

(12) PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. **AU 199855371 B2**
(10) Patent No. **714906**

(54) Title
Liquid container for ink jet head

(51)⁶ International Patent Classification(s)
B41J 002/175

(21) Application No: **199855371**

(22) Application Date: **1998 .02 .18**

(30) Priority Data

(31) Number	(32) Date
9-35058	1997 .02 .19
9-112714	1997 .04 .30

(33) Country
JP
JP

(43) Publication Date : **1998 .08 .27**

(43) Publication Journal Date : **1998 .08 .27**

(44) Accepted Journal Date : **2000 .01 .13**

(71) Applicant(s)
Canon Kabushiki Kaisha

(72) Inventor(s)
Hajime Kishida; Ken Tsuchii

(74) Agent/Attorney
SPRUSON and FERGUSON,GPO Box 3898,SYDNEY NSW 2001

(56) Related Art
AU 48244/96
AU 48245/96
AU 44317/93

ABSTRACT

LIQUID CONTAINER FOR INK JET HEAD

5

A liquid container includes a main body (1) for accommodating liquid
contributable to image formation; a liquid absorbing material (2), accommodated in said
main body, for holding the liquid; a liquid supply port (3), in said main body, for
supplying the liquid toward an ejection head for the image formation; an air vent (4) for
10 fluid communication between said main body and an ambience; wherein a projected
surface (6) is projected toward inside of said main body at a part of an inner surface of
said main body adjacent said liquid supply port.



S & F Ref: 410349

AUSTRALIA
PATENTS ACT 1990

COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

Name and Address
of Applicant: Canon Kabushiki Kaisha
3-30-2 Shimomaruko
Ohta-ku
Tokyo
JAPAN

Actual Inventor(s): Hajime Kishida and Ken Tsuchii

Address for Service: Spruson & Ferguson, Patent Attorneys
Level 33 St Martins Tower, 31 Market Street
Sydney, New South Wales, 2000, Australia

Invention Title: Liquid Container for Ink Jet Head

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

Liquid container for ink jet head

FIELD OF THE INVENTION AND RELATED ART

The present invention relates to a liquid
5 container for accommodating liquid to be used for
recording by an ejection head(ink jet head) which
forms images by ejection of droplets onto sheets.

In conventional printers, an ejection head
for image formation by ejection of droplets onto
10 sheets, can be carried on a carriage which makes
reciprocal movement in a direction perpendicular to
the sheet feeding direction in a plane parallel to the
sheet.

In such a scanning type apparatus, the
15 carriage is moved on a line in response to
instructions, and simultaneously, the droplets are
ejected in response to ejection signals to effect the
image formation on the sheet, and thereafter, the
sheet is fed through a predetermined distance by a
20 feeding device, and these operations are repeated.
As for the droplet ejecting type, there are a type
using an electrothermal transducer element(heater) and
a type using a piezoelectric element(piezoelectric),
in either of which the ejections of the ink droplets
25 are controllable by an electrical signals. In the
liquid droplet ejecting method using the
electrothermal transducer element, an electric signal

is supplied to the electrothermal transducer element so that ink adjacent the electrothermal transducer element is instantaneously boiled, and the droplet is ejected at a high speed by an abrupt growth of a
5 bubble caused by the instantaneous of the ink by the boiling.

Since the liquid is consumed during the image formation, the ejection head has to be always supplied with the liquid. To accomplish this there is a system,
10 for example, wherein an ink container is provided in a main assembly of the ink jet recording apparatus, and an ink supply tube is extended from the ink container to the recording head to supply the ink with negative pressure provided by a static head difference between
15 the ink jet head and the ink container. Such a type, however, results in bulky structure, and therefore, it is unsuitable to a popular type machines from the standpoint of the size and the price.

As another system, there is a so-called
20 liquid container carrying type wherein a liquid container which is detachably mountable relative to the ejection head carried on the carriage, an is connected to a liquid supply port of the ejection head. In this system, the liquid container is
25 exchanged with a new one after the liquid therein is consumed up.

In such a liquid container carrying type, the

ejection head is usually disposed below the liquid container. Therefore, if the liquid container has an open-to-ambience structure, a means has to be provided to produce a predetermined negative pressure to
5 prevent the liquid from leaking out through the droplet ejection outlet(orifice) of the ejection head. Additionally, in order to stabilize the ejection property, a stable meniscus should be maintained at the droplet ejection outlet of the ejection head. In
10 such a liquid container, the negative pressure is adjusted to a predetermined level in consideration of the static head difference between the ejection portion of the ejection head and the liquid surface in the container so as to maintain the stabilized
15 meniscus at the ejection outlet. Therefore, the state of the liquid in the liquid container is influential to the liquid droplet ejection performance from the ejection head.

In order to generate such negative pressure,
20 Japanese Laid-open Patent Application No. SHO- 56- 67269 and Japanese Laid-open Patent Application No. SHO- 59-98857, for example, proposes a spring urged bladder ink container type using an ink bladder urged by a spring in an ink container. With such a type,
25 the manufacturing step is complicated, and therefore, the manufacturing cost is high, and in addition the ink content per unit volume of the ink container,

i.e., the ink holding rate is smaller if the thickness of the container is smaller, with the result of higher running cost.

For example, Japanese Laid-open Patent

5 Application No. HEI- 2-21466 discloses a container, the inside of which is divided into a plurality of ink chambers, which in turn are communicated through a fine hole which is capable of producing a negative pressure. In this type, however, the ink does not
10 exist at the fine hole portion depending on the orientation of the ink container, with the result of no negative pressure, or the negative pressure tends to reduce by the expansion of the air in the ink chamber due to the ambient temperature or the like, so
15 that ink leaks relatively easily.

There is a further known system wherein an absorbing material occupies the entire inside space of the ink container, and the ink is retained by the absorbing material. The absorbing material is a
20 liquid absorbing material in the form of a porous material such as a sponge, and it is ordinary that absorbing material has originally a size larger than the inside volume of the container, and is compressed when it is placed therein.

25 With such a system, the ink amount which can be actually used from the container is smaller than the total volume of the ink container since the ink

amount which can be contained in the absorbing material is limited to provide the stable negative pressure to avoid the ink leakage or the like, and since the ink in the absorbing material sometimes
5 cannot be completely used up since the absolute value of the negative pressure increases with the consumption of the ink retained in the absorbing material.

There is a further system, which is a so-
10 called half-sponge ink container type which increases the amount of the ink which can be consumed. An example of this is disclosed in Japanese Laid-open Patent Application No. HEI- 6-40043 wherein the container includes a liquid retaining member
15 accommodating portion accommodating a liquid retaining member for negative pressure production, and an ink accommodating portion accommodating the ink next to the liquid retaining member accommodating portion and communicating therewith through a passage. This
20 container for ink jet printer, therefore, is provided with a liquid retaining member accommodation chamber for accommodating the liquid retaining member and the ink accommodation chamber for accommodation the ink, so that ink holding rate is improved while stabilizing
25 the negative pressure, with a simple structure, thus accomplishing the low manufacturing cost, low running cost, highly reliable and the downsizing of the

apparatus.

A detailed description will be made as to the structure of liquid containers.

Figures 15 and 16 show conventional liquid
5 containers.

The container of Figure 15 supplies the recording liquid to a wire dot head, and the liquid absorbing material 101 has a thicknesses which is different at the front side portion and the rear side
10 portion, wherein when it is placed in the main body 102 of the container, the front side portion is compressed by the cap 103. With this structure, the capillary force provided by the liquid absorbing material 101 increases toward the liquid supply port
15 104 so that ink can be concentrated at the ink supply port side efficiently.

In Figure 16, the container is integral with an ink jet head, and three chambers of the container accommodates the liquid absorbing materials 201,
20 respectively, wherein an ejection head 203 is provided at the bottom portion of the main body 202. The liquid absorbing material 210 is press-contacted to the supply pipe 205 which is in communication with the orifices 204 of the ejection head 203 ((Japanese Laid-
25 open Patent Application No. SHO- 63-87242). With such a structure, the portion of the liquid absorbing material 210 which is contacted to the supply pipe 205

is compressed, and therefore, the capillary force of the portion is larger so that ink is efficiently collected to the supply pipe 205. Japanese Laid-open Patent Application No. SHO- 55-161661 discloses a
5 structure using fiber as the absorbing material, and the configuration of the container per se is reduced toward the connecting portion to improve the supply of the ink.

Figure 17 shows another liquid container.

10 This is disclosed in Japanese Laid-open Patent Application No. HEI- 7-125239, wherein a negative pressure producing member accommodating chamber 401 accommodating a negative pressure producing member 402 is in fluid communication with a liquid containing
15 chamber 403 accommodating liquid 404 through a fluid communication path 405, wherein a bottom portion of the negative pressure producing member accommodating chamber 401 between the fluid communication path 405 and the liquid supply port 406 provided at the bottom
20 portion is lowered, so that compression of the negative pressure producing member 402 is eased at the lowered portion to provide a liquid rich region 408.

The above described liquid containers involve a problem arising from the compression required for
25 placing it in the container.

Figure 18 is a schematic sectional view illustrating insertion of the liquid absorbing

material into the main body of the container having a flat thin type rectangular parallelepiped configuration, and Figure 19 is a schematic sectional view of the liquid container after the liquid
5 absorbing material is placed therein.

As shown in Figure 18, the liquid absorbing material 303 is inserted into the main body 304 of the container while compressing it in the longitudinal direction, and more particularly, it is compressed
10 down to less than the inner longitudinal dimension of the main body 304 using compression plates 305 and 306. At this time, the compression ratio is high in the neighborhood of the compression plates 305 and 306, and it is low in the neighborhood of the center.
15 When the liquid absorbing material 303 is placed into the main body 304 of the container with this state, this compression ratio distribution of the liquid absorbing material 303 remains at it is after it is inserted into the main body 304, as shown in Figure
20 19.

With such non-uniform compression ratio, the pore sizes of the porous material are not uniform, and therefore, the capillary forces of the liquid impregnated in the absorbing material are locally
25 different. Therefore, only the liquid at the central portion where the capillary force is small is consumed, and the liquid adjacent the container side

wall surface where the capillary force is strong is left, with the result that supply performance is deteriorated, for example, the continuity of the liquid is stopped before the liquid is used up.

5 This problem is eased by use of the structure shown in said Figures 15, 16, but the non-uniform compression still exists in Figure 15, and in the Figure 16 structure, the compression unevenness still exists although the compression ratio adjacent the
10 supply pipe is high. With the structure of Figure 17, the supply of the liquid is sufficient.

 In the case of the flat thin type liquid container, the size of the maximum area side of the container necessarily increases with the increase of
15 the accommodation capacity of the liquid. The air vent of the liquid container is sealed by a sealing material so as to avoid evaporation of the liquid during the transportation or in storage. Therefore, if the liquid container which is made of thermoplastic
20 resin material is kept under a high temperature ambience, the maximum area side which is relatively easily deformed is expanded by the internal pressure even to such an extent of plastic deformation with the result of increase of outer dimensions. As a result,
25 the container may be unable to be mounted to the carriage particularly in the case of the downsized apparatus.

Accordingly, it is a principal object of the present invention to provide a liquid container which can stably supply the liquid as much as possible to the ejection head.

5 It is another object of the present invention to provide a liquid container which can be mounted to the carriage even if the outer dimension is increased due to the plastic deformation under the high temperature ambience during transportation or the
10 like.

 Since the above described half-sponge ink container type is provided with the absorbing material, the same problem arises. When the amount of the ink in the ink accommodation chamber becomes
15 very small, the ink tends to remain at the corner portions, at the marginal areas of the bottom surface in the ink accommodation chamber or adjacent the projection, so that consumable amount of the ink reduces. When the ink remaining amount detection of
20 the ink accommodation chamber is effected, the remaining amount detection is unstable due to the remainder ink, with the result that small printing warning may be produced prior to the appropriate timing, or that forced print stop timing may be
25 appropriate.

 It is a further object of the present invention to provide a liquid container for an ink jet

recording apparatus with which a large amount of the ink can be stably supplied.

Summary of the Invention

According to one aspect of the present invention, there is provided a liquid
5 container comprising:

a main body for accommodating liquid contributable to image formation;

a liquid absorbing material, accommodated in said main body, for holding the
liquid;

a liquid supply port, in said main body, for supplying the liquid toward an
10 ejection head for the image formation;

an air vent for fluid communication between said main body and an ambience;

wherein a projected surface is provided which is projected toward inside of said
main body a part of an inner surface of said main body adjacent said liquid supply port,
and wherein said projected surface has a portion smoothly continuing to the inner surface
15 of said main body such that said liquid absorbing material is contacted by said projected
surface including the smoothly continuing portion.

According to another aspect of the present invention there is provided an ink
container comprising:

20 a first chamber accommodating a liquid absorbing material and having a liquid
supply port for supplying liquid toward an ejection head for image formation and an air
vent for fluid communication with a communication;

a second chamber for containing the liquid to be supplied to said first chamber,
said second chamber being in fluid communication with said first chamber through a
communicating portion provided adjacent a bottom portion of said ink container. in use,
25 being substantially hermetically sealed except for said communicating portion;

a partition wall for separating said first chamber and second chamber and
defining a top end of said fluid communication path. wherein said container has a
substantially flat thin and rectangular parallelepiped configuration; and

30 wherein a projected surface is provided which is projected toward inside of said
first chamber at a part of an inner surface of each of lateral side of said first chamber
sandwiching a side having a liquid supply port, adjacent said liquid supply port. and
wherein said projected surface has a portion smoothly continuing to the inner surface of
said first chamber such that said liquid absorbing material is contacted by said projected
surface including the smoothly continuing portion.



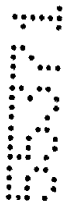
According to another aspect of the present invention there is provided an ink container comprising:

5 a first chamber accommodating a liquid absorbing material and having a liquid supply port for supplying liquid toward an ejection head for image formation and an air vent for fluid communication with a communication;

a second chamber for containing the liquid to be supplied to said first chamber, said second chamber being in fluid communication with said first chamber through a communicating portion provided adjacent a bottom portion of said ink container, in use, being substantially hermetically sealed except for said communicating portion;

10 a partition wall for separating said first chamber and second chamber and defining a top end of said fluid communication path, wherein said container has a substantially flat thin and rectangular parallelepiped configuration; and

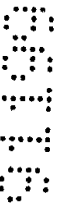
wherein a projected surface is provided which is projected toward inside of said first chamber at a part of an inner surface of each of lateral side of said first chamber sandwiching a side having a liquid supply port, adjacent said liquid supply port, and wherein said second chamber is provided with an ink introduction groove extending to said communicating portion, and wherein said projected surface has a portion smoothly continuing to the inner surface of said first chamber such that said liquid absorbing material is contacted by said projected surface including the smoothly continuing portion.



20 According to another aspect of the present invention there is provided a liquid container comprising:

a main body for accommodating liquid contributable to image formation;

a liquid absorbing material, accommodated in said main body, for holding the liquid;



25 a liquid supply port, in said main body, for supplying the liquid toward an ejection head for the image formation;

an air vent for fluid communication between said main body and an ambience;

30 wherein a projected surface is projected toward inside of said main body at a part of an inner surface of said main body adjacent said liquid supply port, wherein said projected surface occupies 40 to 80% of a length of said main body.

According to another aspect of the present invention there is provided an ink container comprising:



a first chamber accommodating a liquid absorbing material and having a liquid supply port for supplying liquid toward an ejection head for image formation and an air vent for fluid communication with a communication;

a second chamber for containing the liquid to be supplied to said first chamber, said second chamber being in fluid communication with said first chamber through a communicating portion provided adjacent a bottom portion of said ink container in use, being substantially hermetically sealed except for said communicating portion;

a partition wall for separating said first chamber and second chamber and defining a top end of said fluid communication path, wherein said container has a substantially flat thin and rectangular parallelepiped configuration; and

wherein a projected surface is projected toward inside of said first chamber at a part of an inner surface of each of lateral side of said first chamber sandwiching a side having a liquid supply port, adjacent said liquid supply port, wherein said projected surface occupies 40 to 80% of a length of said first chamber.

According to another aspect of the present invention there is provided an ink container comprising:

a first chamber accommodating a liquid absorbing material and having a liquid supply port for supplying liquid toward an ejection head for image formation and an air vent for fluid communication with a communication;

a second chamber for containing the liquid to be supplied to said first chamber, said second chamber being in fluid communication with said first chamber through a communicating portion provided adjacent a bottom portion of said ink container in use, being substantially hermetically sealed except for said communicating portion;

a partition wall for separating said first chamber and second chamber and defining a top end of said fluid communication path, wherein said container has a substantially flat thin and rectangular parallelepiped configuration; and

wherein a projected surface is projected toward inside of said first chamber at a part of an inner surface of each of lateral side of said first chamber sandwiching a side having a liquid supply port, adjacent said liquid supply port, and wherein said second chamber is provided with an ink introduction groove extending to said communicating portion, wherein said projected surface occupies 40 to 80% of a length of said first chamber.

The liquid absorbing material may be of non-compression type which has been compressed to a desired compression ratio at the time of placing it into the main body of



the container or of a heat compression type which has been compressed to a desired compression ratio before it is placed into the main body. The liquid contributable to the image formation may be colour ink including a colouring component such as yellow, cyan, magenta or black colouring component or a liquid containing a component which
5 reacts with the colour ink.

According to the above description, the projected surface is

7
8
9
10
11
12



effective to compress the low compression ratio of the liquid absorbing material so that compression ratio becomes relatively uniform in the longitudinal direction. Therefore, a larger amount of the liquid
5 in the container can be used up.

During the transportation of the liquid container in which the air vent is usually sealed, the maximum area side wall tends to be expanded by the internal pressure with the possible result of the
10 plastic deformation and therefore the expansion of the outer dimension of the container. Since, however, the outer surface is inwardly recessed in the preferred example, the maximum width (shortest dimension) can be maintained even if the maximum area
15 side wall expands outwardly. Accordingly, the container can be mounted into a mounting space with small tolerance.

The projected surface is effective to compress the low compression ratio of the liquid
20 absorbing material in the first chamber so that compression ratio becomes relatively uniform in the longitudinal direction. Therefore, the liquid level in the first chamber can be maintained without reaching to the wall having the supply port to ensure
25 the liquid supply from the second chamber while permitting ambience introduction.

Since, however, the outer surface is inwardly



recessed in the preferred example of this aspect, the maximum width (shortest dimension) can be maintained even if the maximum area side wall expands outwardly. Accordingly, the container can be mounted into a mounting space with small tolerance.

1595



These and other features and advantages of the present invention will become more apparent upon a consideration of the following description of the preferred embodiments of the present invention taken in conjunction with the accompanying drawings.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic view of a liquid container according to an embodiment of the present invention.

Figure 2 is a cross-section taken along a line A-A' in the projected region of the main body of the container shown in Figure 1.

Figure 3 is a cross-section taken along a line A-A' in the projected region of the main body of the container shown in Figure 1 according to another example.

Figure 4 is a cross-section taken along a line A-A' in the projected region of the main body of the container shown in Figure 1 according to a further example.

Figure 5 is a cross-section taken along a line A-A' in the projected region of the main body of the container shown in Figure 1 according to a yet



further example.

Figure 6 is a cross-section taken along a line B-B' in the recessed region of the main body of the container shown in Figure 1 according to an
5 example.

Figure 7 is a cross-section taken along a line B-B' in the recessed region of the main body of the container shown in Figure 1 according to another example.

10 Figure 8 is a schematic sectional view illustrating a liquid container according to another embodiment of the present invention.

Figure 9 shows an outer appearance of the liquid container of Figure 8, wherein (a) is a top
15 plan view, and (b) is partly broken side view.

Figure 10, (a) is a view as seen in the direction D in (b), and (b) is a view taken along a line C-C' of Figure 9, (b).

Figure 11 illustrates consumption process of
20 the liquid in the liquid container shown in Figure 8.

Figure 12 illustrates consumption process of the liquid in the liquid container shown in Figure 8.

Figure 13 illustrates consumption process when the liquid container is not provided with the
25 inner projected region.

Figure 14 illustrates consumption process when the liquid container is not provided with the

inner projected region.

Figure 15 shows an example of a conventional liquid container.

Figure 16 shows another example of a
5 conventional liquid container.

Figure 17 shows another example of a conventional liquid container.

Figure 18 is a schematic sectional view illustrating insertion of a liquid absorbing material
10 into a main body of a flat thin type rectangular parallelopiped configuration container.

Figure 19 is a schematic sectional view of a liquid container of Figure 18 after the liquid absorbing material is placed therein.

15 Figure 20 is a schematic view of a second chamber according to an embodiment of the present invention, wherein (a) is a cross-sectional view, and (b) is a sectional view taken along a line E-E, and (c) is a sectional view taken along a line F-F.

20 Figure 21 is a schematic view of a second chamber according to a further embodiment of the present invention, wherein (a) is a sectional view, and (b) is a sectional view taken along a line G-G.

Figure 22 is a schematic view of a second
25 chamber according to a further embodiment, wherein (a) is a sectional view, (b) is a sectional view taken along a line H-H, and (c) is a sectional view taken

along a line I-I.

Figure 23 is a schematic view of the second chamber according to a further embodiment of the present invention, wherein (c) is a sectional view,
5 and (b) is a sectional view taken along a line J-J.

Figure 24 is a schematic sectional view of the second chamber according to a further embodiment of the present invention.

Figure 25 is a schematic view of the second chamber according to a further embodiment of the present invention., wherein (a) is a partially
10 sectional view, (b) is a sectional view taken along a line K-K.

Figure 26 is a schematic sectional view of a
15 container according to a further embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the accompanying drawings, the
20 embodiments of the present invention will be described.

(First Embodiment)

Figure 1 is a schematic view of a liquid container according to a first embodiment of the
25 present invention. The liquid container of this embodiment is provided with a main body 1 of the container for accommodating the liquid contributable

to the image formation, a liquid absorbing material 2 for holding the liquid in the main body 1 of the container, a liquid supply port 3 for supplying the liquid out to an ejection head(unshown) provided in a bottom portion(in use) of the main body of the container. In this embodiment, the outer appearance of the container is thin flat type rectangular parallelopiped configuration.

As shown in Figure 1, each of side walls having the maximum area and sandwiching the wall provided with the liquid supply port 3, is provided with inwardly projected inner region(projected surface) and an inwardly recessed inner region(recessed surface). The inner projected region 5 is formed at the region at least adjacent to the liquid supply port 3 on inside surfaces of the maximum area sides. The inner projected region 5 is provided away from the narrow side which is vertical during use.

Figures 2-5 show examples as sectional views of the projected regions 5 of the main body 1 of the container taken along a line A-A. The inner projected region 5 may be of trapezoidal projection formed only on the inside as shown in Figure 2 or of projected curved surface configuration (convex) as shown in Figure 3. Alternatively, the inside may be trapezoidal configuration without changing the

thickness of the side wall as shown in Figure 4, or
may be curved as shown in Figure 5. In this Figure,
the inner projected region L2 is smaller to 40%-80%
relative to the longitudinal inner dimension L1 of the
5 main body 1 of the container, and the inner dimension
W2 is smaller by 5%-20% relative to the inner
widthwise dimension W1 of the main body 1 of the
container.

Here, the description will be made as to the
10 function of the inner projected region 5. As has
been described in conjunction with Figures 18 and 19,
the liquid absorbing material 2 is placed in the main
body 1 of the container with the longitudinal
direction dimension of the liquid absorbing material 2
15 being compressed to less than the inner longitudinal
dimension of the main body 1. Without the inward
projected portion, the compression ratio of the liquid
absorbing material 2 tends to be large adjacent the
narrow vertical wall (in use), and that at the central
20 portion is small. However, according to this
embodiment, the inner projected region 5 presses such
a portion of the liquid absorbing material 1 as has
the low compression ratio portion, but not the portion
having the high compression ratio. As a result, the
25 compression ratio distribution of the liquid absorbing
material 2 is substantially uniform in the
longitudinal direction. Therefore, when the ejection

head (unshown) is driven so that liquid retained in the liquid absorbing material 2 is consumed toward the ejection head through the liquid supply port 3, the liquid is continuously supplied out without being left adjacent the side surfaces.

Referring back to Figure 1, the outer recess regions 6 are inwardly recessed substantially on the outsides of the maximum area sides at the central portions except for the inner projected regions 5

Figures 6 and 7 are sectional views taken along a line B-B' of the outer recess region 6 of an example of the main body 1 of the container shown in Figure 1. As for the outside recessed region 6, only the outer surface of the maximum area side is a trapezoidal recess as shown in Figure 6, or it may be of a curved recessed configuration as shown in Figure 7.

The description will be made as to the function of the outer recess region 6. During the transportation of the liquid container 1, an air vent 4 of the container is usually sealed by a sealing material to prevent evaporation of the liquid or the liquid leakage due to the liquid expansion in the container. When the liquid container 1 is placed or kept under a high temperature ambience during transportation, the maximum area side wall of a thermoplastic resin material, which is relatively

easily deformed, may be expanded by the increased internal pressure even to the extent of the plastic deformation with the result of increase of the outer dimension. According to this embodiment, however,
5 only the substantially central portion of the maximum area side constitutes the outside recessed region 6, and therefore, the outermost widthwise dimension remains the same even if the maximum area sides expand outwardly. Accordingly, the container can be mounted
10 into a mounting space with small tolerance.

(Second Embodiment)

In the foregoing embodiment, the description has been made as to the liquid container of a so-called full sponge type wherein the liquid absorbing
15 material occupies substantially the entire space of the container. Next, the description will be made as to an example of a liquid container of so-called half sponge type.

Figure 8 is a schematic sectional view of a
20 liquid container according to a second embodiment of the present invention. Figure 9 are detailed outer appearance of the liquid container of Figure 8. In Figure 10, (a) and (b) are an outer appearances as seen in the direction D of (b), and a sections taken
25 along a line C-C'. The same reference numerals as in the first embodiment are assigned to the elements having the corresponding functions, and detailed

descriptions thereof are omitted for simplicity.

The liquid container 1 is a container having a substantially flat thin type rectangular parallelopiped configuration. The container 1
5 comprises a first chamber 7 for accommodating a liquid absorbing material 2, and a second chamber 9 for accommodating liquid 11 adjacent the first chamber 7, said second chamber 9 being separated by a partition wall 8 from the first chamber 7. The bottom
10 portion(in use) of the first chamber 7 is provided with a liquid supply port 3 for supplying the liquid toward the ejection head(unshown), and the upper portion (in use) of the first chamber 7 is provided with an air vent 4. The liquid supply port 3 may be
15 provided with a fibrous member(press-contact member for ink discharge) to permit satisfactory discharge of the liquid. The first chamber 7 is in fluid communication with the second chamber 9 through a communicating portion 10 formed adjacent the bottom
20 portion of the partition wall 8. The upper portion of the second chamber 9 is provided with a liquid filling port 12 for filling the ink thereinto. The liquid filling port 12 is sealed by a ball seal 13, so that second chamber 9 is substantially hermetically
25 sealed except for the communicating portion 10. Adjacent the communicating portion at the bottom portion of the second chamber 9, a remainder detecting

portion 14 for permitting optical monitoring of the remaining amount of the liquid 11. The surface of the first chamber 7 of the partition wall 8 is provided with an ambience introduction path 15

5 including a groove extended toward the communicating portion 10 from non-end part thereof. Japanese Laid-open Patent Application No. HEI- 6-40043 is incorporated here as to the detailed structure of the structure of the ambience introduction path 15. An

10 outside of a narrow wall which is vertical (in use) is provided with a latch lever 16, which functions to securely engage the main body 1 of the container with the carriage(unshown).

In the first chamber 7, each of the maximum

15 area side walls sandwiching the wall provided with the liquid supply port 3, has an inner projected region 5 and an outside recessed region 6. The inner projected region 5 is so formed that at least the region, adjacent the liquid supply port 3, of the

20 inside of the maximum area side is projected toward the inside of the first chamber 7. The inner projected region 6 is spaced from the narrow vertical (in use) wall of the first chamber 7. The inner projected region 5 is extended from the bottom portion

25 of the first chamber 7 to the neighborhood of the top end Pa of the ambience introduction path 15. Cross-sectional views of the container of Figure 8 taken

along a line B-B ' through the inner projected region 5, are the same as that shown in Figure 2 or 3.

On the other hand, the inner recess region 6 in the first chamber 7 is formed at the substantially central portion except for the inner projected region 5, on the outside of each of the maximum area sides, and is inwardly recessed. Cross-sectional views of the container of Figure 8 taken along a line A-A' through the outer recessed region 5, are the same as that shown in Figure 6 or 7.

The operation principle of the liquid container of this embodiment will be described. Figures 11 and 12 show the consumption process of the liquid in the liquid container 1 of Figure 8.

As shown in Figures Figure 18 and 19, the liquid absorbing material 2 is placed in the first chamber 7 of the main body 1 of the container with the longitudinal dimension of the liquid absorbing material 2 being compressed to less than the inner longitudinal dimension of the first chamber 7 of the main body 1. As a result, after the liquid absorbing material 2 is placed in the first chamber, the compression ratio of the liquid absorbing material 2 is large adjacent the narrow vertical wall (in use), and that at the central portion is small.

If the liquid is ejected through the orifice of the ejection head(unshown), the liquid held in the

liquid absorbing material 2 of the first chamber 7 is first supplied to the ejection head through the liquid supply port 3. With continued ejecting operation, the amount of the liquid in the liquid absorbing material 2 decreases due to the liquid supply (consumption). Since the compression ratio of the liquid absorbing material 2 is high adjacent the narrow vertical wall of the liquid container 1 and adjacent the partition wall 8, the liquid remains there, but only the liquid at the central portion of the first chamber 1 where the capillary force is small, is supplied out. Therefore, the liquid surface in the liquid absorbing material 2 lowers at the central portion of the first chamber 7 as shown in Figure 11.

When the liquid is consumed from the liquid absorbing material 2, the liquid surface in the liquid absorbing material 2 reaches the inner projected region 5. The inner projected region 5 presses the liquid absorbing material 1 only at the low compression ratio portion not the high compression ratio portion thereof, so that liquid level in the central portion of the first chamber 7, particularly the lowered level rises. As a result, the liquid level in the liquid absorbing material 2 having reached the inner projected region 5 maintains substantially constant.

Since the inner projected region 5 starts with a level substantially equal to the top end Pa of the ambience introduction path 15, the air at the liquid level in the liquid absorbing material 2 can be introduced into the second chamber 9 through the ambience introduction path 15 and through the communicating portion when the liquid level in the liquid absorbing material 2 reaches the predetermined level. At this time, the static head provided by the ejection portion of the ejection head, the reduced pressure in the second chamber 9 and the capillary force in the liquid absorbing material 2 are balanced. Since the top end of the ambience introduction path and the upper portion of the inner projected region are substantially at the same level, the introduction of the air from the ambience introduction path is stabilized, and the static head difference can be maintained constant, and therefore, the ejection of the ink through the head is also stabilized. The same level feature is preferable from the standpoint of the stabilized ink supply.

When the liquid supply(consumption) occurs from the liquid ejection outlet 3, the liquid quantity in the first chamber 7 does not reduce, and the liquid 11 in the second chamber 9 is consumed. Thus, the amount of the liquid corresponding to the liquid supply is consumed from the second chamber 9, and the

corresponding amount of the ambient air is introduced into the first chamber 7 through the air vent 4, without changing the liquid distribution in the first chamber 7. As long as the liquid is consumed from
5 the second chamber 9, the actions are repeated so that constant negative pressure is provided in the main body 1 of the container.

As soon as the liquid consumption from the second chamber 9 ends, the liquid is supplied again
10 from the liquid absorbing material 2 in the first chamber 7. Since the density distribution of the liquid absorbing material 2 is uniform, the liquid is consumed continuously to the end through the liquid supply port 3, similarly to the first embodiment.

15 As compared with this embodiment, the function will be described as to when the inner projected region 5 is not provided. Figures 13 and 14 show the consumption process of the liquid when the liquid container 1 is not provided with the inner
20 projected region 5.

In this case, too, the compression ratio of the liquid absorbing material 2 is high adjacent the narrow vertical wall of the liquid container 1 and adjacent the partition wall 8 due to the insertion of
25 the liquid absorbing material 2 into the first chamber 7. Therefore, with the liquid consumption, the liquid surface in the liquid absorbing material 2 lowers at

he central portion of the first chamber 7 shown in Figure 13. With the continued liquid ejection, the liquid surface at the central portion of the first chamber 7 lowers greatly, sometimes even to such an
5 extend to reach the inner bottom surface of the first chamber 7 before the ambience adjacent to the liquid level in the liquid absorbing material 2 reaches the top end Pa of the ambience introduction path 15. Depending on the non-uniformity of the liquid
10 absorbing material 2, the liquid may be discontinued at the bottom portion as shown in Figure 13. If this occurs, the liquid 11 cannot be supplied from the second chamber 9 into the first chamber 7, and in addition, the air is introduced into the ejection head
15 through the liquid supply port 3 with the result that ejection becomes unstable even to the extent of ejection failure.

According to this embodiment, however, the lowering of the liquid level with the liquid
20 consumption at the central portion where the compression ratio is low due to the insertion of the liquid absorbing material 2, is suppressed by the inner projected region 5, thus maintaining the liquid level constant. In this manner, it can be avoided
25 that liquid level in the liquid absorbing material 2 in the first chamber reaches the bottom portion having the liquid supply port 3 before the start of the gas-

liquid exchange between the first chamber 7 and the second chamber 9 with the result of disabled introduction of the ambience to the liquid supply port, so that stabilized ejection property can be maintained.

As regards the function of the outer recess region 6 is the same as with the first embodiment. In brief, since the only the central portion of the outer surface of the maximum area side constitutes the inner recess region 6 (toward the inner side), the outermost width of the container can be maintained even if the maximum area wall expands outwardly due to the high temperature ambience occurring during transportation or the like. Accordingly, the container can be mounted into a mounting space with small tolerance.

The liquid absorbing material 2 usable with the first and second embodiments, may be of any material if it can retain the liquid despite the weight of the liquid and the small scale vibration imparted thereto. It may be cotton-like member comprising fiber net or a porous material having through pores. A sponge material such as foam polyurethane resin material is preferable since the liquid retaining force and the negative pressure production is easily adjustable. The foam is preferable since the adjustment is possible so as to provide the desired compression ratio (porosity)

during the manufacturing of the liquid absorbing material. There are, for example, a heat compression type wherein the compression ratio has been controlled to a predetermined level by the heat compression
5 treatment prior to placing into the main body of the container, and a non-compression type wherein a foam having a predetermined porosity per unit volume is cut into predetermined dimensions to provide a desired
10 compression ratio when it is placed in the main body of the container. The problem of the compression distribution arising from the insertion of the absorbing material into the main body of the container exists both in the heat compression type and the non-compression type.

15 The liquid 11 contributable to the image formation, may be color ink containing a coloring component such as yellow, cyan, magenta black or the like.

In another example, before or after the image
20 formation on the sheet material with the color ink, processing liquid may be applied to the same area, or processing liquid may be applied to the entire surface of the sheet material to improve the fixing effect of the ink on the sheet material. In such a case, the
25 liquid 11 may be liquid containing a component reactable with the color ink. Examples of such liquid include the ones using anion or cation

reaction.

As described in the foregoing, the present invention is usable with a liquid container having the main body, the liquid absorbing material accommodated
5 in the main body, the liquid supply port, to the ejection head, provided in the main body, and an air vent for fluid communication with the ambience, with the following technical advantages. By the projected surface described above, the density distribution of
10 the compression ratio of the liquid absorbing material when the liquid absorbing material is compressed in the longitudinal direction and inserted into the main body, is uniform. As a result, the liquid can be used up continuously without leaving it adjacent the
15 side wall of the container.

The present invention is usable with a liquid container having substantially flat thin type rectangular parallelepiped configuration, comprising the first chamber open to ambience, the second chamber
20 containing the liquid to be supplied to the first chamber and substantially hermetically sealed except for the communicating portion through which the first and second chambers are in fluid communication with each other, and a partition wall between the and the
25 first chamber and the second chamber and extending above the communicating portion, with the following technical advantages. When the liquid absorbing

material is inserted into the main body of the container while the longitudinal dimension thereof is reduced, the projected surface pressed the low compression ratio portion, not the high compression ratio portion. Therefore, the lowering of the liquid level due to the liquid consumption at the central portion where the compression ratio of the liquid absorbing material is low, can be suppressed, so that substantially constant liquid level can be maintained.

10 Since the projected surface is substantially at the same level as the top end of the ambience introduction path, the ambience adjacent to the liquid surface is enabled to be in fluid communication with the second chamber through the ambience introduction path and the communicating portion at the time when the liquid level in the liquid absorbing material reaches a predetermined level. In this manner, it can be avoided that liquid level in the liquid absorbing material 2 in the first chamber reaches the bottom portion having the liquid supply port 3 before the start of the gas-liquid exchange between the first chamber 7 and the second chamber 9 with the result of disabled introduction of the ambience to the liquid supply port, so that stabilized ejection property can be maintained.

As soon as the liquid consumption in the second chamber, the liquid in the liquid absorbing

material in the first chamber is consumed again, and
the liquid can be consumed continuously from the
liquid supply port since the compression ratio
distribution is made uniform by the inner projected
5 region.

Since the only the central portion of the
outer surface of the maximum area side constitutes the
inner recess region 6 (toward the inner side), the
outermost width of the container can be maintained
10 even if the maximum area wall expands outwardly due to
the high temperature ambience occurring during
transportation or the like. Accordingly, the
container can be mounted into a mounting space with
small tolerance.

15 The structure of the second chamber according
to an embodiment of the present invention will be
described.

Figure 20 shows an ink container using a
structure of the second chamber (ink accommodation
20 chamber) according to this embodiment. In this
Figure, (a) is a vertical cross-section taken at a
substantially longitudinal center, and (b) is a
sectional view taken along a line E-E, and (c) is a
sectional view taken along a line F-F'.

25 In Figure 20, designated by reference numeral
1 is a half-sponge ink container; 7 is a liquid
retaining member accommodation chamber for

accommodating a liquid retaining member 2 having a liquid absorption property, such as urethane sponge; 9 is an ink accommodation chamber for accommodating liquid(ink) 11; 4 is an air vent for introducing the
5 ambience into the liquid retaining member accommodation chamber 7; 11 indicated by hatched portions is ink therein; 23 is a press-contact member of a fibrous member such as PP (polypropylene) or felt. To the press-contact member, a filter portion
10 at the end of an ink receiving tube of the recording head is contacted to supply the ink to the recording head.

Further, designated by 3 is an ink supply port into which the filter is inserted; 10 is a fluid
15 communication path for fluid communication between the liquid retaining member accommodation chamber 7 and the ink accommodation chamber 9; 15 is an ambience introduction groove for introducing the ambience into the ink accommodation chamber 9 when the ink in the
20 liquid retaining member 2 is used to a predetermined level; and 21 is an ink introduction groove which is peculiar to this embodiment.

The ink introduction groove 21 is, as shown in Figure 20, (c), is provided as a groove at the
25 peripheral portion of the bottom surface of the ink accommodation chamber 9, and as shown in Figure 20, (b), it encloses the bottom surface of the ink

accommodation chamber 9, and connects to the liquid retaining member 2 through the fluid communication path 10.

Because of this structure, the ink 11 at the
5 peripheral portion or the corner portion of the bottom surface of the ink accommodation chamber 9 is absorbed in the liquid retaining member 2 through the ink introduction groove 21, the amount of the remainder ink in the ink accommodation chamber 9 without being
10 used, is significantly reduced.

By reducing the capillary force of the ink introduction groove 21 to less than the capillary force of the liquid retaining member 2, the ink 11 in the ink introduction groove 21 can be completely
15 absorbed, so that usage efficiency of the ink 11 is further improved. In addition, by reducing the cross-sectional area of the ink introduction groove 21 is reduced toward the fluid communication path 10, the ink can be positively moved, and therefore, this is
20 preferable.

Figure 21, (a) and (b) are a view corresponding to Figure 1, (b) and a sectional view taken along a line G-G'. In the embodiment of Figure 20, the bottom levels of the liquid retaining member
25 accommodation chamber 7 and the ink accommodation chamber 9 are the same, and the ink introduction groove 21 ends at the fluid communication path 10. In

this embodiment, however, the level of the bottom surface of the liquid retaining member accommodation chamber 7 is lowered to the level of the bottom level of the ink introduction groove 21, so that ink
5 introduction groove 21 does not end at the fluid communication path 10, and therefore, it continues to the liquid retaining member accommodation chamber 7.

Because of this structure, the ink absorption into the liquid retaining member 2 through the ink
10 introduction path 21 is further stabilized. The latitude of the mold division for the manufacturing is increased.

Figure 22, (a), (b) and (c) show a further embodiment wherein (a) shows a view corresponding to
15 said Figure 21, (a), (b) is a sectional view taken along a line H-H, and (c) is a sectional view taken along a line I-I'.

In the embodiments of Figures 20 and 21, the recess constituting the ink introduction groove 21 is
20 provided only in the bottom surface, but in this embodiment, the recess is formed in the side of the fluid communication path 10 to constitute the ink introduction groove 21.

In order to maintain the connection between
25 the ink accommodation chamber 9 and the ink introduction groove 21, the bottom surface of the fluid communication path 10 is lower than the bottom

surface of the ink accommodation chamber 9 as shown in Figure 22, (c).

Thus, the liquid retaining member 2 assuredly enters the ink introduction groove 21, and the
5 absorption of the ink through the ink introduction groove 21 is stabilized.

The latitude of the mold division is increased.

Figure 23, (a) and (b) show this embodiment,
10 wherein (a) shows a view corresponding to the Figure 22, (a), and a sectional view taken along a line J-J'.

In the embodiment of Figure 22, the recess is formed only in the fluid communication path 10 to constitute the ink introduction groove 21, but in this
15 embodiment, the recess is formed also in the side surface of the ink accommodation chamber 9.

By doing so, the connection property between the ink accommodation chamber 9 and the ink introduction groove 21 of the fluid communication path
20 10 is improved, so that stability of the ink suction-out from the ink accommodation chamber 9 through the ink introduction groove 21 is stabilized.

The ink introduction groove 21 in the side surface may be constitution by a projection.

25 Figure 24 is an illustration according to a further embodiment, and show a view corresponding to said Figure 23, (a).

In the embodiments of Figures 20-23, the ink introduction path 21 is provided only in the circumference of the ink accommodation chamber 9, but in this embodiment, a plurality of ink introduction
5 grooves 21 are provided in the bottom surface of the ink accommodation chamber. By doing so, the stability of the ink sucking out is further improved.

Figure 25 illustrates a further embodiment, wherein (a) is a cross-sectional view showing a bottom
10 surface configuration of the ink container according to this embodiment, and (b) is a top plan view of the internal structure.

In this embodiment, the ink introduction groove 21 is used, and in addition, the bottom surface
15 of the ink accommodation chamber 9 is inclined, so that even if the recording head is mounted to the carriage with some inclination, it is assured that fluid communication path 10 is lower to some extent, and therefore, the ink in the ink accommodation
20 chamber 9 flows into the fluid communication path 10 by the gravity.

As shown in Figure 25, (a) (cross-sectional view) (b) which is a sectional view taken along a line K-K', the ink accommodation chamber 9 has an inclined
25 surface 24 lowering toward a fluid communication path 10 for fluid communication with the liquid retaining member accommodation chamber 7 By the provision of

the inclined surface 24, the liquid can be properly introduced to the fluid communication path 10. In addition, in this example, there is provided an ink introduction groove 21 formed as a recess along a
5 bottom portion of the outermost circumference of the ink accommodation chamber 9. The ink introduction groove 21 functions, as described hereinbefore, to introduce the ink from the ink accommodation chamber 9 into the fluid communication path 10.

10 The circumference portion of the bottom surface of the ink accommodation chamber 9 has a larger capillary force than at the bottom surface flat surface portion, so that ink tends to remain. Particularly, the corner portion where the walls are
15 intersect, has a larger capillary force, and therefore, the ink tends to remain. At the final stage of the ink consumption, the liquid passage to the liquid retaining member is discontinued, and the ink flow ends while the ink remains at the corner
20 portion or the peripheral portion. Thus the ink remains in the ink accommodating chamber undesirably. Therefore, it is preferable that ink introduction groove 21 is formed at the corner portion and the circumference portion of the bottom of the ink
25 accommodating chamber 9, and that it is extended along the bottom surface circumference to assure the fluid communication with the liquid retaining member

accommodation chamber 7.

The ink introduction groove 21 is connected with the groove 25 provided in the side surface of the wall constituting the fluid communication path 10 at the fluid communication path 10. By doing so, a continuous groove region is constituted over the ink introduction groove 21 of the ink accommodation chamber 9 and the liquid retaining member accommodation chamber 7.

As shown in Figure 21, the bottom surface of the ink accommodation chamber 9 is at a level higher than the bottom surface of the liquid retaining member accommodation chamber 7, and in order to assure the continuity of the surface from the bottom surface of the ink accommodation chamber 9 to the fluid communication path 10, there is provided a second inclined surface 22 having an inclination angle different from that of the main inclined surface 24 of the ink accommodation chamber. It is for maintaining the continuity between the bottom surface of the ink accommodation chamber 3 and the surface of the fluid communication path 10, and by using this, there is no part which impede the movement of the ink, thus further reducing the remaining amount of the ink.

It is preferable that corner portion of the ink accommodation chamber 9 is formed into a curved surface. If the corner portion has an acute angle, a

capillary force may be produced with the result of retaining a small amount of the ink. The structure of the bottom surface of the ink accommodation chamber 9 is not limited to those described in the foregoing, and the entire inclination may be toward the fluid communication path 10, and the ink introduction groove 21 shown in Figure 24 may be provided.

The structure of the groove 25 provided at each of the sides of the fluid communication path 10 is not limited to those described above, and may be in the form of a recess at the bottom side; alternatively, the recess is not inevitable if the corner constituting the fluid communication path 10 is enough to produce the capillary tube force. The ink introduction path 11 may be converged toward the fluid communication path 8 stepwisely. Then, the ink can be supplied properly toward the liquid retaining member accommodation chamber.

By employing the above-described structure, the ink can be moved smoothly from the ink chamber to the fluid communication path portion, and therefore, the ink in the ink accommodation chamber can be further smoothly supplied.

As described in the foregoing, the provision of the ink introduction groove is effective to reduce the amount of the ink which remains unusably in the ink accommodation chamber to increase the usage

efficiency of the ink, thus reducing the running cost.

When the ink remaining amount detection is effected for the ink accommodation chamber, the remaining amount detection is stabilized, since the
5 amount of the remaining is very small, thus avoiding damaging the print data. The warning is correct, and the printing operation may be forcedly stopped.

By the provision of inclination of the bottom surface of the ink accommodation chamber, the ink can
10 be assuredly sucked out from the ink accommodation chamber even when the ink container is mounted to the carriage inclinedly, so that amount of the unusably remaining ink can be reduced, thus increasing the usage efficiency of the ink, and reducing the running
15 cost.

When the ink remaining amount detection is effected for the ink accommodation chamber, the remaining amount detection is stabilized, since the amount of the remaining is very small, thus avoiding
20 damaging the print data. The warning is correct, and the printing operation may be forcedly stopped.

Figure 26 shows a further embodiment.

In this embodiment, there are provided the ink introduction groove 21, the main inclined surface
25 24, the second inclined surface 22 and the groove 25 as shown in Figure 25, as the structure around the fluid communication path 10 and the ink accommodation

chamber 9. The structure of the liquid retaining member accommodation chamber 7 is as shown in Figure 9. The descriptions of each of the structures is omitted for simplicity.

5 Using these structures, even when the amount of the ink in the ink accommodation chamber 9 becomes very small, the combination of the main inclined surface 24 and the ink introduction groove 21 permits the smooth movement of the ink toward the
10 communicating portion 10, and the combination of the groove 25 and the second inclined surface 22 provided at the region of the communicating portion 10 permits the movement of the small amount of the remaining ink toward the liquid retaining member accommodation
15 chamber 7.

On the other hand, at the liquid retaining member accommodation chamber 7, the static head for the head can be properly maintained to accomplish the stabilized ink supply, because of the provision of the
20 inner projected region constituting the stable ink region. As regards the ink, the state of the liquid retaining member in the inner projected region is quite uniform so that amount of the remaining ink can be extremely reduced.

25 Therefore, this embodiment accomplishes the stable ink supply and the high use efficiency of the ink.

While the invention has been described with
reference to the structures disclosed herein, it is not
confined to the details set forth and this application
is intended to cover such modifications or changes as
5 may come within the purposes of the improvements or the
scope of the following claims.

10

15

15
15
15
15

20

20
20
20

20
20
20

20
20
20

25

The claims defining the invention are as follows:

1. A liquid container comprising:
a main body for accommodating liquid contributable to image formation;
a liquid absorbing material, accommodated in said main body, for holding the
5 liquid;
a liquid supply port, in said main body, for supplying the liquid toward an
ejection head for the image formation;
an air vent for fluid communication between said main body and an ambience;
wherein a projected surface is provided which is projected toward inside of said
10 main body a part of an inner surface of said main body adjacent said liquid supply port,
and wherein said projected surface has a portion smoothly continuing to the inner surface
of said main body such that said liquid absorbing material is contacted by said projected
surface including the smoothly continuing portion.
2. A container as claimed in claim 1, wherein said main body has an outer
15 appearance of flat thin and substantially rectangular parallelepiped configuration, and said
liquid supply port is provided in a narrow side thereof, wherein said projected surface is
provided at each of maximum area side walls sandwiching the side having the liquid
supply port adjacent said liquid supply port.
3. A container as claimed in claim 1 or 2, wherein an outer surface of a
20 substantially central portion of each of maximum area side walls of said main body is
recessed.
4. A container as claimed in claim 2, wherein said projected surface is
spaced apart from narrow walls not having said supply port.
5. A container as claimed in claim 1, wherein said liquid absorbing
25 material is a non-compression type member which is compressed to a desired
compression ratio when it is placed in said main body.
6. A container as claimed in claim 1, wherein said liquid absorbing
material is a heat compression type member which has been compressed substantially to a
desired compression ratio before it is placed in main body.
- 30 7. A container as claimed in claim 1, wherein the liquid is colour ink
including at least a yellow, cyan, magenta or black colouring component.
8. A container as claimed in claim 1, wherein the liquid contains a
component reactable with colour ink including at least a yellow, cyan, magenta or black
colouring component.



9. An ink container comprising:

a first chamber accommodating a liquid absorbing material and having a liquid supply port for supplying liquid toward an ejection head for image formation and an air vent for fluid communication with a communication;

5 a second chamber for containing the liquid to be supplied to said first chamber, said second chamber being in fluid communication with said first chamber through a communicating portion provided adjacent a bottom portion of said ink container, in use, being substantially hermetically sealed except for said communicating portion;

10 a partition wall for separating said first chamber and second chamber and defining a top end of said fluid communication path, wherein said container has a substantially flat thin and rectangular paralleloiped configuration; and

wherein a projected surface is provided which is projected toward inside of said first chamber at a part of an inner surface of each of lateral side of said first chamber sandwiching a side having a liquid supply port, adjacent said liquid supply port, and
15 wherein said projected surface has a portion smoothly containing to the inner surface of said first chamber such that said liquid absorbing material is contacted by said projected surface including the smoothly continuing portion.

10. A container as claimed in claim 9, wherein said liquid supply port is disposed in a bottom portion of said first chamber in use, and said partition wall is
20 provided with an ambience introduction path extending from a non-end part of said partition wall to said communicating portion, and wherein said projected surface is provided between the bottom portion to a direction of a top end of said ambience introduction path.

11. A container as claimed in claim 9 or 10, wherein an outer surface of a
25 substantially central portion of each of maximum area side walls of said first chamber is recessed.

12. A container as claimed in claim 10, wherein said projected surface is spaced apart from said partition wall and from a narrow walls not having said supply port.

13. A container as claimed in claim 9, wherein said liquid absorbing
30 material is a non-compression type member which is compressed to a desired compression ratio when it is placed in said main body.

14. A container as claimed in claim 9, wherein said liquid absorbing material is a heat compression type member which has been compressed substantially to a desired compression ratio before it is placed in main body.



15. A container as claimed in claim 9, wherein the liquid is colour ink including at least a yellow, cyan, magenta or black colouring component.

16. A container as claimed in claim 9, wherein the liquid contains a component reactable with colour ink including at least a yellow, cyan, magenta or black colouring component.

17. A container as claimed in claim 9, wherein said second chamber is provided with an ink introduction groove extending to said communicating portion.

18. A container as claimed in claim 17, wherein said ink introduction groove is provided by a recess in a bottom or lateral inner side of said second chamber.

19. A container as claimed in claim 17, wherein said ink introduction groove is provided by a projection on a bottom surface or a lateral side of said second chamber.

20. A container as claimed in claim 17, wherein said ink introduction groove is contacted to said liquid absorbing material.

21. A container as claimed in claim 17, wherein a capillary force of said ink introduction groove is smaller than a capillary force of said liquid absorbing material.

22. A container as claimed in claim 17, wherein a bottom surface of said second chamber is inclined.

23. A container as claimed in claim 22, wherein the inclination is such that portion adjacent said second chamber is lower.

24. An ink container comprising:

a first chamber accommodating a liquid absorbing material and having a liquid supply port for supplying liquid toward an ejection head for image formation and an air vent for fluid communication with a communication;

a second chamber for containing the liquid to be supplied to said first chamber, said second chamber being in fluid communication with said first chamber through a communicating portion provided adjacent a bottom portion of said ink container, in use, being substantially hermetically sealed except for said communicating portion;

a partition wall for separating said first chamber and second chamber and defining a top end of said fluid communication path, wherein said container has a substantially flat thin and rectangular parallelepiped configuration; and

wherein a projected surface is provided which is projected toward inside of said first chamber at a part of an inner surface of each of lateral side of said first chamber sandwiching a side having a liquid supply port, adjacent said liquid supply port, and



wherein said second chamber is provided with an ink introduction groove extending to said communicating portion, and wherein said projected surface has a portion smoothly continuing to the inner surface of said first chamber such that said liquid absorbing material is contacted by said projected surface including the smoothly continuing portion.

5 25. A container as claimed in claim 24, wherein said liquid supply port is disposed in a bottom portion of said first chamber in use, and said partition wall is provided with an ambience introduction path extending from a non-end part of said partition wall to said communicating portion, and wherein said projected surface is provided between the bottom portion to a direction of a top end of said ambience
10 introduction path.

26. A container as claimed in claim 24, wherein an outer surface of a substantially central portion of each of maximum area side walls of said first chamber is recessed.

27. A container as claimed in claim 25, wherein said projected surface is
15 spaced apart from said partition wall and from a narrow walls not having said supply port.

28. A container as claimed in claim 24, wherein said liquid absorbing material is a non-compression type member which is compressed to a desired compression ratio when it is placed in said main body.

29. A container as claimed in claim 24, wherein said liquid absorbing
20 material is a heat compression type member which has been compressed substantially to a desired compression ratio before it is placed in main body.

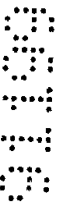
30. A container as claimed in claim 24, wherein the liquid is colour ink including at least a yellow, cyan, magenta or black colouring component.

31. A container as claimed in claim 24, wherein the liquid contains a
25 component reactable with colour ink including at least a yellow, cyan, magenta or black colouring component.

32. A container as claimed in claim 24, wherein said ink introduction groove is provided by a recess in a bottom or lateral inner side of said second chamber.

33. A container as claimed in claim 24, wherein said ink introduction
30 groove is provided by a projection on a bottom surface or a lateral side of said second chamber.

34. A container as claimed in claim 24, wherein said ink introduction groove is contacted to said liquid absorbing material.



35. A container as claimed in claim 24, wherein a capillary force of said ink introduction groove is smaller than a capillary force of said liquid absorbing material.

36. A container as claimed in claim 24, wherein a bottom surface of said second chamber is inclined.

5 37. A container as claimed in claim 36, wherein the inclination is such that portion adjacent said second chamber is lower.

38. A liquid container as claimed in claim 1, wherein said projected surface occupies 40 to 80% of a length of said main body.

39. A liquid container as claimed in claim 9, wherein said projected surface
10 occupies 40 to 80% of a length of said first chamber.

40. A liquid container as claimed in claim 24, wherein said projected surface occupies 40 to 80% of a length of said first chamber.

41. A liquid container as claimed in claim 1, 9 or 24 wherein said projected surface is generally convex surface.

15 42. A liquid container as claimed in claim 1, 9 or 24 wherein said projected surface is provided by a generally trapezoidal shape.

43. A liquid container comprising:

a main body for accommodating liquid contributable to image formation;

20 a liquid absorbing material, accommodated in said main body, for holding the liquid;

a liquid supply port, in said main body, for supplying the liquid toward an ejection head for the image formation;

an air vent for fluid communication between said main body and an ambience;

25 wherein a projected surface is projected toward inside of said main body at a part of an inner surface of said main body adjacent said liquid supply port, wherein said projected surface occupies 40 to 80% of a length of said main body.

30 44. A container as claimed in claim 42, wherein and wherein said projected surface has a portion smoothly continuing to the inner surface of said main body such that said liquid absorbing material is contacted by said projected surface including the smoothly continuing portion.

45. A container as claimed in claim 42, wherein said projected surface is a generally convex surface.

46. A container as claimed in claim 42, wherein said projected surface is provided by a generally trapezoidal shape.



47. An ink container comprising:

a first chamber accommodating a liquid absorbing material and having a liquid supply port for supplying liquid toward an ejection head for image formation and an air vent for fluid communication with a communication;

5 a second chamber for containing the liquid to be supplied to said first chamber, said second chamber being in fluid communication with said first chamber through a communicating portion provided adjacent a bottom portion of said ink container in use, being substantially hermetically sealed except for said communicating portion;

10 a partition wall for separating said first chamber and second chamber and defining a top end of said fluid communication path, wherein said container has a substantially flat thin and rectangular parallelepiped configuration; and

wherein a projected surface is projected toward inside of said first chamber at a part of an inner surface of each of lateral side of said first chamber sandwiching a side having a liquid supply port, adjacent said liquid supply port, wherein said projected surface occupies 40 to 80% of a length of said first chamber.

48. A container as claimed in claim 47, wherein and wherein said projected surface has a portion smoothly continuing to the inner surface of said first chamber such that said liquid absorbing material is contacted by said projected surface including the smoothly continuing portion.

20 49. A container as claimed in claim 47, wherein said projected surface is a generally convex surface.

50. A container as claimed in claim 47, wherein said projected surface is provided by a generally trapezoidal shape.

51. An ink container comprising:

25 a first chamber accommodating a liquid absorbing material and having a liquid supply port for supplying liquid toward an ejection head for image formation and an air vent for fluid communication with a communication;

30 a second chamber for containing the liquid to be supplied to said first chamber, said second chamber being in fluid communication with said first chamber through a communicating portion provided adjacent a bottom portion of said ink container in use, being substantially hermetically sealed except for said communicating portion;

a partition wall for separating said first chamber and second chamber and defining a top end of said fluid communication path, wherein said container has a substantially flat thin and rectangular parallelepiped configuration; and



5

I

53.

54.

12

Canon Kabushiki Kaisha

Patent Attorneys for the Applicant/Nominated Person

SPRUSON & FERGUSON



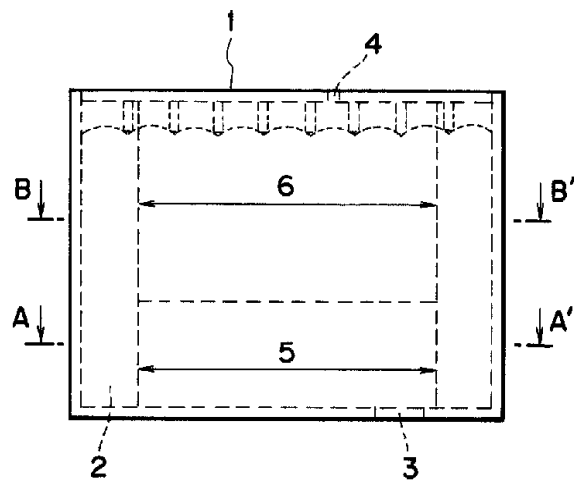


FIG. 1

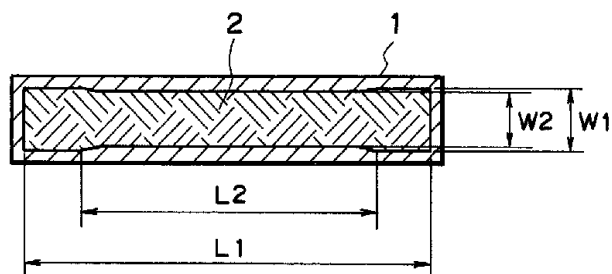


FIG. 2

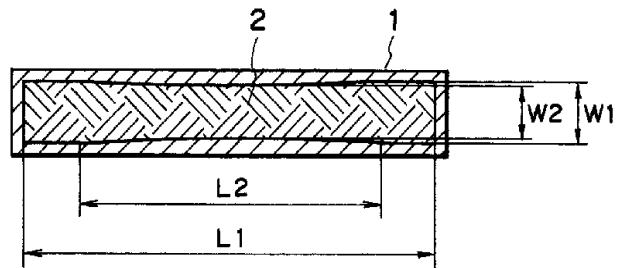


FIG. 3

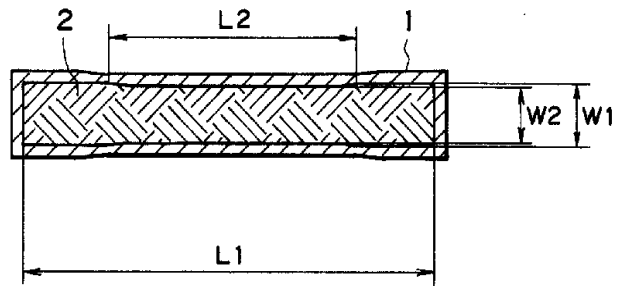


FIG. 4

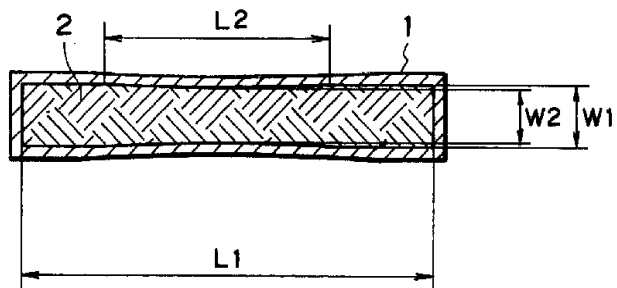


FIG. 5

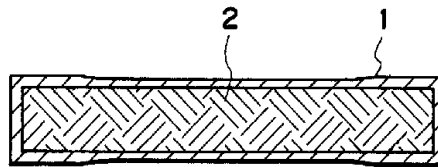


FIG. 6

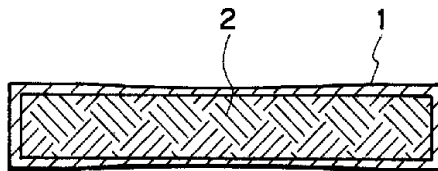


FIG. 7

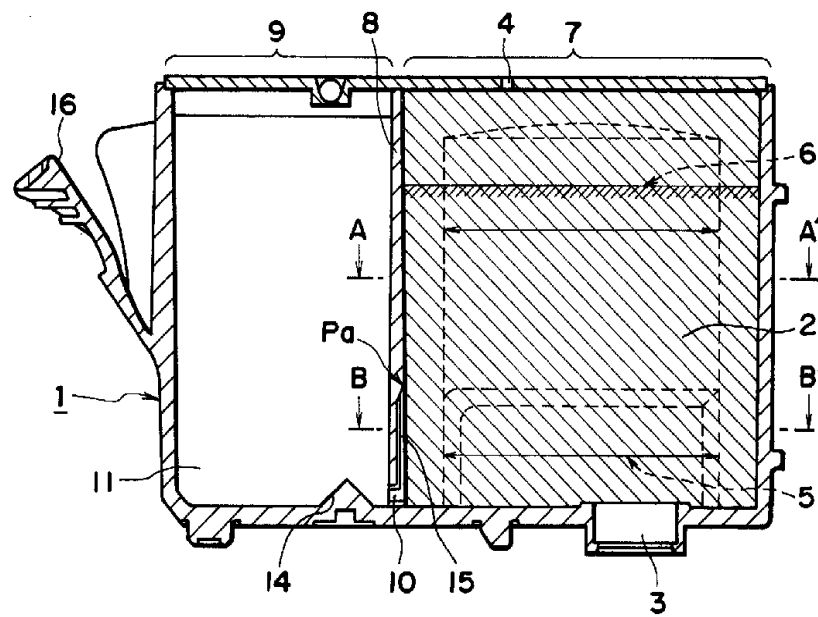
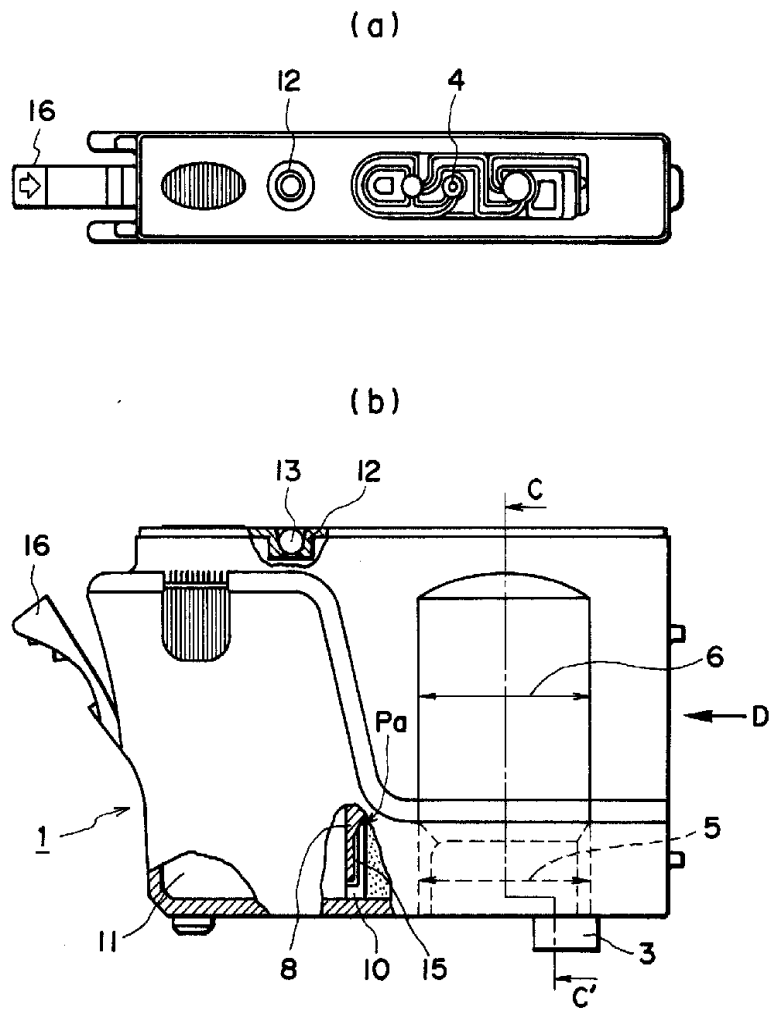


FIG. 8



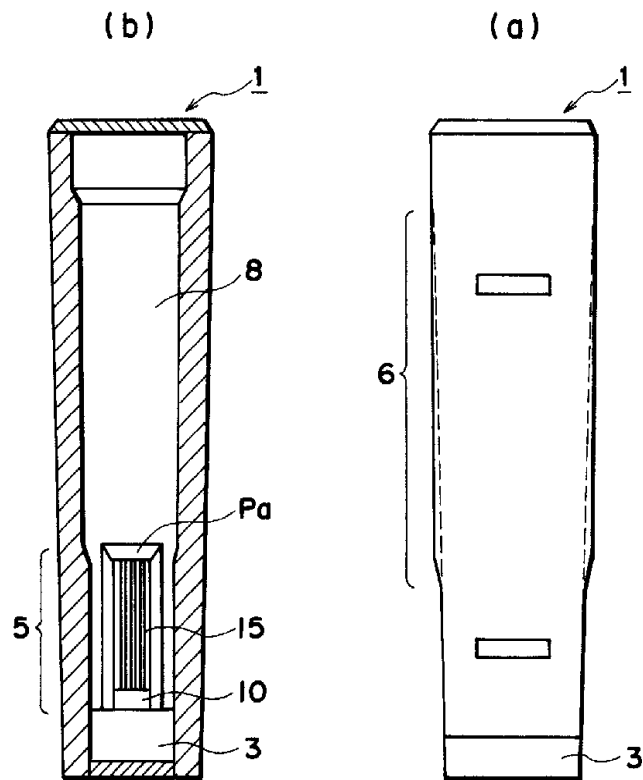


FIG. 10

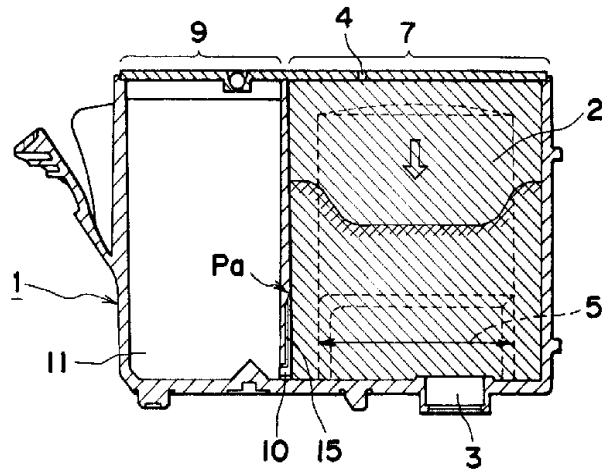


FIG. 11

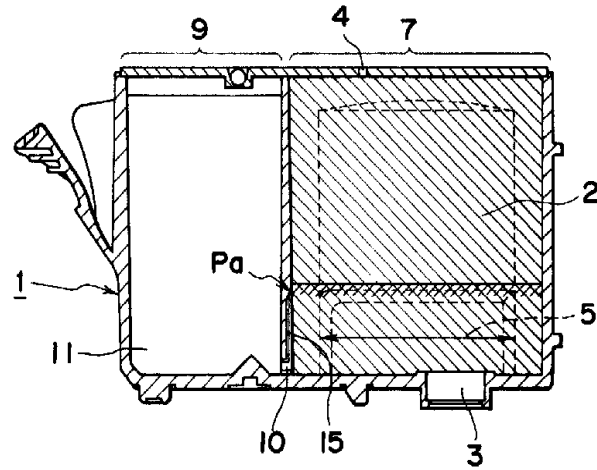


FIG. 12

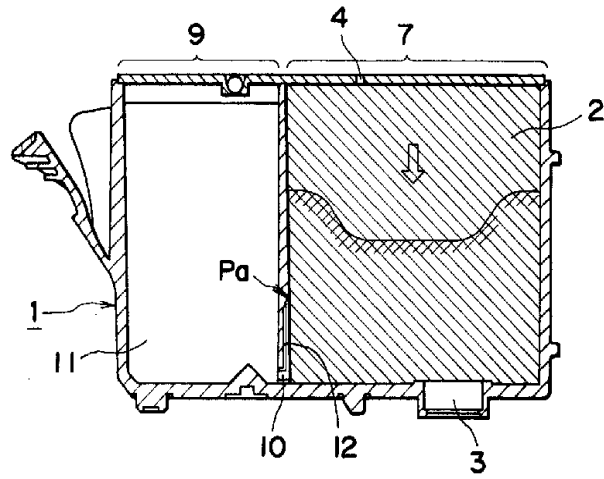


FIG. 13

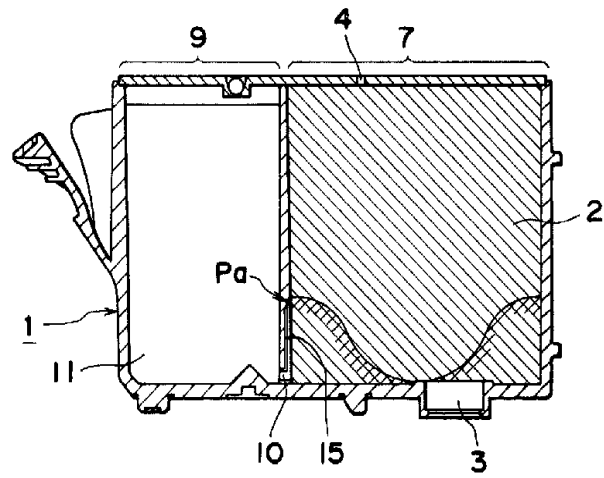


FIG. 14

FIG. 13

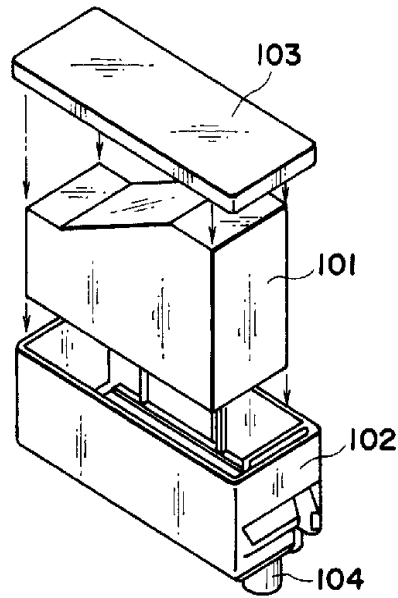


FIG. 15

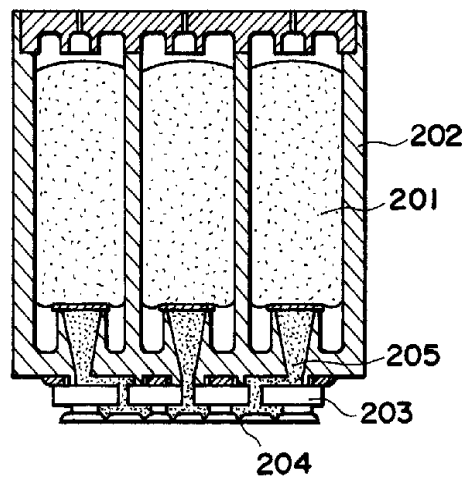


FIG. 16

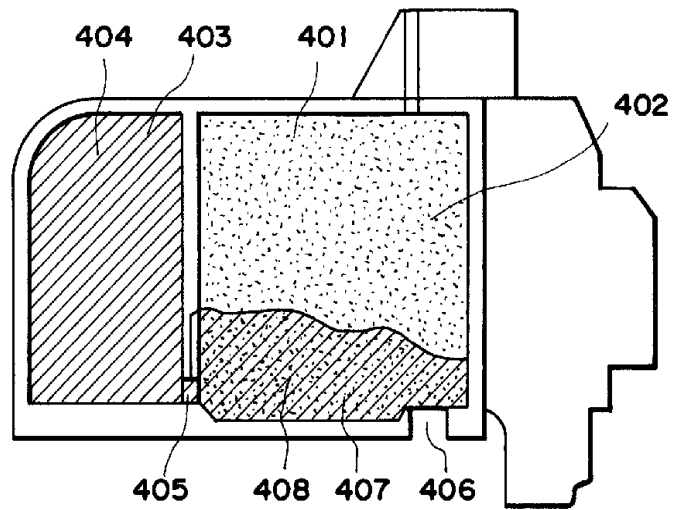


FIG. 17

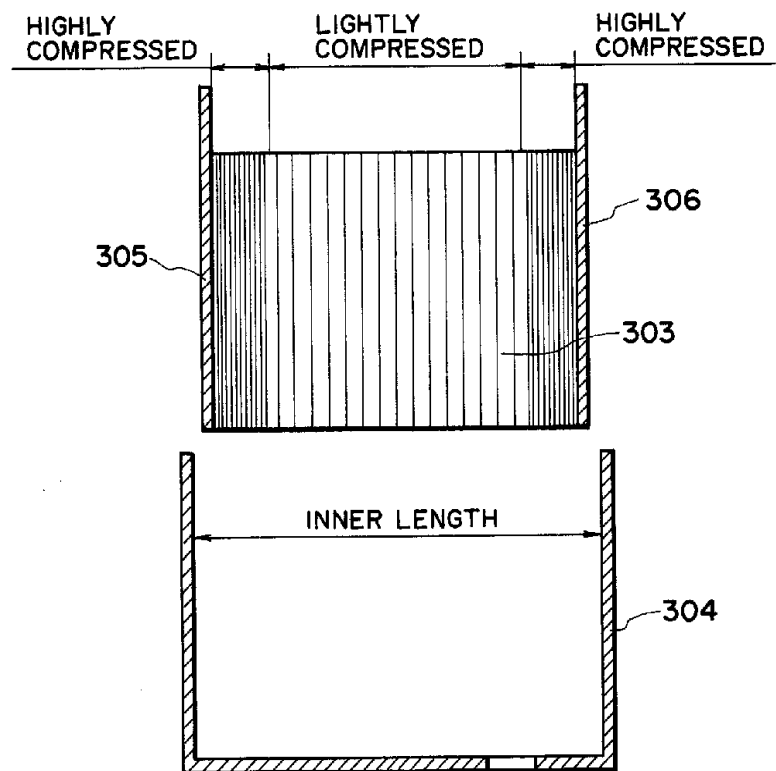


FIG. 18

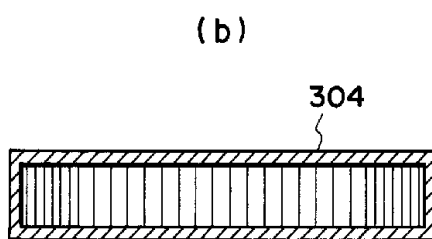
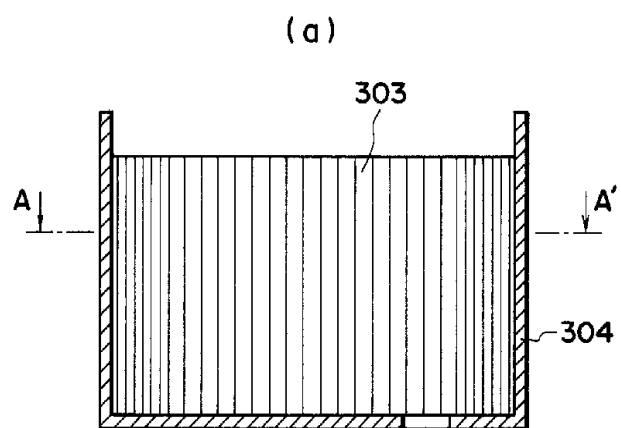


FIG. 19

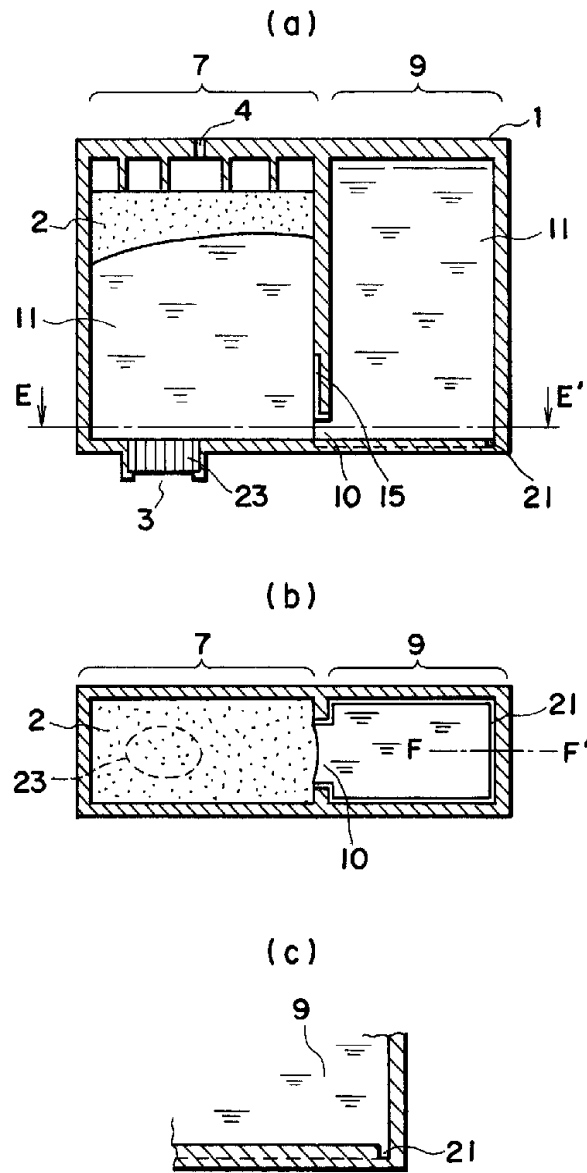


FIG. 20

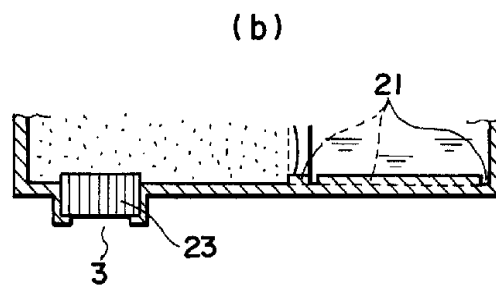
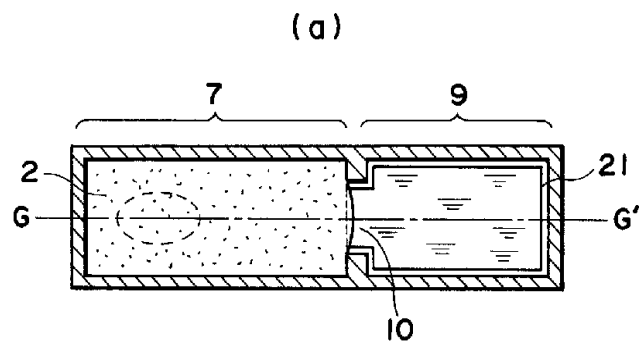
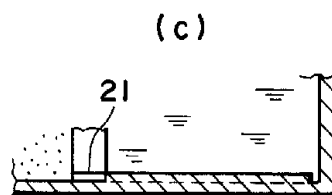
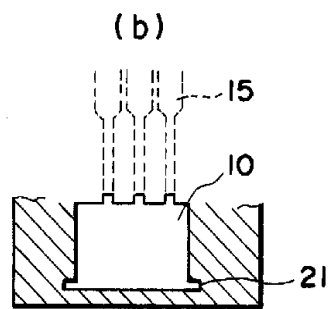
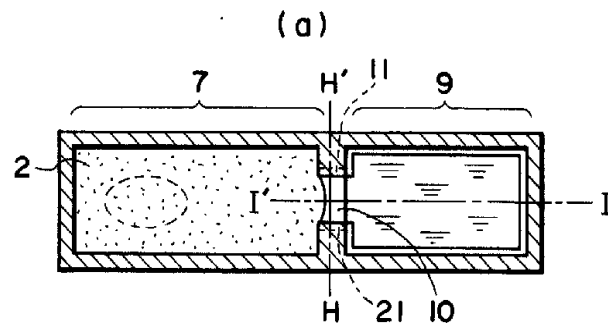


FIG. 21

**FIG. 22**

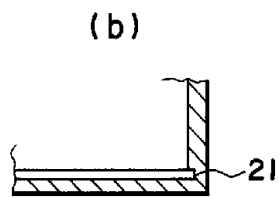
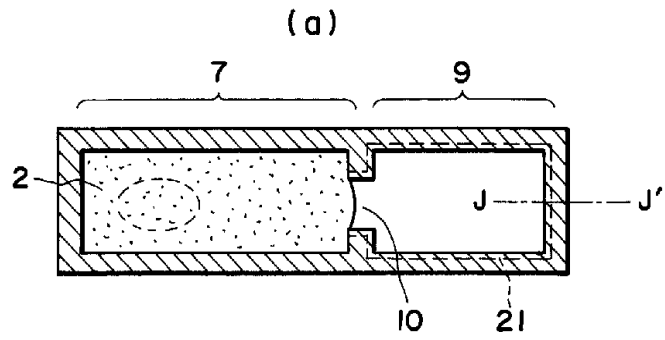


FIG. 23

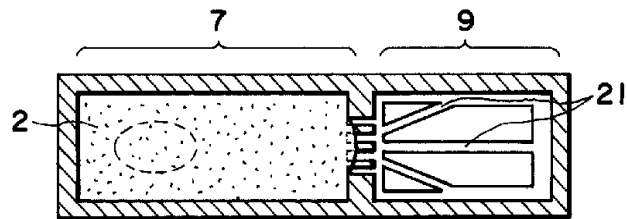


FIG. 24

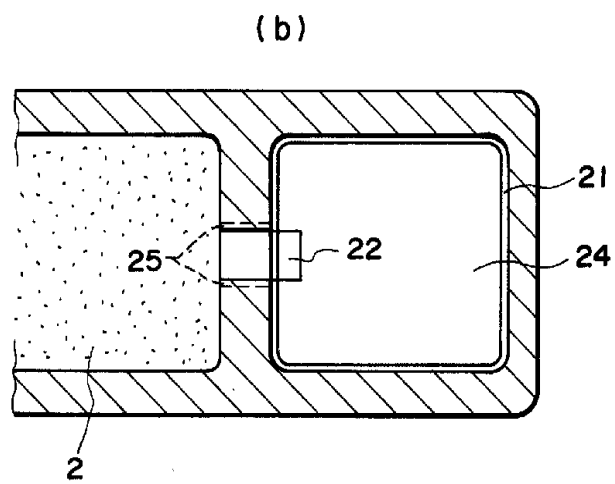
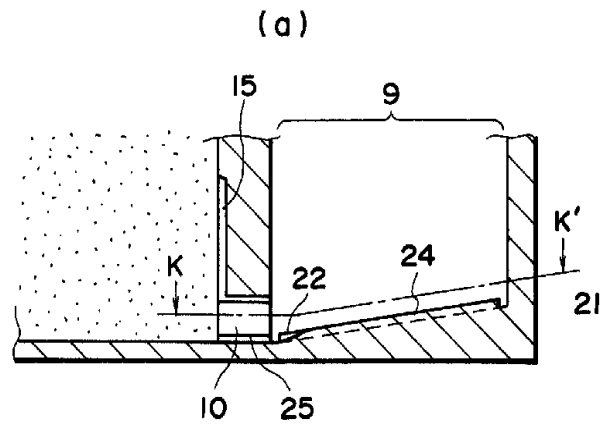


FIG. 25

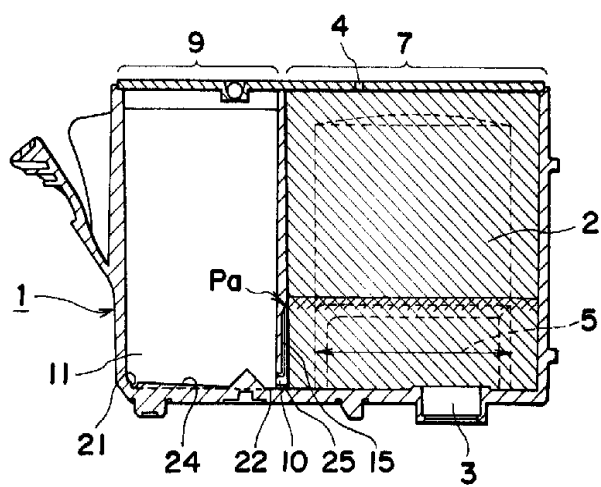


FIG. 26