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Liquid container and liquid discharge apparatus

Abstract

There is provided a liquid container including: a pouch and a case. The pouch includes a flexible bag and a spout with a first opening. The case includes a tank to store a liquid flowed through the second opening. The spout is fitted into the case, and the bag is positioned in the tank.

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Background/Summary

REFERENCE TO RELATED APPLICATIONS

(1) This application claims priority from Japanese Patent Application No. 2022-057865 filed on Mar. 31, 2022. The entire content of the priority application is incorporated herein by reference.

BACKGROUND ART

(2) In an image recording apparatus of ink jet type, for example, it is possible to replace the cartridge containing an ink for refill with the ink. A publicly known liquid container is provided in

a casing where a new ink is containable, the liquid container being expandable to receive waste ink.
DESCRIPTION
(3) In an image recording apparatus, waste ink is produced, for example, in a purge process. The purge process serves to cause the ink to flow out of the nozzles by a positive pressure or negative pressure, in order to eliminate foreign substances and the like from the nozzles of a head. The purge process using the negative pressure may often bring air mixed into the waste ink. Therefore, because the waste ink and air will flow into the liquid container, the liquid container cannot be completely fulfilled with the waste ink, so as to bring about a problem of decreasing the storable amount of the waste ink.
(4) The present disclosure is conceived in view of the above situation, and an object thereof is to provide a liquid container capable of containing liquid effectively in a pouch and a tank.
(5) According to an aspect of the present disclosure, there is provided a liquid container including: a pouch and a case. The pouch includes a flexible bag and a spout with a first opening. The case includes a tank configured to store a liquid flowed through the second opening. The spout is fitted into the case, and the bag is positioned in the tank.
(6) The liquid flowing in via the second opening is stored in the tank. The liquid having filled the bag of the pouch is positioned in the tank separately from the liquid stored in the tank.

Description

(1) FIG. **1** is a perspective view of an outer appearance of an image recording apparatus **100** according to an embodiment of the present disclosure.
(2) FIG. **2** is a cross section view depicting the cross section II-II of FIG. **1**.
(3) FIG. **3** is a perspective view of a maintenance mechanism **60**.
(4) FIG. **4** is a cross section view depicting the cross section II-II of FIG. **1**, and depicting a state where a first support mechanism **51** is in a second rotating position and the maintenance mechanism **60** is in a standby position.
(5) FIG. **5** is a cross section view depicting the cross section II-II of FIG. **1**, and depicting a state where the first support mechanism **51** is in a first rotating position and the maintenance mechanism **60** is in a maintenance position.
(6) FIG. **6** is a perspective view of a liquid cleaner tank **76**.
(7) FIG. **7** is another perspective view of the liquid cleaner tank **76**.
(8) FIG. **8** is a back side view of the liquid cleaner tank **76**.
(9) FIG. **9** is a perspective view depicting a case body **77** and a film **79**.
(10) FIG. **10** is another perspective view depicting the case body **77**.
(11) FIG. **11** is a partial cross section view depicting the cross section XI-XI of FIG. **8**.
(12) FIG. **12** is a perspective view of a pouch **90**.
(13) FIG. **13** is a perspective view of a cartridge installation unit **110**.
(14) An embodiment of the present disclosure will be explained below. Note that, needless to say, this embodiment presents merely one aspect of the present disclosure, and can undergo changes and modifications without departing from the true spirit and scope of the present disclosure. Further, in the following explanation, an up-down direction is defined on such a reference as with an image recording apparatus **100** being placed in a usable condition (the state of FIG. **1**), a front-rear direction is defined regarding the side where a discharge port **33** is provided as the near side (or the front side), and a left-right direction is defined when the image recording apparatus **100** is viewed from the near side (the front side).
(15) <Outer Appearance Configuration of the Image Recording Apparatus **100**>
(16) The image recording apparatus **100** (an example of the liquid discharge apparatus) depicted in FIG. **1** is configured to record an image on a sheet S of a roll **37** (see FIG. **2**) by an ink jet recording

method.
(17) As depicted in FIG. **1**, the image recording apparatus **100** includes a casing **30**. The casing **30** includes an upper casing **31** and a lower casing **32**. The upper casing **31** and the lower casing **32** are shaped into an approximate cuboid as a whole, and sized as disposable on a desk. That is, the image recording apparatus **100** is suitable to be placed on a desk for use. Of course, the image recording apparatus **100** may also be placed on a floor or rack for use. Note that in the casing **30**, a frame may be provided appropriately for supporting every member.
(18) As depicted in FIG. **2**, the upper casing **31** is supported by the lower casing **32** in a rotatable manner. The upper casing **31** is rotatable between an opened position and a closed position as depicted in FIG. **2** about a rotating shaft **15** provided at the lower end at the rear side to extend in the left-right direction. Note that the upper casing **31** is not limited to the configuration of rotating on the rotating shaft **15** but may be rotated on a hinge or the like, for example.
(19) As depicted in FIG. **2**, when the upper casing **31** is in the closed position, an internal space **31**A of the upper casing **31** and an internal space **32**A of the lower casing **32** are unexposed to the outside. When the upper casing **31** is in the opened position, the internal space **31**A of the upper casing **31** and the internal space **32**A of the lower casing **32** are exposed to the outside.
(20) As depicted in FIG. **1**, a front surface **32**F of the lower casing **32** is formed with the slit-like discharge port **33** elongated in the left-right direction. The sheet S (see FIG. **2**) finished with image recording is discharged from the discharge port **33**.
(21) A front surface **31**F of the upper casing **31** is provided with an operation panel **44**. A user can use the operation panel **44** for inputs in order to operate the image recording apparatus **100** and determine various settings.
(22) As depicted in FIG. **1**, a front cover **39** is positioned in the front surface **32**F of the lower casing **32**. The front cover **39** can let its upper end fall frontward to open about an unshown rotating shaft extending along the left-right direction in the vicinity of its lower end. The front cover **39** is opened and closed to expose and shield a cartridge installation unit **110** and the like (see FIG. **2**) positioned in the internal space **32**A of the lower casing **32**.
(23) <Internal Configuration of the Image Recording Apparatus **100**>
(24) As depicted in FIG. **2**, in the internal spaces **31**A and **32**A, there are arranged a holder **35**, a tensioner **45**, a conveyance roller pair **36**, a conveyance roller pair **40**, a head unit **38**, a first support mechanism **51**, a second support mechanism **52**, an ink tank **34**, a liquid cleaner tank **76**, a maintenance mechanism **60**, and the like.
(25) Note that, without illustration, a fixation unit, an image sensor, a cutter, and the like are positioned in the internal space **32**A at the downstream side of the head unit **38** in a conveyance direction. The fixation unit is a heater or an ultraviolet radiator to fix the ink on the sheet S. If the fixation unit is a heater, then the ink contains a resin to form a film on the sheet S by heat. If the fixation unit is an ultraviolet radiator, then the ink contains a resin to be cured by ultraviolet radiation. The image sensor optically reads out the image recorded on the sheet S and outputs an image data to a controller **130** to express the readout result. The cutter serves to cut the sheet S finished with image recording.
(26) A partition wall **41** is provided in the internal space **32**A. The partition wall **41** partitions a rear lower part of the lower casing **32** to define the sheet accommodation space **32**C. The sheet accommodation space **32**C is enclosed by the partition wall **41** and the lower casing **32** to become a space secluded from the head unit **38** and the like.
(27) The roll **37** is accommodated in the sheet accommodation space **32**C. The roll **37** has a core pipe and the elongate sheet S. The sheet S is rolled around the core pipe into a roll shape in a circumferential direction of the axial core of the core pipe. The sheet S may be as wide as from the minimum width to the maximum width at which the image recording apparatus **100** can record images. That is, the sheet accommodation space **32**C can accommodate the roll **37** of a plurality of types with different widths. Note that the roll **37** may not have a core pipe such that the sheet S

may be rolled on the holder **35** in a removable manner into a roll shape. Further, the sheet accommodation space **32**C may also accommodate fanfold paper. As depicted in FIG. **1**, a right cover **35**A is positioned in a right surface **32**R of the lower casing **32**. The right cover **35**A is opened and closed to expose and shield the holder **35** and the like positioned in the sheet accommodation space **32**C.

(28) As depicted in FIG. **2**, the sheet accommodation space **32**C is open upward at the rear side. In detail, an interspace **42** is formed between the partition wall **41** and a rear surface **32**B, that is, in an upper part at the rear side of the roll **37**. The conveyance roller pairs **36** and **40** rotate to pull out the sheet S upward from the rear end of the roll **37** and guide the same to a tensioner **45** via the interspace **42**.

(29) The tensioner **45** is positioned above the partition wall **41** in a rear part of the internal space **32**A. The tensioner **45** has an outer circumference **45**A facing the outside of the lower casing **32**. The outer circumference **45**A is sized to be larger than the maximum width of the sheet in the left-right direction, and shaped symmetrically to the center of paper passage (the center of the sheet S in the left-right direction). The upper end of the outer circumference **45**A is positioned at almost the same vertical level as a nip D of the conveyance roller pair **36** in the up-down direction.

(30) The sheet S pulled out from the roll **37** is brought on in contact with the outer circumference **45**A. The sheet S is curved frontward along the outer circumference **45**A, extending in a conveyance direction to be guided to the conveyance roller pair **36**. The conveyance direction is a frontward orientation along the front-rear direction. The tensioner **45** applies a tension to the sheet S by a publicly known method.

(31) The conveyance roller pair **36** is positioned in front of the tensioner **45**. The conveyance roller pair **36** has a conveyance roller **36**A and a pinch roller **36**B. The conveyance roller **36**A is in contact with the pinch roller **36**B at almost the same vertical level as the upper end of the outer circumference **45**A.

(32) The conveyance roller pair **40** is positioned in front of the conveyance roller pair **36**. The conveyance roller pair **40** has a conveyance roller **40**A and a pinch roller **40**B. The conveyance roller **40**A is in contact with the pinch roller **40**B at almost the same vertical level as the upper end of the outer circumference **45**A.

(33) A driving force is transmitted from an unshown motor to the conveyance rollers **36**A and **40**A to rotate the same. The conveyance roller pair **36** in rotation nips the sheet S extending from the tensioner **45** in the conveyance direction to send out the same in the conveyance direction along a conveyance surface **43**A. The conveyance roller pair **40** in rotation nips the sheet S sent out from the conveyance roller pair **36** to send out the same in the conveyance direction. Further, the conveyance roller pairs **36** and **40** rotate to pull out the sheet S toward the tensioner **45** through the interspace **42** from the sheet accommodation space **32**C.

(34) As depicted in FIG. **2**, a conveyance path **43** is formed in the internal space **32**A from the upper end of the outer circumference **45**A to the discharge port **33**. The conveyance path **43** is a space through which the sheet S is passable, extending almost linearly along the conveyance direction. In detail, the conveyance path **43** expands in the conveyance direction and the left-right direction and along the long conveyance surface **43**A in the conveyance direction. Note that in FIG. **2**, the conveyance surface **43**A is depicted with a two-dot chain line in depicting the conveyance path **43**. The conveyance path **43** is defined by guide members (not shown) positioned apart from each other in the up-down direction, the head unit **38**, a conveyance belt **101**, and the like.

(35) The head unit **38** is positioned downstream from the conveyance roller pair **36** in the conveyance direction and above the conveyance path **43**. The head unit **38** has a head module **49** having a plurality of nozzles **38**A. From the plurality of nozzles **38**A, an ink is discharged downward toward the sheet S supported by a conveyance belt **101**. By virtue of this, image is recorded on the sheet S.

(36) The first support mechanism **51** is positioned below the conveyance path **43** at the downstream

side of the conveyance roller pair **36** in the conveyance direction. The first support mechanism **51** faces the head unit **38** from below the head unit **38**. The first support mechanism **51** has the conveyance belt **101** and a supporter **104**. The conveyance belt **101** supports the sheet S positioned right below the head unit **38** and conveyed by the conveyance roller pair **36** in the conveyance direction. The conveyance belt **101** conveys the supported sheet S in the conveyance direction. The supporter **104** can support the maintenance mechanism **60**.

(37) The second support mechanism **52** is positioned below the conveyance roller pair **40** and fixed inside the lower casing **32** by being supported by the lower casing **32**. The second support mechanism **52** can support the maintenance mechanism **60**.

(38) The ink tank **34** stores the ink. The ink is a liquid containing a pigment and the like. The ink has a viscosity suitable for uniform dispersion of the pigment. The pigment serves to provide a color to the ink. The ink is supplied from the ink tank **34** to the head unit **38** through an unshown tube.

(39) The liquid cleaner tank **76** stores a liquid cleaner. The liquid cleaner is used in cleaning the nozzles **38**A of the head unit **38**. The liquid cleaner tank **76** is also used for storing the liquid cleaner as a waste liquid having been used for cleaning the nozzles **38**A.

(40) As depicted in FIGS. **2** and **13**, the cartridge installation unit **110** is box-like and open frontward, being positioned in the vicinity of the front end and the lower end of the lower casing **32**. The liquid cleaner tank **76** is inserted rearward into the cartridge installation unit **110**. A supply needle **112** (an example of the first needle) is positioned on a rearward end surface **111** of the cartridge installation unit **110** to extend frontward. The supply needle **112** is open at the front end, and linked to a flow channel **113** at the rear end. The flow channel **113** is linked with a supply tube **175** which will be descried later on. A valve **116** is positioned in the flow channel **113** to open and close the flow channel **113**. A discharge needle **114** (an example of the second needle) is positioned on the rearward end surface **111** of the cartridge installation unit **110** to extend frontward. The front end of the discharge needle **114** is open and the rear end is linked with a flow channel **115**. The flow channel **115** is connected with a waste liquid tube **178** which will be described later on. A suction pump **117** is positioned in the flow channel **115**. An atmosphere communication needle **122** is positioned on the end surface **111** of the cartridge installation unit **110** to extend frontward. The front end of the atmosphere communication needle **122** is open and the rear end is in communication with the internal space of the casing **30** through an unshown flow channel. An optical sensor **129** is positioned on the end surface **111** of the cartridge installation unit **110**. In the optical sensor **129**, a light emitter and a light receiver are aligned at an interval in the left-right direction.

(41) If the liquid cleaner tank **76** is installed into the cartridge installation unit **110**, then the supply needle **112** is inserted into a supply hole **93** (see FIG. **6**) of the liquid cleaner tank **76**. By virtue of this, the liquid cleaner stored in the pouch **90** of the liquid cleaner tank **76** is supplied to the maintenance mechanism **60** via the supply needle **112**, the flow channel **113**, and the supply tube **175**. Further, the discharge needle **114** is inserted into an inflow hole **73** (see FIG. **6**) of the liquid cleaner tank **76**. By virtue of this, the waste liquid flowing out of the maintenance mechanism **60** is discharged to a tank **77**A of the liquid cleaner tank **76** via the waste liquid tube **178**, the flow channel **115**, and the discharge needle **114**. Further, the atmosphere communication needle **122** is inserted into an atmosphere communication hole **72** of the liquid cleaner tank **76**. By virtue of this, the tank **77**A comes into atmospheric communication with the outside. Further, an indicator **75** is positioned between the light emitter and the light receiver of the optical sensor **129**. By virtue of this, the amount of the waste liquid in the indicator **75** is detected by the optical sensor **129**. The flow channel **113** and the supply tube **175** are an example of the first liquid circuit. The flow channel **115** and the waste liquid tube **178** are an example of the second liquid circuit.

(42) Note that an installation case similar to the cartridge installation unit **110** is also provided for the ink tank **34**, but any detailed explanation is omitted here therefor. The ink tank **34** stores the

ink. The ink is a liquid containing a pigment and the like. The ink has a viscosity suitable for uniform dispersion of the pigment. The pigment serves to provide a color to the ink. The ink tank **34** is removed from the cartridge installation unit **110** if the ink is used up, and replaced by a new one storing the ink.

(43) The maintenance mechanism **60** serves for maintaining the head unit **38**. The maintenance mechanism **60** is configured to be movable and moved right below the head unit **38** when the maintenance is carried out for the head unit **38** (see FIG. **5**).

(44) The maintenance of the head unit **38** includes a purge process, an immersion process, a wiping process, and the like. The purge process serves, as depicted in FIG. **5**, to suck the ink from the nozzles **38**A with a suction pump with the nozzles **38**A being covered by a cap **62** of the maintenance mechanism **60**. The immersion process serves to immerse the nozzles **38**A in the liquid cleaner supplied to the cap **62** with the nozzles **38**A being covered by the cap **62**. The wiping process serves to wipe a lower surface **50** of the head module **49** of the head unit **38** with a sponge wiper **64** and a rubber wiper **63** of the maintenance mechanism **60**.

(45) <Maintenance Mechanism **60**>

(46) As depicted in FIG. **3**, the maintenance mechanism **60** includes a support **61**, the sponge wiper **64**, the rubber wiper **63**, and the cap **62**. Note that in the following explanation of the maintenance mechanism **60**, the maintenance mechanism **60** is supported by the second support mechanism **52**.

(47) <Support **61**>

(48) The support **61** has a base **61**A, a main body **61**B mounted on the base **61**A, and a wiper holder **61**C holding the sponge wiper **64** and the rubber wiper **63** on the main body **61**B. The base **61**A has a box-like shape with its top being open.

(49) A lower surface **121** of the base **61**A is contactable with the upper surface of the first support mechanism **51** from above. By virtue of this, the maintenance mechanism **60** can be supported by the first support mechanism **51**. Further, the lower surface **121** is contactable with the upper surface of the second support mechanism **52** from above. By virtue of this, the maintenance mechanism **60** can be supported by the second support mechanism **52**.

(50) As depicted in FIG. **2**, the base **61**A includes a rack **154**. The rack **154** is formed at the right end of the lower surface **121** of the base **61**A. The rack **154** can engage a gear **105**. With the rack **154** and the gear **105** being engaged, rotation of the gear **105** moves the maintenance mechanism **60** in the front-rear direction with respect to the first support mechanism **51**.

(51) As depicted in FIG. **2**, the rack **154** can engage a gear **118** and a gear **119**. With the gear **105** in rotation under the condition of at least one of the gear **118** and the gear **119** being engaged with the rack **154**, the maintenance mechanism **60** slides on the second support mechanism **52**.

(52) By virtue of this, the maintenance mechanism **60** is movable between the standby position depicted in FIG. **2**, and the maintenance position depicted in FIG. **5**. The maintenance mechanism **60** in the maintenance position or in the wiping position faces the lower surface **50** of the head module **49** of the head unit **38** in the up-down direction.

(53) The main body **61**B is approximately box-like in shape and open at the top. The main body **61**B is smaller than the base **61**A. The main body **61**B is fixed on the base **61**A when mounted on the base **61**A. The main body **61**B is formed with a flow channel allowing for communication of the liquid cleaner stored in the liquid cleaner tank **76**. The flow channel is supplied with the liquid cleaner from the liquid cleaner tank **76** via the supply tube **175**, and the waste liquid is discharged from the flow channel to the liquid cleaner tank **76** via the waste liquid tube **178**. The liquid cleaner is supplied to the sponge wiper **64** via the flow channel.

(54) The wiper holder **61**C holds three sponge wipers **64**A, **64**B, and **64**C, three rubber wipers **63**A, **63**B, and **63**C, and three caps **62**A, **62**B, and **62**C, respectively. A sponge wiper **64** is formed of a sponge being a porous body absorbing and holding liquids. In this embodiment, three sponge wipers **64** (**64**A, **64**B, and **64**C) are provided. Note that the number of sponge wipers **64** is not limited to three but is set according to the number of head modules **49** of the head unit **38** described

earlier on. Hereinbelow, the three sponge wipers **64**A, **64**B, and **64**C will also be referred to as the sponge wiper **64**, collectively. The sponge wiper **64** is a long cuboid longer in the left-right direction than in an oblique direction and in the up-down direction. The sponge wiper **64** is longer in the up-down direction than in the oblique direction. A lower part of the sponge wiper **64** enters into the flow channel of the main body **61**B.

(55) The rubber wiper **63** is formed of a rubber being an elastic body absorbing liquids but not holding the same. In this embodiment, three rubble wipers **63** (**63**A, **63**B, and **63**C) are provided. Note that the number of rubber wipers **63** is not limited to three but is set according to the number of head modules **49** of the head unit **38** described earlier on. Hereinbelow, the three rubber wipers **63**A, **63**B, and **63**C will also be referred to as the rubber wiper **63**, collectively.

(56) The rubber wiper **63** is formed into a plate-like shape expanding in the up-down direction and the left-right direction. The rubber wiper **63** is shorter in the oblique direction than the sponge wiper **64** in the oblique direction. By virtue of this, the rubber wiper **63** becomes more likely to flex on contacting with the lower surface **50** of the head module **49** in the wiping process. The rubber wiper **63** is a little longer in the left-right direction than the sponge wiper **64** in the left-right direction.

(57) The cap **62** is made of an elastic material such as rubber, silicon, or the like. The cap **62** is box-like and open at the top. In this embodiment, the cap **62** is constructed from three caps (**62**A, **62**B, and **62**C). Note that the number of caps **62** is not limited to three but is set according to the number of head modules **49** of the head unit **38** described earlier on. Hereinbelow, the three caps **62**A, **62**B, and **62**C will also be referred to as the cap **62**, collectively.

(58) A bottom plate **69** of the cap **62** is formed with an inflow port (not shown) for the liquid cleaner to flow into the cap **62**, and an outflow port A for the liquid cleaner to flow out of the cap **62**. The inflow port is connected with one end of the supply tube **175**. The other end of the supply tube **175** is connected to the liquid cleaner tank **76**. The outflow port is connected to one end of the waste liquid tube **178**. The other end of the waste liquid tube **178** is connected to the liquid cleaner tank **76**. With the suction pump **117** being driven, the liquid is sucked from the outflow port of the cap **62** to the liquid cleaner tank **76**.

(59) <Movement of the Maintenance Mechanism **60**>

(60) The maintenance mechanism **60** is movable between the standby position and the cleaning end position along the oblique direction in the form of sliding on the second support mechanism **52** and being supported by the second support mechanism **52**.

(61) As depicted in FIG. **2**, the maintenance mechanism **60** in the standby position is positioned at the front side of a rotating leading end **51**A of the first support mechanism **51** (the downstream side in the conveyance direction). In other words, the maintenance mechanism **60** in the standby position is positioned at the opposite side to a shaft **109**A of the first support mechanism **51** with respect to the rotating leading end **51**A of the first support mechanism **51**. The maintenance mechanism **60** in the standby position is supported on the second support mechanism **52**. On this occasion, the rack **154** is engaged with both the gears **118** and **119**.

(62) The maintenance mechanism **60** is movable between the standby position and the maintenance position by overpass between the second support mechanism **52** and the first support mechanism **51** in the second rotating position. The standby position is where the maintenance mechanism **60** has withdrawn from the maintenance position.

(63) With an unshown motor being driven, the first support mechanism **51** comes to the second rotating position as depicted in FIG. **4**. In this state, with the unshown motor being driven, if a gear **120** rotates counterclockwise in FIG. **4**, then the gears **118** and **119** rotate clockwise in FIG. **4**. By virtue of this, the maintenance mechanism **60** in the standby position moves in a rearward orientation **4**.

(64) With the maintenance mechanism **60** being supported only by the first support mechanism **51**, and with the motor being driven, the first support mechanism **51** is rotated from the second rotating

position to the first rotating position. By virtue of this, as depicted in FIG. **5**, the maintenance mechanism **60** comes to the maintenance position. The maintenance mechanism **60** in the maintenance position is positioned between the head unit **38** and the first support mechanism **51** in the first rotating position. Note that if the maintenance mechanism **60** moves from the maintenance position to the standby position, then the operation opposite to the above is carried out.
(65) The maintenance mechanism **60** is movable between the maintenance position and the wiping position by way of sliding with respect to the first support mechanism **51** and being supported by the first support mechanism **51** in the first rotating position. The wiping position is at the front side of the maintenance position (at the standby side). That is, the first support mechanism **51** can support the maintenance mechanism **60** positioned in the maintenance position, in the wiping position, and between the two positions.
(66) <Image Recording Process>
(67) Hereinbelow, an explanation will be made on a process of recording an image on the sheet S (the image recording process).
(68) When the image recording process is not carried out, the image recording apparatus **100** is in the standby state. In the standby state, as depicted in FIG. **5**, the head unit **38** is in the capped position, the first support mechanism **51** is in the first rotating position supporting the maintenance mechanism **6**, and the maintenance mechanism **60** is in the maintenance position. On this occasion, the cap **62** covers the nozzles **38**A.
(69) If the controller of the image recording apparatus **100** receives a command to record an image on the sheet S from outside such as from an information processing device or the like connected with the operation panel **44** and the image recording apparatus **100** via the LAN or the like, then the maintenance mechanism **60** is moved to the standby position from the maintenance position. Then, the first support mechanism **51** is rotated from the second rotating position to the first rotating position.
(70) Next, conveying the sheet S is started such that the ink is discharged from the nozzles **38**A with the sheet S being positioned right below the head unit **38**. By virtue of this, the image is recorded on the sheet S.
(71) <Purge Process>
(72) Hereinbelow, the purge process for sucking the ink from the nozzles **38**A will be explained.
(73) When the image recording process is not carried out, the image recording apparatus **100** is in the standby state. In the standby state, as depicted in FIG. **5**, the first support mechanism **51** is in the first rotating position supporting the maintenance mechanism **6**, and the maintenance mechanism **60** is in the maintenance position. On this occasion, the cap **62** covers the nozzles **38**A.
(74) The purge process is carried out on receiving a command from the outside or at a predetermined timing in the standby state, for example. The following explanation will be made on the process of the controller **130** receiving the command to carry out the purge process when the image recording apparatus **100** is in the standby state.
(75) In the purge process, if the suction pump is driven, then the ink in the nozzles **38**A is sucked, and discharged from the space formed by the cap **62** and the lower surface **50** of the head module **49**, to the liquid cleaner tank **76**, via the waste liquid tube **178**. By virtue of this, the nozzles **38**A are prevented from clogging due to solidification of the ink.
(76) <Wiping Process>
(77) After the purge process, the wiping process is carried out for the sponge wiper **64** and the rubber wiper **63** to wipe the lower surface **50** of the head module **49** of the head unit **38**. By moving the head unit **38** upward, the cap **62** departs from the lower surface **50** of the head module **49**.
(78) Next, the suction pump is driven to supply the liquid cleaner to the sponge wiper **64** from the liquid cleaner tank **76** via the supply tube **175**.
(79) Next, the maintenance mechanism **60** is moved from the maintenance position to the wiping position. In the course of the maintenance mechanism **60** being moved from the maintenance

position to the wiping position, the sponge wiper **64** and the leading end (the upper end) of the rubber wiper **63** is in contact with the lower surface **50** of the head module **49** while sliding thereon. By virtue of this, the lower surface **50** of the respective head modules **49**A, **49**B, and **49**C is wiped. As a result, liquids, foreign substances and the like attached on the lower surface **50** are removed.

(80) <Capping Process>

(81) In the capping process, the suction pump **117** is driven to supply the liquid cleaner to the caps **62**A, **62**B, and **62**C via the supply tube **175** from the liquid cleaner tank **76**. Thereafter, the head unit **38** is driven downward to let the cap **62** contact with the lower surface **50** of the head module **49**. By virtue of this, the nozzles **38**A are put into a space where the liquid cleaner exists, such that the ink in the nozzles **38**A is less likely to get dried. The head unit **38** moves downward to cause the cap **62** to depart from the lower surface **50** of the head module **49**. On this occasion, the liquid cleaner in the caps **62**A, **62**B, and **62**C is discharged to the liquid cleaner tank **76**.

(82) <Liquid Cleaner Tank **76**>

(83) The liquid cleaner tank **76** (an example of the liquid container) stores the liquid cleaner. The liquid cleaner includes an organic solvent, a surfactant, water, and the like. The liquid cleaner tank **76** is also a space storing the waste liquid. In the liquid cleaner tank **76**, the liquid cleaner is stored in the pouch **90** while the waste liquid is stored in the case body **77** outside of the pouch **90**. The liquid cleaner tank **76** will be removed from the cartridge installation unit **110** if the liquid cleaner is consumed up or the waste liquid gets to the full level, and a new liquid cleaner tank **76** will replace the old one.

(84) As depicted in FIGS. **6** to **10**, the liquid cleaner tank **76** has the case body **77**, a cover **78**, the film **79**, and the pouch **90**. Note that in the following explanation, the up-down direction, the front-rear direction and the left-right direction based on the liquid cleaner tank **76** are defined according to the respective directions of the casing **30**, with the liquid cleaner tank **76** being installed in the cartridge installation unit **110**. The case body **77**, the cover **78**, and the film **79** are an example of the case.

(85) The case body **77** is box-like, having an upward opening **81**. The case body **77** has a lower wall **82**, a front wall **83**, a rear wall **84** (an example of the lateral wall), a left wall **85**, and a right wall **86**. The lower wall **82** is rectangular, and elongate in the front-rear direction as viewed in the up-down direction. The front wall **83** extends upward from the front end of the lower wall **82**. The front wall **83** is formed with a recess **83**A recessing rearward. The recess **83**A is open in the lower wall **82**, too. The recess **83**A serves as the handle for a user to draw out the case body **77**. The rear wall **84** extends upward from the rear end of the lower wall **82**.

(86) The left wall **85** extends upward from the left end of the lower wall **82** to link the front wall **83** and the rear wall **84**. The right wall **86** extends upward from the right end of the lower wall **82** to link the front wall **83** and the rear wall **84**.

(87) As depicted in FIG. **9**, the opening **81** is defined by the upper end of the front wall **83**, the upper end of the rear wall **84**, the upper end of the left wall **85**, and the upper end of the right wall **86**. The opening **81** lets the internal space of the case body **77** be exposed to the outside. The internal space of the case body **77** forms the tank **77**A. On the upper end of the front wall **83**, the upper end of the rear wall **84**, the upper end of the left wall **85**, and the upper end of the right wall **86** defining the opening **81**, a welding surface **87** is positioned for welding the film **79**. The welding surface **87** is formed into a rectangular shape enclosing the opening **81**. As depicted in FIG. **10**, with the film **79** being welded on the welding surface **87**, the opening **81** is sealed tightly.

(88) At the outside of the welding surface **87**, three screw holes **88** aligning in the front-rear direction are positioned to form two arrays separated in the left-right direction. In other words, three screw holes **88** align in the front-rear direction on the upper end of the left wall **85**, the other three screw holes **88** align in the front-rear direction on the upper end of the right wall **86**.

(89) The film **79** welded on the case body **77** is covered by the cover **78**. The cover **78** has a plate-

like rectangular shape in contact with the upper end of the front wall **83**, the upper end of the rear wall **84**, the upper end of the left wall **85**, and the upper end of the right wall **86**. Three through holes **89** aligning in the front-rear direction are positioned to form two arrays separated in the left-right direction. The through holes **89** are arranged to correspond to the screw holes **88**. With the cover **78** covering the film **79**, the screws **94** are inserted into the through holes **89** and the screw holes **88** to screw together such that the cover **78** is fixed on the case body **77**.

(90) Three openings are formed in the rear wall **84** of the case body **77**. Spouts **70**, **71**, and **79** are fitted into the respective openings. The spout **70** has the atmosphere communication hole **72** extending in the front-rear direction. The atmosphere communication hole **72** is open in the spout **70** toward both sides of the front-rear direction. With the spout **70** being fitted in the opening of the rear wall **84**, the atmosphere communication hole **72** comes into communication with the tank **77**A and the outside.

(91) The spout **71** has the inflow hole **73** (an example of the second opening) extending in the front-rear direction. The inflow hole **73** is open in the spout **71** toward both sides of the front-rear direction. With the spout **71** being fitted in the opening of the rear wall **84**, the tank **77**A, through the inflow hole **73**, communicates with the outside. The discharge needle **114** is inserted into the inflow hole **73**. Note that the inflow hole **73** may be opened and closed by a valve. In such a case, if the discharge needle **114** is inserted into the inflow hole **73**, then the valve switches from the closed state to the opened state.

(92) A spout **92** has the supply hole **93** (an example of the first opening) extending in the front-rear direction. The spout **92** is a component of the aftermentioned pouch **90**. The supply hole **93** is open in the spout **92** toward both sides of the front-rear direction. With the spout **92** being fitted in the opening of the rear wall **84**, the internal space of a bag **91** of the pouch **90**, through the supply hole **93**, communicates with the outside. The supply needle **112** is inserted into the supply hole **93**. Note that the supply hole **93** may be opened and closed by a valve. In such a case, if the supply needle **112** is inserted into the supply hole **93**, then the valve switches from the closed state to the opened state.

(93) As depicted in FIG. **11**, in the opening of the rear wall **84**, between the spout **92** and the opening periphery of the rear wall **84**, an O-ring **74** is arranged and sealed tightly. Without illustration, between the spouts **70** and **71** and the opening periphery of the rear wall **84**, O-rings **74** are also arranged and sealed tightly.

(94) As depicted in FIGS. **6** and **8**, the indicator **75** is positioned on the rear wall **84**. The indicator **75** is box-like and hollow, made of a member having a light transmission feature. The outer appearance of the indicator **75** is thin and long in the up-down direction. The indicator **75** is exposed to the outside via an opening **84**A of the rear wall **84**. The internal space of the indicator **75** is in communication with the tank **77**A. If the waste liquid stored in the tank **77**A increases its level up to the position of the indicator **75**, then the waste liquid enters into the internal space of the indicator **75**, to form a liquid level at the same height as the tank **77**A. Because the indicator **75** is light transmittable, the waste liquid level formed in the internal space of the indicator **75** is observable from the outside. An optical sensor **129** (see FIG. **2**) provided in the cartridge installation unit **110** determines whether or not the waste liquid level has reached a predetermined position of the indicator **75**. Note that the part between the indicator **75** and the periphery of the opening **84**A is sealed tightly with a packing or the like.

(95) As depicted in FIG. **8**, in the tank **77**A, the atmosphere communication hole **72** is positioned above the inflow hole **73**. The inflow hole **73** is positioned above the supply hole **93**. The center **75**C of the internal space of the indicator **75** according to the up-down direction is positioned above the inflow hole **73**. A lower end **75**L of the internal space of the indicator **75** is positioned below the atmosphere communication hole **72**.

(96) As depicted in FIG. **10**, in the tank **77**A of the case body **77**, the pouch **90** is accommodated to store the liquid cleaner. As depicted in FIG. **12**, the pouch **90** has the flexible bag **91** and the spout

92 (an example of the spout). As depicted in FIGS. **6** and **8**, the spout **92** is fitted in the opening of the rear wall **84** of the case body **77**, while the bag **91** is positioned in the tank **77**A.

(97) As depicted in FIG. **12**, the bag **91** can expand into a cube due to a welded sheet made of a synthetic resin. The spout **92** is positioned in the vicinity of the lower end of the bag **91**. The spout **92** is a member made of a synthetic resin. The spout **92** is welded around a through hole formed in the bag **91**. Note that in FIG. **12**, the spouts **70**, **71**, and **92** are depicted as fitted in the opening of the rear wall **84** of the case body **77**. Further, the bag **91** is depicted as expanding into a cubic shape.

(98) The spout **70** is positioned in the vicinity of the upper end of the rear wall **84**. The spout **70** is a member made of a synthetic resin. The spout **71** is positioned a little lower than the spout **70** in the vicinity of the upper end of the rear wall **84**. The spout **71** is also a member made of a synthetic resin.

(99) The liquid cleaner filling the bag **91** is supplied to the maintenance mechanism **60**, and finally discharged as the waste liquid to the tank **77**A via the inflow hole **73** of the spout **71**. The waste liquid discharged to the tank **77**A also includes the ink discharged from the head module **49**. Therefore, considering the ink amount included in the waste liquid, the amount of the liquid cleaner filling the bag **91** shall be preferably a little less than the volume of the tank **77**A.

Technical Effects of the Embodiment

(100) According to this embodiment, the waste liquid of inflow via the inflow hole **73** is stored in the tank **77**A. The liquid cleaner filling the bag **91** of the pouch **90** is positioned in the tank **77**A, being separated from the waste liquid stored in the tank **77**A. By virtue of this, it is possible to accommodate the liquid cleaner and the waste liquid effectively in the pouch **90** and the tank **77**A, respectively.

(101) Further, the bag **91** contracts due to the supply of the liquid cleaner from the pouch **90**. The bag **91** contracts as much as the volume of the waste liquid storable space expands in the tank **77**A of the case body **77**. Because the liquid cleaner supplied from the pouch **90** occupies the better part of the waste liquid, the amount of the liquid cleaner supplied from the bag **91** is almost the same as the amount of the waste liquid flowing into the tank **77**A. Therefore, without upsizing the case body **77**, it is possible to secure the supply amount of the liquid cleaner and the collection amount of the waste liquid in the liquid cleaner tank **76**. Further, the air mixed into the waste liquid is discharged with the air from the tank **77**A via the atmosphere communication hole **72**. Therefore, even if some air is mixed into the waste liquid, there is still no decrease in the waste liquid amount collectable in the tank **77**A.

(102) Further, it is possible to determine the level of the waste liquid stored in the tank **77**A from the outside via the indicator **75**. Because the center **75**C of the internal space of the indicator **75** according to the up-down direction is positioned above the inflow hole **73**, it is possible to determine the level of the liquid via the indicator **75** before the level of the waste liquid stored in the tank **77**A reaches the inflow hole **73**. Further, because the lower end **75**L of the internal space of the indicator **75** is positioned below the atmosphere communication hole **72**, it is possible to determine the level of the liquid via the indicator **75** before the level of the waste liquid stored in the tank **77**A reaches the atmosphere communication hole **72**.

(103) While the invention has been described in conjunction with various example structures outlined above and illustrated in the figures, various alternatives, modifications, variations, improvements, and/or substantial equivalents, whether known or that may be presently unforeseen, may become apparent to those having at least ordinary skill in the art. Accordingly, the example embodiments of the disclosure, as set forth above, are intended to be illustrative of the invention, and not limiting the invention. Various changes may be made without departing from the spirit and scope of the disclosure. Therefore, the disclosure is intended to embrace all known or later developed alternatives, modifications, variations, improvements, and/or substantial equivalents. Some specific examples of potential alternatives, modifications, or variations in the described

invention are provided below:
(104) <Modifications>
(105) In the abovementioned embodiment, the waste liquid stored in the tank **77**A enters into the internal space of the indicator **75**. However, the waste liquid may not enter into the internal space of the indicator **75** but, for example, a float, a rotating member, or the like may move vertically according to the position of the liquid level of the tank **77**A in the internal space of the indicator **75**.
(106) Further, in the abovementioned embodiment, the liquid cleaner or the waste liquid was explained as an example of the liquid. However, the liquid may also be a liquid preserver or the like filling the head, the flow channels, and the like when the apparatus is not in use over a long period of time.
(107) The present disclosure may include the following aspect. The second opening may be positioned above the first opening.
(108) The tank stores more quantity of the liquid.
(109) The bag of the pouch may be filled with the liquid.
(110) The case may include an atmosphere communication hole for communication between inside and outside of the tank.
(111) The liquid flows into the tank more readily via the second opening.
(112) The atmosphere communication hole in the tank may be positioned above the second opening.
(113) The liquid stored in the tank less readily flows into the atmosphere communication hole.
(114) The case may include an indicator displaying a level of the liquid stored in the tank.
(115) It is possible to determine the level of the liquid stored in the tank from the outside via the indicator.
(116) The indicator may include an internal space allowing the liquid stored in the tank to flow thereinto, and the vertical center of the internal space of the indicator may be positioned above the second opening.
(117) It is possible to determine the level of the liquid via the indicator before the level of the liquid stored in the tank reaches the second opening.
(118) A lower end of the internal space of the indicator may be positioned below the atmosphere communication hole for the communication between inside and outside of the tank.
(119) It is possible to determine the level of the liquid via the indicator before the level of the liquid stored in the tank reaches the atmosphere communication hole.
(120) The first opening, the second opening, and an opening of the atmosphere communication hole in an outer surface of the case may be positioned at an identical lateral surface of the case, and the first opening, the second opening, and the opening of the atmosphere communication hole may be sealed tightly from liquid.
(121) The case may include a main body having an opening at the top, a film welded to the opening of the main body, and a cover fixed on the main body to cover the film.
(122) According to an aspect of the present disclosure, there is provided a liquid discharge apparatus including: the liquid tank set forth above; an installation case installed with the liquid tank; a first needle inserted in the spout, in an installed state of the liquid tank being installed in the installation case; a second needle inserted in the second opening in the installed state; a head configured to discharge the liquid; a maintenance mechanism configured to clean the head; a first liquid circuit for communication between the pouch and the maintenance mechanism via the first needle; and a second liquid circuit for communication between the tank and the maintenance mechanism via the second needle.
(123) The bag of the pouch may be filled with a liquid cleaner to clean the head.

Claims

1. A liquid container comprising: a pouch including a flexible bag and a spout with a first opening; and a case with a second opening, the case including a tank configured to store a liquid flowed through the second opening, wherein the spout is fitted into the case, and the bag is positioned in the tank; wherein the case includes an atmosphere communication hole for communication between inside and outside of the tank.
2. The liquid container according to claim 1, wherein the second opening is positioned above the first opening.
3. The liquid container according to claim 1, wherein the bag of the pouch is filled with the liquid.
4. The liquid container according to claim 1, wherein the atmosphere communication hole in the tank is positioned above the second opening.
5. The liquid container according to claim 1, wherein the case includes an indicator configured to display a level of the liquid stored in the tank.
6. A liquid container comprising: a pouch including a flexible bag and a spout with a first opening; and a case with a second opening, the case including a tank configured to store a liquid flowed through the second opening, wherein the spout is fitted into the case, and the bag is positioned in the tank; wherein the case includes an indicator configured to display a level of the liquid stored in the tank.
7. The liquid container according to claim 6, wherein a lower end of the internal space of the indicator is positioned below the atmosphere communication hole for communication between inside and outside of the tank.
8. The liquid container according to claim 1, wherein the first opening, the second opening, and an opening of the atmosphere communication hole in an outer surface of the case are positioned at an identical lateral surface of the case, and the first opening, the second opening, and the opening of the atmosphere communication hole are sealed tightly from liquid.
9. The liquid container according to claim 1, wherein the case includes: a main body having an opening at the top; a film welded to the opening of the main body; and a cover fixed on the main body to cover the film.
10. A liquid discharge apparatus comprising: the liquid container according to claim 1; an installation case installed with the liquid container; a first needle inserted in the spout, in an installed state of the liquid container being installed in the installation case; a second needle inserted in the second opening in the installed state; a head configured to discharge the liquid; a maintenance mechanism configured to clean the head; a first liquid circuit for communication between the pouch and the maintenance mechanism via the first needle; and a second liquid circuit for communication between the tank and the maintenance mechanism via the second needle.
11. The liquid discharge apparatus according to claim 1, wherein the liquid is a liquid cleaner, and the bag of the pouch is filled with the liquid cleaner to clean a head.
12. The liquid container according to claim 6, wherein the indicator includes an internal space allowing the liquid stored in the tank to flow thereinto, and a vertical center of the internal space of the indicator is positioned above the second opening.
13. A liquid container comprising: a pouch including a flexible bag and a spout with a first opening; and a case with a second opening, the case including a tank configured to store a liquid flowed through the second opening, wherein the spout is fitted into the case, and the bag is positioned in the tank; wherein the case includes: a main body having an opening at the top; a film welded to the opening of the main body; and a cover fixed on the main body to cover the film.