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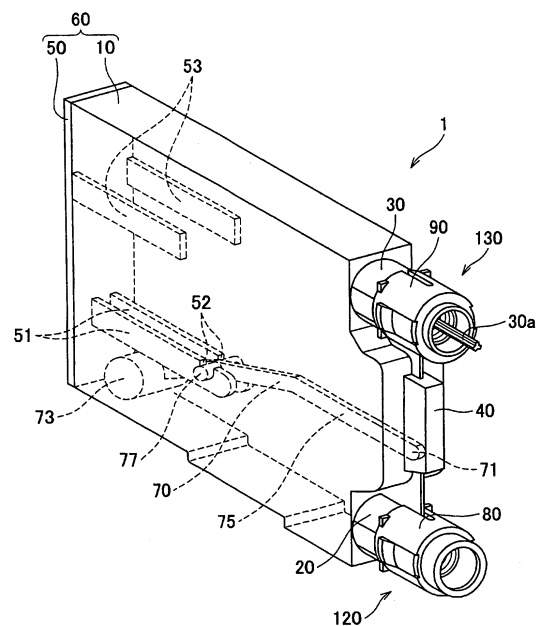
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(54) **Ink cartridge**

(57) An ink cartridge (1) is provided which allows fabrication by means of resin metal mold molding using a metal mold of simple structure. An ink tank (60) which stores ink, and which also supports a sensor arm (70) in its interior in a manner allowing rocking according to the amount of ink remaining, is formed by a bottomed, box-shaped body (10) possessing a main opening (11) and by a lid (50) which covers the main opening (11) of the body (10), each of which is formed from a resin material. An ink supply path (20) and an air-communicating path (30) communicating with the ink tank (60) are provided on a wall confronting a main opening (11) of the body (10). On the lid (50) there is also provided a supporting flange (51) which projects toward the interior of the ink tank (60) and supports the sensor arm (70) in a manner allowing rocking.

Figure 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to an ink cartridge which stores an ink.

BACKGROUND OF THE INVENTION

[0002] A known ink jet printer performs printing by ejecting ink from a nozzle toward a recording sheet. Such an ink jet printer is provided with an attachable/removable ink cartridge. JP H7-068 776 A discloses an ink cartridge having an ink supply hole for supplying ink within a tank to a printer head. The ink supply hole is provided on a lower side of a side wall when the ink cartridge is installed in a printer.

[0003] However, if the ink jet head ejects ink when the ink within the ink cartridge is depleted, printing is not performed and air may also come into the ink jet head. When air comes into the ink jet head, in the worst case, the head becomes unusable. Consequently, it is desirable to monitor how much ink is within the ink reservoir, and when there is substantially no ink within the ink reservoir, to prohibit the attempted ejecting of ink from the ink jet head.

[0004] JP 2005-125 738 A discloses a technology which detects the amount of ink remaining within a cartridge. Specifically, the ink cartridge described in this document is provided with a rocking member which is supported by a support member provided on a bottom wall of the ink tank so that the rocking member can rock when the ink cartridge is attached to a printer. A detected part is provided on one end of the rocking member, and a float part is provided on the other end. Consequently, as the surface of the ink drops due to a decrease in ink within the tank, the position of the float part along a vertical direction drops, and the position of the detected part along a vertical direction rises. Thus, the change in position of the detected part is detected, thereby allowing detection of ink depletion.

[0005] An ink cartridge provided with ink supply hole in a side wall, as described in the aforementioned JP H7-068776A, may be resin-molded. An ink cartridge may be made so as to comprise two members, that is, a body and a lid. The body has an ink supply hole on its side wall and an opening confronting the side wall. The lid covers the opening of the body. The number of parts for making the ink cartridge is no more than two, and the design of molding die is facilitated. In this case, the extraction direction of the body from the molding die is perpendicular to the side wall in which the ink supply hole is formed.

[0006] Here, a remaining ink detection technique using a rocking member as described in JP 2005-125738A may be applied to the ink cartridge described in JP H7-068776A. As described above, a support member supporting a rocking member is provided on a bottom

wall when the ink cartridge is installed in a printer. Thus, the ink supply hole provided at a lower side of the side wall and a supporting member of a rocking member are located on the same imaginary line along the extraction direction of the body. In such a case, an extraction of the body from the molding die becomes difficult, which complicates the die design.

[0007] SUMMARY OF THE INVENTION

Thus, an object of the present invention is to offer an ink cartridge that can be resin-molded using an easily designed molding die.

[0008] An ink cartridge according to the present invention is defined in claim 1. It comprises an ink tank and a rocking member. The ink tank stores ink, and is formed by a bottomed, box-shaped body having a main opening thereon, and a lid which covers the main opening of the body, each of which is formed from a resin material. The rocking member is supported in such a manner that it can rock in response to a change in the amount of ink remaining within the ink tank. An ink supply hole is provided in a wall confronting the main opening of the body. The ink supply hole communicates with the ink tank. A support flange is provided on the lid to protrude from the lid toward the interior of said ink tank. The support flange supports the rocking member in such a manner that the rocking member is able to rock.

[0009] Due to this structure, the member supporting the rocking member is provided on the lid; thus, different from the case in which this member is provided on a bottom wall of the body when the ink cartridge is attached to the ink jet printer, there is no difficulty in the extraction of the body from the molding die during resin-molding of the body in which the extraction direction of the body from the die is perpendicular to the side wall in which the ink supply hole is formed. Consequently, the ink cartridge can be resin-molded using an easily designed molding die.

[0010] In the ink cartridge according to the present invention, a projecting part may be provided on the wall confronting the main opening and above the ink supply hole. The projecting part may project toward the outside of the ink tank, have a width narrower than the width of the ink tank and possess light-transmitting property. A space communicating with the ink tank may be formed in the interior of the projecting part. One end of the rocking member may possess light-obscuring property and may be disposed in the space formed in the interior of the projecting part.

[0011] Here, "above" means "above when an ink cartridge is in an attitude to be installed in an ink jet printer".

[0012] Due to this structure, the projecting part has light-transmitting property; thus, one end of the rocking member which possesses light-obstructing property and is disposed in a space within the projecting part can be detected by a light-transmitting-type optical sensor provided outside the ink cartridge. At such time, the projecting part projects from the body and is thereby easily accessed from outside the ink cartridge; additionally, the

projecting part has a width narrower than the width of the ink tank, which allows detection of one end of the rocking member by means of an inexpensive light-transmitting-type optical sensor.

[0013] In the ink cartridge according to the present invention, a float part may be provided on the other end of the rocking member opposite to the one end of the rocking member. The float part may have a smaller specific gravity than that of ink stored in the ink tank. When the ink cartridge is installed in an ink jet printer, the projecting part is irradiated by a light-transmitting-type light sensor provided in said ink jet printer.

[0014] Due to this structure, the other end of the rocking member provided with a float changes its position downward as ink in the ink tank decreases, and the other end changes its position upward. As a result, the optical sensor detects one end of the rocking member disposed within the projecting part, which allows detection of the amount of ink remaining.

[0015] In the ink cartridge according to the present invention, contact flanges may be provided on the lid to project from the lid toward the inside of the ink tank. The contact flanges contact respectively two interior wall surfaces which confront each other in the body in a state in which the main opening of said body is covered by said lid. Due to this structure, the strength of the ink cartridge is increased.

[0016] The ink cartridge according to the present invention, an air-communicating hole may be provided on the wall confronting said main opening and above said projecting part. Due to this structure, the air-communicating hole can be formed by an easily designed molding die.

(BRIEF DESCRIPTION OF THE DRAWINGS)

[0017] (0058)

- Figure 1 oblique view of the ink cartridge of an embodiment of the present invention.
- Figure 2 partial disassembled view of the ink cartridge illustrated in Figure 1.
- Figure 3 cross-sectional view of the body and lid illustrated in Figure 1.
- Figure 4 side view showing a side wall wherein the ink supply part and air-introduction part of the ink tank illustrated in Figure 1 are provided.
- Figure 5 drawing describing the method for attaching the ink cartridge illustrated in Figure 1 to an ink jet printer.
- Figure 6 drawing describing the motion of the sensor arm illustrated in Figure 1.
- Figure 7 oblique view illustrating the ink cartridge pertaining to the comparative example.
- Figure 8 figure illustrating an instance in which the position of the supporting flanges and ink supply path do not overlap in a vertical orienta-

tion in the ink cartridge pertaining to the comparative example.

Figure 9 figure illustrating an instance in which the position of the supporting flanges and ink supply path do not overlap along the width direction in the ink cartridge pertaining to the comparative example.

(BEST EMBODIMENT OF THE INVENTION)

[0018] An optimal embodiment of the present invention is described below with reference to figures. Figure 1 is an oblique view of an ink cartridge pertaining to this embodiment.

[0019] As shown in Figure 1, an ink cartridge 1 is constructed as a roughly six-surface body. Specifically, this structure comprises roughly six surfaces including one pair of approximately rectangular surfaces comprising the largest surface area, and side surfaces positioned in 4 orientations joined to the pair of the aforementioned surfaces. As described hereinafter, the direction along the long perimeter of the pair of approximately rectangular surfaces comprising the largest surface area of the six-surface body is termed the lengthwise direction, the direction along the short perimeter of such surfaces is termed the short direction, and the direction connected to the aforementioned pair of surfaces (direction perpendicular to the lengthwise direction and short direction) is termed the width direction. The pair of approximately rectangular surfaces connecting the largest surface area of the six-surface body at the short perimeters thereof is also termed the front surface and the back surface.

[0020] As illustrated in Figure 1, an ink cartridge 1 is formed by a bottomed box-shaped body 10 comprising a main opening 11 (see Figures 2 and 3), and a lid 50 closing the main opening 11 of the body 10; and there are principally provided an ink tank 60 which stores ink, and a sensor arm 70 supported in such a manner that it can rock according to a change in the amount of ink remaining in the ink tank 60. The ink tank 60 and the sensor arm 70 are constructed from a resin material (e.g., polypropylene) and are manufactured by injection molding. The body 10 of the ink tank 60 has light-transmitting property, and the sensor arm 70 has light-obscuring property. Additionally, in the ink cartridge 1 there are provided an ink supply part 120 which supplies externally (specifically, to an ink jet printer 1000 (see Figure 5)) ink stored in the ink tank 60, and an air-introducing part 130 which introduces air into the ink tank 60.

[0021] The state illustrated in Figure 1 is an attitude in which the ink cartridge 1 is attached to an ink jet printer 1000 (see Figure 5). Specifically, the ink cartridge 1 is attached in an attitude such that the surfaces comprising the largest surface area are vertical, and the lengthwise direction of the surfaces forming the largest surface area is along a horizontal direction. At such time, an ink supply part 120 and an air-introducing part 130 are positioned on a side surface, with the ink supply part 120 positioned

on the bottom side and the air-introducing part 130 positioned on the top side. Hereinafter, the "bottom side" in the attitude wherein the ink cartridge 1 to the ink jet printer 1000 is attached is simply termed the "bottom side," and the top side in the attitude of attachment is simply termed the "top side." References simply to a "vertical direction" also mean the vertical direction of the ink cartridge 1 in an attitude of attachment to the ink jet printer 1000.

[0022] The body 10 and lid 50 that form the ink tank 60 are next described in detail using Figures 2 and 3.

[0023] As illustrated in Figures 2 and 3, on the bottom side of the wall confronting the main opening 11 of the body 10 there is provided an ink supply path 20 which communicates with the tank 60, and on the top side there is provided an air-communicating path 30 which communicates with the ink tank 60. Here, the direction facing the inside of the tank 60 from the wall confronting the main opening 11 of the body 10 is simply termed the "inside direction," and the direction facing the outside of the ink tank 60 is simply termed the "outside direction."

[0024] The ink supply path 20 and the air-communicating path 30 are each formed in a cylindrical shape extending along the lengthwise direction. In further detail, as illustrated in Figure 3, the proximity of one end of the ink supply path 20 and the air-communicating path 30 each project to the inside direction, and the proximity of the other end projects to the outside direction. A portion of an ink supply mechanism 80 illustrated in Figure 2 is inserted into the ink supply path 20. The ink supply part 120 is thereby formed. A portion of an air-introducing mechanism 90 illustrated in Figure 2 is also inserted into the air-communicating path 30. The air-introducing part 130 is thereby formed.

[0025] When the ink cartridge 1 is not attached to an ink jet printer 1000, the supply mechanism 80 closes off an ink flow path, and when the ink cartridge 1 is attached to an ink jet printer 1000, and an ink extraction tube 1015 (see Figure 5) of the ink jet printer 1000 is inserted, the ink flow path opens. Consequently, when the ink cartridge 1 is attached to the ink jet printer 1000, the ink supply part 120 is able to supply an ink within the ink tank 110 to an ink jet printer 1000.

[0026] The air-introducing mechanism 90 has a rod-shaped valve-opening part 30a which projects toward the outside of the air-communicating path 30 in a state in which a portion of the air-introducing mechanism 90 is placed within the air-communicating path 30. When an ink cartridge 1 is not attached to the ink jet printer 1000, the air-introducing mechanism 90 closes off the air flow path, and when the ink cartridge 1 is attached to the ink jet printer 1000, the valve-opening part 30a contacts an attachment surface 1013 (see Figure 5) of the ink jet printer 1000, and when pressure is applied to the valve-opening part 30a toward the inside of the air-communicating path 30, the air flow path opens. Consequently, when an ink cartridge 1 is attached to the ink jet printer 1000, the air-introducing part 130 is able to bring air into communication with the inside of the ink tank 110.

[0027] As illustrated in Figure 4, which is a drawing of the ink cartridge 1 as seen from the wall side on which the ink supply part 120 and the air-introducing part 130 are provided, the length along the width direction of the ink supply part 120 and the air-introducing part 130 is nearly the same as the length D1 along the width direction of the ink cartridge 1.

[0028] Returning to Figures 2 and 3, on the wall of the body 10 on which the ink supply path 20 and the air-communicating path 30 are provided, a detection part 40 projecting to the outside direction is provided between the ink supply path 20 and the air-communicating path 30. As illustrated in Figure 4, the length D2 of the detection part 40 along the width direction is shorter than the length D1 of the ink cartridge 1 (ink tank 60) along the width direction. Inside the detecting part 40, there is formed a space which communicates with the ink tank 60 and extends vertically. As illustrated in Figure 1, one end of the sensor arm 70 supported within the ink tank 60 is disposed within the space of the detection part 40 and changes position vertically within the space. At the bottom end of the space within the detection part 40, there is provided a contact member 40a which makes contact with one end of the sensor arm 70 when one end of the sensor arm 70 changes its position downward.

[0029] As illustrated in Figure 5(b), when an ink cartridge 1 is attached to the ink jet printer 1000, the detection part 40 is provided at a position sandwiched between a light-emitting part 1014a and a light-receiving part 1014b of a transmitting-type remaining ink quantity detection sensor 1014 provided in the ink jet printer 1000.

[0030] From a lid 50, toward the inside of the ink tank 60, there projects a pair of supporting flanges 51 which support the sensor arm 70, and a pair of contact flanges 53 which contact respectively a pair of mutually confronting inner wall surfaces which form the largest surface area of the body 10 in a state in which the main opening 11 of the body 10 is covered by the lid 50. As illustrated in Figure 4, the pair of supporting flanges 51 is provided adjacent to the both ends of the lid 50 in the width direction, but provided more to the inside than the both ends of the lid 50 in the width direction, so as to line along the width direction.

[0031] On the supporting flanges 51 there is formed an arm-supporting part 52 which supports, in such a manner that the sensor arm 70 can rock, a hereinafter-described attachment shaft 77 of the sensor arm 70. The arm supporting part 52 is a U-shaped cutout as seen from the vertical direction of a paper in Figures 2 and 3.

[0032] The sensor arm 70 is next described. As illustrated in Figure 1, the sensor arm 70 is an approximately rod-shaped member formed by a material with a lower specific gravity than the specific gravity of ink; one end, as described above, forms a detected part 71 disposed within the detection part 40 of the body 10, and the other end forms a float part 73. The detected part 71 and the float part 73 are connected by a connecting part 75.

[0033] The connecting part 75 has the attachment

shaft 77 that extends along the width direction of the ink cartridge 1. Both proximal ends of the attachment shaft 77 are supported respectively by the pair of arm support parts 52 formed in the pair of supporting flanges 51. More specifically the both proximal ends of the attachment shaft 77 respectively fits into the cut-outs of the arm support parts 52 so that the attachment shaft 77 does not easily come off the arm support parts 52, but the sensor arm 70 can rock freely about the attachment shaft 77. Consequently, in a state in which the attachment shaft 77 is supported by the arm support part 52, the sensor arm 70 is allowed to rock with the attachment shaft 77 as a center of rotation. At such time, as illustrated in the Figure 1, within the tank 60, the detected part 71 is located within the detection part 40, and the float part 73 is located proximal to the bottom side of the wall confronting the wall on which the detection part 40 is provided.

[0034] The volumetric proportion occupied by the float part 73 on the sensor arm 70 is made substantially large, and the volume from the attachment shaft 77 to the float part 73 is made substantially larger than the volume from the attachment shaft 77 to the detected part 71. In further detail, these volumetric proportions are designated such that when the float part 73 is located within an ink, a clockwise moment in Figure 1 acting on the sensor arm 70 due to forces of gravity and buoyancy becomes larger than the counterclockwise moment, and when a portion of the float part 73 is exposed from the ink surface, the clockwise moment and the counterclockwise moment become equal. Consequently, after a portion of the float part 73 is exposed from the ink surface, as the amount of ink decreases and the ink surface descends further, the float part 73 follows the ink surface and moves downward. When the float part 73 moves downward, the sensor arm 70 rotates with the attachment shaft 77 as the rotation center, and the detected part 71 moves upward.

[0035] The motion of the sensor arm 70 is next described with continuing reference to Figure 6. When a substantial amount of ink is stored within the ink tank 60 and the float part 73 is located within the ink, as described above, the clockwise moment in Figure 6 acting on the sensor arm 70 is larger than the counterclockwise moment. In other words, a force rotating the sensor arm clockwise in Figure 6 acts on the sensor arm 70. At such time, as illustrated by the solid lines, the detected part 71 contacts the contact member 40a within the detection part 40, and the clockwise rotation of the sensor arm 70 is regulated. When the sensor arm 70 is at the position illustrated by the solid lines, in other words, when the detected part 71 contacts the contact member 40a, the detected part 71 blocks between the light-emitting part 1014a and the light-receiving part 1014b of the remaining ink quantity detection sensor 1014 provided in the ink jet printer 1000. This state is one in which ink is present, and a control substrate (not illustrated) of the ink jet printer 1000 makes a determination that ink is present.

[0036] In contrast, when the amount of ink remaining within the ink tank 60 decreases, the ink surface de-

scends below the location of the float part 73 of the sensor arm 70 illustrated by the solid lines, a portion of the float part 73 is exposed from the ink, as described above, and the clockwise moment and the counterclockwise moment acting on the sensor arm 70 become equal; thus, when the amount of ink remaining decreases further, the float part 73 follows the decrease of the ink surface and changes its position downward in a vertical direction. At such time, the sensor arm 70 rotates counterclockwise in Figure 6. Consequently, the detected part 71 changes its position upward within the detection part 40. Then, as the amount of ink remaining approaches zero, as illustrated by the broken lines in Figure 6, the float part 73 contacts the bottom wall of the ink tank 60. When the sensor arm 70 is at the location illustrated by the broken lines, the space between the light-emitting part 1014a and the light-receiving part 1014b of the remaining ink quantity detection sensor 1014 provided in the ink jet printer 1000 is opened, and light passes between the light-emitting part 1014a and the light-receiving part 1014b. This state is one in which no ink is present, and a control substrate (not illustrated) of the ink jet printer 1000 makes a determination that no ink is present.

[0037] The attachment of an ink cartridge 1 to an ink jet printer 1000 is next described with continuing reference to Figure 5.

[0038] As illustrated in Figure 5(a), the remaining ink quantity detection sensor 1014 is disposed in an attachment part 1010 of an ink jet printer 1000 to which an ink cartridge is to be attached. The remaining ink quantity detection sensor 1014 is formed in an approximate c-shape, the open end of the c-shape is the light-emitting part 1014a which emits light, and the other end is the light-receiving part 1014b which receives light. The light-emitting part 1014a and light-receiving part 1014b project from the attachment surface 1013. The remaining ink quantity detection sensor 1014 is structured such that when the light-receiving part 1014b has received light emitted by the light-emitting part 1014a, a signal is output (or is not output) to a control substrate (not illustrated) provided in the ink jet printer 1000, and when the light-receiving part 1014b does not receive light emitted by the light-emitting part 1014a, a signal is not output (or is output) to the control substrate.

[0039] On the side (Figure 5(a), bottom side) of the attachment surface 1013 confronting the ink supply part 120, the ink extraction tube 1015 is provided so as to project; while, on the side (Figure 5(a), top side) confronting the air-introduction part 130 of the attachment surface 1013, the attachment surface 1013 is formed flat. An ink flow path 1013a is connected to the ink extraction tube 1015, and ink passing through the ink flow path 1013a is supplied to a discharge port not illustrated. An air introduction path 1013b is formed on the attachment surface 1013 of the air-introduction part 130 side, and air passing through the air-introduction path 1013b is introduced into the ink cartridge 1 (ink tank 60).

[0040] As illustrated in Figure 5(b), when an ink car-

tridge 1 is attached to the attachment part 1010, the ink extraction tube 1015 is inserted into the ink supply part 120, creating a state in which ink can be supplied; the valve-opening part 30a of the air introduction part 130 contacts the attachment surface 1013, creating a state in which air can be introduced; and the detection part 40 is disposed between the light-emitting part 1014a and the light-receiving part 1014b of the remaining ink quantity detection sensor 1014, creating a state in which the amount of ink remaining can be detected.

[0041] A manufacturing process for the ink cartridge 1 is next described. First, the body 10 and the lid 50 of the ink tank 60 are resin-molded. At such time, the body 10 is formed such that the direction perpendicular to the wall on which the ink supply path 20 and the air-communicating path 30 are provided becomes the direction that the body 10 is extracted from the molding die. The lid 50 is also formed such that the direction that the supporting flanges 51 and contact flanges 53 project becomes the direction that the lid 50 is extracted from the molding die.

[0042] Next, a separately fabricated and assembled ink supply mechanism 80 and air-introduction mechanism 90 are attached respectively to the ink supply path 20 and air-communicating path 30, forming the ink supply part 120 and air-introduction part 130. Thereafter, the attachment shaft 77 of the sensor arm 70 fabricated separately by resin-molding is fitted into the arm-supporting part 52 of the lid 50. The main opening 11 of the body 10 is also covered by the lid 50. At such time, the detected part 71 of the sensor arm 70 attached to arm-supporting part 52 of the lid 50 is disposed within the detecting part 40 of the body 10. Next, the body 10 and lid 50 are welded together. The welding of the body 10 and lid 50 is performed without gaps, so as to prevent leakage of an ink stored in the ink tank 60.

[0043] As described above, the ink cartridge 1 in this embodiment is formed by means of a bottomed box-shape body 10 comprising a main opening 11, and by a lid 50 which closes the main opening 11 of the body 10; and there are provided principally an ink tank 60 which stores an ink, and a sensor arm 70 supported in such a manner that it can rock corresponding to the amount of ink remaining in the ink tank 60. In the wall confronting the main opening 11 of the body 10 there is provided an ink supply path 20 which communicates with the ink tank 60. Additionally, projecting from the lid 50 there is a pair of supporting flanges 51 which face the inside of the ink tank 60 and support the sensor arm 70. Consequently, no difficulties in extraction of the body 10 from the molding die arise when resin-molding is performed such that the extraction direction becomes a direction perpendicular to the wall in which the ink supply path 20 is formed, different from the case that a member supported by the sensor arm 70 is provided on a bottom wall of body 10 when the ink cartridge is attached to the inkjet printer 1000. Consequently, it is possible to resin-mold the ink cartridge using an easily designed molding die.

[0044] In the ink cartridge 1 of the present embodi-

ment, the body 10 has light-transmitting property; further, above the ink supply path 20 on the wall confronting the main opening 11 of the body 10, there is provided the detection part 40 projecting toward the outside direction with the width D2 narrower than the length D1 along the width direction of the ink tank 60. Within the detection part 40 there is formed a space which communicates with the tank 60, and the detected part 71 provided at one end of a sensor arm 70 supported within the ink tank 60 and having light-obscuring property is disposed within the aforementioned space. Consequently, the detected part 71 on the sensor arm 70 can be detected by a light-transmitting-type remaining ink quantity detection sensor 1014 provided in an ink jet printer 1000 in which the ink cartridge 1 is attached. In addition, at such time, because the detection part 40 projects from the body 10, access from the outside ink cartridge 1 is easy, and in addition, because the detection part 40 has a width narrower than width of the ink tank 60, the detected part 71 can be detected by an inexpensive light-transmitting-type sensor.

[0045] In the ink cartridge 1 of the present embodiment, the approximately rod-shaped sensor arm 70 is formed from a material with a specific gravity lower than the specific gravity of ink, and on the end region of the side opposite the side where the detected part 71 on the sensor arm 70 is provided, there is provided the float part 73. When the ink cartridge 1 is installed in an ink jet printer 1000, the detection part 40 is irradiated by the light-transmitting-type remaining ink quantity detection sensor 1014 provided in the ink jet printer 1000. Consequently, the float part 73 changes its position downward as the amount of ink within the ink tank 60 is reduced, and the detected part 71 changes its position upward. Thus, the detected part 71 disposed within the detection part 40 is detected by the remaining ink quantity detection sensor 1014, and the amount of ink remaining is detected.

[0046] In addition, in the ink cartridge 1 of the present embodiment, there projects from the lid 50 a pair of contact flanges 53 which contact respectively a pair of inner wall surfaces confronting each other and forming the largest surface area of the body 10 in a state in which the main opening 11 of the body 10 is covered by the lid 50. Consequently, the strength of the ink cartridge 1 in the width direction is increased.

[0047] In addition, in the ink cartridge 1 of the present embodiment, an air-communicating path 30 is provided above the detecting part 40 on the wall confronting the main opening 11 of the body 10. Consequently, the air-communicating path 30 can be resin-molded using an easily designed molding die.

[0048] A favorable embodiment of the present invention has been described above, but the present invention is not limited to the foregoing embodiment, and various design changes can be made within the limitations described in the Scope of Claims. For example, in the foregoing embodiment, above the ink supply path 20 on the wall confronting the main opening 11 of the body 10 hav-

ing light-transmitting property, there is provided the detection part 40 projecting toward the outside direction with a width narrower than the width of the ink tank 60. A space communicating with the ink tank 60 is formed inside the detection part 40. The detected part 71 provided at one end of the sensor arm 70 having light-obscuring property is disposed within the space formed inside the detection part 40. However, the present invention is not limited to this. It is acceptable if only the detection part 40 in the ink tank 60 has light-transmitting property. It is also acceptable if only the detected part 71 on the sensor arm 70 has light-obscuring property. And it is also acceptable if the detection part 40 does not have a width narrower than the width of the ink tank 60 and does not project toward the outside direction.

[0049] In the foregoing embodiment, the float part 73 is provided on the end portion of a rod-shaped sensor arm 70 on a side opposite from a side where there is provided a detected part 71. The float part 73 changes its position downward as the amount of ink within the ink tank 60 decreases and the detected part 71 changes its position upward within the inner space of the detection part 40. The detected part 71 is detected by the light-transmitting-type remaining ink quantity detection sensor 1014 provided in an ink jet printer 1000. However, the method for detection of the detected part 71 is not limited thereto. The detected part 71 may be detected by a reflection-detecting-type sensor.

[0050] Additionally, in the foregoing embodiment, the sensor arm 70 is made with a specific gravity smaller than the specific gravity of ink, but there is no limitation thereto, and it is acceptable if at least the float part 73 has a specific gravity smaller than the specific gravity of ink.

[0051] The foregoing embodiment also describes an instance in which there projects from a lid 50 a pair of contact flanges 53 which contact respectively a pair of inner wall surfaces confronting each other and forming the largest surface area of the body 10 in a state in which the main opening 11 of the body 10 is covered by the lid 50; however, the contact flanges 53 may be omitted.

[0052] In addition, the foregoing embodiment describes an instance in which an air-communicating path 30 is provided above a detecting part 40 on a wall confronting the main opening 11 of a body 10; however, the location where the air-communicating path 30 is provided is not limited thereto. The air-communicating path 30 may also be omitted.

(Comparative example)

[0053] A comparative example is here described with continuing reference to Figure 7. The structure of an ink cartridge 401 pertaining to the comparative example differs mainly from the structure of the ink cartridge 1 pertaining to the present embodiment in that, in the ink cartridge 1 pertaining to the aforementioned embodiment, supporting flanges 51 which support a sensor arm 70 are

provided on a lid 50, but in the ink cartridge 401 pertaining to the comparative example, supporting flanges 412 which support a sensor arm 70 are provided on a body 410. The structure in other respects is nearly identical to that of the aforementioned embodiment. Items having a structure nearly identical to the embodiment of the aforementioned embodiment are assigned identical reference numbers, and a description thereof is omitted as appropriate.

[0054] As illustrated in Figure 7, the ink cartridge 401 pertaining to the comparative example is an approximately six-surface shape, and there are provided principally an ink tank 460 formed by a body 410 and a lid 450, and a sensor arm 70 supported in a rocking fashion within the ink tank 460. On the bottom wall of the body 410 there is provided a pair of supporting flanges 412 which support the sensor arm 70, and on a side wall perpendicular to the bottom wall there are provided an ink supply path 20 and an air-communicating path 30.

[0055] When the ink tank 460 of an ink cartridge 401 like that illustrated in Figure 7 is fabricated by a resin-molding, the direction of extraction of the body 410 from the molding die becomes a direction perpendicular to the wall in which the ink supply path 20 and the air-communicating path 30 are provided. In this instance, in which the supporting flanges 412 provided on the bottom wall of the body 410 and the ink supply path 20 are located on the same imaginary line along the extraction direction, the extraction from the die becomes difficult, which makes design of the molding die complicated. Consequently, fabrication of the body 410 with an easily designed molding die requires that the supporting flanges 412 and the ink supply path 20 not be located on the same imaginary line along the extraction direction.

[0056] In order not to place the supporting flanges 412 and the ink supply path 20 on the same imaginary line along the extraction direction, as illustrated in Figure 8, the positions of the supporting flanges 412 and the ink supply path 20 along the vertical direction of the ink cartridge 401 are established so as not to overlap; specifically, it is conceivable to provide an ink supply path 20 such that the lower end (illustrated by broken line A in Figure 8) of the ink supply path 20 is located at a position above the upper end (illustrated by broken line B in Figure 8) of the supporting flanges 412. In this instance, the position of the ink supply path 20 in a vertical direction is limited to one above the upper end portion of the supporting flanges 412. Consequently, the position of the ink supply part 120 is higher than that in the ink cartridge 1 of the present embodiment. As a result, a problem arises in that considerable unused ink remains.

[0057] In order to avoid placing the supporting flanges 412 and the ink supply path 20 on the same imaginary line along the extraction direction, it is conceivable to avoid overlapping the positions of the supporting flanges 412 and the ink supply path 20 in the width direction of the ink cartridge 401. Specifically, as illustrated in Figure 9, it is conceivable to widen the interval between the pair

of supporting flanges 412 to one greater than the width of the ink supply path 20. In this instance, the width of the ink cartridge 401 is wider than the width of the ink supply path 20. Consequently, a problem arises in that the ink cartridge 401 becomes substantially larger in the width direction than the ink cartridge 1 in the embodiment pertaining to the present invention.

[0058] Thus, the ink cartridge 1 of the present embodiment, wherein supporting flanges 51 supporting a sensor arm 70 are provided on a lid 50 allows a reduction in the amount of unused ink remaining as compared to the ink cartridge 401 pertaining to the comparative example, and the ink cartridge 1 of the present embodiment can also be made thinner.

Claims

1. An ink cartridge comprising;

an ink tank (60) for storing ink, which is formed by a bottomed, box-shaped body (10) having a main opening (11), and a lid (50) which covers said main opening (11) of said body (10), each of which is formed from a resin material, and a rocking member (70) supported in such a manner that it can rock in response to a change in the amount of ink remaining within said ink tank (60),

wherein

an ink supply hole is provided in a wall confronting said main opening (11) of said body (10), the ink supply hole communicates with said ink tank (60), a supporting flange (51) is provided on said lid (50) to protrude from said lid (50) toward the interior of said ink tank (60), and the supporting flange (51) supports said rocking member (70) in such a manner that the rocking member (70) can rock.

2. The ink cartridge according to Claim 1,

wherein a projecting part (40) is provided on the wall confronting said main opening (11) above said ink supply hole, the projecting part (40) projects toward the outside of said ink tank (60) and has a width (D2) narrower than the width (D1) of said ink tank (60) and possesses light-transmitting property, a space communicating with said ink tank (60) is formed in the interior of said projecting part (40), and one end of said rocking member (70) possesses light-obscuring property and is disposed in said space formed in the interior of said projecting part (40).

3. The ink cartridge according to Claim 2,

wherein a float part (73) is provided on the other end of said rocking member (70) opposite to said one end of said rocking member (70), the float part (73)

has a smaller specific gravity than that of ink stored in said ink tank, and when the ink cartridge (1) is installed in an ink jet printer (1000), said projecting part is irradiated with light emitted from a sensor (1014) provided in said ink jet printer (1000).

4. The ink cartridge according to any of Claims 1 through 3,

wherein contact flanges (53) are provided on said lid (50) to project from said lid (50) toward the inside of said ink tank (60), the contact flanges (53) contact respectively two interior wall surfaces of the ink tank (60) which confront each other.

5. The ink cartridge according to any of Claims 1 through 4, wherein an air-communicating hole is provided on the wall confronting said main opening (11) above said projecting part (40).

Figure 1

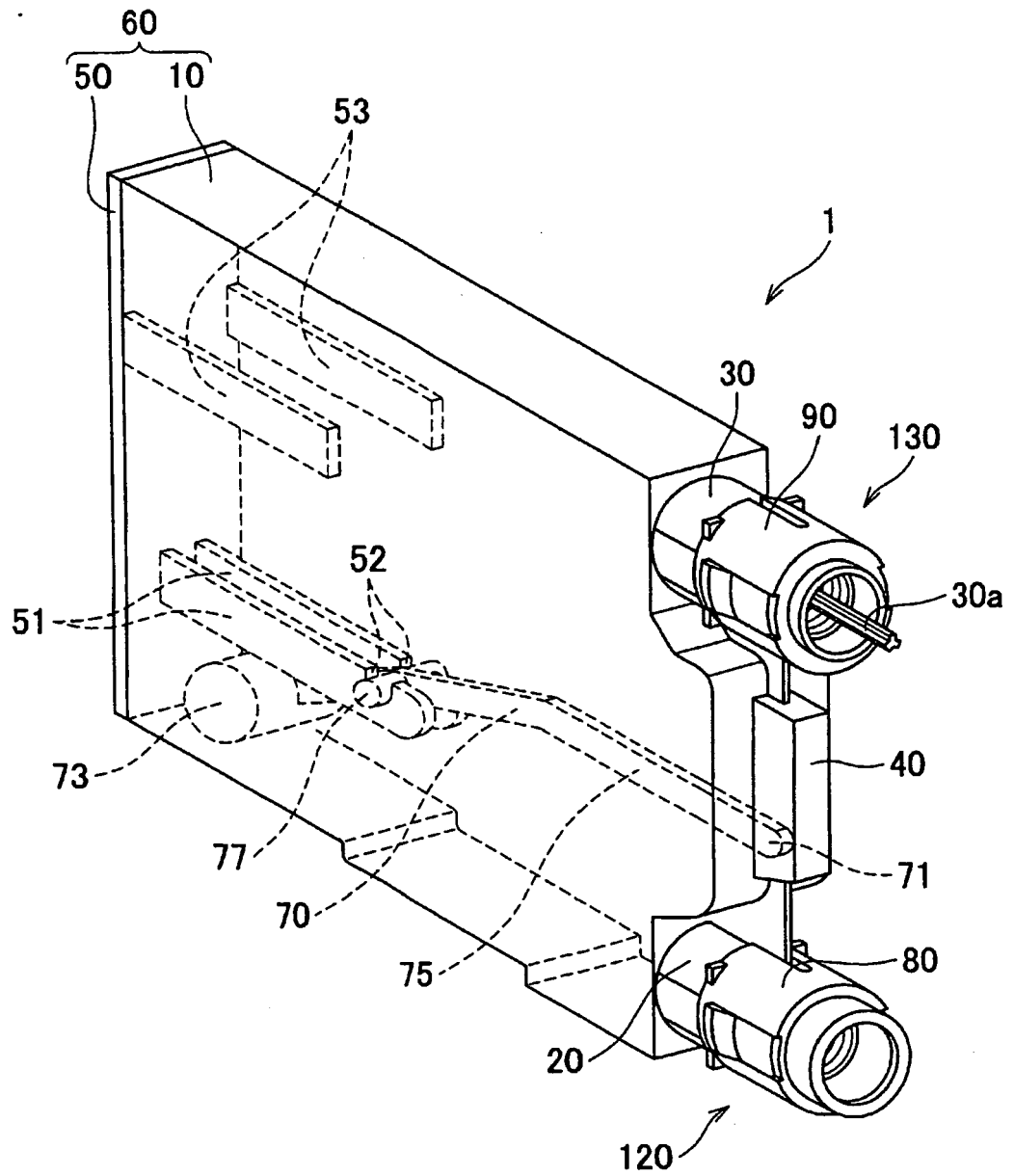


Figure 2

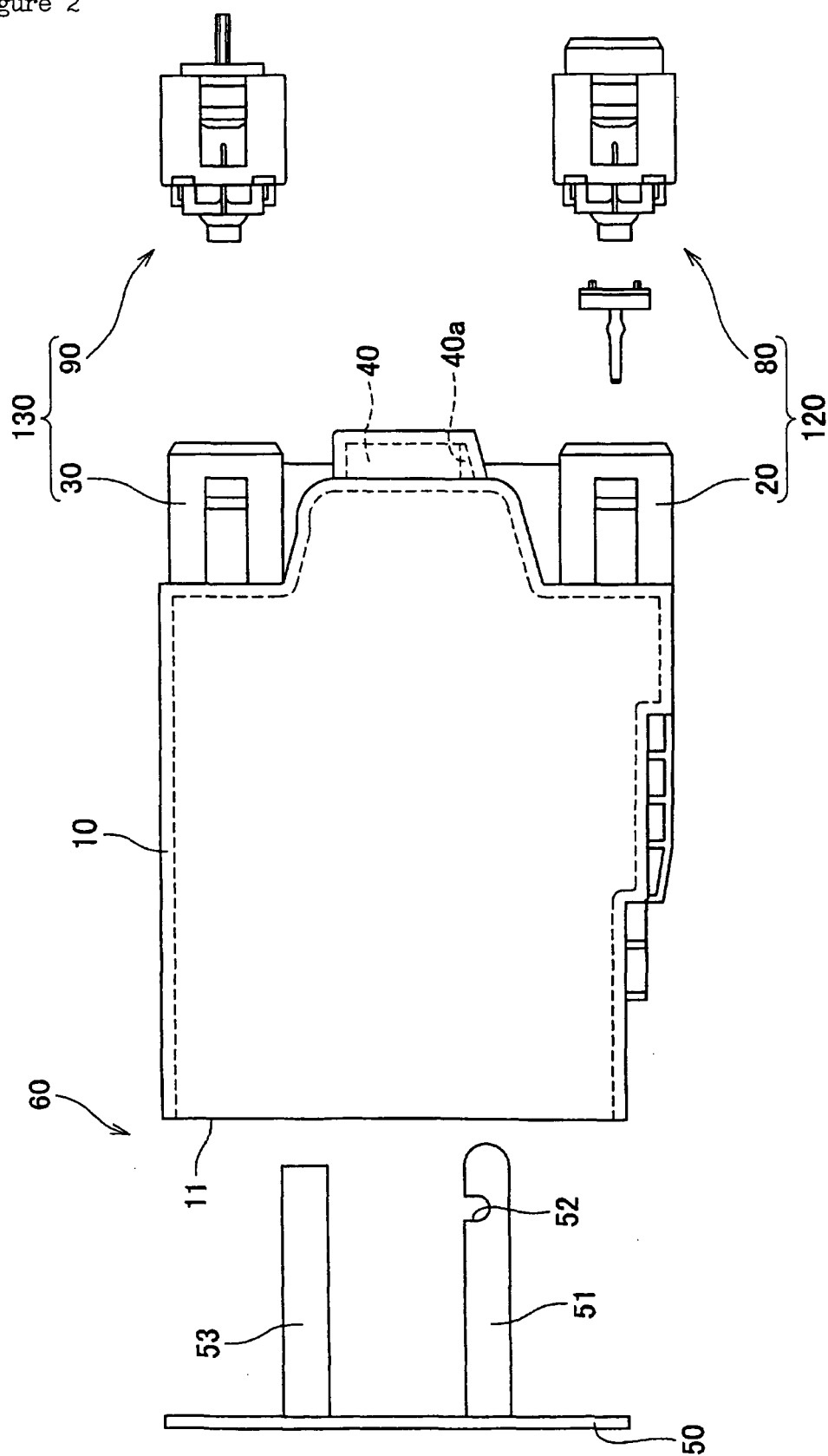


Figure 3

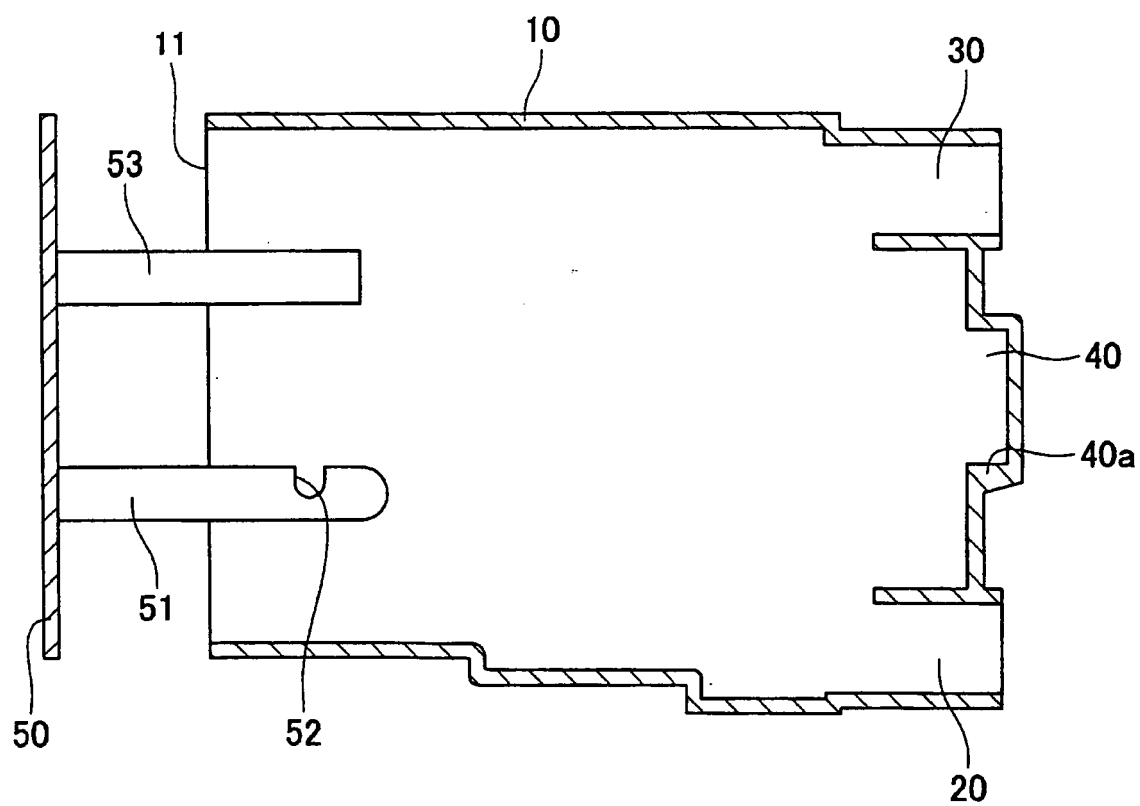


Figure 4

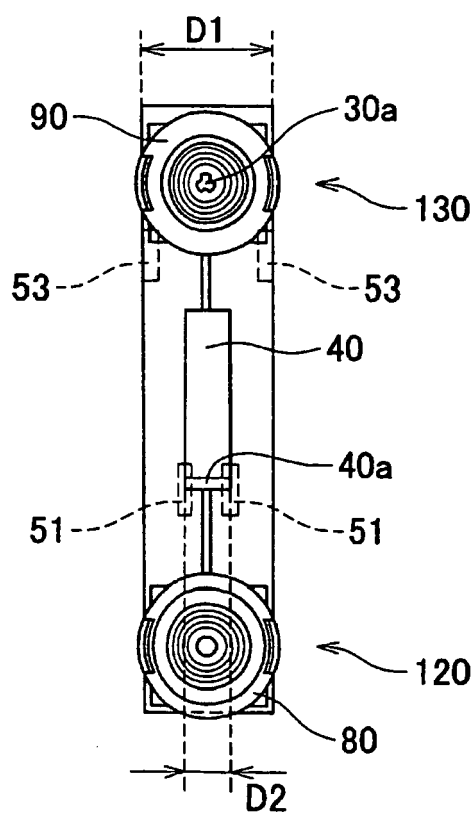
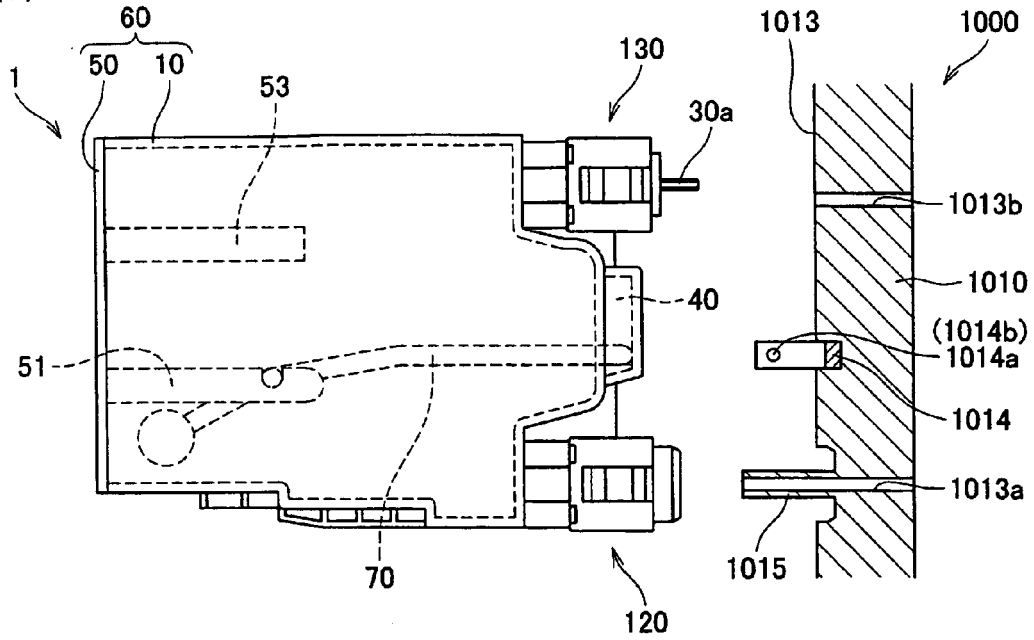


Figure 5

(a)



(b)

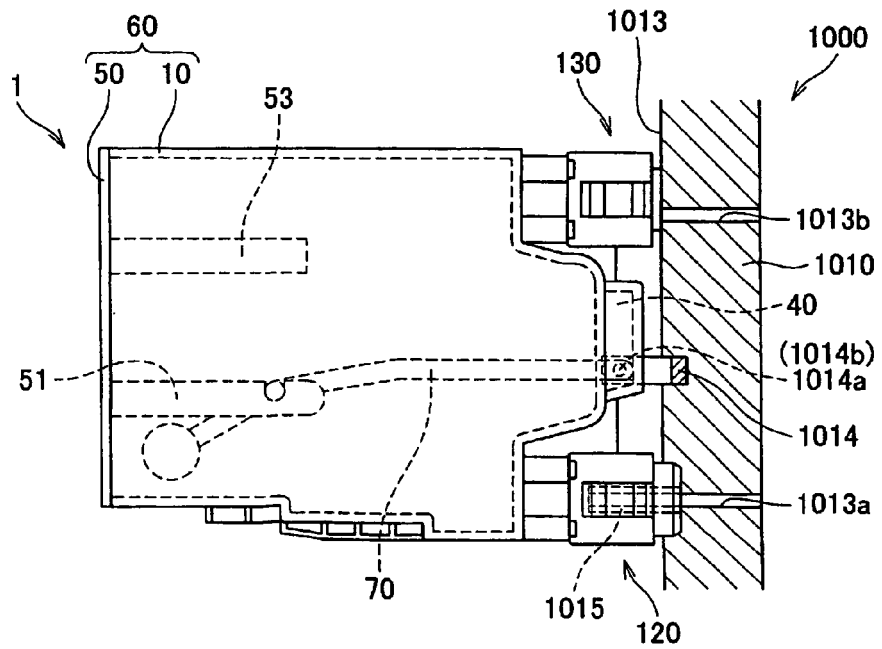


Figure 6

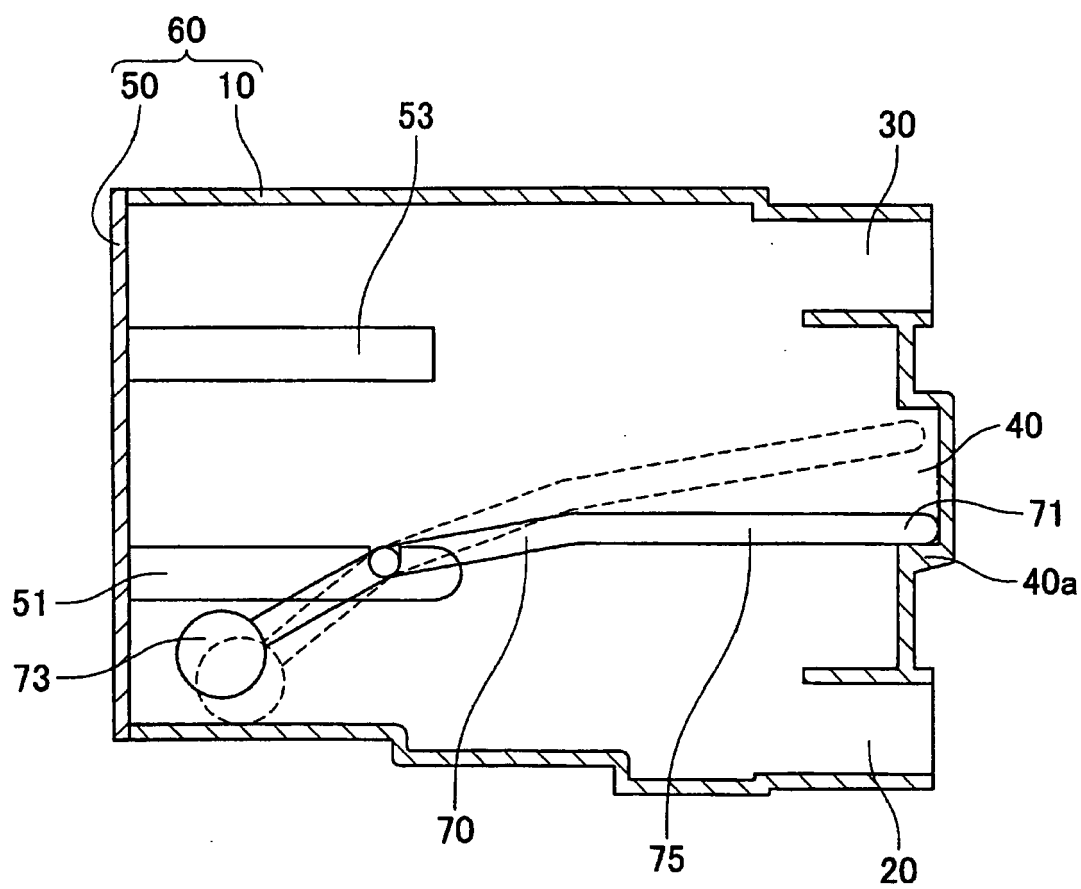
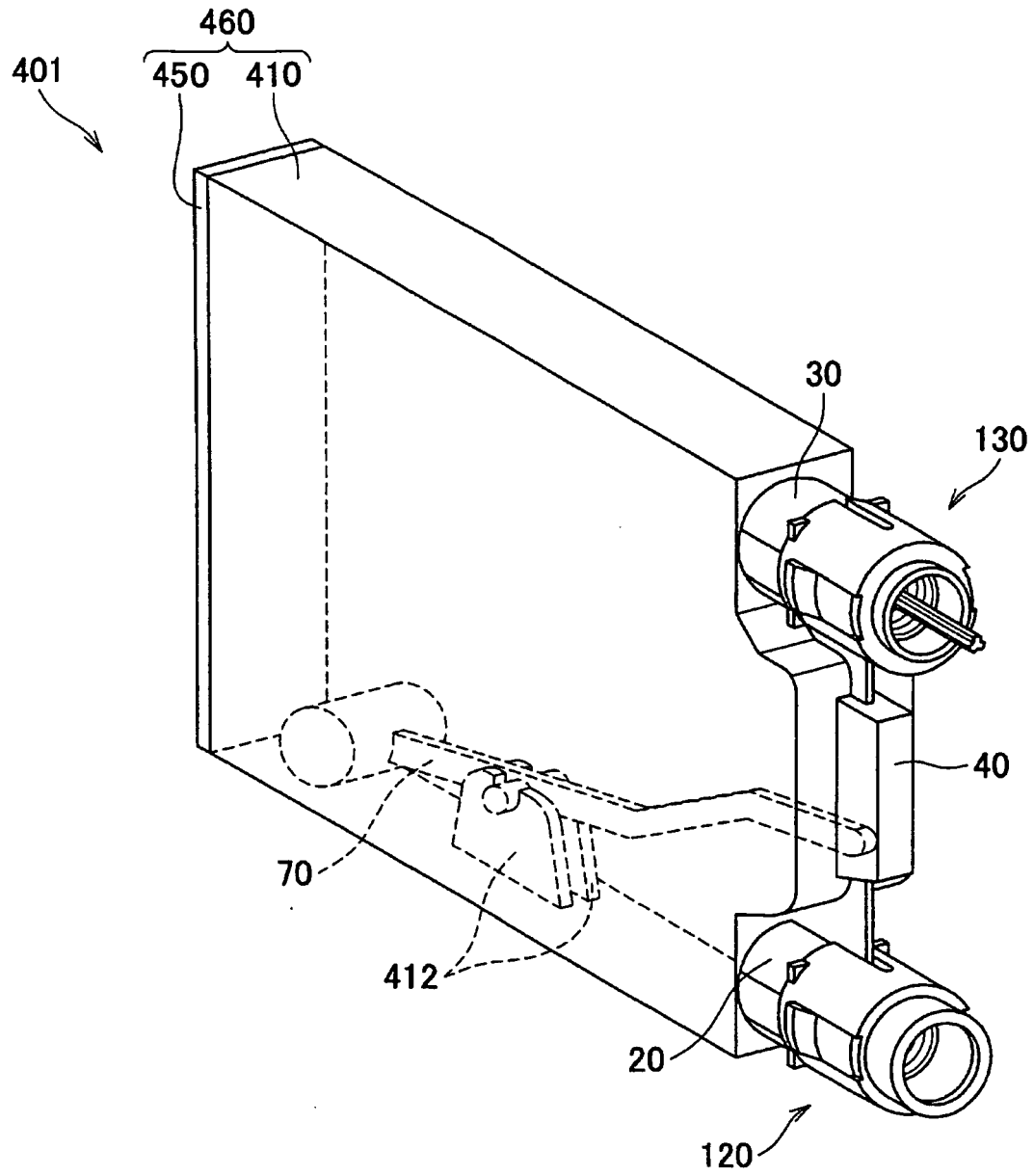


Figure 7



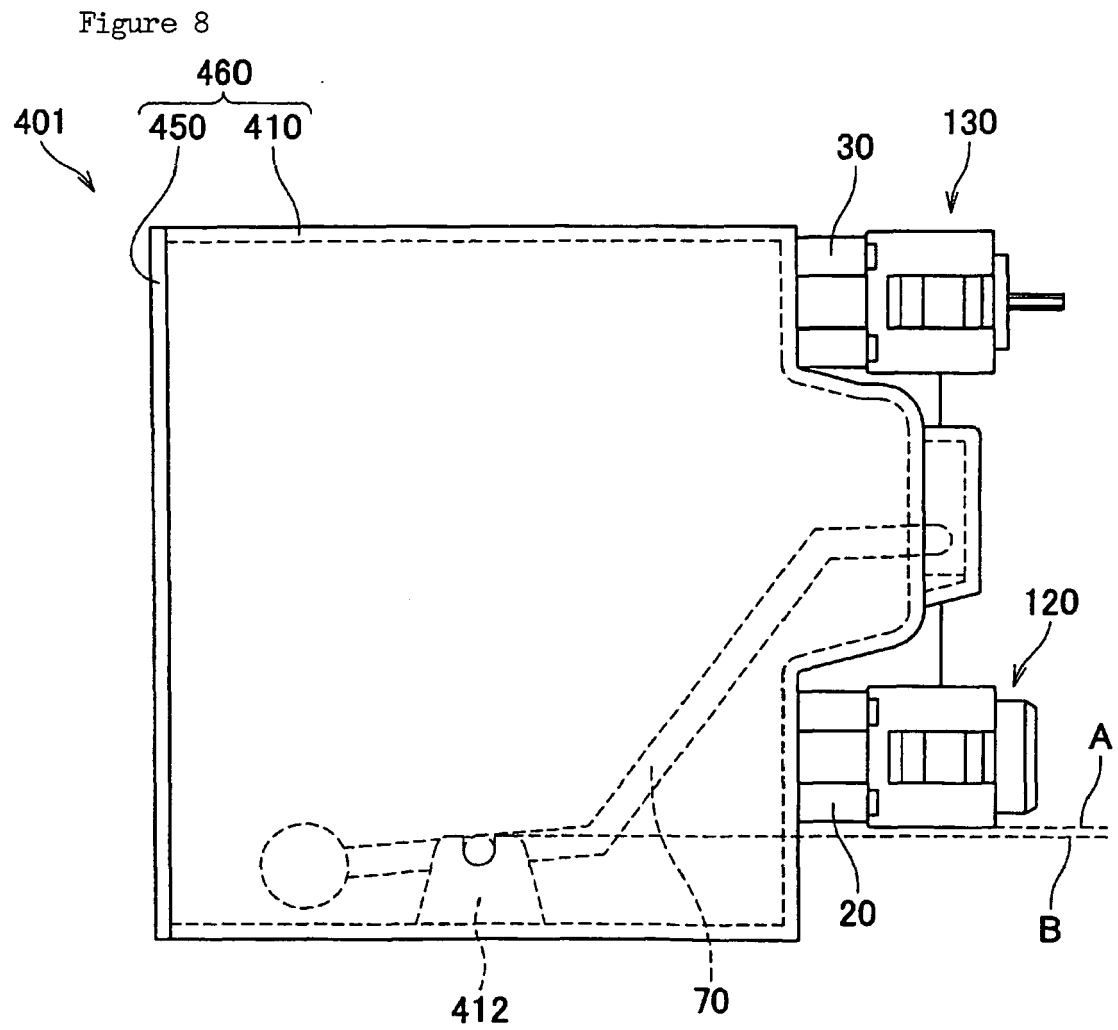
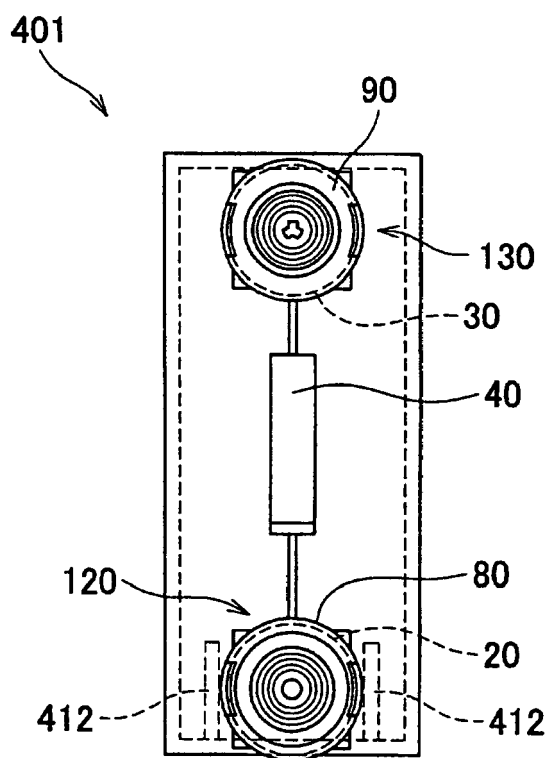


Figure 9





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EUROPEAN SEARCH REPORT

Application Number
EP 06 01 9206

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 May 2007	Examiner Gavaza, Bogdan
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