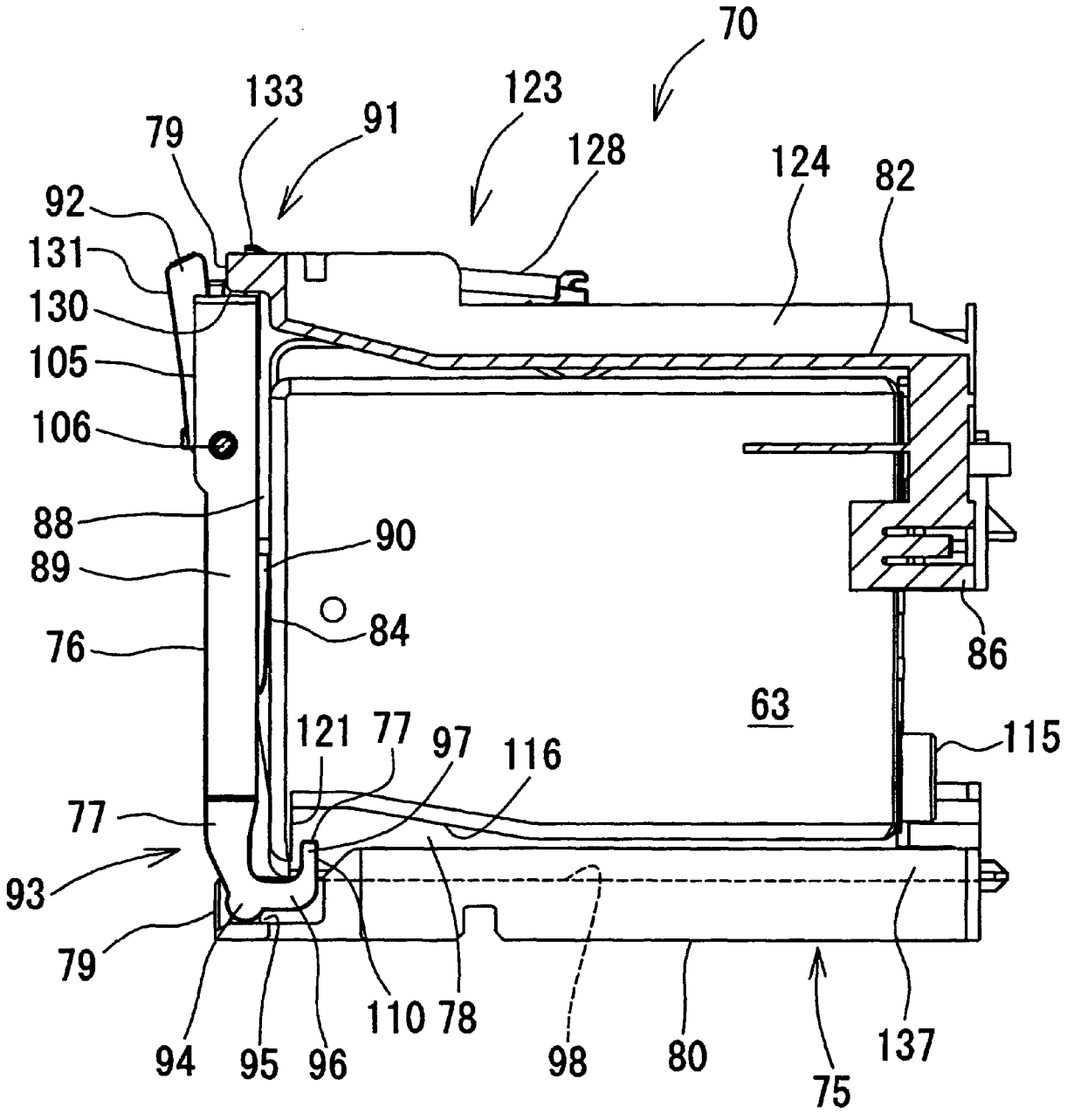
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FIG.7

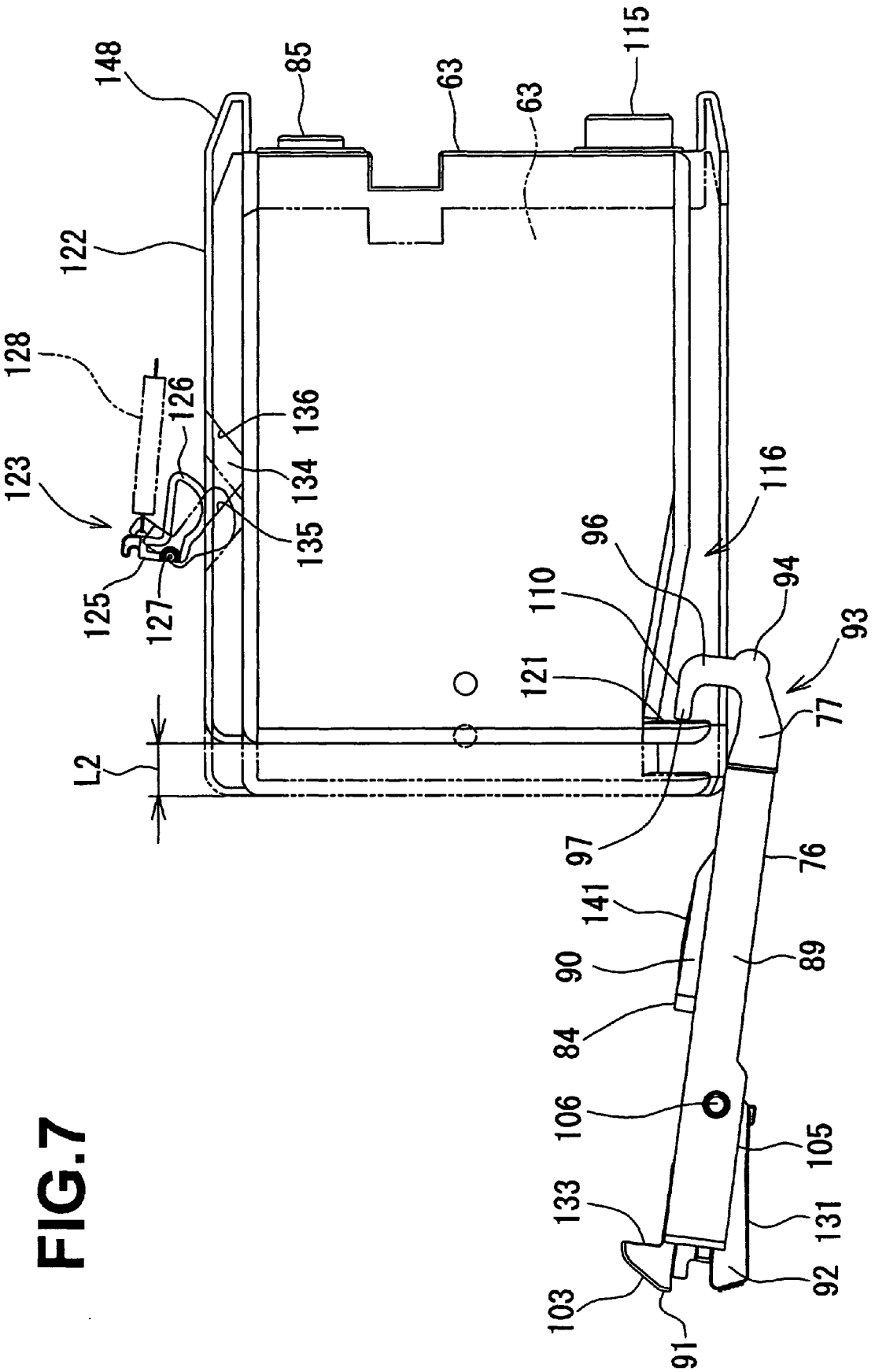
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FIG.8

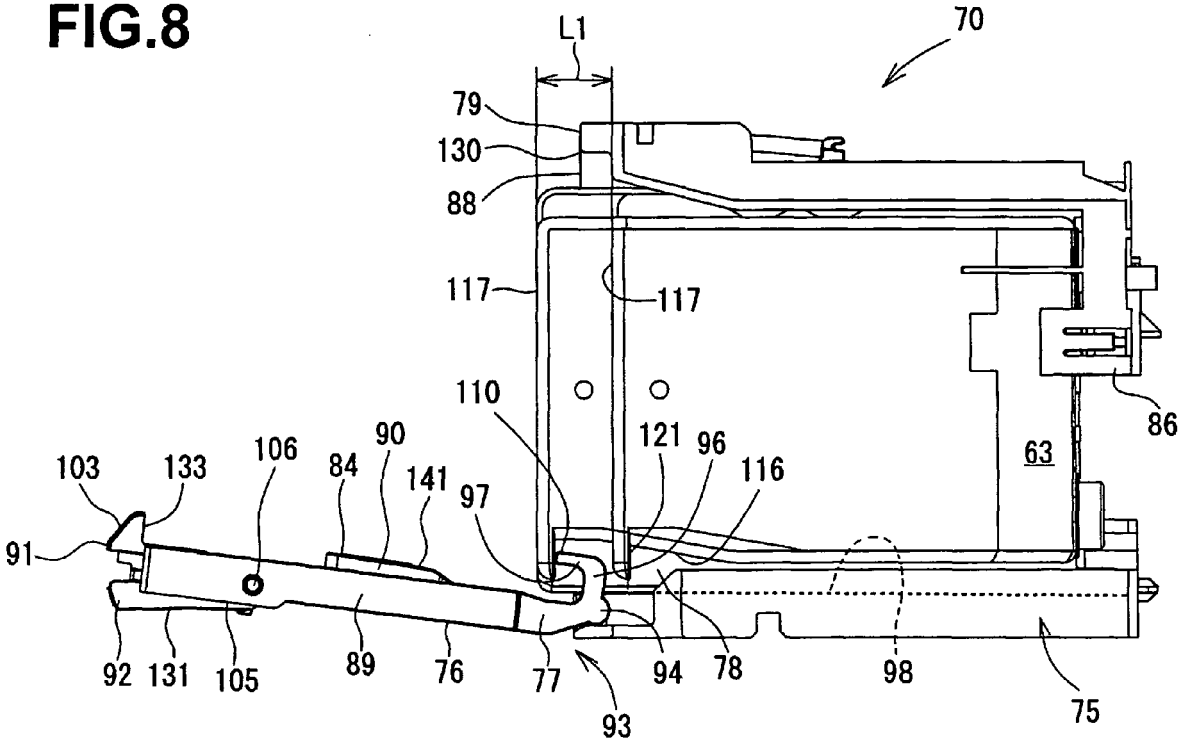
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FIG.9

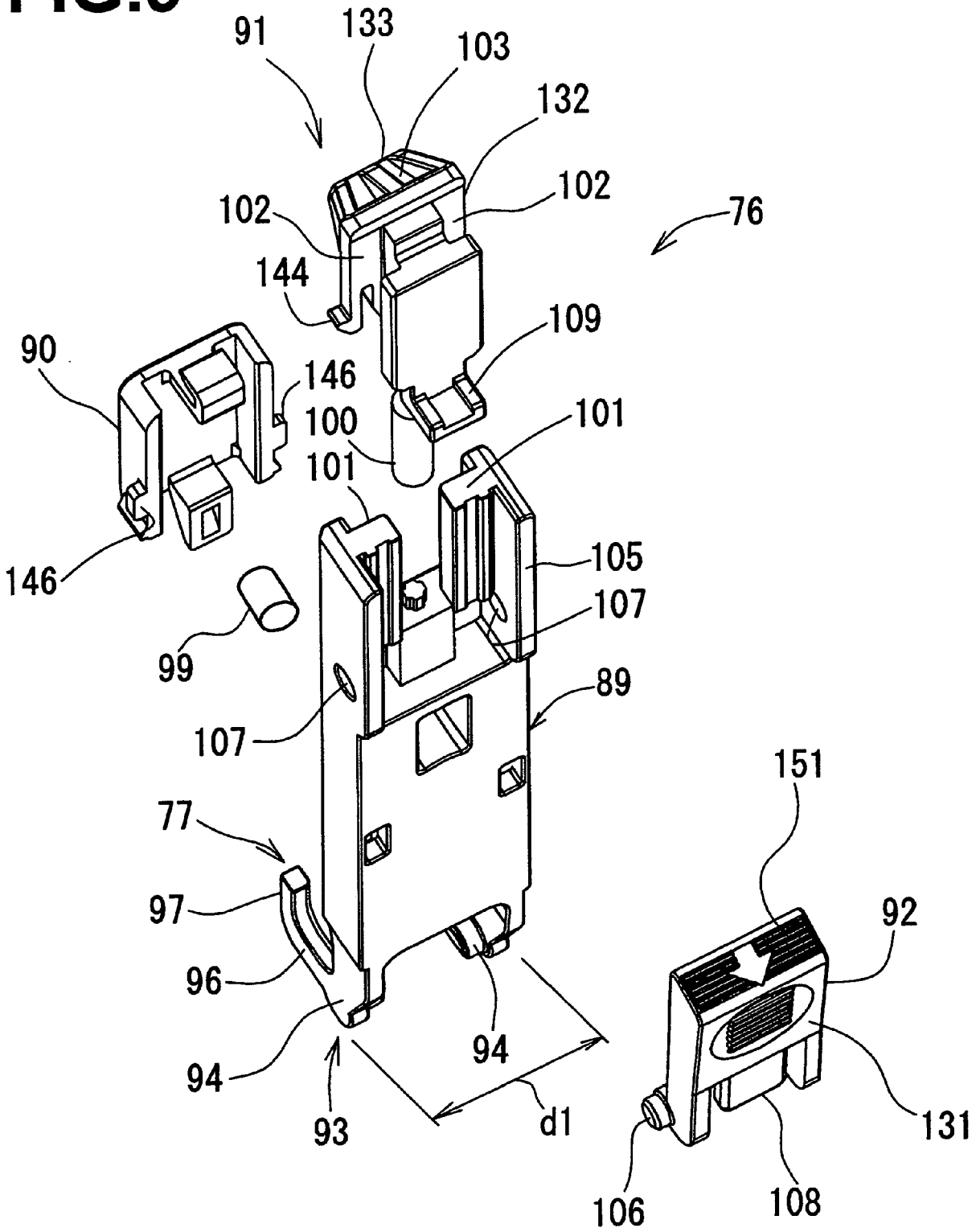
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FIG.10

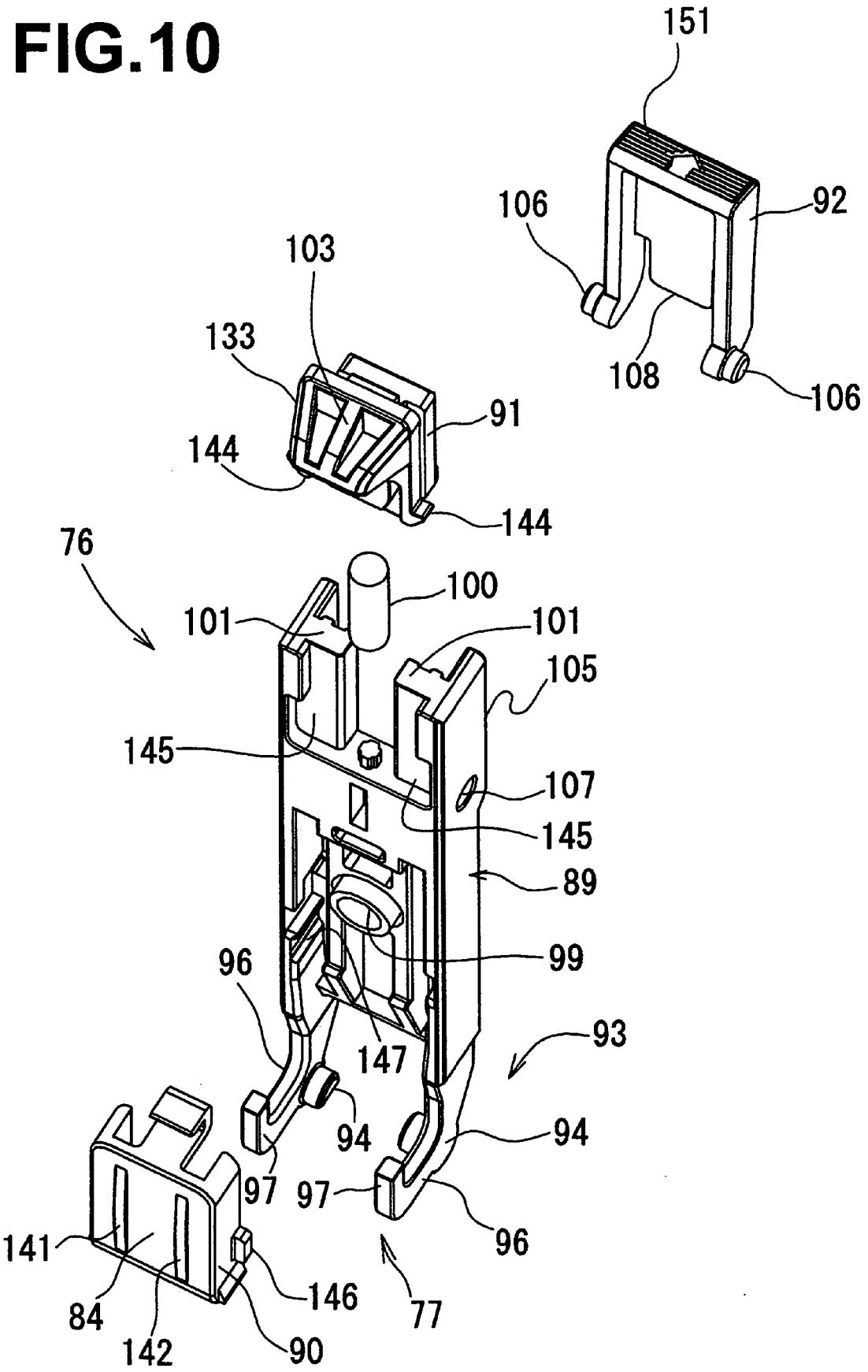
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FIG.11

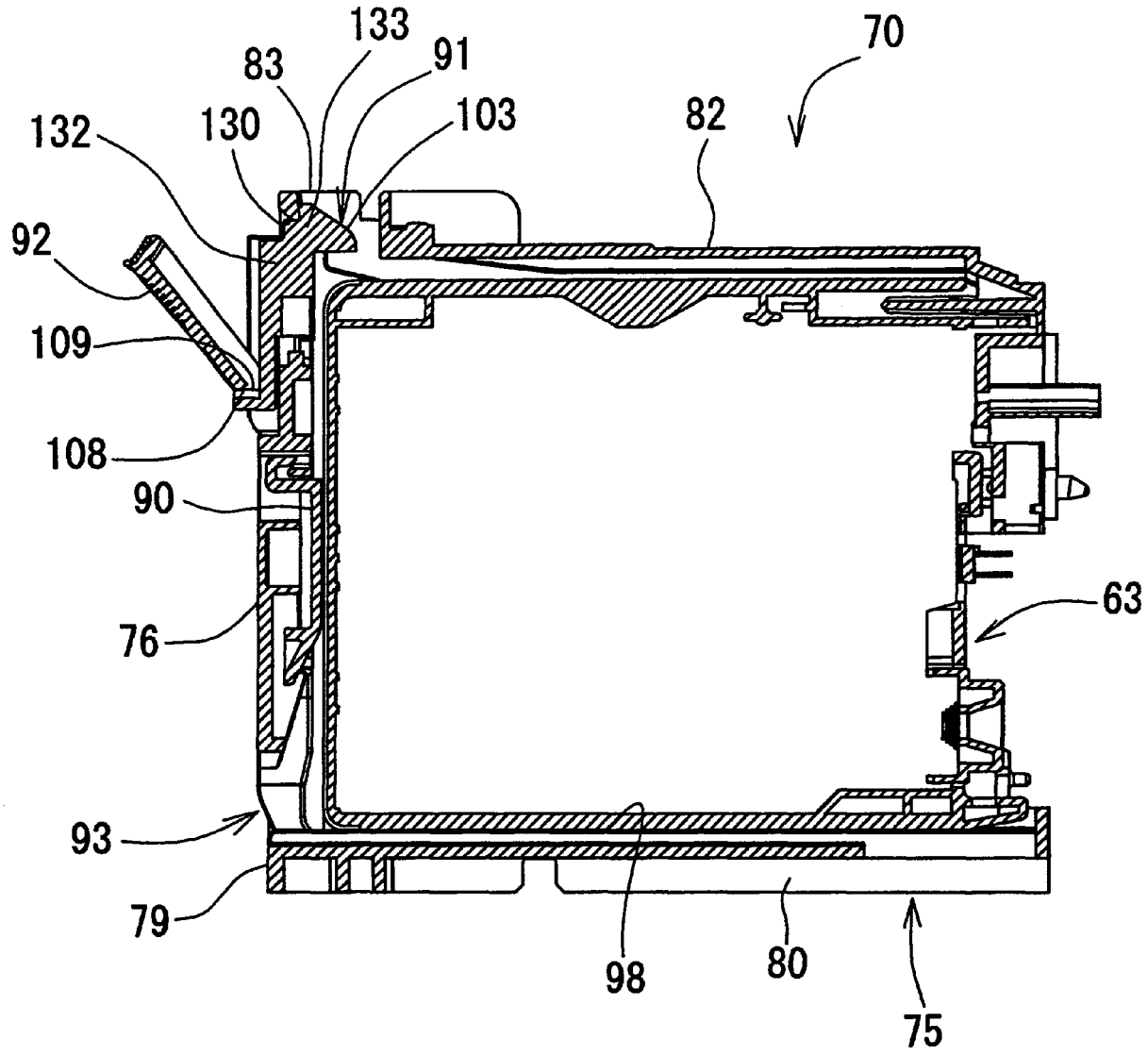

FIG.12

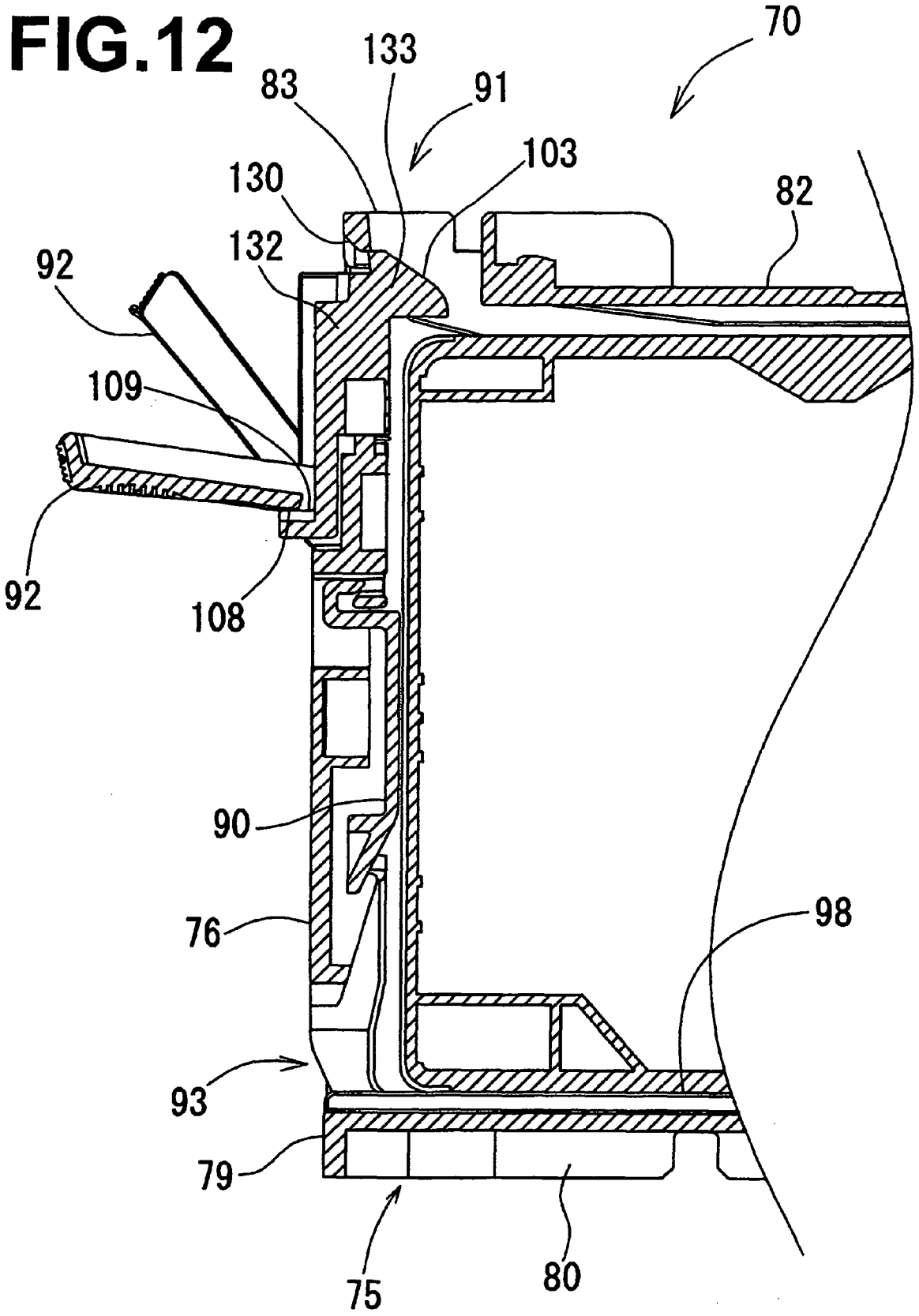

FIG.13

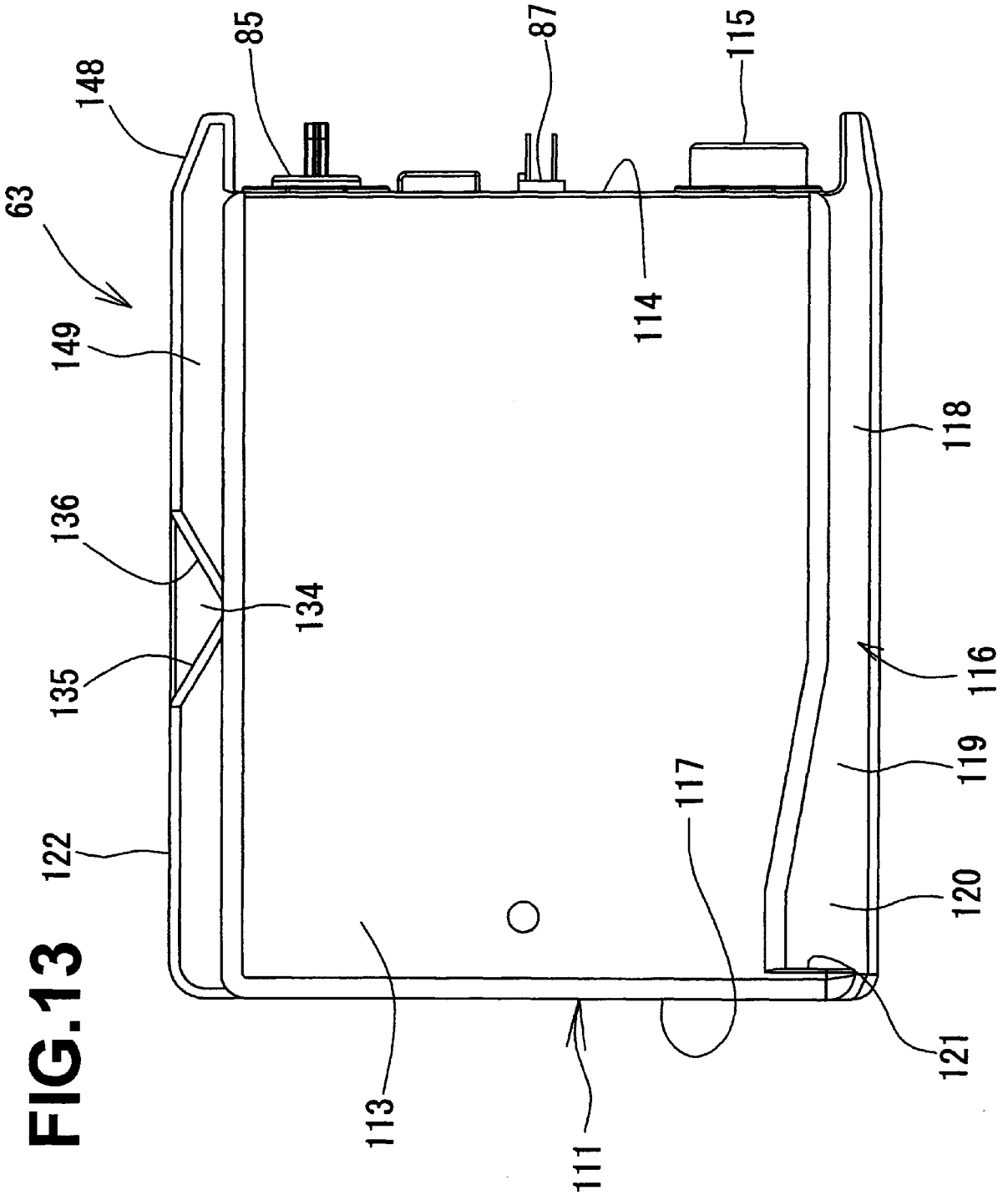
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FIG.14

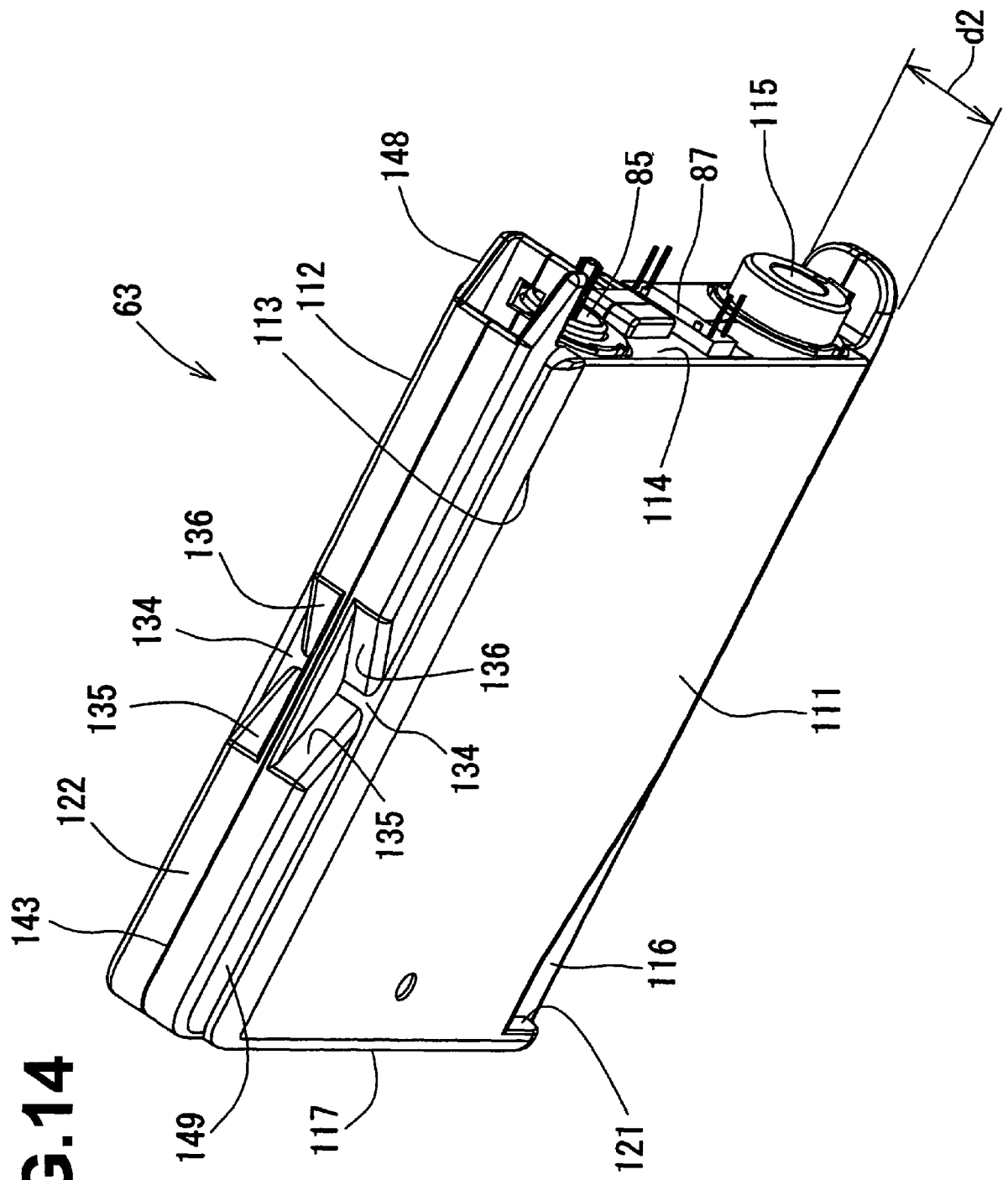
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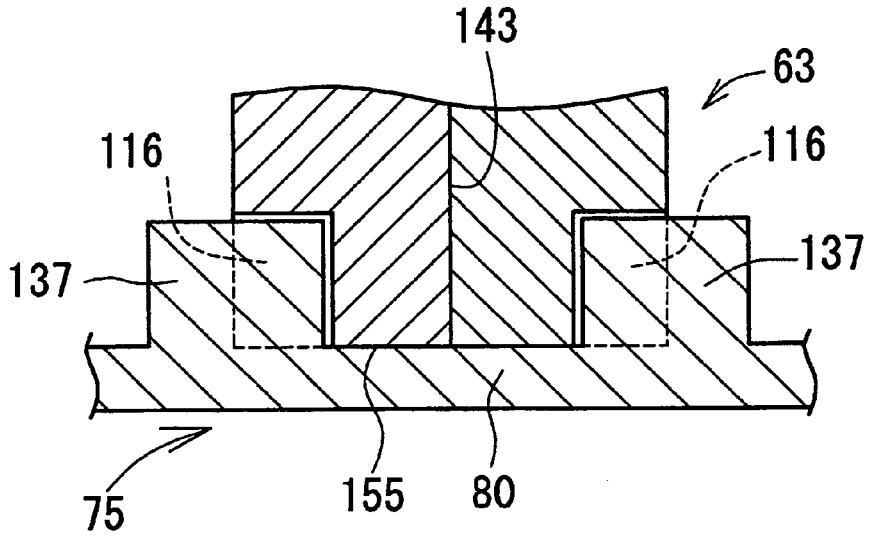
FIG.15

(a)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(b)

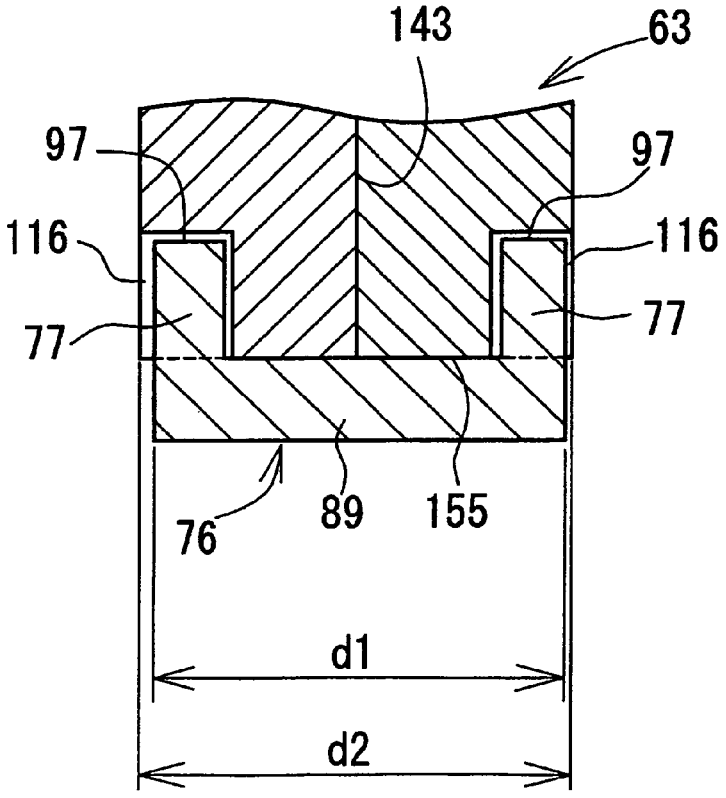
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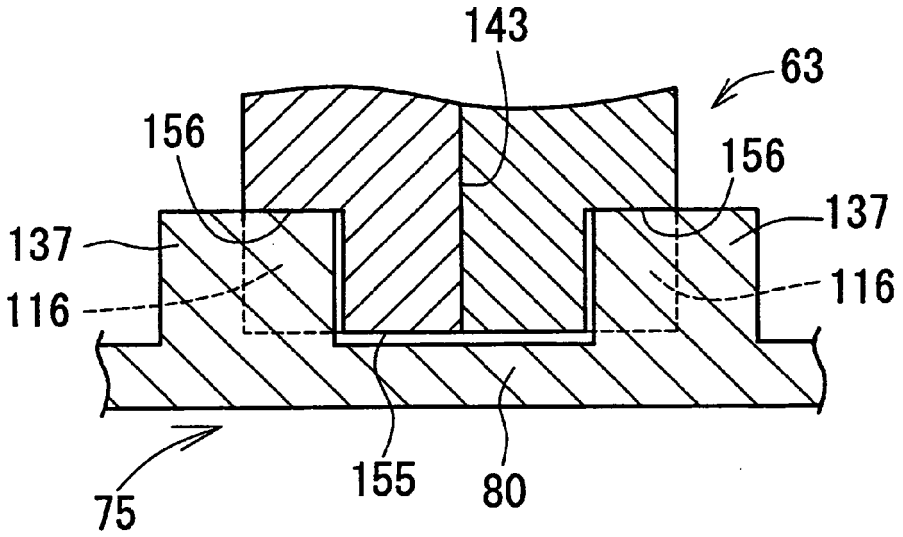
FIG.16

(a)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(b)

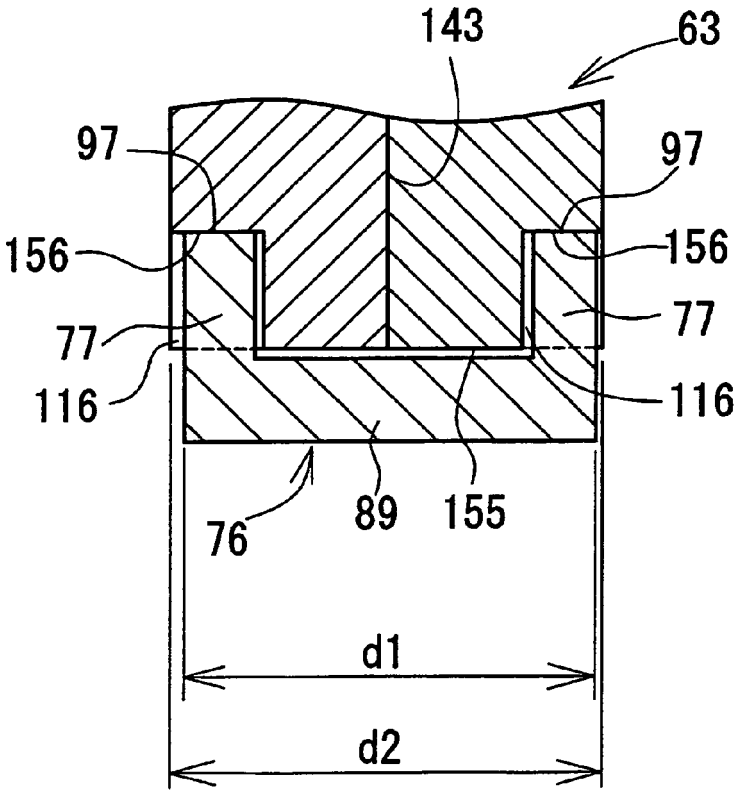
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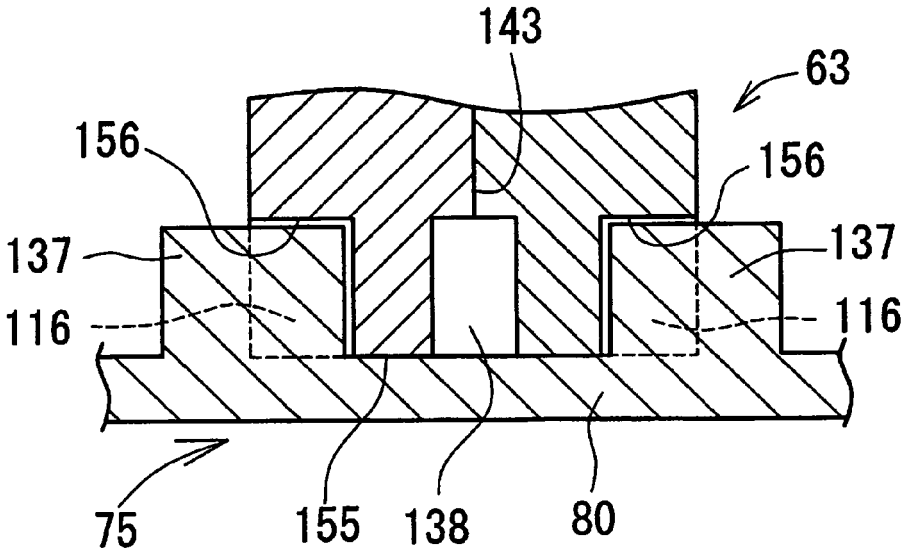
FIG.17

(a)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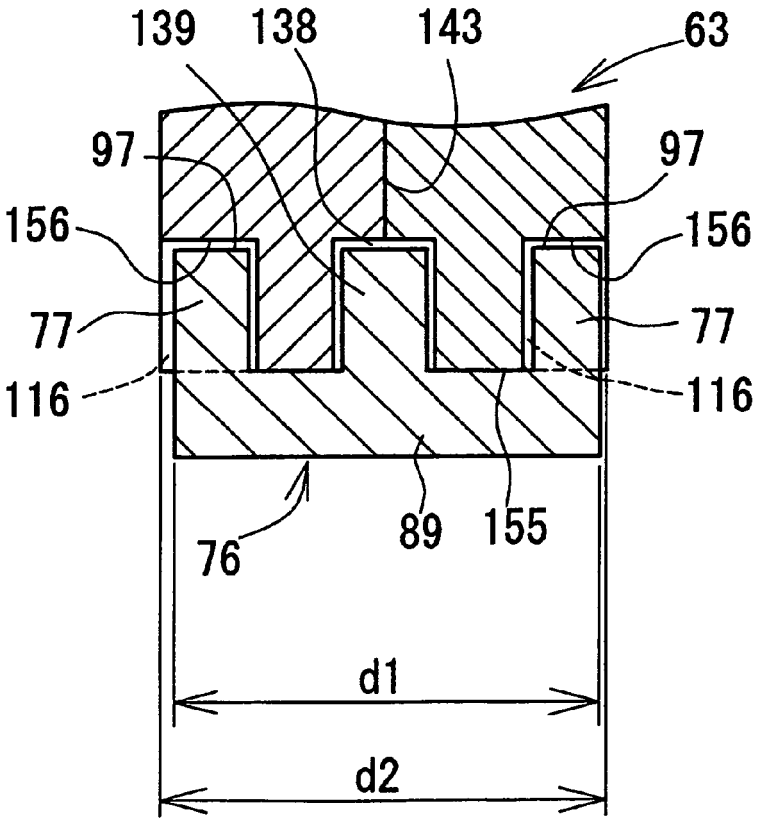
(b)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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 01 3000

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 Y	EP 0 478 244 A2 (CANON KK [JP]) 1 April 1992 (1992-04-01) * column 13, line 29 - line 44 *	1-3,5,6 4,7, 12-14	INV. B41J2/175
X Y A	US 2004/135857 A1 (HASHII KAZUHIRO [JP] ET AL) 15 July 2004 (2004-07-15) * paragraphs [0126], [0178] *	8,11 4,12-14 9,10	
Y	WO 98/55322 A1 (HEWLETT PACKARD CO [US]) 10 December 1998 (1998-12-10) * abstract *	7	

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	30 October 2006	Gavaza, Bogdan

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30-10-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0478244 A2	01-04-1992	AT 156756 T	15-08-1997
		AU 650675 B2	30-06-1994
		AU 8467191 A	04-06-1992
		CA 2051964 A1	23-03-1992
		CN 1061183 A	20-05-1992
		CN 1079691 A	22-12-1993
		DE 69127247 D1	18-09-1997
		DE 69127247 T2	04-12-1997
		KR 9700615 B1	16-01-1997
US 2004135857 A1	15-07-2004	AU 2003244220 A1	10-06-2004
		BR 0303439 A	08-09-2004
		CA 2438419 A1	26-05-2004
		CN 1502472 A	09-06-2004
		CN 1623789 A	08-06-2005
		CN 1623790 A	08-06-2005
		CN 1623791 A	08-06-2005
		JP 3624950 B2	02-03-2005
		JP 2005022345 A	27-01-2005
		MX PA03007822 A	03-12-2004
		NZ 527875 A	25-11-2005
		SG 111998 A1	29-06-2005
WO 9855322 A1	10-12-1998	CN 1116175 C	30-07-2003
		DE 69812125 D1	17-04-2003
		DE 69812125 T2	04-12-2003
		DE 69832642 D1	05-01-2006
		DE 69832642 T2	24-08-2006
		EP 1011980 A1	28-06-2000
		ES 2249676 T3	01-04-2006
		ES 2194322 T3	16-11-2003
		JP 2002510253 T	02-04-2002
		US 6585359 B1	01-07-2003

EPO FORM P0459

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Patent documents cited in the description

- JP 11348303 A **[0005]**
- JP 10109427 A **[0005]**
- JP 2004345246 A **[0005]**
- JP 2005219416 A **[0005]**
- JP 2005096446 A **[0005]**
- JP 6106730 A **[0005]**