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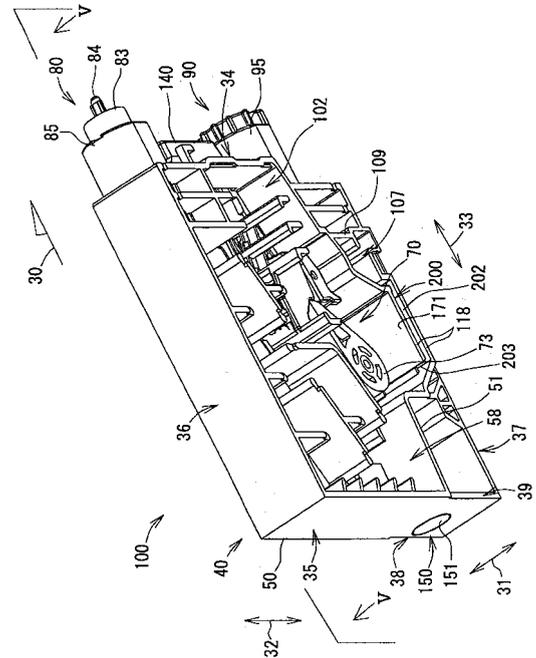
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(54) **Ink cartridges**

(57) In order to prevent increase of bubbles in the neighborhood of an ink supply port when the pressure in an ink chamber is returned to atmospheric air pressure, an ink cartridge (100) has an ink supply valve (90). The ink supply valve (90) is accommodated in a valve accommodating chamber (54) formed at the lower portion of a front wall (34) side of a main body (40). An ink supply chamber (107) is provided at the back side of the valve accommodating chamber (54). The valve accommodating chamber (54) and the ink supply chamber (107) communicates with each other through a hole (110). An ink flow channel (200) is provided so as to extend from the ink supply chamber (107) along the bottom surface (171) of the ink chamber (102). The ink flow channel (200) extends to the back wall (35). A hole (203) for leading ink from the ink chamber (102) to the ink flow channel (200) is formed at one end side in the direction to the back wall.

(FIG.1)



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**Description**

[Technical Field]

**[0001]** The present invention relates to an ink cartridge in which ink is stored.

[Background Art]

**[0002]** An ink-jet printing type image printing device is generally known. An ink cartridge is detachably provided to the image printing device. The ink cartridge has an ink chamber in which ink is stored, an ink supply unit for supplying ink to the outside from the ink chamber, etc. The ink stored in the ink chamber is supplied through the ink supply unit to a printhead equipped to the image printing device.

**[0003]** When ink is filled in the ink chamber of the ink cartridge, gas (bubbles) may exist in the ink supply unit partitioned from the ink chamber.

There is a case where an ink cartridge is put in a packaging bag and sealed under a pressure-reduce state in order to deaerate gas dissolved in ink.

**[0004]** An arm which rotates in accordance with the amount of ink in the ink chamber is provided in the ink chamber of the ink cartridge. One end of the arm is detected by an optical sensor, whereby it is detected whether the amount of ink in the ink chamber is less than a predetermined amount or not.

[Disclosure of the Invention]

[Technical Problem]

**[0005]** The pressure in the ink chamber of an unused ink cartridge is set to be lower than the atmospheric air pressure. Therefore, the pressure in the ink chamber is returned to the atmospheric air pressure before the ink cartridge is used. Under the state that the pressure in the ink chamber is reduced to be less than the atmospheric air pressure, bubbles in the ink expand. Therefore, when the pressure in the ink chamber is returned to the atmospheric air pressure, the bubbles constrict, that is, the volume of the bubbles is reduced. Therefore, in order to compensate the difference in volume between the expansion state and the constriction state, ink and air flow from the ink chamber into the ink supply unit. When the opening of the flow channel through which the ink supply unit and the ink chamber communicate with each other comes into contact with ink, the ink flows into the ink supply unit. When the opening of the flow channel comes into air, the air flows into the ink supply unit.

**[0006]** Furthermore, when the remaining amount of ink in the ink chamber is reduced, one end of the arm approaches to the bottom surface of the ink chamber. At this time, ink is held in the gap formed between the one end of the arm and the bottom surface by the surface tension of the ink. This ink is discarded together with the

ink cartridge without being used.

**[0007]** Therefore, an object of the present invention is to provide an ink cartridge that can prevent increase of air in an ink supply unit when the pressure in an ink chamber is returned to atmospheric air pressure.

**[0008]** Furthermore, another object of the present invention is to provide an ink cartridge that can prevent waste of ink (ink from being needlessly discarded) by finishing up the ink in the ink chamber.

[Means for Resolution]

**[0009]** An ink cartridge having at least a first wall and an ink chamber in which ink is stored is equipped with a first hole formed in the first wall, a first chamber that communicates with the outside through the first hole and is partitioned from the ink chamber, and a flow channel through which the first chamber and the ink chamber communicate with each other, the first chamber communicating with the ink chamber through a second hole of the flow channel. Accordingly, even when the pressure in the ink chamber is set to atmospheric air pressure, increase of bubbles in the first chamber can be prevented.

**[0010]** Furthermore, an ink cartridge having at least bottom wall and having an ink chamber in which ink is stored includes a first hole that is formed in a first wall continuous with the bottom wall and communicates with the outside, a first flow channel through which the ink chamber and the first hole communicate with each other, a float portion which moves between a first position in the neighborhood of the bottom wall and a second position spaced from the bottom wall, and a second hole that is disposed at the opposite side to the first hole of the first flow channel and are disposed in the neighborhood of the float portion located at the first position. Accordingly, ink between the float portion and the bottom surface of the ink chamber can be guided to the flow channel by capillary force of the ink, and thus the remaining amount of ink under an empty state can be reduced.

[Brief Description of the Drawings]

**[0011]**

[Fig. 1] Fig. 1 is a perspective view showing the exterior appearance construction of an ink cartridge 100 according to an embodiment of the present invention.

[Fig. 2] Fig. 2 is a left side view of the ink cartridge 100.

[Fig. 3] Fig. 3 is a right side view of the ink cartridge 100.

[Fig. 4] Fig. 4 is a cross-sectional view of a IV-IV section line in Fig. 3.

[Fig. 5] Fig. 5 is a cross-sectional view of a V-V section line in Fig. 1.

[Fig. 6] Fig. 6 is a schematic diagram showing a

method of setting the pressure in an ink chamber 102 to atmospheric air pressure.

[Detailed Description of Embodiment]

**[0012]** An ink cartridge 100 according to an embodiment of the present invention will be described hereunder with reference to the drawings. The embodiment described below is merely an embodied example of the present invention, and it is needless to say that the embodiment may be properly modified without departing from the subject matter of the present invention.

**[0013]** The ink cartridge 100 is applied to an ink-jet printing type image printing device. As shown in Fig. 1, the ink cartridge 100 is designed in a flattened substantially hexahedral shape. In more detail, the ink cartridge 100 is designed in a substantially rectangular parallelepiped which is narrow in the width direction (the direction of an arrow 31) and longer in the height direction (the direction of an arrow 32) and depth direction (the direction of an arrow 33) than in the width direction. The ink cartridge 100 is inserted in the standing state into a cartridge accommodating portion (not shown) of an image printing device shown in Fig. 1 in a direction indicated by an arrow 30 (hereinafter referred to as "insertion direction 30").

**[0014]** In this embodiment, in the ink cartridge 100, the wall at the front side of the insertion direction 30 is set as a front wall (first wall) 34, the wall at the rear side in the insertion direction 30 is set as a back wall 35, the wall at the upper side in the vertical direction is set as an upper wall 36, and the wall at the lower side in the vertical direction is set as a bottom wall 37 as shown in Fig. 1. Two surfaces which are adjacent to each of the front wall 34, the back wall 35, the upper wall 36 and the bottom wall 37 and face each other are set as side walls 38, 39. When viewed from the back surface 35, the left side is set as a left-side wall 38, and the right-side is set as a right-side wall 39. The pair of these side walls 38 and 39 having the maximum area in the main body 40. In this embodiment, each of the faces 34 to 39 does not represent a specific plane, but it defines the whole face appearing when each of the faces 34 to 39 of the ink cartridge 100 is oriented to the front side.

**[0015]** The ink cartridge 100 is roughly constructed by a main body 40 in which ink is stored, an atmospheric air communication valve 80, an ink supply valve 90 and an arm 70. These elements are mainly formed of resin materials. The present invention is also applicable to an ink cartridge 100 equipped with a case covering substantially the whole of the main body 40, a protector covering the ink supply valve 90, etc., etc.

**[0016]** The main body 40 is equipped with a frame 50 and a film (not shown). A filling channel 158, a bypass 270 and an ink flow channel 200 are formed by the frame 50 and the film. The frame 50 is a member constituting the housing of the ink cartridge 100. The frame 50 forms six faces of the ink cartridge 100. Accordingly, the six faces 34 to 39 of the ink cartridge 100 are coincident with

the six faces of the frame 50. In the following description, the respective faces of the frame 50 are represented by using reference numerals (34 to 39) allocated to the respective surfaces of the ink cartridge 100.

5 **[0017]** The frame 50 is formed of a light-transmissible member, for example, a transparent or translucent resin material. This frame 50 is obtained by conducting injection molding of resin material. Polyacetal, nylon, polyethylene, polypropylene or the like may be used as the resin material. This frame 50 is roughly equipped with plural wall members (the outer peripheral wall 51, the inner wall 52, etc.), a detection unit 140 serving as a site irradiated with light from an optical sensor disposed in the device, a valve accommodating chamber 54, an atmospheric air communication channel 55 and an ink filling section 150.

10 **[0018]** The outer peripheral wall 51 is provided so as to bridge the left-side face 38 of the ink cartridge 100 and the right side face 39 of the ink cartridge 100. The outer peripheral wall 51 is annularly disposed substantially along the front wall 34, the upper wall 36, the back wall 35 and the bottom wall 37 so as to form a space therein.

15 **[0019]** The film is welded to the edge portions of both the side surfaces 38, 39 sides of the frame 50, that is, the edge portions of the side surfaces 38, 39 sides of the outer peripheral wall 51 by a well-known thermal welding method. The openings 57, 58 are closed by the film described above. Accordingly, the space surrounded by the outer peripheral wall 51 and the film is compartmented as the ink chamber 102. Ink is stored in the thus-compartmented ink chamber 102. In this embodiment, the ink chamber 102 is formed by the frame 50 and the film. However, the frame 50 itself may be formed as a rectangular parallelepiped container so that the ink chamber 102 is formed in the container.

20 **[0020]** The ink filling section 150 is provided at the back wall 35 side of the frame 50. Specifically, the ink filling section 150 is disposed at a slightly lower position than the center stage of the back wall 35 of the frame 50. Ink is filled from the ink filling portion 150 into the ink chamber 102. After ink is filled into the ink chamber 102, the ink filling section 150 is hermetically sealed while the pressure in the ink chamber 102 is set to be less than the atmospheric air pressure. Accordingly, the pressure in the ink chamber 102 of the unused ink cartridge 100 is kept to be less than the atmospheric air pressure.

25 **[0021]** A detection unit 140 which projects from the front wall 34 of the frame 50 so as to be away from the ink chamber is provided. The detection unit 140 visually or optically detects the amount of ink stored in the ink chamber 102. The detection unit 140 is formed integrally with the frame 50. Accordingly, the detection unit 140 is formed of transparent or translucent material having light-transmissible property, so that light can be transmitted through the detection unit 140.

30 **[0022]** The detection unit 140 is projected from the center stage of the front wall 34 of the frame 50 so as to be away from the ink chamber so that an internal space continuous with the ink chamber is formed. The detection

unit 140 comprises substantially rectangular five partition walls, and a space 142 (see Fig. 5) surrounded by the partition walls is formed. No wall is provided at the ink chamber 102 side of the detection unit 140, and the space 142 is continuous with the ink chamber 102.

**[0023]** When the ink cartridge 100 is mounted in the image printing device, the detection unit 140 intersects the optical path of an optical sensor such as a photointerruptor or the like which is provided to the image printing device. An area to be irradiated with light of the optical sensor is provided on the side surface of the detection unit 140.

**[0024]** An arm 70 is provided to the ink chamber 102. The arm 70 is formed of a light shielding resin material. The arm 70 is swingably supported by a rib 74 erected at the center of the width direction (the direction of an arrow 31) of the outer peripheral wall 51. A float portion 73 serving as a buoyancy body is provided to one end of the arm 70. The float portion 73 vertically moves in conformity with the ink level in the ink chamber 102. An indicator portion 72 located in the space 142 of the detection unit 140 is provided to the other end of the arm 70.

**[0025]** When the float portion 73 moves vertically in accordance with the amount of ink in the ink chamber 102, the arm 70 is swung around the supporting point thereof, and the indicator portion 72 moves vertically in the space 142 of the detection unit 140 in accordance with the swing operation concerned. Specifically, the indicator portion 72 moves from a first position located in an area irradiated with light of the optical sensor to a second position located out of the light-irradiated area. The vertically moving indicator portion 72 is detected by the optical sensor through the detection unit 140, whereby it is judged whether the amount of ink is less than a predetermined amount or not.

**[0026]** As shown in Fig. 5, a cylindrical atmospheric air communication channel 55 is provided in the neighborhood of the upper end at the front wall 34 side of the frame 50, in other words, above the detection unit 140. The atmospheric air communication channel 55 is continuously formed from an opening (not shown) formed in the front wall 34 to the ink chamber 102 side. This atmospheric air communication channel 55 is partitioned from the ink chamber 102 by a substantially cylindrical side wall 120. The atmospheric air communication channel 55 communicates with the ink chamber 102.

**[0027]** The atmospheric air communication valve 80 is constructed as a valve mechanism for opening or closing the atmospheric air communication channel extending from the opening (not shown) formed in the front wall 34 to the ink chamber 102 side. For example, the atmospheric air communication valve 80 is constructed by a valve main body 87 which is slidably supported in the atmospheric air communication channel 55, a seal member 83 provided to the peripheral edge of the opening, a cap 85 for fixing the seal member 83, a spring 86 for urging the valve main body 87 to the seal member 83 side, a rod 84 joined to the valve main body 87, etc. The

cap 85 and the seal member 83 are provided with through holes (not shown). These through holes form an atmospheric air communication port 81 through which the atmospheric air communication channel 55 and the outside communicate with each other. The rod 84 is inserted into the atmospheric air communication port 81 so as to project to the outside. Under the state that no external force is applied to the rod 84, the valve main body 87 is brought into contact with the seal member 83 by a spring 86, and thus the valve main body 87 is located at a closing position. On the other hand, when the rod 84 is pressed from the external against the press force of the spring, the valve main body 87 is separated from the seal member 83, and the valve main body 87 moves to an open position, so that's the atmospheric air communication port 81 is opened.

**[0028]** As shown in Fig. 5, a cylindrical valve accommodating chamber 54 and an ink supply chamber 107 are provided at the lower portion of the front wall 34 side of the frame 50, in other words, below the detection unit 140. The valve accommodating chamber 54 and the ink supply chamber 107 are disposed in juxtaposition with each other in the depth direction (the right-and-left direction of Fig. 5) of the ink cartridge 100. The valve accommodating chamber 54 is disposed at the front wall 34 side, and the ink supply chamber 107 is disposed in the valve accommodating chamber 54. The valve accommodating chamber 54 and the ink supply chamber 107 are partitioned by a partition wall 109 constituting a part of the outer peripheral wall 51. A hole 110 is formed in the partition wall 109. The ink supply chamber 107 and the valve accommodating chamber 54 communicate with each other through the hole 110.

**[0029]** The valve accommodating chamber (first chamber) 54 is partitioned from the ink chamber 102 by a substantially cylindrical side wall 130. The valve accommodating chamber 54 communicates with the ink chamber 102 through the ink supply chamber 107 and an ink flow channel 200.

**[0030]** The ink supply valve 90 is accommodated in the valve accommodating chamber 54. The ink supply valve 90 is a valve mechanism for opening/closing the ink flow channel extending from the opening (not shown) formed in the front wall 34 to the ink chamber 102. The ink supply valve 90 is constructed by a valve main body 97 supported slidably in the ink supply chamber 107, a seal member 93 provided to the peripheral edge of the opening, a cap 95 for fixing the seal member 93, a spring 86 for urging the valve main body 97 to the seal member 93 side, a control valve 99, etc., for example. Through holes (not shown) are formed in the cap 95 and the seal member 93, and these through holes form an ink supply port (first hole) 91 through which the valve accommodating chamber 54 and the outside communicate with each other. Under the state that no external force is applied to the valve main body 97, the valve main body 97 is brought into contact with the seal member 93 by a spring 96 to close the ink supply port 91. On the other hand, a tubular

ink needle is inserted into the ink supply port 91, and the valve main body 97 separates from the seal member 93 against the press force of the spring 86 and moves to an open position, so that the ink supply port 91 is opened. When the tubular ink needle is inserted into the ink supply port 91, the valve accommodating chamber 54 communicates with the inner hole of the ink needle, whereby ink can be supplied to a printhead of an image printing device.

**[0031]** The control valve 99 controls the flow-in/out of ink passing through the hole 110. The provision of the control valve 99 prevents rapid counter flow of ink from the valve accommodating chamber 54 through the hole 110 to the ink chamber 102 side.

**[0032]** As shown in Fig. 2, a hole 272 is formed in the side wall 130 which partitions the valve accommodating chamber 54. The hole 272 is formed at the left-side face 38 side of the side wall 130. This hole 272 penetrates through the side wall 130 into the valve accommodating chamber 54. One end of a bypass 270 is connected to the hole 272.

**[0033]** The ink supply chamber 107 (second chamber) is partitioned by a partition wall 112, a partition wall 109, a bottom wall 118 forming a bottom surface 171 corresponding to the lowest surface of the ink chamber 102, and a film covering both the side surfaces 38, 39 of the frame 50. Specifically, the film is welded to the partition wall 112, the partition wall 109 and the edge portions at both the side surface 38, 39 sides of the bottom wall 118, and a space surrounded by these walls is constructed as the ink supply chamber 107. The volume of the ink supply chamber 107 is smaller than the valve accommodating chamber 54. Each of the partition wall 112, the partition wall 109 and the bottom wall 118 constitutes a part of the outer peripheral wall 51.

**[0034]** The partition wall 112 is provided so as to surround the hole 110. In detail, it is designed in a substantially semi-arch shape around the joint portion between the partition wall 109 and the bottom wall 118, and one end thereof is joined to the partition wall 109 while the other end thereof is joined to the bottom wall 118.

**[0035]** As shown in Fig. 3, a hole 111 (third hole) is formed in the bottom surface 113 of the ink supply chamber 107. The hole 111 is formed at the right-side surface 39 side of the bottom surface 113. The ink flow channel 200 extends from the hole 111 in the depth direction of the frame 50.

**[0036]** The ink flow channel 200 is constructed as a flow channel partitioned from the ink chamber 102. The ink flow channel 200 is provided below the bottom surface 171 of the ink chamber 102. The ink flow channel 200 is partitioned by a groove 202 formed at the edge portion of the right-side surface 39 side of the bottom wall 118 and the film welded to the edge portion at the right-side surface 39 side of the frame 50.

**[0037]** The end portion of the ink flow channel 200 reaches the back wall 35 side of the bottom wall 118. A hole 203 (second hole) penetrating from the ink flow

channel 200 into the ink chamber 102 is formed at the extension end of the ink flow channel 200. Ink flows in/out through the hole 203 between the ink chamber 102 and the ink flow channel 200. As shown in Figs. 3 and 4, the hole 203 is disposed in the neighborhood of the lower side of the float portion 73 (in the neighborhood of a site surrounded by a broken line of Fig. 4) moving to the position (first position) at which it comes into contact with the bottom surface 171.

**[0038]** The ink flow channel 200 is provided, and thus the ink chamber 102 and the valve accommodating chamber 54 communicate with each other through the hole 203, the ink flow channel 200, the hole 211, the ink supply chamber 107 and the hole 110. That is, ink can flow through the respective sections between the ink chamber 102 and the valve accommodating chamber 54.

**[0039]** Next, the constructions of the ink filling portion 150 and its surrounding will be described in detail. The ink filling portion 150 is disposed at a slightly lower position than the center stage of the back wall 35 of the frame 50. The ink filling portion 150 is formed integrally with the frame 50.

**[0040]** As shown in Fig. 2, the ink filling portion 150 is equipped with a cylinder portion 152. The cylinder portion 152 is formed continuously from an opening 151 formed in the back wall 35 to the ink chamber 102 side. The back portion of the cylinder portion 152 is constructed by the outer peripheral wall 51. Ink is filled from the opening 151 of the cylinder portion 152 in the cylinder portion 152.

**[0041]** A hole 153 is formed in the side wall at the left-side surface 38 side of the cylinder portion 152. The hole 153 penetrates through the side wall of the cylinder portion 152. This hole 153 is provided to make the cylinder portion 152 and the ink chamber 170 communicate with each other.

**[0042]** The filling channel 158 is connected to the hole 153. As shown in Fig. 2, the filling channel 158 is formed at the left-side surface 38 side of the frame 50. The filling channel 158 is constructed as an ink flow channel partitioned from the ink chamber 102. The filling channel 158 is provided so as to extend downwardly from the side of the hole 153 of the cylinder portion 152 to the bottom wall 37 side of the frame 50 and further extend to the front wall 34 side in parallel to the bottom wall 37 of the frame 50 below the ink flow channel 200. The terminal of the filling channel 158 is connected to a hole 157 formed at the lower side of the ink supply chamber 107. As shown in Figs. 2 and 3, the hole 157 is formed so as to extend from the left-side surface 38 of the frame 50 to the right-side surface 39, and communicates with the ink supply chamber 107 at the right-side surface 39 side. That is, the ink filling portion 150 and the ink supply chamber 107 are connected to each other through the filling channel 158.

**[0043]** A bypass 270 is formed at the left-side surface 38 side of the frame 50. This bypass 270 is constructed as an ink flow channel different from the filling channel 158 and the ink flow channel 200. A hole 275 is formed

in the partition wall 161 forming the back surface of the cylinder portion 152. The bypass 270 is provided so as to extend downwardly from the hole 275 to the bottom surface 171 side of the ink chamber 102 and further extend to the front wall 34 side substantially in parallel to the bottom wall 37 of the frame 50. The end portion at the front wall 34 side of the bypass 270 is connected to a hole 272 formed in the side wall 130 of the valve accommodating chamber 54. That is, the bypass 270 communicates with the valve accommodating chamber 54 through the hole 272.

**[0044]** The bypass 270 is partitioned by a groove 277 formed at the edge portion of the left-side surface 38 side of the outer peripheral wall 51 (containing the bottom wall 118) in the neighbor of the bottom surface 171 and the film welded to the edge portion at the left-side surface 38 side of the frame 50.

**[0045]** As described above, the ink cartridge 100 is provided with the filling channel 158, the ink flow channel 200 and the bypass 270. Therefore, ink filled from the opening 151 is branched to a passage passing through the filling channel 158 (see an arrow 46 of Fig. 2) and a passage passing through the bypass 270 and the valve accommodating chamber 54 (see an arrow 49 of Fig. 2), and then led to the ink chamber 102.

**[0046]** In detail, when ink is filled from the opening 151 under the state that the ink supply port 91 is closed, the filled ink flows from the inside of the cylinder portion 152 into each of the hole 153 and the hole 275 as indicated by the arrow 46. The ink passing through the hole 153 flows into the filling channel 158, passes through the filling channel 158 while led to the front wall 34 side, and reaches the hole 157 as indicated by the arrow 46. Then, the ink shifts from the hole 157 to the right-side surface 39 side, passes through the ink supply chamber 107 and the ink flow channel 200 and flows into the ink chamber 102.

**[0047]** On the other hand, as indicated by the arrow 49, the ink passing through the hole 275 passes through the bypass 270 and is led to the front wall 34 side. Then, the ink passes from the terminal of the bypass 270 through the hole 272 into the valve accommodating chamber 54. The ink in the valve accommodating chamber 54 flows from the hole 110 into the ink supply chamber 107, passes through the ink flow channel 200 and flows into the ink chamber 102.

**[0048]** A hole 203 is formed in the neighborhood of the contact site (the site surrounded by a broken line of Fig. 4) between the float portion 73 of the arm 70 and the bottom surface 171.

Therefore, even if ink is held in the gap between the lower end of the float portion 73 and the bottom surface 171 by the surface tension of the ink, the ink held in the gap is attracted to the ink flow channel 200 by the capillary force. Accordingly, the ink in the ink chamber 102 can be finished up till the last.

**[0049]** When the unused ink cartridge 100 constructed as described above is mounted in the image printing de-

vice, the pressure in the ink chamber 102 is returned to the atmospheric air pressure by the following method (internal pressure adjusting method). That is, the front surface 34 provided with the atmospheric air communication valve 80 is first placed face up as shown in Fig. 6. At this time, ink in the ink chamber 102 is collected at the back surface 35 side, and air in the ink chamber 102 is collected at the front surface 34 side. Furthermore, the hole 203 provided to the terminal of the ink flow channel 200 is immersed in the ink. Thereafter, the rod 84 of the atmospheric air communication valve 80 is pushed into the ink chamber 102 side, whereby the atmospheric air communication port 81 is opened and air intrudes through the atmospheric air communication port 81 into the ink chamber 102, so that the pressure in the ink chamber 102 is set to the atmospheric air pressure.

**[0050]** In a case where air intrudes as bubbles in the ink flow channel 200, the bubbles expanding under the pressure-reduced state are constricted when the pressure in the ink chamber 102 is set to the atmospheric air pressure. At this time, in order to compensate for the difference in volume between the expansion state of the bubbles and the constriction state of the bubbles, fluid (ink or air) in the ink chamber 102 passes through the hole 203 and intrudes into the ink flow channel 200. As described above, the terminal of the ink flow channel 200 reaches the end portion at the back surface 35 side of the bottom wall 118, and the hole 203 is provided to the terminal. The hole 203 is immersed in the ink at all times except for the case where the amount of ink in the ink chamber 102 is extremely small. Therefore, ink flows into the ink flow channel 200 through the hole 203 (see an arrow 44 of Fig. 3). Conversely, no air intrudes from the hole 203 into the ink flow channel 200. Accordingly, even when the pressure in the ink chamber 102 is set to the atmospheric air pressure, increase of air in the neighborhood of the ink supply port 91 can be prevented.

**[0051]** Furthermore, the hole 203 is formed in the neighborhood of the contact site (the site surrounded by the broken line of Fig. 4) between the float portion 73 of the arm 70 and the bottom surface 171, and thus even when ink is held in the gap between the lower end of the float portion 73 and the bottom surface 171 by the surface tension of the ink, the ink held in the gap is attracted to the ink flow channel 200 by the stream of the ink exiting from the hole 203 to the ink flow channel 200. Accordingly, the ink in the ink chamber 102 can be finished up till the last.

## Claims

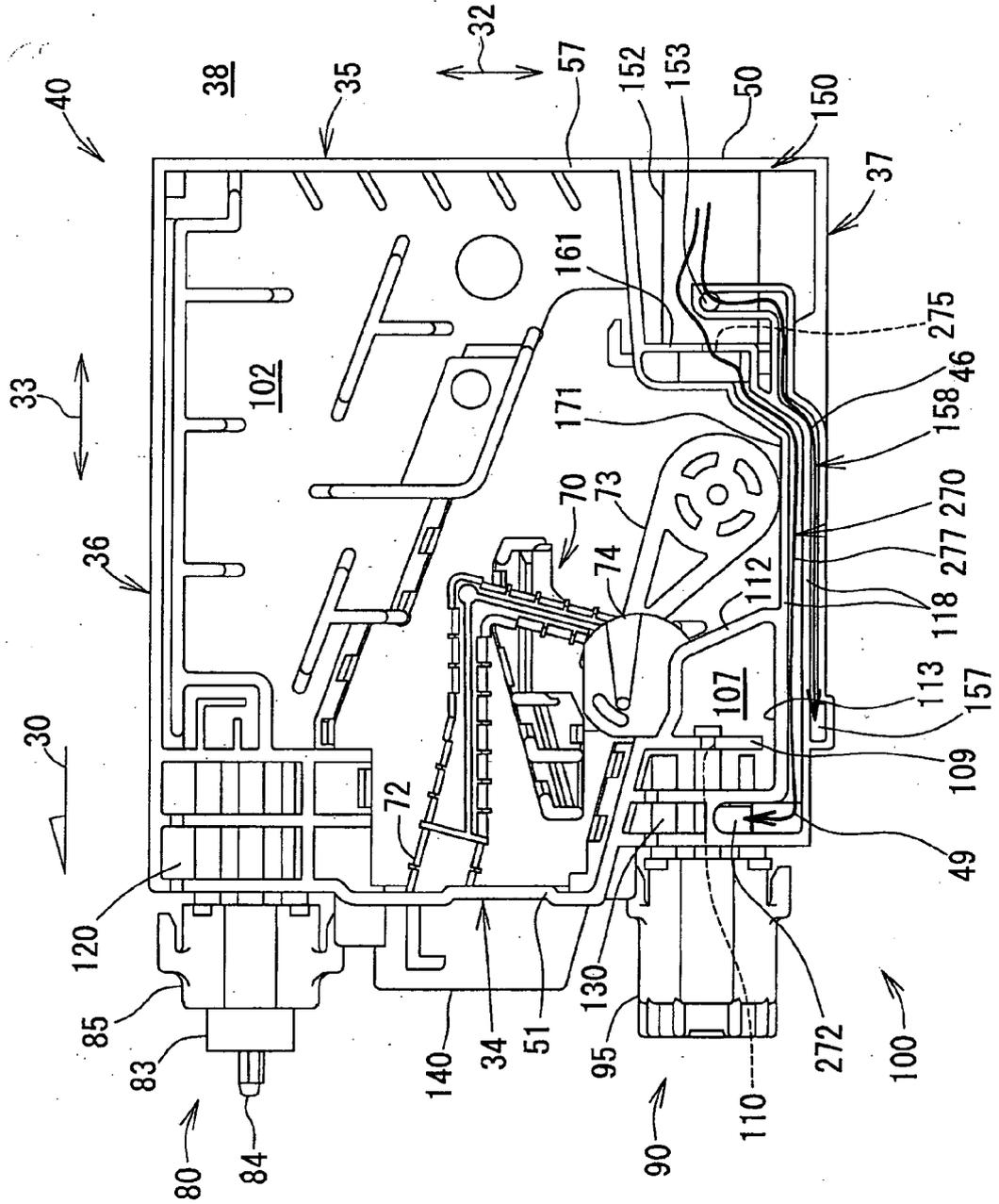
1. An ink cartridge having at least a first wall and an ink chamber in which ink is stored, comprising:

a first hole formed in the first wall;  
a first chamber that communicates with an outside through the first hole, and is partitioned from

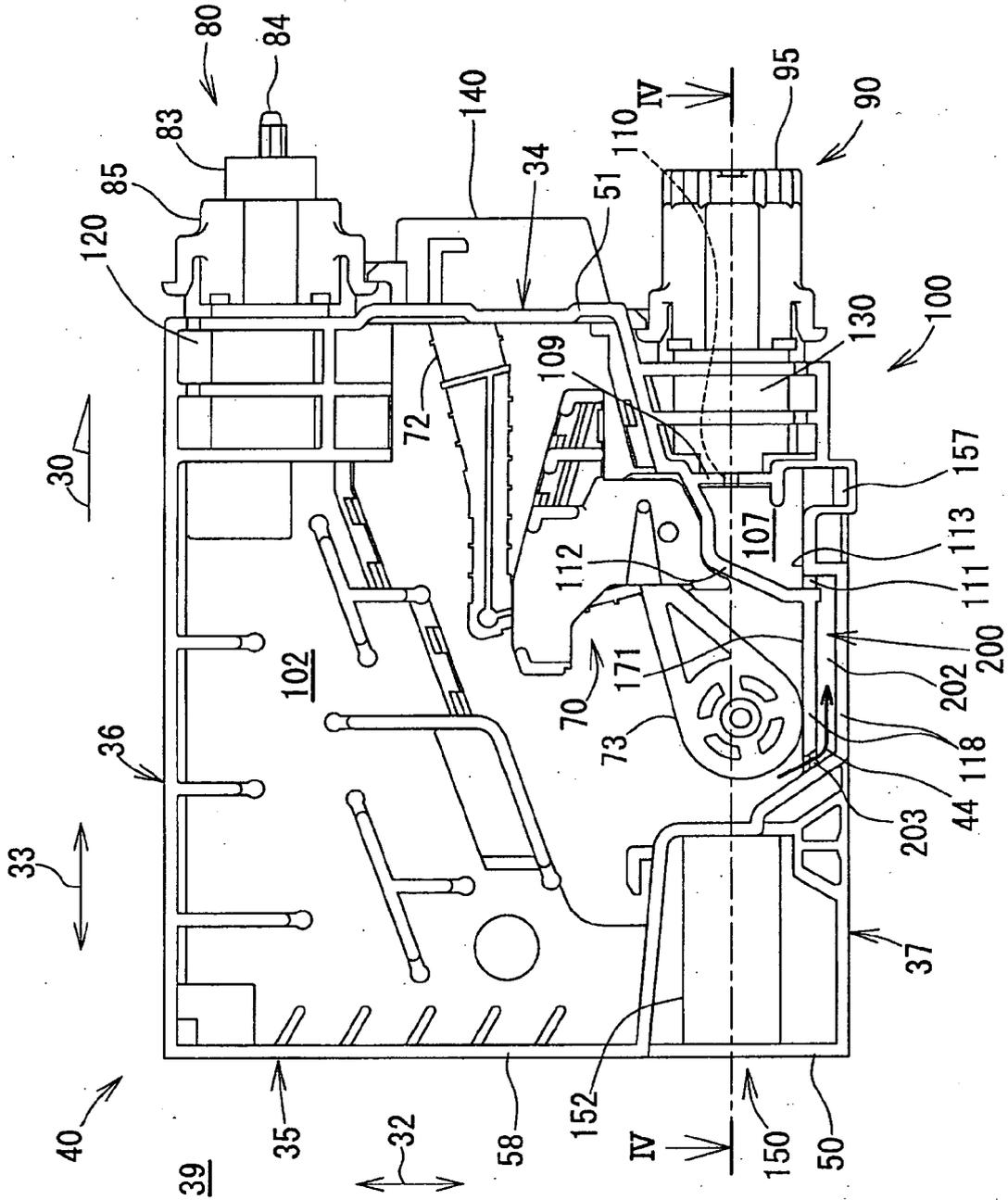
- the ink chamber; and  
a flow channel through which the first chamber and the ink chamber communicate with each other, the first chamber communicating with the ink chamber through a second hole of the flow channel.
2. The ink cartridge according to claim 1, wherein the second hole is an opening formed in the bottom surface of the ink chamber.
  3. The ink cartridge according to claim 1 or 2, wherein the second hole is disposed at the lowest position of a bottom wall of the ink chamber.
  4. The ink cartridge according to any one of claims 1 to 3, wherein the flow channel is formed by a groove formed in a second wall connected to one end of the first wall, and a film welded to the groove.
  5. The ink cartridge according to any one of claims 1 to 4, wherein a second chamber partitioned from the ink chamber and the first chamber is disposed between the first chamber and the flow channel.
  6. The ink cartridge according to claim 5, wherein a third hole is formed in a bottom wall of the second chamber, and the third hole and the flow channel communicate with each other.
  7. The ink cartridge according to any one of claims 1 to 6, wherein the first chamber contains a valve that is movable between a first position at which the hole is closed and a second position at which the hole is opened, and an elastic member for pressing the valve to the first position.
  8. The ink cartridge according to any one of claims 1 to 7, wherein the first hole is located in the neighborhood of the lower end of the first wall under the state that the ink cartridge is mounted in a printing device, and a portion to be irradiated with light is disposed above the hole concerned.
  9. The ink cartridge according to claim 8, further comprising a float portion moving in accordance with the amount of ink, and a rotating member that has one end disposed at the opposite side to the float portion and is rotatable around a supporting point between the float portion and the one end portion, wherein the one end of the rotating member is disposed at the portion to be irradiated with the light.
  10. The ink cartridge according to any one of claims 1 to 9, wherein the flow channel extends from the first chamber to the neighborhood of the float portion.
  11. The ink cartridge according to any one of claims 1 to 10, further comprising an ink filling portion for filling ink into the ink chamber, and a second flow channel for leading the ink filled from the ink filling portion to the second chamber.
  12. The ink cartridge according to any one of claims 1 to 11, further comprising a third flow channel for leading to the first chamber the ink which is filled from the ink filling portion to fill the ink into the ink chamber.
  13. an ink cartridge having at least bottom wall and having an ink chamber in which ink is stored includes a first hole that is formed in a first wall continuous with the bottom wall and communicates with the outside, a first flow channel through which the ink chamber and the first hole communicate with each other, a float portion which moves between a first position in the neighborhood of the bottom wall and a second position spaced from the bottom wall, and a second hole that is disposed at the opposite side to the first hole of the first flow channel and are disposed in the neighborhood of the float portion located at the first position.
  14. The ink cartridge according to claim 13, further comprising an arm member provided rotatably in the ink chamber, wherein the float portion is provided to a first end of the arm member.
  15. The ink cartridge according to claim 13 or 14, wherein a portion that has a space continuous with the ink chamber and is irradiated with light is provided above the first hole in the first wall, and a second end of the arm member moves the light-irradiated portion.
  16. The ink cartridge according to any one of claims 13 to 15, further comprising an ink filling portion for filling ink into the ink chamber, and a second flow channel for leading the ink filled from the ink filling portion to the neighborhood of the second hole.
  17. The ink cartridge according to claim 16, wherein the second flow channel communicates from the ink filling portion with the first flow channel.



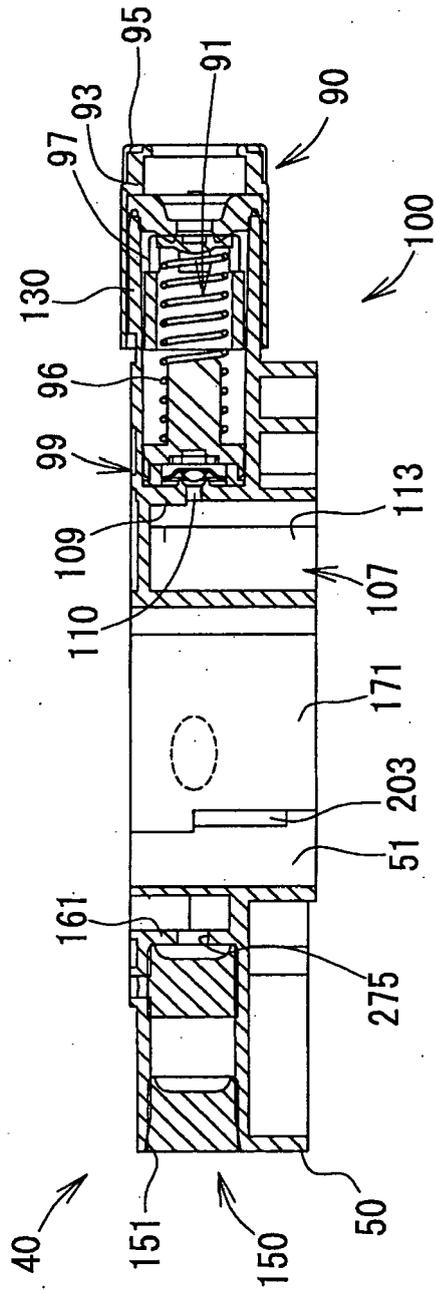
(FIG.2)



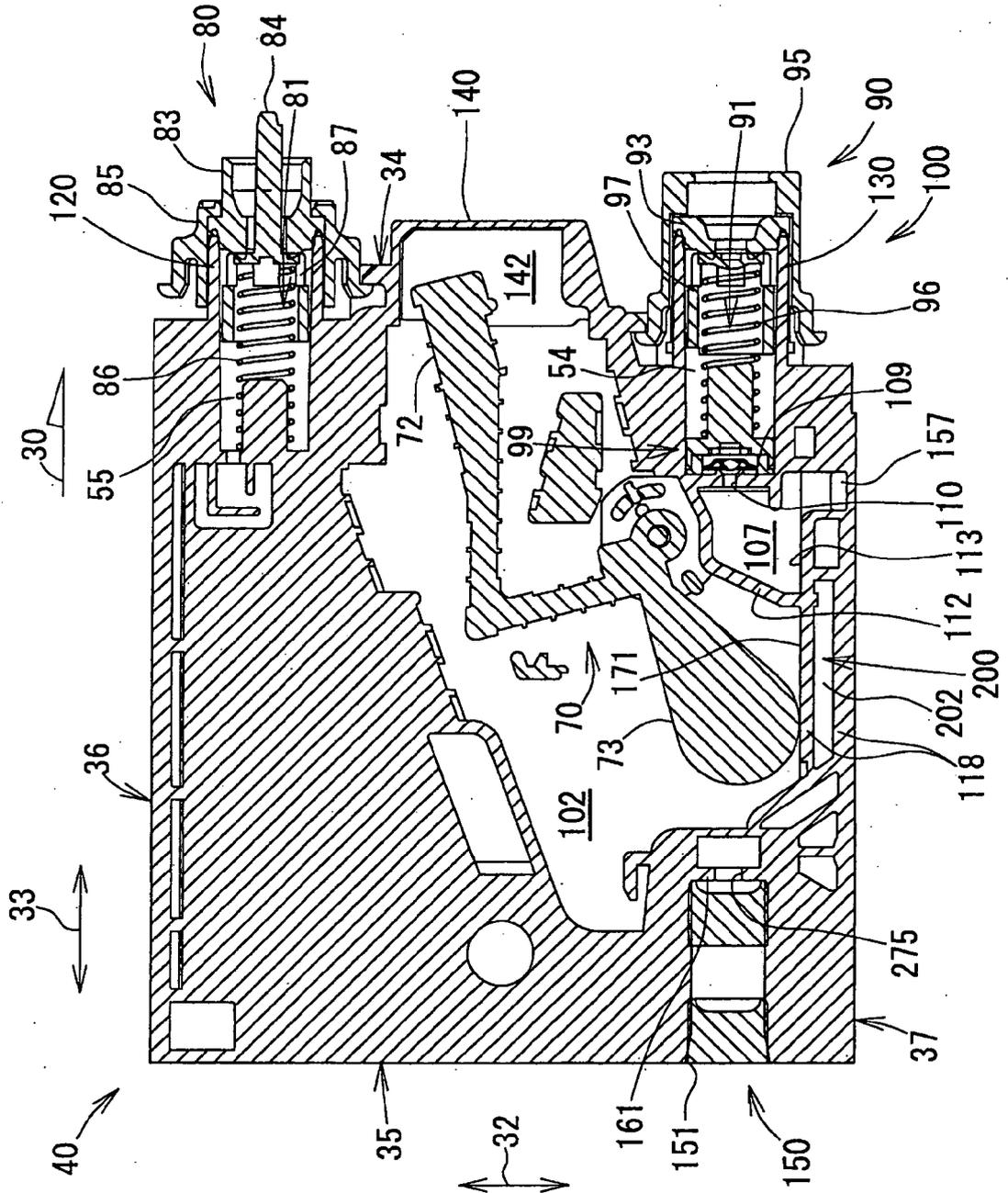
(FIG.3)



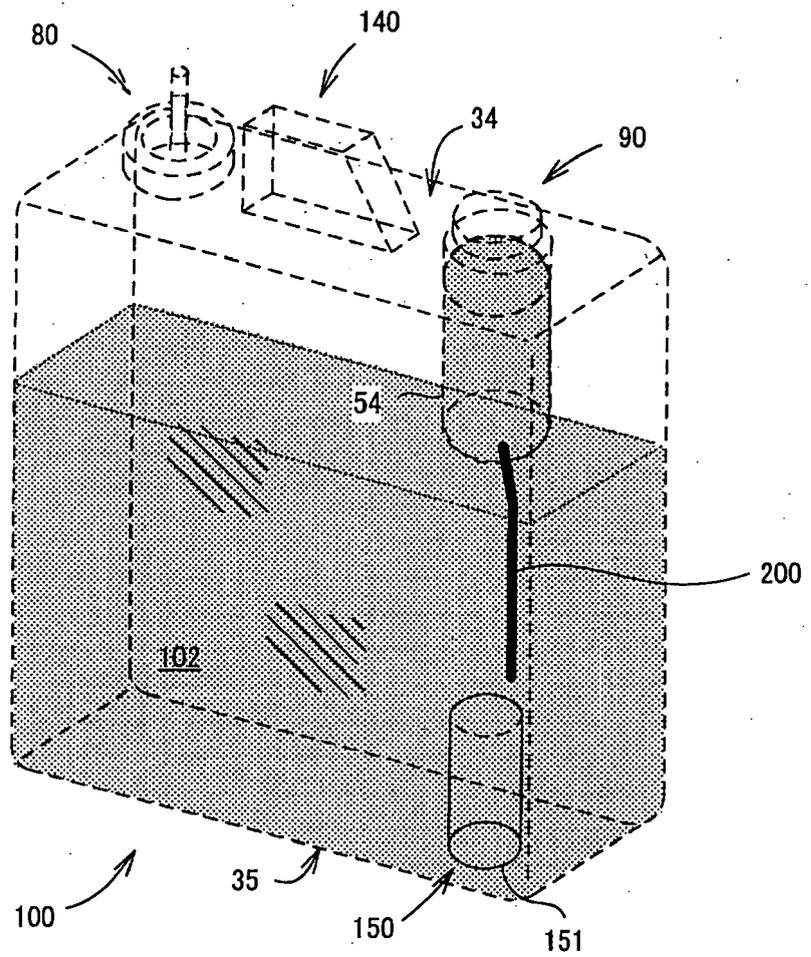
(FIG.4)



(FIG.5)



(FIG.6)





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